Revised Environmental Assessment

Federal Street Multimodal Connector, HPP 8000 (17)

St. Albans,Vermont

Prepared for **Federal Highway Administration, Vermont Agency of Transportation, and the City of St. Albans, Vermont**

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FEDERAL STREET MULTIMODAL CONNECTOR PROJECT
ST. ALBANS, VERMONT

REVISED ENVIRONMENTAL ASSESSMENT

VTRANS PROJECT ST ALBANS HPP 8000 (17)
Submitted Pursuant to
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by the

US Department of Transportation
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and the
City of St. Albans

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Table of Contents

Table of Contents i

Project Overview 1-1

1.1 Introduction 1-1
1.2 Study Area Description 1-2
1.3 Project Background and Previous Studies 1-4
1.4 Project Purpose 1-5
1.5 Project Need 1-6

Proposed Action and Alternatives 2-1

2.1 Introduction 2-1
2.2 Development of Alternatives 2-1
2.3 Alternatives Corridors and Approaches 2-3
2.3.1 Augmenting Capacity on Main Street 2-3
2.3.2 One-Way Pairs on Main and Federal Streets 2-3
2.3.3 New Roadway Outside Federal Street Corridor 2-3
2.4 Corridor Segment Designations 2-4
2.4.1 Proposed Nason Street Connector (South Main St. to Nason St.) 2-5
2.4.2 Lemnah Drive and Allen Street (Nason St. to Stowell St.) 2-5
2.4.3 Allen / Catherine / Federal St. Segment (Stowell St. to Kingman St.) 2-6
2.4.4 Federal St. (Kingman St. to Lower Newton St.) 2-7
2.4.5 Lower Newton St. (Federal St. to North Main St.) 2-8
2.5 No-Action Alternative 2-8
2.6 Elements Common to All Action Alternatives 2-9
2.6.1 Typical Roadway Section 2-9
2.6.2 Proposed Nason Street Connector 2-10
2.6.3 Lemnah Drive 2-10
2.6.4 Federal St. 2-11
2.6.5 Lower Newton St. 2-11
2.7 Lower Welden Street at Allen Street and Lemnah Drive 2-11
2.7.1 Alternative 1: Roundabout (Proposed Action) 2-11
2.7.1.1 Advantages 2-12
2.7.1.2 Disadvantages 2-12
2.7.2 Alternative 2: Signalized 2-12
2.7.2.1 Advantages 2-13
2.7.2.2 Disadvantages 2-13
2.8 Lake Street at Catherine / Federal Streets 2-13
2.8.1 Alternative 1: Signalized with One-Way Roads (Proposed Action) 2-13
2.8.1.1 Advantages 2-14

2.8.1.2 Disadvantages 2-14
2.8.2 Alternative 2: Roundabout 2-14
2.8.2.1 Advantages 2-14
2.8.2.2 Disadvantages 2-15
2.8.3 Alternative 3: Signalized, Two-Way Catherine St. 2-15
2.8.3.1 Advantages 2-15
2.8.3.2 Disadvantages 2-15
2.8.4 Alternative 4: Elongated Roundabout 2-15
2.8.4.1 Advantages 2-16
2.8.4.2 Disadvantages 2-16
2.9 Summary of the Proposed Action 2-16

Affected Environment, Environmental Consequences, and Mitigation 3-1

3.1 Overview 3-1
3.2 Traffic 3-2
3.2.1 Existing Traffic Conditions 3-2
3.2.1.1 Methodology 3-3
3.2.2 Future Year Traffic Conditions 3-6
3.2.3 Traffic Results 3-8
3.2.3.1 2010 No Action and Proposed Action 3-8
3.2.3.2 2030 No Action and Proposed Action 3-10
3.3 Wetlands 3-18
3.3.1 Regulatory Context 3-18
3.3.2 Methodology 3-19
3.3.3 Affected Environment 3-20
3.3.4 Environmental Consequences 3-20
3.3.4.1 No Action 3-21
3.3.4.2 Proposed Action 3-21
3.3.5 Mitigation 3-22
3.4 Surface Waters 3-23
3.4.1 Regulatory Context 3-23
3.4.2 Methodology 3-24
3.4.3 Affected Environment 3-24
3.4.3.1 Stevens Brook 3-24
3.4.3.2 Rugg Brook 3-25
3.4.4 Environmental Consequences 3-25
3.4.4.1 No Action 3-25
3.4.4.2 Proposed Action 3-26
3.4.5 Mitigation 3-28
3.5 Groundwater & Drinking Water Resources 3-29
3.5.1 Regulatory Context 3-29
3.5.2 Methodology 3-29
3.5.3 Affected Environment 3-29
3.5.4 Environmental Consequences 3-29
3.5.4.1 No Action 3-29
3.5.4.2 Proposed Action 3-30
3.5.5 Mitigation 3-30
3.6 Floodplains and Floodways 3-30

3.6.1 Regulatory Context 3-30
3.6.2 Methodology 3-30
3.6.3 Affected Environment 3-31
3.6.4 Environmental Consequences 3-31
3.6.4.1 No Action 3-31
3.6.4.2 Proposed Action 3-31
3.6.5 Mitigation 3-32
3.7 Farmlands 3-32
3.7.1 Regulatory Context 3-32
3.7.2 Methodology 3-32
3.7.3 Affected Environment 3-32
3.7.4 Environmental Consequences 3-32
3.7.4.1 No Action 3-33
3.7.4.2 Proposed Action 3-33
3.7.5 Mitigation 3-33
3.8 Wildlife 3-33
3.8.1 Regulatory Context 3-33
3.8.2 Methodology 3-33
3.8.3 Affected Environment 3-34
3.8.4 Environmental Consequences 3-34
3.8.4.1 No Action 3-34
3.8.4.2 Proposed Action 3-35
3.8.5 Mitigation 3-35
3.9 Threatened and Endangered Species 3-35
3.9.1 Regulatory Context 3-35
3.9.2 Methodology 3-36
3.9.3 Affected Environment 3-36
3.9.4 Environmental Consequences 3-37
3.9.4.1 No Action 3-37
3.9.4.2 Proposed Action 3-37
3.9.5 Mitigation 3-37
3.10 Air Quality 3-37
3.10.1 Regulatory Context 3-37
3.10.2 Methodology 3-38
3.10.2.1 Pollutants of Concern 3-38
3.10.2.2 Microscale Analysis 3-39
3.10.3 Environmental Consequences 3-41
3.10.3.1 Particulate Matter 3-42
3.10.3.2 Mobile Source Air Toxics 3-43
3.10.4 Mitigation 3-44
3.11 Noise 3-45
3.11.1 Regulatory Context 3-45
3.11.2 Methodology 3-48
3.11.3 Affected Environment 3-49
3.11.4 Environmental Consequences 3-50
3.11.4.1 No Action 3-50
3.11.4.2 Proposed Action 3-50

3.11.5 Mitigation 3-52
3.12 Parks, Recreation and Conservation Land 3-53
3.12.1 Regulatory Context 3-53
3.12.2 Methodology 3-53
3.12.3 Affected Environment 3-53
3.12.4 Environmental Consequences 3-54
3.12.4.1 No Action 3-54
3.12.4.2 Proposed Action 3-54
3.12.5 Mitigation 3-54
3.13 Historic Resources 3-54
3.13.1 Regulatory Context 3-54
3.13.2 Affected Environment 3-55
3.13.2.1 Properties Formally Listed in the National Register of Historic Places 3-55
3.13.2.2 Properties Determined Eligible for the National Register of Historic Places 3-57
3.13.3 Environmental Consequences 3-60
3.13.3.1 No Action 3-60
3.13.3.2 Proposed Action 3-60
3.13.4 Mitigation 3-62
3.14 Archeological Resources 3-62
3.14.1 Regulatory Context 3-63
3.14.2 Methodology 3-63
3.14.3 Affected Environment 3-64
3.14.3.1 Archeological Sensitivity 3-65
3.14.3.2 Results of Archeological Site Identification Survey 3-65
3.14.4 Environmental Consequences 3-66
3.14.4.1 No Action 3-66
3.14.4.2 Proposed Action 3-66
3.14.5 Mitigation 3-66
3.15 Acquisitions (Right-of-Way) 3-67
3.15.1 Regulatory Context 3-67
3.15.2 Methodology 3-67
3.15.3 Affected Environment 3-67
3.15.4 Environmental Consequences 3-67
3.15.4.1 No Action 3-68
3.15.4.2 Proposed Action 3-68
3.15.5 Mitigation 3-69
3.16 Environmental Justice 3-70
3.16.1 Regulatory Context 3-70
3.16.2 Methodology 3-71
3.16.2.1 Identify Environmental Justice Populations 3-71
3.16.2.2 Determine if Impacts Disproportionately Affect Environmental Justice Populations 3-72
3.16.3 Affected Environment 3-72
3.16.3.1 Minority Populations in the Study Area 3-72
3.16.3.2 Low-Income Populations in the Study Area 3-73
3.16.4 Environmental Consequences 3-75

3.16.4.1 Effect on Minority Populations 3-76
3.16.4.2 Effect on Low-income Populations 3-76
3.16.4.3 Environmental Justice Finding 3-77
3.16.5 Mitigation 3-77
3.17 Hazardous Materials 3-78
3.17.1 Regulatory Context 3-78
3.17.2 Methodology 3-78
3.17.3 Hazardous Sites Database Results 3-80
3.17.3.1 State Listed Hazardous Waste Database Results 3-80
3.17.3.2 UST/LUST and AST/LAST Database Results 3-80
3.17.3.3 RCRA Database Results 3-81
3.17.3.4 DEC SPILLS Database Results 3-81
3.17.3.5 Summary of Results 3-81
3.17.4 Environmental Consequences 3-82
3.17.4.1 No Action 3-83
3.17.4.2 Proposed Action 3-83
3.17.5 Mitigation 3-83
3.18 Cumulative Impacts 3-84
3.18.1 Cumulative Impact Framework 3-84
3.18.2 St. Albans Downtown Streetscape Project 3-85
3.18.2.1 Project Description 3-85
3.18.2.2 Potential Resource Impacts 3-86
3.18.3 St. Albans Cooperative Creamery 3-87
3.18.3.1 Project Description 3-87
3.18.3.2 Potential Resource Impacts 3-87
3.18.4 Multimodal Transit Center 3-88
3.18.4.1 Project Description 3-88
3.18.4.2 Potential Resource Impacts 3-89
3.18.5 Conclusion 3-90
3.19 Summary of Mitigation and Project Commitments 3-91

Section 4(f) Resources 4-1

4.1 Introduction and Purpose of this Chapter 4-1
4.1.1 Definition of “Use” 4-1
4.2 Proposed Action 4-2
4.3 Description of Section 4(f) Resources 4-3
4.3.1 Public Parks, Recreation Areas, Wildlife and Waterfowl Refuges 4-3
4.3.2 Archeological Resources 4-3
4.3.3 Historic Properties 4-3
4.4 Use of Historic Properties 4-4
4.4.1 Central Vermont Railroad Headquarters Historic District 4-4
4.4.2 St. Albans Historic District 4-4
4.4.3 Willard Furniture Manufacturing Company 4-5
4.4.4 Giroux Furniture Company 4-5
4.4.5 Federal/Lake/Catherine Streets Intersection Historic District 4-6
4.4.6 163 Federal Street 4-6
4.4.7 174 Federal Street 4-6

4.5 Section 4(f) De Minimis Determination 4-6
4.6 Measures to Minimize Harm 4-7
4.7 Coordination 4-8
4.8 Section 4(f) Conclusion 4-8

Agency Coordination/Public Participation 5-1

5.1 Agency Coordination 5-1
5.2 Public Meetings 5-1
5.3 Permit Requirements 5-2

References 6-1

Appendices:

- Appendix A: Purpose and Need Statement Adopted by the St. Albans City Council
- Appendix B: Supplemental Traffic Report
- Appendix C: Request for Preliminary Jurisdictional Determination and USACE Correspondence
- Appendix D: Air Quality Analysis
- Appendix E: Noise Analysis
- Appendix F: National Register of Historic Places Eligibility Analysis
- Appendix G: Section 106 Determinations of Effect Memorandum
- Appendix H: Archeological Information
- Appendix I: Right-of-Way Acquisition Impacts
- Appendix J: Hazardous Materials
- Appendix K: Transcript of Public Hearing
- Appendix L: Response to Comments Received During Public Comment Period

Figures

Figure No.	Description
1.2-1	Project Location Map (USGS)
1.2-2	Project Location Map (Aerial)
2.3-1	Proposed Alternatives Presented in the 2005 Corridor Study
2.4-1	Corridor Segment Designations
2.6-1	Proposed Action Overview (Sheet 1 of 2)
2.6-1	Proposed Action Overview (Sheet 2 of 2)
2.6-2	Typical Roadway Sections
2.6-3	Proposed Action – Nason St. Connector
2.6-4	Proposed Action – Nason St. Connector to Lemnah Dr. Segment
2.6-5	Proposed Action – Lemnah Dr. Segment
2.6-6	Proposed Action – Federal St. Segment
2.6-7	Proposed Action – Federal St. Segment
2.6-8	Proposed Action – Federal St. Segment to Lower Newton St. Segment
2.6-9	Proposed Action – Lower Newton St. Segment
2.7-1	Lower Welden St. Alternative 1 – Proposed Action
2.7-2	Lower Welden St. Alternative 2
2.8-1	Lake St. Alternative 1 – Proposed Action
2.8-2	Lake Street Alternative 2
2.8-3	Lake Street Alternative 3
2.8-4	Lake Street Alternative 4
3.2-1	Turning Movement Count Locations w. Existing Lane Use &Traffic Control
3.2-2	2010 Weekday Peak Hour Volumes – AM Peak Hour
3.2-3	2010 Weekday Peak Hour Volumes – PM Peak Hour
3.2-4	2010 Weekday Peak Hour Volumes – No-Action AM Peak Hour
3.2-5	2010 Weekday Peak Hour Volumes – No-Action PM Peak Hour
3.2-6	2030 Weekday Peak Hour Volumes – No-Action AM Peak Hour
3.2-7	2030 Weekday Peak Hour Volumes – No-Action PM Peak Hour
3.2-8	2010 Weekday Peak Hour Volumes – Proposed Action AM Peak Hour
3.2-9	2010 Weekday Peak Hour Volumes – Proposed Action PM Peak Hour
3.2-10	2030 Weekday Peak Hour Volumes – Proposed Action AM Peak Hour
3.2-11	2030 Weekday Peak Hour Volumes – Proposed Action PM Peak Hour
3.3-1	Wetlands Map
3.4-1	Surface Waters
3.4-2	Conceptual Stormwater Management Plan
3.4-3	Conceptual Stormwater Management Plan
3.4-4	Conceptual Stormwater Management Plan
3.4-5	Conceptual Stormwater Management Plan
3.4-6	Conceptual Stormwater Management Plan
3.5-1	Groundwater and Drinking Water Resources
3.6-1	Flood Hazard Areas
3.7-1	Prime Farmland and US Census Bureau Urbanized Centers
3.8-1	Wildlife Habitat
3.9-1	Special Species Status
3.10-1	Microscale Air Quality Analysis Intersections
3.11-1	Noise Monitoring & Receptor Locations – Sheet 1 of 3
3.11-1	Noise Monitoring & Receptor Locations – Sheet 2 of 3

3.11-1 Noise Monitoring & Receptor Locations – Sheet 3 of 3
3.12-1 Public Parks and Recreation Lands
3.13-1 Historic Districts and Sites
3.14-1 Archeological Resources
3.15-1 Right-of-Way Acquisitions
3.16-1 Minority Populations
3.16-2 Low-Income Populations
3.17-1 Hazardous Materials
4.4-1 Section 4(f) Impacts – CVR Headquarters Historic District
4.4-2 Section 4(f) Impacts – CVR Headquarters Historic District
4.4-3 Section 4(f) Impacts – CVR Headquarters Historic District
4.4-4 Section 4(f) Impacts – St. Albans Historic District
4.4-5 Section 4(f) Impacts – Willard Manufacturing Company Building
4.4-6 Section 4(f) Impacts – Giroux Furniture Company Building
4.4-7 Section 4(f) Impacts – Federal/Lake/Catherine Streets Intersection Historic District
4.4-8 Section 4(f) Impacts – 163 and 174 Federal Street

Tables

Table No.	Description	Page
Table 1.5-1	Existing Roadway Widths	1-7
Table 2.8-1	Lake Street at Catherine/Federal Streets Levels of Service	2-16
Table 3.2-1	2010 Existing Signalized Intersection Analysis Summary	3-5
Table 3.2-2	2010 Existing Unsignalized Intersection Analysis Summary	3-5
Table 3.2-3	2010 and 2030 Signalized Intersection Analysis Summary	3-12
Table 3.2-4	2010 Unsignalized Intersection Analysis Summary	3-13
Table 3.2-5	2030 Unsignalized Intersection Analysis Summary	3-15
Table 3.2-6	2010 Roundabout Capacity Analysis Summary at Lower Welden Street	3-17
Table 3.2-7	2030 Roundabout Capacity Analysis Summary at Lower Welden Street	3-17
Table 3.3-1	Impacts to State and Federally Regulated Jurisdictional Wetlands	3-22
Table 3.10-1	National Ambient Air Quality Standards	3-39
Table 3.10-2	Ranking of Study Area Intersections	3-40
Table 3.10-3	Predicted Maximum CO Concentrations	3-42
Table 3.11-1	Common Outdoor and Indoor Sound Levels	3-46
Table 3.11-2	Noise Abatement Criteria (NAC) One-Hour, A-Weighted Sound Levels in Decibels (dB(A))	3-48
Table 3.11-3	Sound Levels From Traffic Noise Model, Version 2.5 - Leq dB(A)	3-51
Table 3.15-1	Anticipated ROW Impacts	3-69
Table 3.15-2	Full ROW Acquisitions	3-69
Table 3.16-1	Minority Populations in the Study Area	3-74
Table 3.16-2	Low-income Populations in the Study Area	3-75
Table 3.17-1	Results of OHM Computer Database Search	3-79
Table 3.18-1	Potential Use of & Parking at the St. Albans Multimodal Transit Center	3-89
Table 4.4-1	Impacts to the Central Vermont Railroad Headquarters Historic District	4-4
Table 4.4-2	Impacts to the St. Albans Historic District	4-5
Table 4.4-3	Impacts to the Giroux Furniture Company Building Parcel	4-5
Table 5.1-1	Agency Coordination	5-1

Table 5.2-1 Public and City Council Meetings 5-2
Table 5.3-1 Anticipated Permit Requirements and Agreements 5-3

Acronyms

AADT	Average Annual Daily Traffic
AASHTO	American Association of State Highway and Transportation Officials
ACM	Asbestos Containing Materials
ACHP	Advisory Council on Historic Preservation
ADAAG	Americans with Disabilities Act Accessibility Guidelines
ALS	Aquatic Life Use Support
ANR	Vermont Agency of Natural Resources
APE	Area of Potential Effect
ARA	Archaeological Resource Assessment
AST	Aboveground Storage Tank
ASTM	American Society for Testing and Materials
BMP	Best Management Practice
CAAA	Clean Air Act Amendments of 1990
CAP	Corrective Action Plan
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation and Liability Information System
CFR	Code of Federal Regulations
CNE	Common Noise Environments
CO	Carbon Monoxide
CORRACTS	Corrective Action Sites
CVR	Central Vermont Railroad
CWA	Clean Water Act
dB	Decibels
dB(A)	A-Weighted Decibel
DEC	Vermont Department of Environmental Conservation
DHP	Vermont Division for Historic Preservation
DHV	Design Hourly Volume
EA	Environmental Assessment
EFH	Essential Fish Habitat
EJ	Environmental Justice
EO	Elemental Occurrence
EPA	US Environmental Protection Agency
EPR	Environmental Protection Rules
EPSC	Erosion Prevention and Sediment Control
FEMA	Federal Emergency Management Agency
FGIRPC	Franklin-Grand Isle Regional Planning Commission

FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
FPPA	Farmland Protection Policy Act
GIS	Geographic Information System
HAZWOPER	Hazardous Waste Operations and Emergency Response
HCL	High Crash Location
HHS	United States Department of Health and Human Services
INDC	Individual Construction Phase Discharge Permit
INDS	Individual Operational Phase Discharge Permit
IRIS	Integrated Risk Information System
ISA	Initial Site Assessment
lbs/yr	pounds per year
LOS	Level of Service
LUST	Leaking Underground Storage Tank
LRFD	Load and Resistance Factor Design
LWCF	Land and Water Conservation Fund
MPH	Miles Per Hour
MSAT	Mobile Source Air Toxics
NAC	Noise Abatement Criteria
NAAQS	National Ambient Air Quality Standards
NATA	National Air Toxics Assessment
NECR	New England Central Railroad
NEPA	National Environmental Policy Act of 1969
NFIP	National Flood Insurance Program
NOAA	National Oceanic and Atmospheric Administration
NPL	National Priorities List
NPS	National Park Service
NRCS	Natural Resource Conservation Service
National Register	National Register of Historic Places
NRPC	Northwest Regional Planning Commission
OHM	Oil and/or Hazardous Materials
OHW	Ordinary High Water
OSHA	Occupational Safety and Health Administration
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PM	Particulate Matter
PSI	Preliminary Site Investigation
RCRA	Resource Conservation and Recovery Act
ROW	Right-Of-Way
SHPO	State Historic Preservation Office
SPA	Source Protection Area
STP	Stormwater Treatment Practice
SWPPP	Stormwater Pollution Prevention Plan
SWL	Active Solid Waste Landfill Facilities
TIGER	Transportation Investment Generating Economic Recovery
TMC	Turning Movement Counts

TMDL	Total Maximum Daily Load
TNM	Traffic Noise Model
TSD	Treatment, Storage and Disposal
UA	Urbanized Area
UC	Urban Cluster
UFP	Unanticipated Finds Plan
US	United States
USACE	United States Army Corps of Engineers
USC	United States Code
USFWS	United States Fish and Wildlife Service
USDA	United States Department of Agriculture
USDOT	United States Department of Transportation
UST	Underground Storage Tank
v/c ratio	volume to capacity ratio
VCGI	Vermont Center for Geographic Information
VTFWD	Vermont Department of Fish and Wildlife
VMT	Vehicle Miles of Travel
VPD	Vehicles Per Day
VTNNHP	Vermont Nongame and Natural Heritage Program
VSA	Vermont Statutes Annotated
VSMM	Vermont Stormwater Management Manual
VTrans	Vermont Agency of Transportation

1

Project Overview

1.1 Introduction

The Federal Street Multimodal Connector Project, proposed by the City of St. Albans, Vermont (the City), would reconstruct the Federal Street Corridor to improve its use by automobiles, trucks, pedestrians, bicyclists, and public transit. Currently, US Route 7 (North and South Main Street) bisects the City's downtown which results in heavy north-south passenger and commercial traffic and congestion and detracts from the downtown human environment. The proposed Federal Street Multimodal Connector is intended to provide a parallel urban collector route to divert through and truck traffic from the City's downtown and create an alternative access to Interstate 89 (I-89).

The Federal Street Multimodal Connector Project, also referred to as the "Project" and the "Proposed Action," encompasses the Federal Street Corridor; a series of south to north trending streets one block west of Main Street that currently function as an informal bypass for Main Street traffic through the City. These streets include Lemnah Drive, Allen Street, Market Street, Catherine Street and Federal Street; bounded on the south by Nason Street and on the north by Lower Newton Street. The Federal Street Corridor includes a mix of residential, commercial, and industrial land uses and has inherent problems in its current configuration that make it inadequate as a bypass. The proposed improvements would encompass a total of 2.1 miles of roadway, including a section of new roadway linking the corridor to the Interstate Access Road. The typical roadway section would include 11-ft. travel lanes in each direction, 4-ft. wide (min.) bicycle lanes (5-ft. wide where on-street parking is provided); 2 to 4-ft. wide grass utility strips, and 5-ft. wide sidewalks. Intersection improvements would be carried out at locations with long-standing deficiencies in roadway geometry and pedestrian management, including that at Allen / Catherine / Federal Streets and Lemnah Drive at Lower Welden Street. In addition, a new

bridge would be constructed over Stevens Brook. The Proposed Action and the consideration of alternatives are described in **Chapter 2**.

This Environmental Assessment (EA) was prepared to describe and assess the environmental consequences that may result from the Proposed Action. This document discloses the direct, indirect, and cumulative impacts that would result from the Proposed Action. Environmental, social, and cultural resources were considered, and impacts to these resources were avoided and minimized to the greatest extent practicable. Where appropriate, mitigation of impacts was incorporated into the Project.

This analysis is conducted in compliance with the requirements of the National Environmental Policy Act of 1969 (NEPA), the Council on Environmental Quality (CEQ) Regulations 40 CFR 1500 and 1508, and Federal Highway Administration (FHWA) Technical Advisory T6640.8A as well as FHWA regulations implementing NEPA as described in 23 CFR 771.

The FHWA allocated funds for the design and construction of the Federal Street Multimodal Connector through the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), a federal transportation bill enacted in 2005, including the following earmarked funds:

- $960,000 for construction of the St. Albans Intermodal Connector with I-89 for the City of St. Albans; and
- $1,500,000 for improvements to Federal Street to allow large trucks to reach destinations without going through downtown. The improvements were described as including 0.3 mile of new road construction, and 2 miles of reconstruction.

Through the course of this Project, coordination with state and federal agencies as well as the general public has occurred and will continue to occur. These coordination efforts are outlined in **Chapter 5**. Further, the Federal Street Multimodal Connector Project would require permitting by state and federal entities. See **Section 5.3** for a list of the anticipated permits that would be required prior to implementing the Proposed Action.

1.2 Study Area Description

The Project is located entirely within the City of St. Albans in the Lake Champlain Valley of northwest Vermont. The City is approximately 2.0 square miles in size and is relatively urbanized with approximately 6,900 residents.[1] The City is surrounded by the Town of St. Albans, which, while larger in terms of area (60.8 sq mi), is more

[1] Population data are from the 2010 US Census. http://quickfacts.census.gov/qfd/states/50/5061675.html, accessed March 1, 2012.

rural, with approximately 6,400 residents living among the extensive farmlands which border the adjacent Lake Champlain.

The Study Area is shown in **Figures 1.2-1** and **1.2-2**. The Study Area was developed to encompass potential direct and indirect effects to resources that may result from construction of the Project as well as to circumscribe possible design alternatives.

The Project involves five sections of existing and proposed roadway totaling approximately 2.1miles. From south to north, these sections include:

- **The "Nason Street Connector" (0.30 miles)**. The Nason Street Connector is a proposed new two-lane roadway which would extend the Interstate Access Road (St. Albans State Highway) westerly past US Route 7 across City-owned property to the intersection of Lemnah Drive and Nason Street. The proposed alignment of this connector road lies within an undeveloped area running parallel to Nason Street, which is a residential neighborhood.
- **Lemnah Drive and Allen Street from Nason Street to Stowell Street (0.42 miles)**. Lemnah Drive is situated within commercial/industrial properties including the City's municipal complex. Lemnah Drive crosses Stevens Brook on a short span bridge. Stevens Brook is a perennial stream that has been identified as having impaired water quality by the State of Vermont.[2]
- **Allen/Catherine/ Federal Streets from Stowell Street to Kingman Street (0.60 miles)**. This area is more urban in character and considered a portion of the downtown area of the City of St. Albans. A variety of businesses and multiple-family properties are the predominant land use. The headquarters of the New England Central Railroad (NECR) are located within this segment at the intersection of Federal Street with Lake Street. Catherine and Allen Streets are a mixture of high-density residential and commercial/industrial properties.
- **Federal Street from Kingman Street to Lower Newton Street (0.61 miles).** Federal Street is a mixed neighborhood of single-family homes and small businesses on the east side of the road and commercial/industrial uses on the west. These commercial properties include the St. Albans Cooperative Creamery and portions of the NECR along with associated industrial and commercial buildings.
- **Lower Newton Street from Federal Street to US Route 7 (North Main Street) (0.17 miles).** Land use within this portion of the Study Area is a mix of residential and commercial, with single-family homes and a few businesses lining the street. At the intersection of Lower Newton and Federal Streets is the industrial factory known as the Fonda Group Property, vacated in 2005 when the Solo Cup Company closed the plant. In 2006, the City purchased the plant and with financial assistance from the Environmental

[2] See **Section 3.4** of this EA for additional information on Stevens Brook.

Protection Agency (EPA) brownfield cleanup program. The buildings were demolished in 2011. Additional cleanup activities will be conducted.

An important feature located just west of the Project area is the NECR railroad system and associated headquarters, which are located at the corner of Lake Street and Federal Street. NECR is the successor to the Central Vermont Railway (CVR). The NECR line carries freight traffic and provides Amtrak passenger service to the City of St. Albans. The Amtrak station is located on Federal Street just north of Lake Street. This station is the northern terminus of the Amtrak Vermonter line that makes daily trips to Washington, DC. Freight trips across the at-grade mainline crossings of Nason Street and Lower Welden Street are currently infrequent and their timing is irregular.

1.3 Project Background and Previous Studies

Upgrades to the Federal Street Corridor have been contemplated by the City since at least the 1970s. A number of publicly-funded transportation studies have considered the corridor improvements in increasing levels of detail:

- The need and desire for a new north-south route to accommodate through traffic and to improve access to the City's industrial area was first identified in a 1974 *Economic and Transportation Study* (Environmental Consulting Group 1974).
- In 1976, a study completed by the Franklin-Grand Isle Regional Planning Commission defined the Federal Aid Transportation System in St. Albans, and identified rebuilding and extending Federal Street as a top priority (FGIRPC 1976).
- The need for improvements in the Federal Street Corridor was emphasized again in the 1991 *St. Albans Traffic Circulation Study*, which identified the extension of Federal Street as its most important recommendation.
- The 1995 *Federal Street Corridor Study* (Northwest Regional Planning Commission 1995) reviewed traffic and engineering options for the project. This study evaluates the feasibility of constructing an "arterial bypass" parallel to Main Street in the City of St. Albans. The bypass route would consist of:
    - The Nason Street Connector - A new section of roadway between the US Route 7 intersection with the Interstate Access Road and Nason Street.
    - Reconstruction of existing local roads along Lemnah Drive, Allen Street, Catherine Street, and Federal Street.
    - Construction of a "Northerly Connector" – a new section of roadway between the intersections of Federal Street with Lower Newton Street and US Route 7 with VT Route 105. While this EA refers to this

portion of the project as the "Northerly Connector," it is also known in some previous studies as the "Federal Street Extension."[3]

The 1995 study presented traffic projections and congestion analyses for 1995 and 2015 scenarios, presented concept designs and order of magnitude cost estimates for the Federal Street project, identified right-of-way impacts and acquisition needs, discussed potential land use changes, identified potential natural and cultural resource impacts, and included an implementation plan.

- A 2002 Northwest Regional Planning Commission (NRPC) study entitled *St. Albans Traffic Circulation Study* (NRPC 2002) evaluated existing and future transportation needs in the Town and City of St. Albans and recommended a list of highway, bicycle and pedestrian facilities; and multimodal facility projects as well as land use and development suggestions. The recommendations of this study included the construction of improvements to Federal Street.
- In 2005, the NRPC updated the *Federal Street Corridor Study* (NRPC 2005). This report updated the 1995 design concepts for the Federal Street connector based on the traffic volumes and VTrans policy changes (i.e., 2000 Highway Capacity Manual) that had occurred over the previous decade. This study included the Northerly Connector, but following this report, the City decided to exclude the Northerly Connector from further consideration.

1.4 Project Purpose

The Purpose and Need for the Project was developed following several transportation studies focused on St. Albans as outlined in **Section 1.3**, and in consultation with the citizens and municipal leaders of the City. The Purpose and Need was formally adopted by the St. Albans City Council on November 22, 2011 (see **Appendix A**).

The purpose of the Federal Street Multimodal Connector Project has been defined in accordance with the requirements of NEPA, CEQ Regulations 40 CFR Part 1500-1508, and FHWA's Technical Advisory T6640.8A as follows:

- To increase economic competitiveness and livability in Downtown St. Albans by providing an efficient and convenient alternate north-south route for truck and automobile traffic currently using Main Street (US Route 7);
- To resolve long-standing traffic flow problems that have impacted the competitiveness of commercial and industrial properties using "Complete Street" design principles where appropriate; and

[3] While all studies up to 2005 included the "Northerly Connector" within the definition of the Federal Street Corridor improvements, the City has since decided to exclude this portion of the project from the Proposed Action. More detail on the decision to exclude the Northerly Connector from further action is provided in **Section 2.3** of this EA.

- To harness the economic power of multiple transportation modes located in close proximity to one another in an environment containing commercial, residential, and industrial uses.

1.5 Project Need

The Project need is defined by the concerns and deficiencies identified in the following areas:

Traffic Circulation and Mobility

Main Street (US Route 7) is the primary north-south corridor through the City. Heavy truck and commuter traffic often create congestion and peak hour delay through the downtown, most notably at the intersections of Main Street (US Route 7) at Lake Street and Fairfield Street (VT Route 36, see **Figure 1.2-1**). Motor vehicle congestion has a negative impact on the livability and safety of the otherwise pedestrian-focused commercial downtown.

To avoid vehicular congestion on Main Street, motorists often seek relief by traveling on adjacent residential side streets to access the Federal Street Corridor. This is detrimental to the livability and pedestrian safety of those residential neighborhoods. The Federal Street Corridor includes a mix of residential, commercial, and industrial land uses. Its current function as an informal bypass for Main Street traffic is documented through existing vehicle turn movement counts and origin-destination studies that show that during critical peak hours, motorists that are familiar with the local street network are bypassing the aforementioned congested Main Street intersection with Lake and Fairfield Streets. However, the Federal Street Corridor has inherent problems and in its current configuration it is inadequate as a bypass. These problems are due primarily to the corridor's piecemeal construction history and are exacerbated by the informally routed overflow traffic. Problems along the Federal Street Corridor include:

- inconsistent and substandard roadway geometrics
- inconsistent pedestrian and bicycle accommodations
- poor access management
- lack of provision for turning movements at key intersections
- lack of direct connection to I-89
- generally poor state of repair

Prior studies have shown that points south of Lake Street (Catherine Street, Market Street, Allen Street, and Lemnah Drive) have fewer vehicles using the corridor as a bypass route, due to inconsistent roadway geometrics (**Table 1.5-1**). Motorists unfamiliar with the area will follow the posted routes - US Route 7, VT Route 36, VT

Route 104, VT Route 105 and VT Route 207 and are most likely to continue through the congested downtown area.

In addition to deficiencies in existing lane and shoulder widths, the Federal Street Corridor is not presently suitable as a bypass route because key intersections are not configured to best accommodate through or turn movements and do not have pedestrian crossings that meet current standards. Examples include Lake Street at Federal/Catherine Streets and Federal Street at Lower Newton Street. These intersections experience long vehicle delays and congestion due to bypass traffic. Moreover, vehicular delays are compounded because the corridor does not have direct access to I-89 via the Interstate Access Road. Therefore, vehicles must travel on residential side streets to gain access to Main Street (US Route 7), Federal Street, and the Interstate Access Road.

Table 1.5-1 Existing Roadway Widths

Roadway	Approximate Existing Width
Catherine Street	28 ft with 5 ft sidewalk
Allen Street	24 ft
Lemnah Drive	26 ft with 4 ft grass strip & 4 ft sidewalk (total 34 ft)

The need exists to manage access and through traffic along the Federal Street Corridor in ways that improve mobility and follow current roadway standards, while protecting and enhancing the economic vitality of the corridor. The need extends beyond vehicular traffic to include improved access, safety, and experience for pedestrians and cyclists. These combined actions are entirely consistent with the downtown master plan (City of St. Albans 2009).

Roadway

The Federal Street Corridor does not have a direct link to the Interstate Access Road and would require a new roadway segment from Lemnah Drive to South Main Street to make the corridor a viable alternate route to Main Street (US Route 7). This proposed roadway link would complete the corridor and provide direct access to the Amtrak station and the commercial/industrial area within the Federal Street Corridor, provide an alternate route for commuter traffic and truck deliveries, reduce vehicle delay in the downtown area and enrich the downtown experience, thus increasing the economic competitiveness of development and redevelopment opportunities in both the downtown and the Federal Street Corridor.

Bicycle and Pedestrian Accommodations

The corridor does have an extensive sidewalk system in place, however many of these facilities do not meet the Americans with Disabilities Act Accessibility Guidelines (ADAAG) for public sidewalks. Overall, the corridor does not meet Complete Street principles. Pedestrians are hindered from traveling within the corridor and crossing to businesses and residences due to the poor existing sidewalk

conditions, the lack of designated crosswalks, the long pedestrian crossing caused by the wide roadway width on Federal Street, and because the sidewalk does not continue south on Lemnah Drive. Bicyclists also are not well accommodated on Catherine Street, Allen Street, and Lemnah Drive due to the existing roadway width of 24 ft to 34 ft. The minimum standard for travel lanes, pedestrian, and bicycle accommodations is 35 ft without parking, 43 ft with parking on one side, and 51 ft with parking on both sides. In all cases, the existing roadway width does not meet these minimum standards, and safety and livability are hindered with the current configuration.

Intersections

The intersections south of the intersection of Lake Street at Federal/Catherine Street do not have enough roadway width for a tractor trailer (WB-50 or 64) to complete a turn or travel through the intersection without occupying some of the opposing lane. The right-of-way (ROW) width on Catherine Street does not have adequate width to construct a sidewalk, a bicycle lane on both sides of the street, and two travel lanes. The majority of the existing pedestrian facilities do not meet the current ADAAG for public sidewalks and in some locations sidewalks do not exist at all.

The intersection geometry of Lake Street at Federal/Catherine Streets is not well-defined due to the stop-controlled Federal Street and Catherine Street approaches being offset, the excessive extra pavement, missing sidewalk sections, and driveways that are not well defined. During peak periods, these issues cause congestion, delay, and conflicts between all modes of travel. Sight distance is obstructed by utility poles, buildings, and vehicles parked on the north side of Lake Street. Pedestrians have a long, unprotected east-west crossing through the intersection on the southerly side of Lake Street.

The unsignalized intersection of Allen Street, Catherine Street, Market Street, and Stebbins Street has excess pavement that is not well-defined due to existing geometry, driveways that are not well defined, and sight distance which is constrained by the geometry and an existing building location.

The unsignalized intersection of the Interstate Access Road and South Main Street (US Route 7) lacks pedestrian or bicycle accommodations. It resembles a highway on/off-ramp due to the roadway width and geometry, and lacks appropriate traffic control relative to the amount of vehicular traffic traveling through this intersection.

Overall, none of the intersections along this corridor meet Complete Street principles.

Bridge

The existing Lemnah Drive Bridge is posted for 12,000 pounds, which does not meet the current American Association of State Highway and Transportation Officials (AASHTO) Load and Resistance Factor Design (LRFD) Bridge Design Specification for HL-93 loading (25 ton). The required HL-93 loading would accommodate truck

traffic (i.e., WB 64) on the bridge for those vehicles traveling through the City to another destination and those trucks stopping at commercial and industrial businesses, such as the St. Albans Cooperative Creamery, Inc. and NECR. The existing roadway width across the bridge of approximately 29 ft will not accommodate pedestrian and bicycle facilities, which require a minimum width of 35 ft (two -11 ft travel lanes, two –4 ft (min) bicycle lanes and one 5-ft.sidewalk).

Lighting

The Federal Street Corridor lacks consistent and adequate street lighting. Like the roads, the street lighting has been developed in segments over time and there are gaps where adequate lighting levels are not currently achieved. Appropriate lighting levels are important for pedestrian and motorist safety and this would be based on the VTrans Roadway Light Policy (0.5 to 2.0 foot-candles) and the standards from the Illuminating Engineering Society of North America.

Drainage

Portions of the Federal Street Corridor are very flat and reportedly experience periodic minor flooding.

Access Management

Many of the existing residential and commercial driveways within the Study Area lack clear definition or do not conform to current driveway design standards. This results in inefficient parking and unmanaged vehicle and pedestrian conflict points, and it detracts from the overall character, safety and efficiency of the corridor.

Parking

The existing on-street parking is relatively informal and uncontrolled within the corridor. A portion of Federal Street is close enough to Main Street and the City parking lots that it should be considered part of the overall downtown parking scheme.

Aesthetics and Community Character

This corridor contains a mix of residential, commercial, and industrial land uses with a varied roadway width, non-standard sidewalks and pedestrian crossings, poor roadway and intersection geometry, lack of access control, and varied or missing streetscape amenities. The result is that the corridor does not have an attractive, consistent, livable identity that would attract people to it for either residential or commercial purposes.

The City completed a downtown master plan in September 2009 (City of St. Albans 2009), which describes a vision for the section of the City bordered by Main, Federal, Lake, and Kingman Streets. The plan describes how this core area should look and feel when it is completed, and any development and investment in public

infrastructure should reflect the City's vision. The plan describes enhancing the "Downtown Core Block" (Main, Kingman, Lake and Federal Streets) to create significant structured parking, an internal circulation system, infill development and redevelopment opportunities while considering and creating a dynamic pedestrian environment.

2

Proposed Action and Alternatives

2.1 Introduction

In order to satisfy the Purpose and Need for the Project, the City of St. Albans has considered a range of alternatives. In this Chapter, the assessment of alternatives is discussed, including the No-Action Alternative, alternatives discussed in a previous study from 2005, and the suite of alternatives that were purposefully developed and analyzed as part of the current Project.

2.2 Development of Alternatives

The Federal Street Purpose and Need Statement (**Chapter 1**) provides a detailed description of the City's objectives for this Project. The purpose includes implementing multimodal transportation improvements that will lead to community benefits such as increased economic competitiveness and improved livability of the downtown. The Purpose and Need also highlights a number of existing conditions that should be addressed, including traffic congestion, inadequate pedestrian / bicycle accommodations and poor access management.

In developing the Project alternatives, several factors and approaches were considered:

- **Previous Study and Design Efforts.** Previous studies were reviewed when first identifying viable alternatives for further review. As the Project definition efforts progressed, it became clear that some prior alternatives were very effective at improving transportation but were perhaps unrealistic given potential environmental impact and cost implications.
- **Local Needs.** The design alternatives were developed on a segment by segment basis to address the localized specific needs, but the overall corridor objectives were also considered.
- **Regional Needs**. The Project should support the relevant provisions in the Regional Transportation Plan, especially as it relates to the connection between land use and transportation and the inclusion of pedestrian and bicycle facilities as part of highway projects.

- **Design Standards.** Design standards and guidelines that were used to develop the alternatives included but were not limited to: the Vermont State Standards for the Design of Roads and Streets, the Manual on Uniform Traffic Control Devices (MUTCD), the Americans with Disabilities Accessibility Guidelines (ADAAG), the Vermont Pedestrian and Bicycle Facility Planning and Design Manual, AASHTO LRFD Bridge Design Specification for HL-93 loading (25 ton) for the Stevens Brook bridge, and the Highway Capacity Manual. The design year selected for the Project was 2030. This date represents the 20 years recommended by the Highway Capacity Manual for new construction or reconstruction. The year 2010 was used as the starting date as it represents the time of Project initiation and collection of baseline information, including the traffic volume data collection program (**Section 3.2.1**). The expected functional classification of the Project following completion is Urban Collector.
- **Complete Street Principles**. Use of Complete Street principles that facilitate all modes of travel was deemed important.
- **Multimodal Enhancement**. There are multiple modes of transportation within the City and the Federal Street Corridor has the opportunity to improve the connectivity between these modes. The City is central to highway access, intercity freight and passenger rail and bus service, an extensive City sidewalk and bicycle system, and it is the western terminus of the Missisquoi Valley Rail Trail. However, efficient connections between these different modes are largely missing. By improving the Federal Street Corridor as a multimodal link and through implementing effective wayfinding signage, travelers can be provided information on how and where to transfer between these modes.
- **Impacts to Environmental and Cultural Resources**. Surveys were conducted within the Study Area to identify environmental, social and cultural resources. Project engineers considered these resources in developing the design of roadway alternatives. For example, in screening a range of potential solution alternatives, the apparent cultural resource impacts were considered and some alternatives were dropped out from further consideration based on the degree of impact.
- **Cost.** The relative cost of construction was considered when evaluating alternatives within the Federal Street Corridor, although factors such as resource impacts and operations were more instrumental in comparing the alternatives.
- **Right-of-Way Impacts.** The Project engineers attempted to design improvements to the roadway facility without the need to expand the facility outside of the existing documented right-of-way in order to minimize impacts to private property.

2.3 Alternatives Corridors and Approaches

The Federal Street Corridor was first identified for transportation improvements in 1974, and subsequent studies have further evaluated the needs and potential benefits for improvements within the corridor. However, alternative corridors and approaches were evaluated during the current planning process to see if the Project's purpose and need could be satisfied by pursuing improvements that were previously not considered in detail. These alternatives are discussed below.

2.3.1 Augmenting Capacity on Main Street

The Purpose & Need for the Project includes increasing economic competitiveness and livability of the downtown by providing an alternate route for traffic. While the Main Street (Route 7) corridor does provides a parallel north-south route, adding capacity through the downtown (i.e., one additional lane in each direction) would require eliminating on-street parking, which would have a negative impact on downtown businesses and accessibility. Furthermore, such an approach would make the downtown less pedestrian friendly since crossing distances would increase with the additional lanes. For these reasons, this alternative was dismissed from further consideration.

2.3.2 One-Way Pairs on Main and Federal Streets

Establishing a one-way pair using Main Street and Federal Street, each having two lanes, was considered. This alternative was not selected for further consideration because it would necessitate making improvements to both streets as opposed to just one. Moreover, it would likely result in an overall reduction in transportation efficiency since Main Street is the highest volume route and this alternative would result in a longer and more time consuming route for one of the two directions. A one-way pair would also make access to Main Street businesses more difficult from one direction.

2.3.3 New Roadway Outside Federal Street Corridor

Constructing a new bypass road either east or west of the downtown area was evaluated. However, no such route was deemed to be feasible for the following reasons:

- The area east of Main Street is zoned entirely as residential. A new bypass road through this area would be inconsistent with zoning, would have adverse impacts on community character, and would potentially require considerable ROW acquisition. The Federal Street Corridor is the only continuous north-south corridor in the City that is almost completely zoned Business and Service-Industrial. Residential areas are also zoned farther to the west.

- The development of a corridor outside of the downtown area would not be consistent with one of the stated purposes of the Project, to "… harness the economic power of multiple transportation modes located in close proximity to one another in an environment containing commercial, residential, and industrial uses.

- In the 2005 Federal Street Corridor Study Update (NRPC 2005), the "Federal Street Connector" was identified as a component of the Western Vermont Freight Gateway Program, and "an important component of a much larger transportation corridor that is significant for Vermont and New England." Alternative corridors would lack this direct link to the railroad should freight or passenger rail service increase.

Based on the unsuitability of the preceding three alternative corridors and approaches, planning focused on improvements within the Federal Street Corridor proper. The current Project includes the same roadway segments as the 2005 Corridor Study with the exception of the northern terminus. The 2005 Study included the so-called "Northerly Connector," which extended the corridor past Lower Newton Street all the way to US Route 7 (Main Street) and VT Route 105 (NRPC 2005). The Northerly Connector was not considered as an alternative in this EA since the City has no plans to include that connection with the Project now or in the foreseeable future. This is because NECR owns property that would be crucial for the construction of the connector, a portion of the Northerly Connector would fall north of the City/Town border, and the City has purchased the former Fonda Group Property (an existing brownfield) for non-transportation redevelopment purposes.

The 2005 study evaluated four alternatives at the Lake Street / Federal Street / Catherine St. intersection. Those included two signalized intersections and two roundabouts (see **Figure 2.3-1**). All four of those alternatives would directly impact the historic Giroux Furniture Company building.

The 2005 study served as a valuable starting point for the current study, but based on direction from the City and input from the VTrans Historic Preservation Officer, the design team worked to develop additional alternatives that would provide multimodal benefits while preserving historic structures.

2.4 Corridor Segment Designations

This EA focuses on improvements within the Federal Street Corridor, consisting of the south to north streets one block west of Main Street from Nason Street in the south to Lower Newton Street in the north.

To facilitate the discussion of the design alternatives considered in this EA within the Federal Street Corridor, the Study Area has been broken into five segments as follows.

- Proposed Nason Street Connector (South Main St. to Nason St.)
- Lemnah Drive and Allen Street (Nason St. to Stowell St.)
- Allen / Catherine / Federal St. Segment (Stowell St. to Kingman St.)
- Federal St. (Kingman St. to Lower Newton St.)
- Lower Newton St. (Federal St. to North Main St.)

These segments are based on roadway geometry, intersection configurations and complexity, and existing land use. They are similar to those used in the 2005 Corridor Study Update (NRPC 2005) and thus provide some continuity with past studies. These five segments total approximately 2.1 miles and are depicted in **Figure 2.4-1** and described in detail from south to north below.

With the exception of Lemnah Drive, all of the existing Federal Street Corridor segments are classified as Urban Collectors. With the completion of this Project it is anticipated that a single Urban Collector functional classification would apply to the entire corridor.

2.4.1 Proposed Nason Street Connector (South Main St. to Nason St.)

The Nason Street Connector is a proposed 0.30-mile, two-lane roadway which would extend the Interstate Access Road westerly past US Route 7 to the intersection of Lemnah Drive and Nason Street. The proposed alignment of this connector road lies within an undeveloped area running parallel to Nason Street, which is a residential neighborhood. This connection has been envisioned in prior studies, including the 1995 Federal Street Corridor Study (NRPC 1995) and its 2005 update (NRPC 2005).

The Nason Street Connector is intended to provide ease of access to the Federal Street Corridor from I-89. This formal connection would result in reduced traffic on residential side streets such as Nason Street, which currently experience car and truck traffic volumes that impact the quality of life on those streets.

2.4.2 Lemnah Drive and Allen Street (Nason St. to Stowell St.)

This 0.43-mile segment includes Lemnah Drive from Nason Street to Lower Welden Street and Allen Street from Lower Welden Street to Stowell Street. Lemnah Drive has one lane in each direction and a posted speed limit of 25 MPH. There is no on-street parking in this segment and sidewalks are provided only on the east side of Allen Street and on a short (320 ft) stretch of Lemnah Drive along the east side of the

road running north from Nason Street. Lemnah Drive is stop-controlled at both Lower Welden Street and Nason Street, as both of these streets require free east/west movement due to the lack of available queuing space between the Federal Street Corridor and the railroad crossings. The northern terminus of Lemnah Drive meets Lower Welden Street obliquely, resulting in poor roadway geometry.

Overhead utilities run along the east side of the road. The road is partially curbed and drainage is collected in catch basins and a closed drainage system except where stormwater is allowed to run off to the surrounding land.

Lemnah Drive is a recently improved street; it was extended in 1999 to connect Nason Street to Lower Welden Street. It was extended over three acres of land previously owned by NECR and it now provides continuous access to commercial / industrial properties including the City's municipal complex. Buildings are restricted to the eastern side of the road, with undeveloped lands adjacent to the NECR railroad line lying to the west acting as open air storage yards. The only bridge in the Study Area is located within this reach, crossing over Stevens Brook about midway between Lower Welden Street and Nason Street.

2.4.3 Allen / Catherine / Federal St. Segment (Stowell St. to Kingman St.)

This 0.36 mile roadway segment begins at Stowell Street and extends north to Kingman Street. Federal Street has designated on-street parking on both sides of the street whereas Catherine Street has only a few spaces and Allen Street has no on-street parking. Sidewalks are present on the east side of Allen Street and Catherine Street. The posted speed limit is 25 MPH.

This segment is more urban in character and considered a portion of the downtown area of the City. Land use is varied in this segment. The headquarters of the NECR is located within this segment at the northwest corner of the intersection of Federal Street with Lake Street. Immediately opposite and to the south of the headquarters is the Giroux Furniture Company building, currently a furniture store. Catherine and Allen Streets are fronted by a mixture of high-density residential and commercial / industrial properties. Between Stowell Street and Stebbins Street, the west side of the road is lined with trees, separating the traveled way from a railroad siding and open air storage yard; the east side of the road is characterized by high-density residential buildings.

This road segment, located near the center of the Study Area, is characterized by the intersection of the south terminus of Federal Street with Lake Street and with Catherine Street. Lake Street has free movement east/west, whereas Catherine and Federal Street are stop-controlled. There are a number of deficiencies in this intersection, leading to conflicts between all modes of travel:

- The Federal Street and Catherine Street alignments are offset through this intersection, leading to motorist confusion, increased congestion, and increased collisions, as evidenced by the intersection being categorized as a high accident location.[4]
- Motor vehicle delay on the stop-controlled side streets can lead to impatience and risk-taking during peak periods.
- The amount of pavement in the intersection and lack of traffic controls and pavement markings or other visual keys adds to the confusion.
- Sight distances are obscured by utilities, buildings, and on street parking.
- There is a general lack of pedestrian accommodations, and the distance required to travel by foot without a sidewalk along the south side of Lake Street between Market Street and Catherine Street (front of the Giroux Furniture Company building) is overly long.

Farther south in this segment, the intersection of Allen Street, Catherine Street, Market Street and Stebbins Street is equally deficient, possessing complicated geometry and poor sightlines due to building interference. There is a significant offset in the alignment between Allen Street and Catherine Street (the principal north/south route) through this intersection. Moreover, because Market Street offers another north/south route, this can complicate the motorist decision-making process. These deficiencies, coupled with the fact that Allen Street and Catherine Street are stop-controlled, whereas Stebbins Street through Market Street has free east/west movement, contributes to the intersection of Stebbins Street with Allen Street being identified as a high-crash location in the Long Range Transportation Plan 2003-2008 (NRPC 2003).

2.4.4 Federal St. (Kingman St. to Lower Newton St.)

The Federal Street segment commences at Kingman Street and runs north for 0.61 miles along Federal Street to Lower Newton Street. This segment has one lane in each direction with informal on-street parking on both sides of the road and a sidewalk that runs along the east side of the road. The posted speed limit is 25 MPH. There are five minor side streets between Kingman Street and Lower Newton Street, two of which are one-way. Each side street is stop controlled, whereas Federal Street has free north/south movement. There are no signalized intersections within this segment.

Overhead utilities run along the east side of the road with poles between the sidewalk and road surface. The road is mostly curbed and drainage is collected in catch basins and a closed drainage system.

[4] VTrans historical crash data, 2005 to 2009, see **Appendix B**.

Land use in this segment is mostly a mix of single family residential with some high-density residential and some notable commercial and industrial land uses being present, such as the St. Albans Cooperative Creamery north and west of Hudson Street. Commercial and institutional uses such as the District Courthouse at the corner of Federal Street and Kingman Street also front onto Federal Street.

2.4.5 Lower Newton St. (Federal St. to North Main St.)

The Lower Newton Street segment (0.17 miles) represents the northern limit of the Study Area. It commences at the intersection of Lower Newton Street and Federal Street and runs east to North Main Street. This segment has one lane in each direction and a sidewalk running along the south side of the road. The posted speed limit is 25 miles per hour (MPH). The intersection with North Main Street is signalized in an offset four-way configuration. Federal Street is stop-controlled at Lower Newton Street, whereas Lower Newton Street has free east/west movement.

Overhead utilities run along the south side of the road with poles between the sidewalk and road surface. The road is curbed and drainage is collected in catch basins and a closed drainage system.

Land use is predominantly single-family residential with the notable exception being the recently demolished factory formerly known as the Fonda Group Property just north of the intersection of Federal Street and Lower Newton Street.

An inactive at-grade crossing of Lower Newton Street across the NECR line is present just west of this intersection. In its inactive status, the crossing has no adverse effect on traffic operations, though in the future it could revert to active rail use or it could be rail banked and converted to a rail trail that would connect to the Missisquoi Valley Rail Trail that currently terminates at North Main Street less than a mile north of the Federal Street Corridor.

2.5 No-Action Alternative

The No-Action Alternative would consist of maintaining the same roadway system described above. Congested traffic conditions along Main Street would continue and pedestrian connectivity between businesses on Main and Federal Streets would remain poor. Commercial and industrial activities within the corridor would remain challenged by ongoing deficiencies in vehicular circulation and lack of more direct access to I-89 via the Interstate Access Road. The No-Action Alternative would fail to realize the recommended improvements to the Federal Street Corridor as outlined in the draft *Northwest Regional Transportation Plan, 2010-2015* (NRPC 2012) under the Plan's US Route 7 Corridor Goals and Strategies.

The No-Action Alternative does not assume that all improvements in the corridor would cease. For example, the Lemnah Drive bridge and corridor-wide sidewalk

upgrades are still foreseeable improvements that the City would undertake over time. Roadway and traffic signal upgrades would also occur on Main Street (US Route 7), which parallels the Federal Street Corridor to the east.

The No-Action Alternative does not fulfill the Project's Purpose and Need but is analyzed in this EA to establish a baseline to assess the environmental impacts and mitigation measures of the Proposed Action.

2.6 Elements Common to All Action Alternatives

All action alternatives include pavement and related infrastructure reconstruction, bike and pedestrian enhancements, lighting, landscape and utility improvements. For much of the Study Area, because of constraints posed by existing buildings, the relative simplicity of the roadway segment, or the relative lack of traffic flow problems, there are no alternative actions for these improvements. For example, the Federal Street segment is a straight stretch of roadway that contains three 3-way intersections and two 4-way intersections, with no stop-control along Federal Street itself. The Lower Newton Street segment is similarly straightforward. Action alternatives were thus restricted to the two principal roadway segments with deficient intersection geometry, traffic flow problems, recognized high-crash locations, and a lack of pedestrian accommodations. These include the intersection of Lemnah Drive and Lower Welden Street, and the intersection of Lake Street with Federal and Catherine Streets, discussed in **Section 2.7** and **Section 2.8**, respectively.

Figure 2.6-1 provides an overview of the Proposed Action for the entire Study Area. The typical section for the Proposed Action is described in the following section, along with descriptions for the roadway segments for which no alternative approaches were deemed to be warranted.

2.6.1 Typical Roadway Section

To satisfy the Project's Purpose and Need with respect to realizing the potential of multiple transportation modes in close proximity to one another, the typical roadway section for the Project corridor includes the following elements (see **Figure 2.6-2**):

- 11-ft. wide travel lanes for each direction of vehicular traffic;
- 4-ft. wide (min.) bicycle lanes (5-ft. wide where on-street parking is provided);
- 2 to 4-ft. wide grass utility strips; and
- 5-ft. wide sidewalk (on both sides of the road along Federal Street, on one side elsewhere).

Depending on the age and condition of the road surface and the need to repair or relocate buried utilities, full depth reconstruction may be required. In areas where recent roadwork has been performed, road surface rehabilitation may be possible. The stormwater collection system along the entire corridor would be reconstructed during this process, with runoff collected by curbing and catch basins and routed to treatment areas. As part of making the Federal Street Corridor more attractive to businesses and residents, the City would strive to move the overhead utilities underground so they would be more reliable and unobtrusive. Street trees would be planted in the grass utility strip where appropriate, and energy efficient street lights would also be provided. Access management improvements such as driveway formalization and consolidation would be implemented, and traffic and wayfinding signage would be added and improved as appropriate.

Details on the proposed action by road segment are provided in the following sections.

2.6.2 Proposed Nason Street Connector

Improvements along the proposed Nason Street Connector would include bicycle lanes on both sides of the street, a sidewalk on the north side of the road and dedicated right turning lane at the intersection with South Main Street (see **Figures 2.6-3** and **2.6-4**). The intersection would become signalized, with the addition of left turn lanes on South Main Street. The corner curb radii within this intersection and at the northerly turn onto Lemnah Drive would allow for the easy truck access. This supports the desire to provide trucks an alternate route to US Route 7 through the City and provides a more appropriate path for trucks to access the Federal Street Corridor when compared to the residential side streets that they frequently utilize today. All pedestrian crossings within the signalized intersection would be marked and properly signed, and controlled by pedestrian signals. A privacy fence and/or dense landscape treatment would be installed to provide a visual buffer between the proposed Nason Street Connector and the backyards of the Nason Street neighborhood and the house at the southwest corner of the South Main Street intersection.

2.6.3 Lemnah Drive

Improvements along Lemnah Drive would include bicycle lanes on both sides of the street and a sidewalk on the east side of the road where existing residential, commercial, and industrial developments are present (see **Figures 2.6-4,** and **2.6-5**). A dedicated left turn lane would be added at Nason Street and all pedestrian crossings would be well signed and marked.

2.6.4 Federal St.

Improvements along Federal Street would include bicycle lanes and sidewalks on both sides of the road, left and right turning lanes at Lower Newton Street, and marked pedestrian crossings for all side streets and across Federal Street at Aldis Street and Kingman Street (see **Figures 2.6-6** through **2.6-9**). The proposed crosswalk across Federal Street at Aldis Street is important since Aldis Street leads to the St. Albans City Elementary School. To provide adequate space for the bicycle lanes, on-street parking would be phased out north of Center Street, but would be provided on both sides of the street from Center Street south.

2.6.5 Lower Newton St.

Lower Newton Street would continue to have one lane in both directions but would have dedicated left turn lanes at both the North Main Street and Federal Street intersections (see **Figure 2.6-9**). The Federal Street intersection would change from being stop-controlled on Federal Street to being signalized.

The narrow right-of-way and the need for dedicated turning lanes preclude the establishment of bike lanes along this road segment. Bicyclists would either share the road on Lower Newton Street as they do today, or they could connect to Main Street on low volume side streets such as Kingman, Center or Hoyt Streets. A sidewalk is proposed along the south side, consistent with existing conditions, with a short segment along the north side west of the Federal Street intersection. All pedestrian crossings would be marked and would include pedestrian-actuated signal heads within the intersection.

The existing outdated traffic signal system at the Lower Newton Street/North Main Street intersection would be replaced with a fully actuated system that would improve efficiency and conform to MUTCD standards. Minor geometric improvements would also be made within the intersection to better accommodate turning trucks.

2.7 Lower Welden Street at Allen Street and Lemnah Drive

Two alternatives have been developed at this intersection, which is currently unsignalized. The first alternative is a one lane roundabout and the second is a traffic signal. These alternatives are described below.

2.7.1 Alternative 1: Roundabout (Proposed Action)

Alternative 1 for the intersection of Lower Welden Street at Allen Street and Lemnah Drive is a standard one-lane roundabout (see **Figure 2.7-1**). This approach is particularly well suited to address the existing configuration, which has Lemnah

Drive approaching the intersection obliquely. Pedestrian crossings would be provided along the north, west, and south arms of the roundabout, and bike/pedestrian paths provided around the perimeter.

2.7.1.1 Advantages

Alternative 1 has a variety of advantages:

- Traffic would be able to bypass Lower Welden Street west of the intersection when a train is passing.
- Queue lengths and delay would be short compared to a traffic signal during off-peak times.
- Access to the fire station, located at the southeast corner of the intersection at 30 Lower Welden Street, would be maintained across a mountable/textured median.
- The roundabout would operate at better levels of service (LOS) than would a signalized intersection (B vs. C), which would result in less overall delay and thus improving air quality and reducing noise.
- The roundabout would include landscape amenities, improving the overall visual effect of the intersection.
- The roundabout would create fewer conflict points than would a four-way intersection (8 versus 32, respectively). Conflict points are defined as locations where vehicles could crash because their normal travel paths intersect.
- The damage incurred in roundabout crashes is generally significantly reduced compared to crashes in a signalized intersection.
- Roundabouts are known to have a traffic calming effect on through traffic.

2.7.1.2 Disadvantages

Disadvantages associated with Alternative 1 include:

- The roundabout creates impacts outside of the ROW.
- The roundabout would result in some longer pedestrian routes, although individual roadway crossing distances would be shorter.

2.7.2 Alternative 2: Signalized

This alternative includes modifications to the existing geometric configuration (see **Figure 2.7-2**). This alternative would install a fully-actuated signal with left turn only lanes provided on Lemnah Drive, Allen Street and Lower Welden Street (westbound). The traffic signal would meet MUTCD signal warrants. The

improvements would also include the addition of continuous 4-ft. (min.) wide bike lanes on both sides of the corridor.

2.7.2.1 Advantages

- This alternative would provide greater control over traffic and pedestrian movements through the intersection.
- Fire station access to the intersection requires that fire pre-emption would be installed, which gives the fire station priority within the signal phasing when leaving the station.
- This alternative would result in less impact outside of the ROW than the roundabout alternative.

2.7.2.2 Disadvantages

- Longer queue lengths would be experienced during the AM and PM peaks, and vehicles would wait longer to pass through the intersection compared to the roundabout during off-peak periods since the roundabout uses yield control on all approaches.
- This alternative would have longer pedestrian crossing distances compared to the roundabout due to the large corner radii required to accommodate turning trucks.

2.8 Lake Street at Catherine / Federal Streets

As previously described, this central unsignalized intersection is characterized by confusing north-south vehicle paths, long delays and poor bike and pedestrian connections. The four solution alternatives that follow are compared in terms of satisfying the Purpose and Need and relative advantages and disadvantages. The resulting levels of service for each of the four alternatives are provided in **Table 2.8-1** at the end of this section.

2.8.1 Alternative 1: Signalized with One-Way Roads (Proposed Action)

Under this alternative the intersection would be signalized with Catherine Street 1-way northbound and Market Street one-way southbound. This alternative includes modifications to the existing intersection geometric configuration. Improvements include the addition of continuous 5-ft. wide bike lanes on both sides of the road, fully-actuated signal with left turn only lanes provided on Federal Street and Catherine Street, right turn only lane on Federal Street and a right turn slip lane from Lake Street to Market Street (**Figure 2.8-1**).

2.8.1.1 Advantages

- This alternative would reduce vehicle conflicts by adding traffic signal controls and by improving the intersection geometry.
- The traffic would be assigned right-of-way for each conflicting movement. Conflicting streams of traffic would share the same intersection by means of time separation.
- The pedestrian facilities are better defined and the routes would be shorter than the existing condition.
- This alternative would provide a desirable centralized location for a municipal parking lot, or a mix of parking, green space or buildings.
- The Giroux Furniture Company building would be preserved.

2.8.1.2 Disadvantages

- This alternative would create impacts outside of the ROW. Market Street is currently owned by the railroad.
- Longer average queue lengths would be experienced during the AM and PM peaks, and vehicles would wait longer to traverse through the intersection compared to the roundabout during off-peak times.
- This would result in more overall delay than the other alternatives.

2.8.2 Alternative 2: Roundabout

This alternative is a standard one-lane roundabout with four approaches (**Figure 2.8-2**).

2.8.2.1 Advantages

- Shorter queue lengths and delay compared to traffic signal alternatives during off-peak times.
- The roundabout would operate at better level of service than the traffic signal during the AM peak. (B vs. D)
- This would result in less overall delay, thus improving air quality and reducing noise.
- It would provide landscape opportunities, and change the overall visual impact of the intersection.
- Fewer conflict points then the four-way intersection (32 conflict points for a 4-way intersection versus 8 in a roundabout)
- The damage incurred in roundabout crash is expected to be significantly reduced compared to a standard intersection.

- Roundabouts are known to have a traffic calming effect on through traffic.

2.8.2.2 Disadvantages

- Substantial ROW impacts would be required to accommodate the roundabout and its approaches.
- This alternative would have longer overall pedestrian through routes and it would not accommodate on-road bicyclists well.
- The historic Giroux Furniture Company building would be demolished.

2.8.3 Alternative 3: Signalized, Two-Way Catherine St.

This alternative includes modifications to the existing geometric configuration. This alternative would install a fully-actuated signal with left turn only lanes provided on Catherine Street and Lake Street eastbound and right turn only lane on Federal Street. The improvements include the addition of continuous 4-ft. (min.) wide bike lanes on both sides of the road (**Figure 2.8-3**).

2.8.3.1 Advantages

- This alternative would have an exclusive pedestrian phase which provides pedestrian access to the crosswalks with fewer vehicular conflicts.
- The traffic would be assigned right-of-way for each conflicting movement of traffic by permitting conflicting streams of traffic to share the same intersection by means of time separation.
- This alternative would be expected to operate at the best level of service of the four build alternatives, and the north-south approaches would be aligned better than the other alternatives.

2.8.3.2 Disadvantages

- This alternative would require substantial ROW impacts.
- Motorists would wait longer to traverse through the intersection compared to the roundabout during off-peak times.
- The historic Giroux Furniture Company building would be demolished.

2.8.4 Alternative 4: Elongated Roundabout

This alternative is a modified one-lane roundabout (**Figure 2.8-4**).

2.8.4.1 Advantages

- This alternative would result in less overall delay compared to the Proposed Action (traffic signal), thus improving air quality and reducing noise.
- It would provide landscape opportunities, and change the overall visual impact of the intersection.
- The historic Giroux Furniture Company building would remain.

2.8.4.2 Disadvantages

- Excessive paved areas would be required in some areas to accommodate the design vehicle (i.e. a heavy truck), which can result in motorist confusion. For example, in this alternative, it may appear to motorists that a left turn can be made from Federal Street south to Lake Street east, but this is not a permitted movement.
- This alternative would create impacts outside of the ROW.
- The alternative would result in some longer pedestrian routes and it would not accommodate on-road bicyclists well.
- This non-standard roundabout geometry does not include sufficient vehicle deflection in the east-west direction to slow vehicle speeds. This, combined with the potentially confusing expansive paved areas, introduces safety concerns when compared to the standard roundabout and signalized alternatives.

Table 2.8-1 Lake Street at Catherine/Federal Streets Levels of Service

Alternative	2030 A.M. Peak	2030 P.M. Peak
1. Signalized w/ One-Way Roads (Proposed Action)	E	E
2. Roundabout	B	F
3. Signalized (Two-way Catherine St.)	C	D
4. Elongated Roundabout	B	F

2.9 Summary of the Proposed Action

The Proposed Action includes the typical roadway and pedestrian improvements that would be constructed throughout the Federal Street Corridor as described in **Section 2.6**. These include two 11-ft. wide travel lanes, two 4-ft. wide (min.) sidewalks, 2 to 4-ft. wide grass utility strips, and a 5-ft. sidewalk (on both sides of the road along Federal Street, on one side elsewhere). It also includes the intersection improvements at the Lower Welden Street /Allen Street /Lemnah Drive and the Lake Street /Catherine Street /Federal Street intersections as described below.

The Proposed Action at the **Lower Welden Street / Allen Street / Lemnah Drive** intersection is the roundabout alternative (Alternative 1). This alternative would process traffic better than the signalized alternative (Alternative 2).

The Proposed Action at the **Lake Street / Catherine Street / Federal Street** intersection is the signalized intersection with Catherine Street and Market Street converted to one-way legs of the intersection (Alternative 1). This alternative improves multimodal mobility while minimizing impacts to cultural resources. The Proposed Action continues the typical on-road bike lanes through the intersection, and it provides signalized pedestrian crossings within the intersection.

The Proposed Action was endorsed by the attendees of a public alternatives presentation meeting on November 29, 2011. It was subsequently endorsed by the St. Albans City Council on December 28, 2011.

3

Affected Environment, Environmental Consequences, and Mitigation

3.1 Overview

This Chapter describes the existing environmental conditions within the Study Area (see **Figure 1.2-1**) potentially affected by the Proposed Action. This Chapter also describes the environmental consequences of the No Action Alternative and the Proposed Action.

The FHWA defines direct, indirect and cumulative impacts based on CEQ regulations (40 CFR § 1500 – 1508). Direct impacts are caused by an action and occur at the same time and place as the action. Indirect effects are caused by the action and are later in time or farther removed in distance, but still reasonably foreseeable. Cumulative impacts are the impacts on the environment that result from the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions.[5]

For purposes of this discussion, impacts resulting from both the roadway improvements (i.e., direct impacts), and temporary construction impacts, as well as the indirect effects were evaluated and are presented for each resource. Cumulative impacts are addressed collectively near the end of this Chapter in **Section 3.18**.

The environmental impact categories considered in this EA include:

- Traffic (Section 3.2);
- Wetlands (Section 3.3);
- Surface Waters (Section 3.4);
- Groundwater and Drinking Water Resources (Section 3.5);

[5] FHWA *Interim Guidance: Questions and Answers Regarding Indirect and Cumulative Impact Considerations in the NEPA Process*, January 31, 2003.

- Floodplains and Floodways (Section 3.6);
- Farmlands (Section 3.7);
- Wildlife (Section 3.8);
- Threatened and Endangered Species (Section 3.9);
- Air Quality (Section 3.10);
- Noise (Section 3.11);
- Parks, Recreation, and Conservation Land (Section 3.12);
- Historic Resources (Section 3.13);
- Archeological Resources (Section 3.14);
- Acquisitions (Right-of-Way) (Section 3.15)
- Environmental Justice (Section 3.16);
- Hazardous Materials (Section 3.17); and
- Cumulative Impacts (Section 3.18).

For each resource category, the Proposed Action is compared to the No Action Alternative to determine its effect. Where impacts could not be avoided, mitigation measures were considered for the Proposed Action and are described where included.

3.2 Traffic

This section summarizes the existing (2010) and future year (2030) traffic operating conditions within the study area. The effects of the No-Action Alternative and the Proposed Action on the transportation system within the defined study area are examined and summarized. A traffic study has also been prepared to provide additional information and detail regarding the traffic evaluation and technical supporting documentation. It is included as **Appendix B**.

3.2.1 Existing Traffic Conditions

Section 2.4 previously described the existing physical characteristics and geometric conditions of the primary corridors and intersections accommodating traffic demands within the Study Area. This section describes the quantity and quality of traffic flow at key locations under the existing conditions for the critical weekday morning and evening commuter peak hours.

A traffic volume data collection program was conducted on Wednesday, September 1, 2010 and Thursday, September 2, 2010 to establish the existing traffic flow characteristics within the Study Area. The traffic volume counts consisted of weekday morning (7:00 – 9:00 AM) and weekday evening (4:00 – 6:00 PM) manual

turning movement counts (TMC) at seven study area intersections. The TMC locations, which are listed below, are also depicted in **Figure 3.2-1** along with the current lane use configuration and traffic control at each intersection. In addition, **Figure 3.2-1** also shows lane use and traffic control at other key intersections within the Study Area to graphically display a more complete roadway system with regard to the physical conditions. The seven TMC locations are:

- US Route 7 (North Main Street) at Upper Newton Street/Lower Newton Street
- Lower Newton Street at Federal Street
- Lake Street at Federal Street/Catherine Street
- Catherine Street/Allen Street at Stebbins Street/Market Street
- Lower Welden Street at Allen Street/Lemnah Drive
- Nason Street at Lemnah Drive
- US Route 7 (South Main Street) at the Interstate Access Road

3.2.1.1 Methodology

As recommended in a Policy on Geometric Design of Highways and Streets[6] and by VTrans, the appropriate volume condition is the 30th highest hour of the year. Given the economic considerations involved in the planning and design of street facilities, this design criterion is selected since the 30th highest hourly volume generally reflects a "point of diminishing return" in that a substantial increase in design requirements would accommodate only very few periods of higher traffic volumes. In fact, VTrans guidelines for traffic studies require that traffic volumes be adjusted to reflect the 30th highest hour, commonly referred to as Design Hourly Volume (DHV).

Historical traffic data obtained from the nearby VTrans Permanent Count Station P6F029 located on US Route 7, 1.7 miles north of I-89 in Georgia indicates that the 30th highest hour typically occurs during the weekday evening peak hour and is approximately nine percent higher than the September weekday evening peak hour volume. Therefore, the September 2010 weekday evening peak hour traffic volumes collected to establish the existing conditions were increased by nine percent to represent the DHV (the 30th highest hour). To determine an appropriate adjustment factor for the weekday morning peak hour condition, the weekday morning volume from Station P6F029 closest to the 30th highest hour was selected for comparison purposes; this weekday morning volume was also found to be nine percent higher than the September weekday morning peak hour volume. Therefore the September 2010 weekday morning peak hour volumes were also adjusted by nine percent. The

[6] American Association of State Highway and Transportation Officials, A Policy on Geometric Design of Highways and Streets 6th Edition, Washington, D.C., 2011.

adjusted 2010 weekday morning and evening peak hour traffic volume networks are presented in **Figures 3.2-2** through **3.2-3**.

Measuring the volume of traffic at Study Area intersections indicates the importance of these intersections to the regional transportation system, but does not necessarily give an indication of the quality of traffic flow. To assess the quality of traffic flow, capacity analyses were conducted to determine how well these intersections serve the traffic demands placed upon them. The traffic performance measures and the evaluation criteria used in the operational analyses are based on the methodology presented in the 2000 Highway Capacity Manual.[7] Proposed roundabouts were evaluated using two analysis tools: SIDRA Intersections[8] software and the National Cooperative Highway Research Program (NCHRP) 572 Roundabout Analysis worksheet.

A primary result of capacity analysis is the assignment of level of service (LOS), which is a qualitative measure describing operational conditions at a given facility under specific traffic volume demands. Level of service is dependent on the effect of a number of factors including roadway geometrics, travel speed, delay, freedom to maneuver, and safety. Six levels of service are defined[9] ranging in letter designation from LOS A to LOS F, with LOS A representing the best operating condition and LOS F representing the worst. LOS C describes a stable flow condition and is considered desirable for design hour traffic flow. LOS D is generally considered acceptable where the cost and impacts of making improvements to provide LOS C are deemed unjustifiable. LOS E reflects a condition of longer delay and poor operations, but can be considered acceptable in a congested area, particularly in cases where traffic control devices and other measures are taken to improve safety or in cases where physical/geometric improvements are not considered feasible because they would result in environmental, historical, or property impacts.

The results of the 2010 existing condition operational analyses, which were conducted for the signalized and unsignalized intersections within the study area, are summarized in **Tables 3.2-1 and 3.2-2**, respectively.

The analysis results indicate that the signalized intersection of US Route 7 at Upper Newton Street/Lower Newton Street operates at LOS B with an average delay of 10 seconds and a volume to capacity ratio (v/c) of 0.39 under the 2010 existing weekday morning peak hour volume. Operations are more congested under the 2010 existing weekday evening peak hour volume where the intersection operates at LOS E with an average delay of 61 seconds and a v/c of 0.82.

▼

[7] 2000 Highway Capacity Manual, Special Report 209, Transportation Research Board, Washington, D.C.
[8] SIDRA Intersection Software, Version 5.1, Akcelik and Associates Pty Ltd.
[9] 2000 Highway Capacity Manual, Special Report 209, Transportation Research Board, Washington, D.C.

Table 3.2-1 2010 Existing Signalized Intersection Analysis Summary

	Weekday AM Peak Hour			Weekday PM Peak Hour		
Intersection	**v/c[1]**	**Delay[2]**	**LOS[3]**	**v/c[1]**	**Delay[2]**	**LOS[3]**
US Route 7 at Upper Newton St/Lower Newton St	0.39	10	B	0.82	61	E

Notes:
1 Volume to capacity ratio
2 Average delay per vehicle expressed in seconds
3 Level of service

Table 3.2-2 2010 Existing Unsignalized Intersection Analysis Summary

	Weekday AM Peak Hour			Weekday PM Peak Hour		
Intersection	**Demand[1]**	**Delay[2]**	**LOS[3]**	**Demand[1]**	**Delay[2]**	**LOS[3]**
US Route 7 at Interstate Access Road						
WB lefts from Interstate Access Road	45	72	F	50	99	F
SB lefts from US Route 7	355	12	B	300	12	B
US Route 7 at Nason St						
EB movements from Nason St	145	85	F	110	132	F
NB lefts from US Route 7	90	10	A	125	10	B
Nason St at Lemnah Dr						
EB movements from Nason St	165	4	A	140	5	A
SB lefts from Lemnah Dr	50	13	B	50	13	B
SB rights from Lemnah Dr	65	9	A	65	10	A
Lower Welden St at Allen St/Lemnah Dr						
EB movements from Lower Welden St	210	1	A	265	1	A
WB movements from Lower Welden St	190	1	A	220	1	A
NB movements from Lemnah Dr	135	19	C	135	19	C
SB movements from Allen St	145	18	C	100	18	C
Stebbins St at Catherine St						
EB movements from Stebbins St	100	3	A	80	5	A
SB movements from Catherine St	100	12	B	75	10	B
Lake St at Federal St/Catherine St						
EB movements from Lake St	335	4	A	620	6	A
WB movements from Lake St	250	1	A	315	1	A
NB movements from Catherine St	65	29	D	100	287	F
SB left/through from Federal St	325	20	C	355	433	F
Lower Newton St at Federal St						
WB movements from Lower Newton St	370	6	A	400	6	A
NB movements from Federal St	135	17	C	425	37	F

1 Demand expressed in vehicles per hour
2 Average delay per vehicle expressed in seconds
3 Level of service

As shown in **Table 3.2-2**, two of the six unsignalized study area intersections experience long delays and operate at poor levels of service during the 2010 weekday morning and evening peak hours. Vehicles exiting from the unsignalized approaches of the Interstate Access Road and Nason Street to US Route 7 (Main Street) operate at

LOS F during both peak hours. Vehicles exiting from the unsignalized approaches of Catherine Street and Federal Street at the Lake Street intersection operate at LOS F during the evening peak hour.

The Federal Street unsignalized approach to the Lower Newton Street intersection also experiences moderate delays under the 2010 weekday evening peak hour volume, operating at LOS F; under the weekday morning peak hour volume the approach operates at LOS C. The remaining three unsignalized study area intersections of Catherine Street/Allen Street at Stebbins Street/Market Street, Lower Welden Street at Allen Street/Lemnah Drive, and Nason Street at Lemnah Drive operate with minor delays (LOS C or better) during the 2010 weekday morning and evening peak hours.

3.2.2 Future Year Traffic Conditions

In 2005, the Northwest Regional Planning Commission, the City of St. Albans, and the Town of St. Albans retained the services of Resource Systems Group, Inc. to conduct the Federal Street Corridor Study – 2005 Update (NRPC 2005). As part of that study, a travel demand model was developed to assist with estimating future traffic volumes. The model was created using Paramics software, a micro-simulation program that estimates the behavior of individual vehicles traveling on the transportation network. The model area encompasses the roadway network surrounded by: US Route 7 from St. Albans State Highway to Upper and Lower Newton Streets, Lower Newton Street from US Route 7 to Federal Street; and Federal, Catherine, Market, Allen, and Lemnah Streets. The 2005 Paramics model was updated and recalibrated to reflect the 2010 existing weekday morning and evening peak hours for the purposes of forecasting traffic volumes and evaluating the effect of the Proposed Action on the peak hour volumes within the Study Area.

With a base year condition of 2010 for the existing conditions, a twenty year forecast to 2030 was selected for analysis purposes. The 2030 No-Action traffic volumes were estimated by reviewing recent traffic growth trends recorded along US Route 7 by the VTrans Permanent Count Station P6F029 located in Georgia, combined with the 2009 to 2029 twenty year growth factor by regression analysis group prepared by VTrans for this same segment of US Route 7. Both the historical data and projected growth factors target an average annual growth rate of 0.5 percent per year. To provide a slightly conservative estimate of 2030 traffic volumes, an average annual growth rate of 1.0 percent was used to forecast for the first ten years of growth (2010 to 2020) and an average annual rate of 0.5 percent was used to forecast for the second ten years (2020 to 2030).

It is important to note that the Paramics traffic model includes more US Route 7 intersections than the two intersections (Upper Newton Street/Lower Newton Street and the Interstate Access Road where TMC data were collected. These intersections include the US Route 7 signalized intersections of Lower Welden Street, Fairfield

Street, Lake Street, and JC Penney Plaza and the unsignalized intersection of Nason Street. Volumes at these locations were estimated based on output provided from the 2005 Paramics model update and have been included in the network development for informational purposes. The 2010 and 2030 No-Action traffic volume networks for the weekday morning and evening peak hour conditions are shown in **Figures 3.2-4** through **3.2-7.**

Once calibrated to the existing condition, the Paramics model was modified to reflect the Build condition of the Proposed Action and to assess the sensitivity of traffic volume assignments under improvement options for the intersections of Lake Street at Federal Street/Catherine Street and Lower Welden Street at Lemnah Drive/Allen Street. The raw Paramics model output volumes were adjusted through the typical traffic modeling pivoting procedure to forecast a Build condition for the Proposed Action. The 2010 and 2030 Proposed Action (Build) traffic volume networks for the weekday morning and evening peak hour conditions are shown in **Figures 3.2-8** through **3.2-11.**

Signal warrants were evaluated for several of the intersections along the Federal Street Corridor using the Peak Hour Volume Warrant criteria outlined in MUTCD[10]. These included the intersections of US Route 7 at the Interstate Access Road, Federal Street with Lower Welden Street, Federal Street with Lake Street, and Federal Street with Lower Newton Street. The peak hour warrants indicated that the intersections of US Route 7 at the Interstate Access Road, Lake Street at Federal Street/Catherine Street, and Lower Newton Street at Federal Street would meet peak hour traffic signal warrants. However, the intersection of Federal Street at Lower Welden Street did not meet the peak hour warrant for a traffic signal.

It is important to note that there were a series of assumptions made and incorporated into the traffic operational analysis with regard to the Proposed Action that adversely affect intersection capacity results, but promote overall safer operations for pedestrians and motorists. Items, such as modified signal timing and phasing plans to accommodate split phases where vehicle conflicts can be eliminated or the incorporation of an exclusive pedestrian phase, reduce the overall capacity of an intersection and increase delay, but improve the overall quality of travel. These improvements cannot be measured, but can be described qualitatively. Specific locations where such items were included in the traffic operational analysis include:

- US Route 7 at Upper Newton Street/Lower Newton Street would have new signal controller equipment with coordination and an exclusive pedestrian phase. In addition, it is assumed that the Upper and Lower Newton Street approaches would be split-phased due to the alignment of the intersection (presently running concurrently).

[10] Manual on Uniform Traffic Control Devices, US Department of Transportation, Federal Highway Administration, 2009.

- US Route 7 at the Interstate Access Road would be a new four-way signalized intersection with the Nason Street Connector. This intersection is assumed to have an actuated exclusive pedestrian phase. In addition, the Interstate Access Road and Nason Street Connector approaches are assumed to be split phased to minimize vehicle conflicts.
- Lake Street at Federal Street/Catherine Street would be signalized with coordination to Main Street and an actuated exclusive pedestrian phase. In addition, the Lake Street approaches are assumed to be split-phased to avoid vehicle conflicts through this elongated intersection. Split phasing is less efficient than other possible intersection configurations at this location, but necessary to avoid roadway widening and resulting property impacts.
- Federal Street at Lower Newton Street would be signalized with coordination and an actuated exclusive pedestrian phase.
- The existing signalized Main Street (US Route 7) intersections with JC Penney plaza, Lake Street, Fairfield Street, and Upper Welden Street/Lower Welden Street would operate under coordination with exclusive pedestrian phases. Although these intersections are not part of the Study Area, they were included in the analysis to provide a system-wide review of the Project's impacts (i.e., the entire Main Street corridor is assumed to operate under coordination and the signal vehicle detection improvements currently in progress for the intersections of Main Street with Lake Street and Fairfield Street are assumed to be complete).

3.2.3 Traffic Results

This section describes the results of the traffic operational analyses that were conducted for the 2010 No Action (No Build) and Proposed Action (Build), and the 2030 No Action and Proposed Action conditions.

3.2.3.1 2010 No Action and Proposed Action

The signalized intersection of US Route 7 with Upper Newton Street and Lower Newton Street is expected to degrade slightly from LOS B to LOS C under the 2010 weekday morning peak hour as a result of the Project, and remain unchanged at LOS E under the weekday evening peak hour. As discussed in **Section 3.2.2**, the incorporation of an actuated exclusive pedestrian phase and split phasing of the off-set side streets under the Proposed Action partially contribute toward the minor change in operations. This intersection was classified as a High Crash Location (HCL) by VTrans based on crash data for the five-year period from 2005 to 2009. Based on historical crash trends at this location, the inclusion of the split phasing and the exclusive pedestrian phase could potentially reduce crashes at this location by 33 percent (addressing 8 out of 24 crashes over the five-year period).

The remaining existing signalized intersections along the US Route 7 corridor (JC Penney, Lake Street, Fairfield Street, and Upper Welden Street/Lower Welden Street) are projected to operate at the same or slightly better levels of service with the Proposed Action; all intersections operating at LOS C or better. It is important to point out that the peak hour traffic volume reductions along the US Route 7 corridor associated with the Proposed Action result in an average reduction of 30 percent in the v/c ratios at these existing signalized intersections due to diversion to Federal Street corridor.

The three new signalized intersections included under the Proposed Action include US Route 7 at the Interstate Access Road /Nason Street Connector, Lake Street at Federal Street/Catherine Street, and Lower Newton Street at Federal Street. All three of these locations experience LOS F operations under their existing unsignalized 2010 No-Action condition. Under the 2010 Proposed Action condition, the signalized intersection of US Route 7 at Interstate Access Road (SASH)/Nason Street Connector is projected to operate at LOS D during the weekday morning and evening peak hours and the intersection of Lower Newton Street at Federal Street is projected to operate at LOS C.

The proposed signalized intersection of Lake Street at Federal Street/Catherine Street is projected to operate at LOS D under the weekday morning peak hour and LOS E under the weekday evening peak hour. As discussed in the previous section, the longer delays incurred at this location are a result of selecting a Proposed Action that is focused on minimizing property impacts and providing exclusive pedestrian phases. In addition, it should be pointed out that the anticipated LOS E signalized intersection delay (69 seconds) is substantially lower than the LOS F unsignalized delay (287 seconds from Catherine Street and 433 seconds from Federal Street). As discussed previously, LOS E can be considered acceptable in congested areas where safety improvements are made that reduce potential intersection capacity and/or at locations where physical improvements are not considered due to the environmental, historical, or property impacts they may cause.

The proposed single lane roundabout at the intersection of Lower Welden Street and Allen Street/Lemnah Drive is projected to operate at LOS A under the 2010 Proposed Action condition during the weekday morning and evening peak hours.

The unsignalized intersection of US Route 7 and Nason Street substantially improves under the Proposed Action with vehicle delays exiting from Nason Street improving from LOS F to LOS B during both peak hours. This improvement is a result of motorists using the new signalized intersection at US Route 7 and the Nason Street Connector, resulting in lower through and turning movement volumes at the unsignalized Nason Street intersection. The remaining unsignalized intersections of Nason Street at Lemnah Drive and Stebbins Street at Catherine Street are projected to operate at acceptable levels of service under the 2010 No-Action and Proposed Action conditions during both peak hours.

3.2.3.2 2030 No Action and Proposed Action

Similar to the 2010 condition, the intersection of US Route 7 with Upper Newton Street and Lower Newton Street would be expected to degrade slightly from LOS B to LOS C during the 2030 weekday morning peak hour as a result of the Project. Traffic operations during the 2030 weekday evening peak hour would be expected to degrade from LOS E (67 seconds delay) to LOS F (91 seconds delay) during the weekday evening peak hour as a result of the Project in the year 2022. As discussed in the previous section, these changes in level of service are partially attributed to incorporating safety measures and pedestrian phases into the intersection's operations. The other factor contributing toward the change in level of service is the diversion of traffic from US Route 7 northbound under the Proposed Action condition utilizing Federal Street and Lower Newton Street to access US Route 7 north of the Study Area.

The other existing signalized intersections along the US Route 7 corridor (JC Penney, Lake Street, Fairfield Street, and Upper Welden Street/Lower Welden Street) are projected to operate at the same or slightly better levels of service with the Proposed Action (LOS C or better). Similar to the 2010 condition, these intersections would experience substantially lower v/c ratios (10 to 30% lower) as a result of the Proposed Action.

Two of the three proposed signalized intersections, US Route 7 at Interstate Access Road/Nason Street Connector and Lake Street at Federal Street/Catherine Street, are projected to operate at LOS E under the 2030 Proposed Action condition during the peak hours. As discussed previously, the longer delays at these locations are attributed to the incorporation of safety measures and exclusive pedestrian phases. It should be noted that the v/c ratios at these locations indicate that the intersections are operating well below capacity for the 2030 forecast year. The third proposed signalized intersection of Lower Newton Street and Federal Street is projected to operate at LOS C.

The proposed single lane roundabout at the intersection of Lower Welden Street and Allen Street/Lemnah Drive is projected to operate at LOS B or better under the 2030 Proposed Action condition during the weekday morning and evening peak hours.

Similar to the 2010 conditions, traffic operations at the US Route 7 and Nason Street unsignalized intersection are projected to substantially improve in 2030 with the Proposed Action. Delays for vehicles exiting from Nason Street are projected to decrease from 340 seconds and 526 seconds (LOS F) during the morning and evening peak hours respectively, to only 17 seconds (LOS C) with the Proposed Action.

All traffic movements at the unsignalized intersection of Stebbins Street at Catherine Street are projected to operate at LOS B or better under the 2030 No Action and Proposed Action conditions. At the unsignalized intersection of Nason Street at

Lemnah Drive, left-turns exiting from the stop-controlled side street approaches (Nason Street) are projected to operate at LOS E during the 2030 peak hours with moderate delays (40 seconds or less). Left-turns from Lemnah Drive are projected to operate at LOS A.

The results of the 2010 and 2030 signalized and unsignalized intersection analyses are summarized in **Tables 3.2-3** through **3.2-7**.

Table 3.2-3 2010 and 2030 Signalized Intersection Analysis Summary

		2010 No Action			2010 Proposed Action			2030 No Action			2030 Proposed Action		
Intersection	**Period**	**v/c[1]**	**Delay[2]**	**LOS[3]**	**v/c[1]**	**Delay[2]**	**LOS[3]**	**v/c[1]**	**Delay[2]**	**LOS[3]**	**v/c[1]**	**Delay[2]**	**LOS[3]**
US Route 7 @ Nason St Connector & St Albans State Highway	AM Peak	Unsignalized			0.66	44	D	Unsignalized			0.81	68	E
	PM Peak				0.71	48	D				0.87	73	E
Lake St @ Federal St & Catherine St	AM Peak	Unsignalized			0.61	43	D	Unsignalized			0.67	59	E
	PM Peak				0.80	69	E				0.90	65	E
Lower Newton St @ Federal St	AM Peak	Unsignalized			0.31	33	C	Unsignalized			0.34	31	C
	PM Peak				0.45	29	C				0.53	26	C
US Route 7 @ Upper Newton Street & Lower Newton Street	AM Peak	0.39	10	B	0.41	20	C	0.45	11	B	0.48	20	C
	PM Peak	0.82	61	E	0.85	58	E	0.91	67	E	1.11	91	F
US Route 7 @ JC Penney Plaza	AM Peak	0.42	11	B	0.32	7	A	0.47	11	B	0.38	7	A
	PM Peak	0.66	16	B	0.51	11	B	0.72	16	B	0.59	8	A
US Route 7 @ Lake Street	AM Peak	0.51	24	C	0.36	21	C	0.60	25	C	0.46	21	C
	PM Peak	0.79	28	C	0.57	29	C	0.92	33	C	0.70	25	C
US Route 7 @ Fairfield Street	AM Peak	0.46	26	C	0.33	22	C	0.54	29	C	0.38	25	C
	PM Peak	0.64	33	C	0.47	24	C	0.75	51	D	0.59	29	C
US Route 7 @ Upper Welden Street & Lower Welden Street	AM Peak	0.59	20	C	0.34	15	B	0.71	25	C	0.50	26	C
	PM Peak	0.83	31	C	0.55	24	C	0.98	49	D	0.69	16	B

1 Volume to capacity ratio
2 Average delay per vehicle expressed in seconds
3 Intersection level of service

Table 3.2-4 2010 Unsignalized Intersection Analysis Summary

	2010 No Action						2010 Proposed Action					
	Weekday AM			Weekday PM			Weekday AM			Weekday PM		
Intersection	Demand[1]	Delay[2]	LOS[3]	Demand[1]	Delay[2]	LOS[3]	Demand[1]	Delay[2]	LOS[3]	Demand[1]	Delay[2]	LOS[3]
US Route 7 at St Albans State Highway												
WB lefts from St Albans State Highway	45	72	F	50	99	F	Signalized			Signalized		
SB lefts from US Route 7	355	12	B	300	12	B						
US Route 7 at Nason St												
EB movements from Nason St	145	85	F	110	132	F	60	14	B	30	14	B
NB lefts from US Route 7	90	10	A	125	10	B	45	8	A	35	8	A
Nason St at Lemnah Dr												
EB movements from Nason St	165	4	A	140	5	A	-	-	-	-	-	-
EB lefts from Nason St	-	-	-	-	-	-	95	27	D	95	28	D
EB through/right from Nason St	-	-	-	-	-	-	70	13	B	50	13	B
WB movements from Nason St	-	-	-	-	-	-	55	19	C	40	21	C
NB lefts from Nason St Connector	-	-	-	-	-	-	45	8	A	70	9	A
SB lefts from Lemnah Dr	50	13	B	50	13	B	5	8	A	5	8	A
SB rights from Lemnah Dr	65	9	A	65	10	A	-	-	-	-	-	-
Lower Welden St at Allen St/Lemnah Dr												
EB movements from Lower Welden St	210	1	A	265	1	A	See Roundabout Table 3.2-6			See Roundabout Table 3.2-6		
WB movements from Lower Welden St	190	1	A	220	1	A						
NB movements from Lemnah Dr	135	19	C	135	19	C						
SB movements from Allen St	145	18	C	100	18	C						

1 Demand expressed in vehicles per hour
2 Average delay per vehicle expressed in seconds
3 Level of service

Table 3.2-4 (cont.) 2010 Unsignalized Intersection Analysis Summary

	2010 No Action						2010 Proposed Action					
	Weekday AM			Weekday PM			Weekday AM			Weekday PM		
Intersection	Demand[1]	Delay[2]	LOS[3]	Demand[1]	Delay[2]	LOS[3]	Demand[1]	Delay[2]	LOS[3]	Demand[1]	Delay[2]	LOS[3]
Stebbins St at Catherine St												
EB movements from Stebbins St	100	3	A	80	5	A	45	11	B	35	12	B
WB movements from Stebbins St	-	-	-	-	-	-	25	10	A	50	11	B
SB movements from Catherine St	100	12	B	75	10	B	-	-	-	-	-	-
Lake St at Federal St/Catherine St												
EB movements from Lake St	335	4	A	620	6	A	Signalized			Signalized		
WB movements from Lake St	250	1	A	315	1	A						
NB movements from Catherine St	65	29	D	100	287	F						
SB left/through from Federal St	325	20	C	355	433	F						
Lower Newton St at Federal St												
WB movements from Lower Newton St	370	6	A	400	6	A	Signalized			Signalized		
NB movements from Federal St	135	17	C	425	37	F						

1 Demand expressed in vehicles per hour
2 Average delay per vehicle expressed in seconds
3 Level of service

Table 3.2-5 2030 Unsignalized Intersection Analysis Summary

	2030 No Action						2030 Proposed Action					
	Weekday AM			Weekday PM			Weekday AM			Weekday PM		
Intersection	Demand[1]	Delay[2]	LOS[3]	Demand[1]	Delay[2]	LOS[3]	Demand[1]	Delay[2]	LOS[3]	Demand[1]	Delay[2]	LOS[3]
US Route 7 at St Albans State Highway												
WB lefts from SASH	55	~	F	60	~	F	Signalized			Signalized		
SB lefts from US Route 7	415	15	B	345	15	B						
US Route 7 at Nason St												
EB movements from Nason St	180	340	F	135	526	F	70	17	C	45	17	C
NB lefts from US Route 7	110	10	A	140	11	B	55	9	A	35	9	A
Nason St at Lemnah Dr												
EB movements from Nason St	195	4	A	170	5	A	-	-	-	-	-	-
EB lefts from Nason St	-	-	-	-	-	-	110	32	D	115	40	E
EB through/right from Nason St	-	-	-	-	-	-	85	14	B	50	14	B
WB movements from Nason St	-	-	-	-	-	-	75	37	E	50	24	C
NB lefts from Nason St Connector	-	-	-	-	-	-	45	9	A	45	9	A
SB lefts from Lemnah Dr	70	15	C	60	14	B	5	8	A	5	8	A
SB rights from Lemnah Dr	80	10	A	80	10	A	-	-	-	-	-	-
Lower Welden St at Allen St/Lemnah Dr												
EB movements from Lower Welden St	260	1	A	315	1	A	See Roundabout Table 3.2-7			See Roundabout Table 3.2-7		
WB movements from Lower Welden St	235	1	A	255	1	A						
NB movements from Lemnah Dr	165	33	D	155	28	D						
SB movements from Allen St	180	29	D	120	24	C						

1 Demand expressed in vehicles per hour
2 Average delay per vehicle expressed in seconds
3 Level of service

Table 3.2-5 (cont.) 2030 Unsignalized Intersection Analysis Summary

	2030 No Action						2030 Proposed Action					
	Weekday AM			Weekday PM			Weekday AM			Weekday PM		
Intersection	Demand[1]	Delay[2]	LOS[3]	Demand[1]	Delay[2]	LOS[3]	Demand[1]	Delay[2]	LOS[3]	Demand[1]	Delay[2]	LOS[3]
Stebbins St at Catherine St												
EB movements from Stebbins St	130	4	A	90	5	A	50	11	B	35	12	B
WB movements from Stebbins St	-	-	-	-	-	-	45	10	A	80	11	B
SB movements from Catherine St	125	13	B	90	11	B	-	-	-	-	-	-
Lake St at Federal St/Catherine St												
EB movements from Lake St	390	5	A	720	7	A						
WB movements from Lake St	315	1	A	375	1	A	Signalized			Signalized		
NB movements from Catherine St	90	97	F	120	~	F						
SB left/through from Federal St	385	39	E	95	~	F						
Lower Newton St at Federal St												
WB movements from Lower Newton St	415	6	A	470	6	A	Signalized			Signalized		
NB movements from Federal St	155	22	C	500	115	F						

1 Demand expressed in vehicles per hour
2 Average delay per vehicle expressed in seconds
3 Level of service

Table 3.2-6 2010 Roundabout Capacity Analysis Summary at Lower Welden Street

		2010 Proposed Action[1]		2010 Proposed Action[2]		2010 Proposed Action[3]		2010 Proposed Action[4]	
Period	**Approach**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**
AM Peak	NB	9	A	10	A	7	A	6	A
	WB	8	A	7	A	6	A	6	A
	SB	8	A	7	A	6	A	6	A
	EB	14	B	6	A	5	A	6	A
	Overall	10	A					6	A
PM Peak	NB	9	A	8	A	6	A	6	A
	WB	8	A	8	A	6	A	7	A
	SB	9	A	9	A	7	A	8	A
	EB	12	B	7	A	5	A	6	A
	Overall	10	A					7	A

1 Output from Sidra Intersection with HCM 2010 methodology
2 Output from Sidra Intersection with HCM 2000 lower methodology
3 Output from Sidra Intersection with HCM 2000 higher methodology
4 NCHRP spreadsheet

Table 3.2-7 2030 Roundabout Capacity Analysis Summary at Lower Welden Street

		2030 Proposed Action[1]		2030 Proposed Action[2]		2030 Proposed Action[3]		2030 Proposed Action[4]	
Period	**Approach**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**
AM Peak	NB	11	B	11	B	8	A	7	A
	WB	8	A	8	A	6	A	7	A
	SB	9	*A*	8	A	6	A	6	A
	EB	17	C	6	A	5	A	7	A
	Overall	12	B					7	A
PM Peak	NB	10	A	9	A	7	A	7	A
	WB	10	B	10	B	8	A	7	A
	SB	10	A	9	A	7	A	9	A
	EB	18	C	7	A	5	A	8	A
	Overall	12	B					8	A

1 Output from Sidra Intersection with HCM 2010 methodology
2 Output from Sidra Intersection with HCM 2000 lower methodology
3 Output from Sidra Intersection with HCM 2000 higher methodology
4 NCHRP spreadsheet

3.3 Wetlands

This section describes the existing wetlands within the Study Area, including jurisdictional and non-jurisdictional wetlands. The environmental consequences of the No-Action and Proposed Action to wetlands are described and avoidance, minimization, and mitigation of impacts to wetlands are discussed. Technical studies supporting this section are provided in **Appendix C.**

3.3.1 Regulatory Context

In Vermont, wetlands comprise less than five percent of the state's surface area. Although they only represent a small portion of overall land cover, wetlands provide important functions, benefiting wildlife, water quality, and the public.

Wetlands are defined as areas inundated by surface water or groundwater sufficient to support a prevalence of vegetative or aquatic life that requires saturated soil conditions. Wetlands generally include swamps, marshes, bogs, sloughs, potholes, wet meadows, river overflows, mud flats, and natural ponds. Areas that do not support hydrophytic vegetation because of lack of hydrology, and perennial streams, reservoirs, and deep lakes, are not considered wetlands and are defined as waterways or waterbodies.

The US Army Corps of Engineers (USACE) has jurisdictional authority over Waters of the United States, which include wetlands and waterways, through Section 404 of the Clean Water Act (CWA). Waters of the US include all waters which are used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide; all interstate waters, including interstate wetlands; and all other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, natural ponds, or drainage ditches leading to regulated Waters of the United States, the degradation or destruction of which could affect interstate or foreign commerce.[11]

Wetlands are federally protected under the Clean Water Act and activities resulting in impacts to them require a permit from the USACE under Section 404 of that same Act. Executive Order 11990 also requires that federal actions which affect wetlands must include a "finding that there are no practicable alternatives" to the proposed construction in wetlands and the Proposed Action includes all practical means to reduce harm to wetlands.

[11] Wetlands Regulatory Program, United States Army Corps of Engineers, (http://www.usace.army.mil/Missions/CivilWorks/RegulatoryProgramandPermits.aspx),

The State of Vermont regulates its wetland resources under the Vermont Wetland Rules (VT Code R. 12 004 056), adopted under the authority of the Water Resources Panel of the Vermont Natural Resources Board (the Panel) pursuant to 10 V.S.A § 6025(d)(5). This statute limits the applicability of these rules to those wetlands which are so significant that they merit protection in this program. Significance is determined by an evaluation of the functions provided by the wetland as described in Section 5 of the Vermont Wetland Rules. As defined in the Vermont Wetland Rules, wetlands are classified as one of three classes: Class I wetlands have been deemed by the Panel to be exceptional or irreplaceable and merit the highest level of protection; Class II wetlands are those wetlands that are protected by the state based on an assessment of functions and values per the Vermont Wetland Rules; and Class III wetlands are not regulated under the Vermont Wetland Rules but are subject to federal jurisdiction.

Pursuant to Section 9 of the Vermont Wetland Rules, proposed activities or uses within Class I or Class II wetlands, or their buffers, other than allowed activities as described in Section 6 of the Vermont Wetland Rules require a permit from the Vermont Department of Environmental Conservation (DEC) Wetlands Section or a conditional use determination or order issued by the Secretary.

3.3.2 Methodology

Wetlands within the Study Area were delineated during field investigations conducted in October 2010. Wetland delineations were made pursuant to the Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region Routine Determination Method (USACE 2009). Wetlands were identified in the field with flagging.

Field notes were taken to record information such as wetland classifications, general characteristics, potential functions and values of the wetland, and any unique qualities observed during the site assessment, along with other considerations relevant to support site findings. Wetlands were classified in accordance with the Classification of Wetlands and Deepwater Habitats of the United Stated (Cowardin, et al. 1979). Wetland functions and values were evaluated based on the field notes and observations according to the USACE Highway Methodology Workbook: Supplement (USACE 1999). Wetland features were located in the field using a total station, with the survey being conducted simultaneously with the existing conditions survey of the corridor.

USACE Wetland Determination Data Forms were completed for onsite wetlands in which data were collected along the wetland and upland boundary. These forms contain detailed information on the vegetation, soils, and hydrology of each wetland as well as the non-jurisdictional upland areas. Wetland Function and Value Evaluation Forms were completed for each wetland delineated. The USACE Wetland Determination Forms and the Highway Methodology Function and Value Forms are

provided in **Appendix C**. The final page of **Appendix C** includes correspondence with the USACE confirming the delineated wetland boundary.

3.3.3 Affected Environment

Two wetlands were identified as a result of the wetland field investigations within the limits of the Study Area. The locations of these wetland resources are displayed on **Figure 3.3-1**. No vernal pools were identified within the Study Area (see also **Section 3.8.3**). The following summary of delineated wetlands details wetland characteristics relative to the criteria for classifying significant wetlands under the Vermont Wetland Rules, as well as the wetland classifications under these rules, as confirmed by the DEC Wetlands Section on December 18, 2012. Stevens Brook, a perennial stream and jurisdictional water of the United States is located in the Lemnah Drive segment of the Study Area, is discussed in **Section 3.4**.

Wetland B

Wetland B is approximately 32,200 sq ft in size within the limits of the Study Area and is located in the southern portion of the Study Area to the south of Nason Street (see **Figure 3.3-1**). It is characterized as a palustrine, forested wetland characterized by an overstory of broad-leaved deciduous trees and by seasonal flooding (Code: PFO1C). Wetland B has been very disturbed by past land use, including dumping. The presence of the trash within Wetland B reduces its functional benefit for protection of surface water quality and/or ground water quality as it has the potential to be a problem source. Wetland B does have the potential to store floodwaters, trap sediments and remove them from surface waters.

Under the Vermont Wetland Rules, Wetland B would require a 50-ft. buffer setback from non-exempt activities.

Wetland F

Wetland F is approximately 2,930 sq ft in size and is located adjacent to Wetland B in the southern portion of the Study Area to the south of Nason Street (see **Figure 3.3-1**). Wetland F is characterized by a palustrine forested vegetative community. Under the Vermont Wetland Rules, Wetland F does not appear to be jurisdictional and would not have a regulated buffer.

3.3.4 Environmental Consequences

Potential impacts to wetland areas were evaluated by overlaying the proposed limits of grading for the Proposed Action on mapping of existing conditions. The overlay plans were then assessed to determine direct and indirect effects on wetlands within the Study Area. The resulting estimates of wetland impacts are reported in **Table 3.3-1.**

3.3.4.1 No Action

In the absence of the Proposed Action, the area surrounding Nason Street may be developed incrementally by the various landowners on which the wetland resources are located. The City of St. Albans owns a narrow corridor purchased as part of the planning for this Project that includes portions of the delineated wetlands by Nason Street. In the absence of this Project for the No-Action Alternative, there would not be any direct impact to wetlands on the property owned by the City of St. Albans.

3.3.4.2 Proposed Action

The Proposed Action includes the construction of the Nason Street Connector; a new section of roadway to connect Lemnah Drive to the Interstate Access Road. The new section of roadway would run parallel to Nason Street in the vicinity of the two delineated wetlands within the Study Area. Direct impacts to the wetlands were avoided and minimized to the extent practicable given other highway design constraints, including site distance, grade and the ability to create a safe intersection at the intersection of the proposed Nason Street Connector and Lemnah Drive.

Table 3.3-1 summarizes both the direct and the indirect impacts to Wetland B. Total direct impacts are limited to Wetland B and amount to 1,506 sq ft. Additionally, there would be 360 sq ft of temporary impact, corresponding to a 5-ft. construction buffer beyond the proposed limits of disturbance. Given the disturbed nature of Wetland B, the overall impact on the functions and values of Wetland B would be minimal.

In addition to wetland impacts, the Project would impact the 50-ft. buffer zone. Total impacts to the buffer of Wetland B for construction of the Nason Street Connector would be 13,193 sq ft, of which 1,605 sq ft would be temporary during construction. At present, preliminary calculations for the sizing of the proposed stormwater best management practice (BMP) located at the southwest corner of the intersection of Nason Street and Lemnah Drive indicate the BMP can be placed entirely within the ROW and outside the buffer for Wetland B (see **Section 3.4.4.2**, **Figure 3.4-2**). However, constructing the outfall from the BMP to the wetland would result in approximately 1,420 sq ft of permanent wetland buffer impact and approximately 25 sq ft of permanent wetland impact at the location of the pipe outfall. Wetland and buffer impacts are summarized in **Table 3.3-1.**

Other indirect impacts to Wetland B would be primarily temporary during construction when there would be the potential for sediments to be carried from the construction area into the wetland during precipitation events. There would be no direct or indirect impacts to Wetland F.

Table 3.3-1 Impacts to State and Federally Regulated Jurisdictional Wetlands

Type of Impact	Area of Impact (sf)
Permanent Wetland Impact	1,531
Temporary Wetland Impact	360
Subtotal Wetland Impacts (Direct)	**1,891**
Class II Wetland Buffer – Permanent	13,008
Class II Wetland Buffer – Temporary	1,605
Subtotal Wetland Buffer Impacts (Indirect)	**14,613**
Total Impacts	**16,504**

3.3.5 Mitigation

While the degree of direct impact to jurisdictional wetlands of the United States as a result of the construction of the Proposed Action would be classified as a non-reporting Category 1 activity by the Department of the Army Vermont General Permit for the State of Vermont (i.e., activities have less than 3,000 sq ft of impact), correspondence received from the USACE during the public comment period for this EA indicated that these impacts, coupled with those required for proposed activities in Stevens Brook (see **Section 3.4.4.2**) would require a Department of the Army Permit. Specifically, the activity would be classified as a Category 2 activity and require authorization under the Vermont General Permit. Coordination with the USACE to confirm this categorization would be carried out once design plans are advanced.

A Vermont State Individual Wetland Permit would be required from the DEC Wetland Section for impacts to the Class II Wetland B and its 50-ft. buffer. Compensation for unavoidable wetland impacts is not anticipated to be required by State permitting, provided that the Project's permit application illustrates how the plans for the proposed road alignment have considered alternative approaches to avoid wetlands and propose the least impact feasible while satisfying the Project's stated Purpose and Need.

The Project would also be required to adhere to Required Best Management Practices (BMPs) set forth in Section V.A. of the Vermont Wetland General Permit. BMPs may include:

1. the use of swamp mats in the location of proposed temporary wetland impacts to avoid rutting the wetland soil;
2. minimizing the clearing of vegetation in the wetland buffer;
3. installation of erosion prevention and sediment control (EPSC) measures in accordance with the provisions of an approved EPSC plan, including the use of a wetland seed mix consisting of native species to revegetate areas of temporary wetland impact; and
4. restoring any disturbed wetland or wetland buffer area.

In addition to these BMPs, the potential for temporary impacts to wetlands during construction would be minimized by the requirement for a Construction Phase Stormwater Discharge Permit and the associated development of an EPSC plan (see **Section 3.4.5** for additional information on stormwater permitting). Should a Category 2 General Permit be required, a Section 401 Water Quality Certification from the DEC would be required, the conditions of which would further safeguard water quality at the impact site.

3.4 Surface Waters

This section discusses surface waters that exist within the vicinity of the Study Area, and includes a discussion of potential surface water impacts associated with the No-Action Alternative and the Proposed Action.

3.4.1 Regulatory Context

In Vermont, protection of streams and rivers is under the jurisdiction of the USACE and the DEC. The DEC has jurisdiction over stream alterations and placement of stream crossing structures pursuant to 10 V.S.A. Chapter 41. The DEC River Management Section issues permits for authorized activities. Stormwater discharge (both operational and construction phase) is regulated by the Stormwater Section of the DEC Watershed Management Division. The Stormwater Section administers the following Environmental Protection Rules (EPR):

- EPR Chapter 18, Stormwater Management Rule for the management of stormwater runoff in waters that are not principally impaired by stormwater runoff, adopted July 4, 2005; and
- EPR Chapter 22, Stormwater Management Rule for Stormwater-Impaired Waters, adopted June 6 2006 (Impaired Rule).

Stormwater runoff, especially in urbanized areas, can contribute to the pollutant loading and hydrologic impacts to surface waters. Impervious surfaces such as pavement, concrete and roof tops restrict recharge of rainfall and snowmelt to underlying soils, and can affect both receiving water quantity and quality. Runoff may contain contaminants such as sediment, heavy metals, nutrients, oils and grease, which if untreated can discharge into surface waters or groundwater. When stormwater infiltrates, pollution materials are mainly adsorbed by the soil. Impervious surfaces do not allow this adsorption to take place, so contaminant concentrations remain high as discharge occurs to surface waters down gradient.

Act 250 criterion 1(E) requires that projects will, when feasible, maintain natural stream channel condition, and will not endanger the health safety, or welfare of the public or adjoining landowners [10 V.S.A. § 6086(a)(1)(E)].

3.4.2 Methodology

Stream delineation and assessment work was completed within the Study Area in October 2010. The ordinary high water mark (OHW) in Stevens Brook was delineated according to methods detailed in the "Regulatory Guidance Letter: Subject – Ordinary High Water Identification" (USACE 2005). Stream delineation and flagging was also conducted pursuant to the Agency of Natural Resources (ANR) Riparian Buffer Guidance (ANR 2005), including top of bank. The flow regime (i.e., ephemeral, intermittent, or perennial) was preliminarily classified based on qualitative observations of instream hydrology indicators at the time of observation, as well as geomorphic characteristics.

Stream features were located in the field using a total station, with the survey being conducted simultaneously with the existing conditions survey of the corridor. Stream features collected in the field are described in the following section and represented on **Figure 3.4-1**.

Stormwater infrastructure data for the Study Area including outfall locations, catch basins, and stormwater piping was acquired from existing City mapping resources and from an existing conditions survey. The stormwater infrastructure data provided a context for existing stormwater conveyance and discharges as well as surface water transport within the Study Area.

3.4.3 Affected Environment

3.4.3.1 Stevens Brook

The sole stream feature that intersects the Study Area is Stevens Brook. Stevens Brook flows west to Lake Champlain. It has a watershed area of approximately 14.7 square miles. It is a perennial stream where is crosses the Study Area, flowing from east to west perpendicular to Lemnah Drive south of the midpoint in the Study Area. This portion of Stevens Brook is approximately 8 to 10 ft wide at OHW, with banks approximately 4 to 8 ft high. The banks of the stream are armored upstream (east) of the delineated portion and the streambank shows signs of past manipulation throughout the Study Area. The water depth at the time of the delineation was estimated at 3 inches to greater than 1 ft. Stevens Brook at this location is classified as a riverine, lower perennial, unconsolidated bottom, mud, permanently flooded (R2UB3H) channel. Lemnah Drive spans Stevens Brook via a bridge.

Downstream and outside of the Study Area, Stevens Brook is listed on the Vermont 303(d) List of Waters (2008) as impaired for stormwater, with consequences for aquatic life use support (ALS). As such, the entire watershed is classified as an impaired watershed due to stormwater runoff. Therefore, the requirements of EPR Chapter 22, *Stormwater Management Rule for Stormwater Impaired Waters* (Impaired Rule) apply. The stream is classified as a Class B waterbody. However,

biomonitoring has determined that it is impaired for ALS, such that it does not meet the criteria for Class B waters. A Total Maximum Daily Load (TMDL) was developed by the DEC in October 2008 and approved by the EPA in February 2009. In accordance with the Impaired Rule, developments within watersheds must meet the "no net increase" criterion, meaning that projects proposing to create new, expanded, or redeveloped impervious surfaces must reduce the washoff sediment load to natural background conditions.

The annual sediment load contributed by land uses within that part of the Study Area lying within the Stevens Brook watershed was estimated using the Simple Method (Schueler 1987). Sediment loads contributed by commercial uses total approximately 1,328 lbs per year while sediment loads contributed by paved transportation surfaces (including driveways) total approximately 15,275 lbs per year, resulting in a total of 16,603 lbs per year.

3.4.3.2 Rugg Brook

The extreme southern portion of the Study Area is located within the Rugg Brook watershed, which is also an impaired watershed due to stormwater runoff, therefore, development within the watershed must also meet the requirements of the Impaired Rule.

Using the Simple Method, the annual sediment load contributed by land uses within that part of the Study Area lying within the Rugg Brook watershed was estimated. Sediment loads contributed by paved transportation surfaces (including driveways) total approximately 1,706 lbs per year, while sediment loads from open/meadow areas total 92 lbs per year, resulting in a total of 1,798 lbs per year.

3.4.4 Environmental Consequences

3.4.4.1 No Action

Under the No-Action Alternative, there would be incremental redevelopment within the Study Area and potentially new development within the forested area south of Nason Street. Assuming that this development is held to the requirements of the Impaired Rule (**Section 3.4.1**), there should not be any adverse impacts to Stevens Brook or Rugg Brook.

The existing stormwater infrastructure is the collective result of many small retrofit projects, and is in generally poor condition. Due to the age of the infrastructure much of the sewer and storm drain systems are combined and discharge to the wastewater treatment plant. The stormwater systems that are not combined have very limited or no treatment practices in place within the Study Area, and therefore, the existing system is not up to current standards. Redevelopment within the Study Area would require compliance with the Vermont Stormwater Management Manual (VSMM)

(ANR 2002), but would be accomplished in piecemeal fashion over time with inherent difficulties/constraints posed by tying into the existing, dilapidated system. Compared to the flexibility afforded by a larger Project footprint, stormwater treatment practices implemented under the No-Action Alternative would be less effective in addressing the stormwater sediment loading that is contributing to the impairment of Stevens Brook.

3.4.4.2 Proposed Action

Stream Impacts

The Proposed Action would include the removal and replacement of the existing bridge that spans Stevens Brook. The streambanks may require slight modification to allow for the removal of the old abutments and installation of new abutments. The design elevation of the bridge structure above the channel would be based on a hydraulic/hydrologic analysis of the contributing watershed and clearance would be sufficient to convey the 25-year storm event plus 1-ft. of freeboard, or the 100-year storm event, whichever is greater.

Stevens Brook has been channelized for some distance upstream and downstream of the Study Area. Within the Study Area, its banks have been armored using stone and gabion, and buildings and parking areas are present less than 30 feet from the top of the stream bank. Given this condition, there is limited opportunity to modify the channel of Stevens Brook as part of the bridge replacement; any channel modifications must tie into the existing stream banks upstream and downstream of the proposed crossing. Due to these constraints, the open area under the proposed bridge would not differ significantly from the open area under the existing structure. Because the existing hydraulic opening would be maintained and the 50± linear feet of stream channel between the new Lemnah Drive bridge and the existing NECR railroad bridge would remain unaltered, the proposed bridge would not impact downstream structures or flood elevations.

Construction of the new bridge span may be possible without the use of construction equipment within the stream channel. However, temporary access to the channel may be required during construction by workers to coordination the installation activities, and accidental disturbance is possible during the overall process. For this reason, 51 linear ft (1,020 sq ft) of temporary impact to the channel have been assumed during construction. This temporary impact would be noted in coordination with the USACE, and would likely require authorization under a Category 2 General Permit as noted in **Section 3.3.5**. A Stream Alteration Permit may be required from the DEC for this activity, should greater than 10 cubic yards of material be excavated within the cross-sectional limits of the stream.

Stormwater Impacts

The Proposed Action would bring the current stormwater collection, conveyance, and treatment infrastructure to current standards. Due to the linear nature of the Project and site constraints posed by existing infrastructure, several discharge locations would be utilized to most efficiently manage the stormwater runoff. The conceptual stormwater management system for the Proposed Action is included as **Figure 3.4-2** through **Figure 3.4-6**.

The proposed stormwater infrastructure system for the Rugg Brook watershed includes new storm drain piping, manholes, catch basins, and a surface BMP to treat both stormwater quality and detain peak stormwater runoff flows prior to discharge. This surface BMP would be located at the very southern end of the Project, within the Rugg Brook watershed at the southwest corner of the intersection of Nason Street and Lemnah Drive (see **Figure 3.4-2**). Stormwater runoff would be collected in a series of catch basins and stormwater piping before being routed to the surface BMP, discharging ultimately to a Class II wetland within the Rugg Brook watershed (Wetland B, see **Section 3.3**).

The proposed stormwater infrastructure system for the Stevens Brook watershed includes new storm drain piping, manholes, catch basins, and proprietary treatment devices to treat stormwater runoff prior to discharge. Due to the urban site constraints of the Study Area, all water quality treatment devices within the Stevens Brook watershed portion of the Project would be subsurface. These four water quality treatment devices would be spread out along the Federal Street Corridor. Stormwater runoff would be collected in a series of catch basins and stormwater piping, before being routed to subsurface water quality treatment device(s), and ultimately discharged to Stevens Brook.

The Proposed Action would increase the amount of impervious area in both the Stevens Brook and Rugg Brook watersheds, both of which are impaired due to stormwater runoff. Both redeveloped impervious and new impervious areas would be collected and treated prior to discharge, resulting in a much improved stormwater system and overall benefit to both stormwater impaired watersheds. The combined sediment load in both watersheds would decrease from an existing condition of 18,400 lbs per year to 4,575 lbs per year, which represents a 75 percent decrease in loading. This decrease in loading, while appreciable, does not achieve compliance with state statute 10 V.S.A 1264a, which requires no increase in sediment loading over natural background conditions. The sediment loading analysis indicates that natural background loading is 642 lbs per year for both watersheds. Therefore, an additional reduction of 3,932 lbs per year would be required. The means to achieve this additional reduction are discussed in the following section.

3.4.5 Mitigation

With respect to stream impacts, the existing bridge at Stevens Brook would be replaced with a structure that also spans the Brook and which would be designed in accordance with VTrans hydraulic design guidelines.

With respect to stormwater management, as previously discussed, the Proposed Action would be carried out within two stormwater impaired watersheds. While the stormwater management system design is currently conceptual, its proposed improvements reflect an effort to maintain existing hydrologic models and flow paths, while improving stormwater quality, in accordance with the Impaired Rule.

Due to the amount of earth disturbance and new/redeveloped impervious areas associated with the Proposed Action and its position within impaired watersheds, Vermont Individual Construction Phase and Operational Phase Stormwater Discharge Permits (INDC and INDS, respectively) would be required. Conditions required by the INDC permit mitigate surface water impacts during construction via the review and approval of EPSC measures. The INDS permit for this Project would require compliance with state statute 10 V.S.A. 1264a, requiring compliance with the VSMM and demonstrating that the Proposed Action does not increase the sediment or hydrologic load of the receiving waters over natural background conditions.

A preliminary determination of the required offset capacity to achieve the no net increase criterion of the Impaired Rule has been completed using the Simple Method (Schueler 1987). The required offsets would be approximately 625 lbs per year for the Rugg Brook watershed and 3,307 lbs per year for the Stevens Brook watershed.

Baseline conditions will be further assessed in the watershed context for both Stevens and Rugg Brook. As Project design is developed, including proposed stormwater treatment practices (STPs), the required offset capacity to achieve no net increase in pollutant loading to each watershed would be confirmed. In the Stevens Brook watershed, due to the relatively limited space available for the implementation of STPs both above and below ground surface, an offset project may be the required to achieve the additional treatment necessary to satisfy the no net increase criterion of the Impaired Rule. A currently permitted offset project (the Stevens/Rugg Diversion Channel offset project) may have sufficient capacity to meet the Project's needs. If that is not the case, the City will be required to identify an offset project elsewhere in the watershed.

For the Rugg Brook watershed, potential offset projects will be identified for review and approval by the City and VTrans. Offset opportunities may include collecting runoff from adjacent impervious areas (such as the Interstate Access Road), or conducting an offsite improvement project elsewhere in the watershed. Federal funds associated with the Project would not be used for stormwater offset purposes in either watershed.

3.5 Groundwater & Drinking Water Resources

This section identifies the presence and current use of groundwater resources in the vicinity of the Study Area. Groundwater can be an important water supply for residential, commercial, and industrial use, and contamination of these groundwater resources can have social, economic, and health-related consequences to the communities that rely on them.

3.5.1 Regulatory Context

Groundwater is regulated within the jurisdiction of the ANR by the Groundwater Protection Rule and Strategy, adopted under the authority of the 10 Vermont Statutes Annotated (V.S.A.) 1390 – 1394. The purpose of this rule and strategy is to manage groundwater resources, minimizing risks to groundwater quality by limiting human activities that may present unreasonable risks to the use classifications of groundwater in the vicinities of such activities.

3.5.2 Methodology

Digital data available from the Vermont Center for Geographic Information (VCGI) were used to determine the presence/absence of groundwater resources within the Study Area. Ground and Surface Water Source Protection Area (SPA) boundaries have been located on USGS topographic maps by the Water Supply Division of the Vermont Department of Conservation and Vermont Department of Health. Buffered SPA's are based on the point location of the water sources. These data are intended to visually display wellhead protection areas and surface water source protection areas.

3.5.3 Affected Environment

No state designated groundwater protection areas have been identified within a one-mile radius of the Study Area. **Figure 3.5-1** shows that the closest Surface Water Source Protection Area is located approximately 2 miles to the southeast and at a higher elevation from the Study Area. The closest Ground Water Source Protection Area is located approximately 2 miles to the northeast of the Study Area. Both areas are well outside of any influence of the Project.

3.5.4 Environmental Consequences

3.5.4.1 No Action

Under the No-Action Alternative and because there are no groundwater resources or surface drinking water sources within the Study Area, there would be no effect to groundwater resources.

3.5.4.2 Proposed Action

The Proposed Action would have no effect on groundwater resources or surface drinking water sources as state designated resources are located a considerable distance from the Study Area.

3.5.5 Mitigation

Mitigation for impacts to groundwater resources or surface drinking water sources would not be required as no impacts to these resources are expected.

3.6 Floodplains and Floodways

This section identifies the presence of regulated 100-year floodplains within the vicinity of the Study Area and assesses impacts associated with the Proposed Action. Regulated 100-year floodplains are floodplains mapped by the Federal Emergency Management Agency (FEMA).

3.6.1 Regulatory Context

Federal projects potentially affecting floodplains require an evaluation under the provisions of Executive Order 11988, Floodplain Management, May 24, 1977. The regulation that sets forth the policy and procedures of this order is "Floodplain Management and Protection of Wetlands," 44 CFR 9, which is under the authority of FEMA. In addition, the policies and procedures of the FHWA regarding the impact of projects on floodplains are found in "Location and Hydraulic Design of Encroachments on Floodplains," 23 CFR 650A.

A 100-year floodplain is defined as having a one percent chance of flooding in any particular year. The 100-year floodplain is comprised of the floodway, which in most cases approximates the water course, and the so called "floodway fringe" that exists outside the channel. Federal regulations, incorporated in local zoning and subdivision regulations, establish stringent standards for where development is permitted and prohibited in these areas.

The City of St. Albans Land Development Regulations Section 305 Flood Hazard Overlay District refers to the federal and state provisions for compliance with the National Flood Insurance Program (NFIP).

3.6.2 Methodology

The effects of the Proposed Action on floodplains and floodways were determined by comparing the limits of FEMA designated floodplains within the Study Area over the limits of work for the Proposed Action. Where the Proposed Action limits of

work occur in the FEMA designated floodplain or flood zone, the nature of the proposed work was analyzed to determine if any of the proposed activities would result in the placement of fill within the limits of the regulated floodplain.

3.6.3 Affected Environment

Based on the 1978 Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM), there are no Zone A (100-year) special flood hazard areas within the Study Area. Portions of the Study Area are characterized as a Zone B special flood hazard area. Zone B is listed as a moderate flood risk area. This zone includes the ROW from Lemnah Street at intersection of Allen Street and Lower Welden Street south to a point roughly 300 ft north of the intersection with Nason Street. The source of flooding for this zone is Stevens Brook and Grice Brook, which converge just east of Lemnah Drive near the western terminus of Gilman Street (see **Figure 3.6.-1**). Flooding is exacerbated by an antiquated stormwater collection system in the Study Area.

No other portions of the Study Area lie within a regulated floodplain and/or flood zone. There are no flood hazard zones along Rugg Brook within a one-mile radius of the Study Area.

3.6.4 Environmental Consequences

3.6.4.1 No Action

Under the No-Action Alternative, redevelopment would continue incrementally within the Zone B area. Such development is unlikely to exacerbate flooding over current levels, though a lack of systematic stormwater management improvements may result in increased flooding over time.

3.6.4.2 Proposed Action

There are no Zone A (100-year) special flood hazard areas within the Study Area. The nature of the redevelopment is such that little change is proposed to occur with respect to finished elevation or surface water flow patterns. In addition, the Proposed Action would result in systematic stormwater management improvements that would help alleviate flooding within portions of the Study Area. The replacement of the bridge over Stevens Brook would not change hydraulic/hydrologic conditions at this conveyance. Accordingly, there would be no substantial impact to floodplains and floodways as a result of the Proposed Action.

3.6.5 Mitigation

Because no impacts are anticipated to the 100-year floodplain, no mitigation is proposed. In addition, the Proposed Action would comply with the City of St. Albans Land Development Regulations in Section 305 Flood Hazard Overlay District.

3.7 Farmlands

This section describes the occurrence of farmland (prime farmland, unique farmland, farmland of statewide importance, and farmland of local importance) with the Study Area and describes the environmental consequences of the No-Action Alternative and the Proposed Action with respect to farmland.

3.7.1 Regulatory Context

The Farmland Protection Policy Act (FPPA) of 1984 {Section 1539-1549, Public Law 97-98, 95 Statute 1341-1344 (7 USC. 4201 et seq.)] provides guidelines to Federal agencies involved in projects that may convert existing or potential farmland areas to non-agricultural uses. According to the FPPA, "Farmland" does not include land already in or committed to urban development. For the 2000 Census, the Census Bureau classifies "urban" as all territory, population, and housing units located within an urbanized area (UA) or an urban cluster (UC).

3.7.2 Methodology

Since the FPPA excludes farmland soils that are in an urbanized area, US Census Bureau digital mapping of UCs was overlaid onto important farmland soil mapping. Farmland soils within the boundary of the UC were deleted from the subsequent analysis. The extent of the UC in the vicinity of the Study Area is shown in **Figure 3.7-1**.

3.7.3 Affected Environment

Figure 3.7-1 shows the limits of the UC as determined by the US Census: 2000. Per the US Census 2000, the entire Study Area lies within a UC. Because the entire Study Area lies within a UC, there are no "Important Farmlands" subject to the provisions of § 658.2 of the FPPA.

3.7.4 Environmental Consequences

This section describes the environmental consequences of the No-Action Alternative and the Proposed Action with respect to farmland.

3.7.4.1 No Action

Although the No-Action Alternative may result in future development to lands currently undeveloped along Nason Street, there would be no impact to important farmlands, as the entire Study Area is disqualified from protection under the FPPA. Additionally, there are no active farmlands within the Study Area.

3.7.4.2 Proposed Action

The Proposed Action would have no effect on important farmland due to the designation of the entire Study Area as a UC.

3.7.5 Mitigation

As there are no active farmlands within the Study Area and there are no qualifying prime, unique, statewide or locally important farmlands protected under the FPPA, no mitigations measures are required or proposed.

3.8 Wildlife

This section identifies wildlife resources in the vicinity of the Study Area as well as impacts to these resources resulting from the Proposed Action. The roles of regulatory agencies, rules, laws, and statutes applicable to the management and protection of these resources are also identified below.

3.8.1 Regulatory Context

The Vermont Fish and Wildlife Department (VTFWD) is responsible for managing and protecting resident fish and wildlife species. VTFWD has promulgated rules for the protection and management of these species; however, these rules pertain almost entirely to the exploitation of the species and not to their habitats. The rules set seasons, bag and creel limits, size requirements, and legal means for the taking of fish, game and furbearing species.

3.8.2 Methodology

The Study Area is within a UC as determined by the US Census Bureau in 2000. The Study Area was evaluated for the occurrence of natural resources and wildlife habitat. From the northern terminus of the Project through to Lemnah Drive at the intersection with Stevens Brook, field scientists made observations on conditions within the existing ROW and just beyond where improvements may be carried out. Because this part of the Study Area is highly developed, improvements would amount to redevelopment activities. The natural resource investigation was therefore

restricted to a relatively narrow swath along the southern section of the Project boundary coincident with the proposed Nason Street Connector.

3.8.3 Affected Environment

The majority of the Study Area consists of previously developed roadways, sidewalks and associated infrastructure. The existing wildlife habitat within the Study Area is of relatively low value. It is suitable for use by animal species commonly found in urbanized environments, including the striped skunk (*Mephitis mephitis*), raccoon (*Procyon lotor*), gray squirrel (*Sciurus carolinensis*), and Virginia opossum (*Didelphis virginiana*). A variety of common songbirds as well as doves and pigeons may also inhabit the Study Area or be present as transients.

With the exception of the southern portion adjacent to Nason Street, the Study Area is completely surrounded by urban development. Main land uses include residential, commercial and industrial. Although the southern portions of the site are forested, there is no connectivity with larger unfragmented habitat blocks and the area has previously been highly disturbed by human activities, including the disposal of rubbish. **Figure 3.8-1** shows the proximity of the Study Area to important wildlife habitat as determined by a GIS search of available State data. Ecologic Core Wildlife Habitat is located well outside of the Study Area.

Field investigations to delineate wetlands and document the presence/absence of vernal pool breeding activity within the Study Area were completed in the spring of 2011.Two wetlands and one stream were identified as a result of the wetland field investigations within the limits of the Study Area. The locations of these wetland resources are displayed on **Figure 3.3-1**. Based on multiple field observations, it was concluded that no vernal pools are present within the Study Area.

Specific wetland descriptions can be found in **Section 3.3.3**. A description of Stevens Brook is contained in **Section 3.4.3**.

3.8.4 Environmental Consequences

3.8.4.1 No Action

Under the No-Action Alternative, lands that are currently undeveloped south of Nason Street may become incrementally developed over time. In the absence of the Project, it is currently unknown what would become of those portions of this area purchased by the City of St. Albans as a connecting ROW from the Interstate Access Road to Lemnah Drive.

3.8.4.2 Proposed Action

The Proposed Action would have minimal effect on wildlife habitat due to the designation of the entire Study Area as a UC and the fact that the majority of the Proposed Action would occur along areas previously developed.

The replacement of the Stevens Brook bridge may result in minor, temporary disturbance to aquatic habitat during construction. Mitigation with respect to bridge construction is discussed below.

3.8.5 Mitigation

Due to the developed nature of the Study Area and the lack of important wildlife habitat there would be minimal impacts to wildlife habitat. Thus, mitigation measures beyond those concerning the Stevens Brook bridge construction are not necessary or proposed.

With respect to the Stevens Brook bridge replacement, coordination with the VTFWD has determined that in-stream work may be subject to a time-of-year restriction to mitigate for impacts to aquatic habitat and fish spawning, with the period of work being June 1 to October 1. Consultation with VTFWD will continue as design plans are advanced.

3.9 Threatened and Endangered Species

This section documents Threatened and Endangered species within, and in the vicinity of, the Study Area, predicts impacts to Threatened and Endangered species, and identifies mitigation measures for any Threatened and Endangered species impacts associated with the Proposed Action.

3.9.1 Regulatory Context

The US Fish and Wildlife Service (USFWS) defines an "Endangered" species as one that is in danger of extinction throughout all or a substantial portion of its range. A "Threatened" species is one that is likely to become endangered in the foreseeable future.[12] The USFWS maintains a list of plants and animals native to the US that are candidates for, or are proposed for, possible addition to the Federal list. Listing, including proposed additions and delistings, are announced through the Federal Register.

[12] *US Fish and Wildlife Service, Endangered Species Program, Laws & Policies, Endangered Species Act* (http://www.fws.gov/endangered/laws-policies/index.html, accessed June 1, 2012).

The Vermont Nongame and Natural Heritage Program (VTNNHP, of the Vermont Fish and Wildlife Department) defines an "Endangered" species as one that is in immediate danger of becoming extirpated from the state. A "Threatened" species is one with a high possibility of becoming "Endangered" in the near future.[13] The VTNNHP maintains a database of rare (Endangered and Threatened) species and Significant Natural Communities in Vermont.

Threatened and Endangered species analyses were conducted in accordance with NEPA, Section 7 of the Federal *Endangered Species Act* (ESA) of 1973, as amended *16 USC 1531 et seq*, and the Vermont Endangered Species Law (10 V.S.A. Chap. 123).

3.9.2 Methodology

A database search was performed to identify state-mapped species of concern within one mile of the Study Area. The results are provided on **Figure 3.9-1**. Two elemental occurrences were identified: one animal species in Stevens Brook downstream of the Study Area; and one plant species in two locations on unnamed tributaries to Rugg Brook, also outside the Study Area. Neither elemental occurrence represents a state or federally listed species.

3.9.3 Affected Environment

Correspondence from the VTFWD in September 2010 indicates that there are no known occurrences of critical wildlife habitat, state listed rare, threatened, or endangered species, or significant natural communities in relation to the Project. A previous letter from the VTFWD dated 2005 indicates that the rare Brook Stickleback may be present in Stevens Brook and requests that the VTFWD be consulted on measures to avoid and minimize potential impacts.

Consultation with US Fish and Wildlife Service databases has concluded that there are no known occurrences of federally listed threatened or endangered species within Franklin County and no federally-designated critical habitat in Vermont.

Consultation with National Oceanic and Atmospheric Administration (NOAA) databases has determined that there is no Essential Fish Habitat (EFH) within the Study Area.

[13] *Vermont Nongame & Natural Heritage Program, Department of Fish and Wildlife, Explanation of Legal Status and Information Ranks* (http://www.vtfishandwildlife.com/library/Reports_and_Documents/NonGame_and_Natural_Heritage/Rare_Threatened_and_Endangered_Species%20%20---%20lists/Explanation_of_Legal_Status_and_Information_ranks.pdf, accessed June 1, 2012)

3.9.4 Environmental Consequences

3.9.4.1 No Action

The No-Action Alternative would have no impact on threatened or endangered species as there are no known populations of threatened or endangered species within the Study Area.

3.9.4.2 Proposed Action

The Proposed Action would have no impact on threatened or endangered species as there are no known populations of threatened or endangered species within the Study Area.

3.9.5 Mitigation

Given the absence of threatened or endangered species within the Study Area, no mitigation measures are recommended.

3.10 Air Quality

The air quality study consisted of a local (microscale) air quality analysis to demonstrate compliance with the National Ambient Air Quality Standards (NAAQS) by evaluating air quality impacts of the following conditions:

- 2010 Existing Condition
- 2010 Build Condition (estimated opening year with the Project improvements)
- 2030 No-Action (No-Build) Condition (future background condition without the Project improvements)
- 2030 Build Condition (design year with the Project improvements)

The 2030 No-Action Condition includes 2010 existing traffic volumes projected to the future year with no planned transportation improvements.

3.10.1 Regulatory Context

The air quality statutes and regulations that are applicable to the Proposed Action include the 1990 Clean Air Act Amendments (CAAA) and the NAAQS. The CAAA is the basis for most federal air pollution control programs. The purpose of the CAAA is to preserve air quality and protect the public's health and welfare. Under the authority of the CAAA, the EPA regulates air quality nationally. EPA delegates authority to the DEC for monitoring and enforcing air quality regulations in the State

of Vermont. Conformity with the State Implementation Plan is not assessed in this analysis because the Proposed Action is located in Chittenden County, which is designated by the EPA as in attainment (i.e., in compliance with applicable standards) for all criteria pollutants. Therefore, this area is exempt from conformity requirements.

Under authority of the CAAA, the EPA established the NAAQS that define allowable limits for atmospheric concentrations of various criteria air pollutants. Primary standards are established at levels designed to protect the public health. Secondary standards are established at levels designed to protect the public welfare by accounting for the effects of air pollution on vegetation, soil, materials, visibility, and other aspects of the general welfare.

3.10.2 Methodology

3.10.2.1 Pollutants of Concern

Air pollution is of concern because of its demonstrated effects on human health. Of special concern are the respiratory effects of the pollutants and their potential toxic effects. Air pollutants of concern include:

- **Carbon monoxide (CO).** Carbon monoxide is a colorless and odorless gas that is a product of incomplete combustion. Carbon monoxide is absorbed by the lungs and reacts with hemoglobin to reduce the oxygen carrying capacity of the blood. At low concentrations, CO has been shown to aggravate the symptoms of cardiovascular disease. It can cause headaches and nausea and, at sustained high concentration levels, can lead to coma and death.
- **Particulate Matter (PM).** Particulate matter is made up of small solid particles and liquid droplets. PM 10 refers to particulate matter with a nominal aerodynamic diameter of 10 micrometers or less, and PM 2.5 refers to particulate matter with an aerodynamic diameter of 2.5 micrometers or less. Particulates can enter the body through the respiratory system. Particulates over 10 micrometers in size are generally captured in the nose and throat and are readily expelled from the body. Particles smaller than 10 micrometers, and especially particles smaller than 2.5 micrometers, can reach the air ducts (bronchi) and the air sacs (alveoli) in the lungs. Particulates, especially PM 2.5, are associated with increased incidence of respiratory diseases, cardiopulmonary disease, and cancer.

The EPA has set the NAAQS for CO and PM 2.5 to protect the public health and welfare. **Table 3.10-1** presents the NAAQS for the major pollutants.

Table 3.10-1 National Ambient Air Quality Standards

Pollutant	Averaging Period	Standard
Carbon Monoxide (CO)	8 hours[1]	9 ppm[2] (10,000 µg/m^3)[3]
	1 hour[1]	35 ppm (40,000 µg/m^3)
Nitrogen Dioxide (NO_2)	Annual	0.053 ppm (100 µg/m^3)
Ozone	8 hour	0.08 ppm
	1 hour[4]	0.12 ppm
PM 10	Annual Arithmetic Mean	Revoked[5]
	24 hours	150 µg/m^3
PM 2.5	Annual Arithmetic Mean	15 µg/m^3
	24 hours	35 µg/m^3

Notes:
1 Not to be exceeded more than once a year.
2 Parts per million.
3 Micrograms per cubic meter.
4 Not to be exceeded more than an average of one day per year over a three year period.
5 Due to a lack of evidence linking health problems to long-term exposure to coarse particle pollution, the agency revoked the annual PM 10 standard in 2006.

3.10.2.2 Microscale Analysis

The microscale analysis evaluated the carbon monoxide emissions of mobile sources at the most congested intersections based upon EPA's air quality modeling guidelines.[14] The traffic data were evaluated and the intersections that are expected to experience an increase in Project generated traffic were identified. Intersections that were modeled in the microscale analysis were selected based on their level of service and traffic volumes rankings. The ranking of the study area intersections is presented in **Table 3.10-2** *Ranking of Study Area Intersections*.

[14] Guideline for Modeling Carbon Monoxide From Roadway Intersections, US Environmental Protection Agency, Office of- Air Quality Planning and Standards, Technical Support Division; Research Triangle Park, NC; EPA-454/R-92-006-(Revised); September 1995

Table 3.10-2 Ranking of Study Area Intersections

Intersections	2030 Build Weekday Evening Volume (vph[1])	LOS[2]
US Route 7, Upper Newton St, and Lower Newton St	**2,410**	**F**
Federal St and Lower Newton St	1,425	C
Lake St, Federal St, and Catherine St	**1,845**	**E**
US Route 7, St Albans State Highway, and Nason St Connector	**1,990**	**E**
US Route 7, Upper Welden St, and Lower Welden St	1,550	B
US Route and JC Penny Plaza	1,400	A
US Route 7 and Lake St	1,830	C
US Route 7 and Fairfield St	1,625	C

1. Traffic volumes expressed in vph = vehicles per hour.
2. LOS = Level of Service
Volumes and levels of service in bold represent the three worst results.

Three Worst Intersections by Volumes and Level of Service

The ranking of the intersections reviewed resulted in the following three worst intersections by highest traffic volumes and LOS (during the peak hour):

- US Route 7, Upper Newton St, and Lower Newton St
- Lake St, Federal St, and Catherine St
- US Route 7, St Albans State Highway, and Nason St Connector

The ranking of intersections resulted in the evaluation of these three intersections in the microscale analysis. The intersections are presented in **Figure 3.10-1** *Microscale Air Quality Analysis Intersections*.

The microscale analysis calculated maximum 1-hour and 8-hour CO concentrations in the Study Area. The EPA's computer model CAL3QHC[15] was used to calculate maximum 1-hour and 8-hour CO concentrations at receptor locations for each

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[15] *User's Guide to CAL3QHC Version 2.0: A Modeling Methodology for Predicting Pollutant Concentrations Near Roadway Intersections*, US Environmental Protection Agency, Office of Air Quality Planning and Standards, Technical Support Division; Research Triangle Park, NC; EPA-454/R-92-006; November 1992.

intersection. These receptor locations were selected because they are located where the public has access and where they are expected to be for periods of time equal to the standards. Receptors were placed at the edge of the roadway, but no closer than ten ft (three meters) from the nearest travel lane, so that they were not within the roadway air quality mixing zone. Receptor locations for the microscale analysis are presented in **Figure 3.10-1** *Microscale Air Quality Analysis Intersections.* While the air quality analysis calculated CO concentrations for five areas at each quadrant of each intersection, the results presented in this report represent the highest concentration at each quadrant of each intersection. Receptor locations farther away from the intersections will have lower concentrations because of the CO dispersion characteristics and because the emission rates for vehicles traveling along the roadways are much lower than the emission rates for vehicles queuing at intersections.

The air quality analysis used "worst-case" assumptions for meteorology. The meteorology included a one meter per second wind speed, a stability class “D” (stable air), and multiple wind directions in five degree increments to ensure calculating the highest CO concentration at each site.

The vehicle emission factors used in the microscale analysis were obtained using the EPA’s MOBILE6.2[16] emission factor model. The model calculated vehicle emission factors in grams per vehicle mile for arterial roadways for existing (2010) and future (2030) conditions. The emission rates in this air quality study reflect Vermont-specific conditions. Model input and output are included in **Appendix D**.

The 1-hour CO concentrations were calculated directly using the EPA’s CAL3QHC Version 2 computer model, with evening peak hour traffic volumes and emissions factors. The air quality study used traffic data (volumes, delays, and speeds) calculated for each analysis year and condition. The 8-hour CO concentrations were calculated by applying a persistence factor of 0.70 to the 1-hour CO concentrations. A conservative 1- and 8-hour background concentration of 2.0 ppm was used. The CO concentrations discussed in the subsequent section and presented in **Table 3.10-3** represent the combined total of the Project and the background concentrations.

3.10.3 Environmental Consequences

The Project is located in an area which is an attainment area for CO, particulate matter, and ozone. The air quality analysis evaluated CO concentrations to demonstrate that the Proposed Action would not create any CO violations of the NAAQS.

Table 3.10-3 *Predicted Maximum CO Concentrations* presents the worst-case concentrations for CO. All of the total concentrations are below the NAAQS. With

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[16] MOBILE 6.2 (Mobile Source Emission Factor Model), Environmental Protection Agency, The May 19, 2004 official release from US EPA, Office of Mobile Sources, Ann Arbor, MI.

the exception of one instance, the increase in CO concentrations between the 2010 Existing and 2010 Build conditions is equal to or less than 1 ppm. Receptor 8 shows a 1-hr concentration increase of 1.4 ppm. The same comparison for 2030 shows a decrease in CO concentrations of less than 1 ppm. Accordingly, the Project would not substantially change the CO concentrations and all results are well below the NAAQS.

Table 3.10-3 Predicted Maximum CO Concentrations[1]

Intersection	Receptor	2010 Existing		2010 Build		2030 No Build		2030 Build	
		1-hr[2]	8-hr[3,4]	1-hr	8-hr	1-hr	8-hr	1-hr	8-hr
US Route 7, Upper Newton St, and Lower Newton St	1-Southwest	4.2	3.5	4.3	3.6	3.6	3.1	3.2	2.8
	2-Southeast	4.3	3.6	4.3	3.6	3.7	3.2	3.3	2.9
	3-Northeast	4.2	3.5	4.3	3.6	3.8	3.3	3.5	3.1
	4-Northwest	4.0	3.4	4.1	3.5	3.5	3.1	3.2	2.8
Lake St, Federal St, and Catherine St	5-Southwest	3.2	2.8	3.3	3.1	3.0	2.7	2.8	2.6
	6-Southeast	3.5	3.1	4.1	3.5	3.4	3.0	3.1	2.8
	7-Northeast	3.5	3.4	4.6	3.4	3.9	3.0	3.3	2.7
	8-Northwest	3.6	3.8	5.0	4.1	4.0	3.4	3.4	3.0
US Route 7, St Albans State Highway, and Nason St Connector	9-Southwest	4.2	3.5	4.1	3.5	3.7	3.2	3.3	2.9
	10-Southeast	4.6	3.8	4.3	3.6	4.0	3.4	3.6	3.1
	11-Northeast	4.9	4.0	4.8	4.0	4.0	3.4	3.6	3.1
	12-Northwest	4.8	3.9	4.6	3.8	4.1	3.5	3.4	3.1

1. The concentrations are expressed in parts per million (ppm).
2. 1-hour concentrations include a background concentration of 2.0 ppm. The 1-hour NAAQS for CO is 35 ppm.
3. 8-hour concentrations include a background concentration of 2.0 ppm. The 8-hour NAAQS for CO is 9 ppm.
4. The 8-hour averaging period concentration was derived by applying a persistence factor of 0.7 to the 1-hour impact concentration.

3.10.3.1 Particulate Matter

The FHWA has developed criteria[17] to determine if a quantitative PM analysis should be conducted. A quantitative PM analysis is not required for the Proposed Action because it is not a project of air quality concern and does not meet FHWA's criteria. For example, the annual average daily traffic (AADT) for US Route 7 in the design year (2030) is approximately 14,500 vehicles per day (VPD), which is substantially below the 125,000 AADT criteria. In addition, facilities with greater than 125,000 AADT and diesel truck traffic which is 8 percent or more of AADT would require a quantitative PM analysis. Based on the AADT traffic data, the annual average daily truck percentage along US Route 7 is expected to remain below the diesel truck traffic criteria of eight percent or more of the AADT. The Proposed Action is not regionally significant and does not have an adverse impact on diesel truck

[17] *Transportation Conformity Guidance for Quantitative Hot-spot Analyses in PM2.5 and PM10 Nonattainment and Maintenance Areas*, Federal Highway Administration, dated December 2010.

congestion. Therefore, the Proposed Action does not require a quantitative PM analysis.

The Proposed Action would not result in an adverse construction air quality impact. The temporary air quality impacts from construction are expected to be minor and can be mitigated as described in **Section 3.10.4** below.

3.10.3.2 Mobile Source Air Toxics

The air quality study evaluated the potential for impact due to air toxics, as required in the FHWA Division 2006 interim guidance (updated in September 2009) on how to analyze mobile source air toxics (MSAT) for NEPA documents. Most air toxics originate from human-made sources, including on-road mobile sources, non-road mobile sources (e.g., airplanes), area sources (e.g., dry cleaners) and stationary sources (e.g., factories or refineries).

Controlling air toxic emissions became a national priority with the passage of the CAAA of 1990, whereby Congress mandated that the US Environmental Protection Agency (EPA) regulate 188 air toxics, also known as hazardous air pollutants. The EPA has assessed this expansive list in their latest rule on the Control of Hazardous Air Pollutants from Mobile Sources (Federal Register, Vol. 72, No. 37, page 8430, February 26, 2007) and identified a group of 93 compounds emitted from mobile sources that are listed in their Integrated Risk Information System (IRIS) (http://www.epa.gov/ncea/iris/index.html). In addition, EPA identified seven compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers from their 1999 National Air Toxics Assessment (NATA) (http://www.epa.gov/ttn/atw/nata1999/). These are acrolein, benzene, 1,3-butadiene, diesel particulate matter plus diesel exhaust organic gases (diesel PM), formaldehyde, naphthalene, and polycyclic organic matter. While FHWA considers these the priority mobile source air toxics, the list is subject to change and may be adjusted in consideration of future EPA rules.

The 2007 EPA rule mentioned above requires controls that will dramatically decrease MSAT emissions through cleaner fuels and cleaner engines. According to an FHWA analysis using EPA's MOBILE 6.2 model, even if vehicle activity (vehicle-miles travelled, VMT) increases by 145 percent as assumed, a combined reduction of 72 percent in the total annual emission rate for the priority MSAT is projected from 1999 to 2050.

Air toxics analysis is a continuing area of research. While much work has been done to assess the overall health risk of air toxics, many questions remain unanswered. In particular, the tools and techniques for assessing project-specific health outcomes as a result of lifetime MSAT exposure remain limited. These limitations impede the ability to evaluate how the potential health risks posed by MSAT exposure should be factored into project-level decision-making within the context of the NEPA.

Nonetheless, air toxics concerns continue to be raised on highway projects during the NEPA process. Even as the science emerges, the public and other agencies expect environmental documents to address MSAT impacts. The FHWA, EPA, the Health Effects Institute, and others have funded and conducted research studies to try to more clearly define potential risks from MSAT emissions associated with highway projects. The FHWA will continue to monitor the developing research in this emerging field. The FHWA policies and procedures for implementing NEPA are prescribed by regulation in 23 CFR 771.

Similar to fine particular matter, the FHWA has issued guidance concerning the need to conduct a quantitative MSAT analysis or a qualitative MSAT analysis or no analysis. No analysis is required for a project that qualifies as a categorical exclusion under 23 CFR 771.117 (c), is exempt under the Clean Air Act (CAA) conformity rule under 40 CFR 93.126, or is a project with no meaningful impacts on traffic volumes or vehicle mix. There is not a significant difference in traffic volumes between the No-Action (No-Build) and Proposed Action (Build) Conditions.

A quantitative MSAT analysis is not required for the Proposed Action because it is not a project of air quality concern and does not meet FHWA's criteria. The Proposed Action also does not create or significantly alter any major intermodal freight facility; it does not create new or add significant capacity to any roadway with an AADT in the range of 140,000 to 150,000, or greater; and it is not located in a populated area with vulnerable populations. The Proposed Action does not meet any of the criteria for a quantitative analysis for MSAT.

3.10.4 Mitigation

The air quality analysis demonstrates that the Proposed Action would not create any exceedances of the CO NAAQS or any other adverse air quality impacts. All of the CO concentrations are substantially below the NAAQS. The Federal Street Multimodal Connector would not:

- Cause any new violation of the NAAQS;
- Increase the frequency or severity of any existing violations; or
- Delay attainment of any NAAQS.

Mitigating fugitive dust emissions generated during construction involves minimizing or eliminating its generation. Fugitive dust measures would include wetting and stabilization to suppress dust generation, cleaning paved roadways, and scheduling construction to minimize the amount and duration of exposed earth. Construction activities would be performed in accordance with the VTrans specifications. The construction mitigation would be in compliance with all applicable local, state, and federal regulations.

Because the Proposed Action would result in an air quality improvement over the future No-Action alternative, no mitigation measures need to be considered.

3.11 Noise

This section discusses the potential effect of Project generated sound levels that might be experienced by adjacent sensitive receptor locations. Changes in traffic levels or the distribution of traffic over a network of streets has the potential to either increase or decrease noise levels in adjacent areas. This phenomenon is discussed below, and impacts associated with the Proposed Action are reviewed.

3.11.1 Regulatory Context

Since the Proposed Action involves new roadway and modified roadway geometry, it is a "Type I" classified project under FHWA noise regulations. Because it is a Type I project, a noise analysis is required in accordance with applicable regulations and guidance.

Noise is defined as unwanted or excessive sound. Sound becomes unwanted when it interferes with normal activities such as sleep, work, or recreation. How people perceive sound depends on several measurable physical characteristics. These factors include:

- **Intensity**. Sound intensity is often equated to loudness.
- **Frequency**. Sounds are comprised of acoustic energy distributed over a variety of frequencies. Acoustic frequencies, commonly referred to as tone or pitch, are typically measured in Hertz. Pure tones have all their energy concentrated in a narrow frequency range.

Sound levels are most often measured on a logarithmic scale of decibels (dB). The human ear does not perceive sound levels from each frequency as equally loud. To compensate for this phenomenon in perception, a frequency filter known as A-weighted decibel [dB(A)] is used to evaluate environmental noise levels. **Table 3.11-1** presents a list of common outdoor and indoor sound levels.

The decibel scale compresses the audible acoustic pressure levels which can vary from the threshold of hearing (0 dB(A)) to the threshold of pain (120 dB(A)). Because sound levels are measured in dB(A), the addition of two sound levels is not linear. Adding two equal sound levels creates a 3 dB(A) increase in the overall level. Research indicates the following general relationships between sound level and human perception:

- A 3 dB(A) increase is a doubling of acoustic energy and is the threshold of perceptibility to the average person.
- A 10 dB(A) increase is a tenfold increase in acoustic energy but is perceived as a doubling in loudness to the average person.

Table 3.11-1 Common Outdoor and Indoor Sound Levels

Outdoor Sound Levels	Sound Pressure (μPa)*		Sound Level dB(A)**	Indoor Sound Levels
	6,324,555	-	110	Rock Band at 5 m
Jet Over Flight at 300 m		-	105	
	2,000,000	-	100	Inside New York Subway Train
Gas Lawn Mower at 1 m		-	95	
	632,456	-	90	Food Blender at 1 m
Diesel Truck at 15 m		-	85	
Noisy Urban Area—Daytime	200,000	-	80	Garbage Disposal at 1 m
		-	75	Shouting at 1 m
Gas Lawn Mower at 30 m	63,246	-	70	Vacuum Cleaner at 3 m
Suburban Commercial Area		-	65	Normal Speech at 1 m
	20,000	-	60	
Quiet Urban Area—Daytime		-	55	Quiet Conversation at 1 m
	6,325	-	50	Dishwasher Next Room
Quiet Urban Area—Nighttime		-	45	
	2,000	-	40	Empty Theater or Library
Quiet Suburb—Nighttime		-	35	
	632	-	30	Quiet Bedroom at Night
Quiet Rural Area—Nighttime		-	25	Empty Concert Hall
Rustling Leaves	200	-	20	
		-	15	Broadcast and Recording Studios
	63	-	10	
		-	5	
Reference Pressure Level	20	-	0	Threshold of Hearing

Source: *Highway Noise Fundamentals*. Federal Highway Administration, September 1980.
*μPA – MicroPascals, which describe pressure. The pressure level is what sound level monitors measure.
**dB(A) – A-weighted decibels, which describe pressure logarithmically with respect to 20 μPa (the reference pressure level).

A variety of sound level indicators can be used for environmental noise analysis. These indicators describe the variations in intensity and temporal pattern of the sound levels. The following is a list of other sound level descriptors:

- L_{10} is the sound level which is exceeded for 10 percent of the time during the time period. During a 100-minute period, the L_{10} would be the sound level which was exceeded by other sound levels for 10 minutes.
- L_{eq} is the A-weighted sound level, which averages the background sound levels with short-term transient sound levels and provides a uniform method for comparing sound levels that vary over time. For highway traffic noise assessment, L_{eq} is typically evaluated over a one-hour time period.

- L_{max} is the maximum sound level measured during the time period.

The assessment of potential future noise impacts associated with the Proposed Action on noise sensitive receptors within the overall Project limits, has been performed in accordance with Title 23 of the Code of Federal Regulations (23 CFR 772), and the most recent version of VTrans Noise Analysis and Abatement Policy[18] (July 13, 2011).

FHWA has established Noise Abatement Criteria (NAC)[19] to help protect the public health and welfare from excessive vehicle traffic noise. The NAC applies to areas having regular human use and where lowered noise levels are desired. They do not apply to the entire tract of land on which the activity is based, but only to that portion where the activity takes place. The NAC is given in terms of the hourly, A-weighted, equivalent sound level in decibels (dB(A)). Recognizing that different areas are sensitive to noise in different ways, the NAC varies according to land use as shown in **Table 3.11-2**.

VTrans has adopted the FHWA NAC and considers noise impacts to occur when:

1) Existing or future sound levels approach (within 1 dB(A)) or exceed the NAC, or;

2) when future sound levels exceed existing sound levels by 15 dB(A) or more. The FHWA regulations require consideration of noise abatement measures whenever a project is found to have noise impacts.

[18] *VTrans Noise Analysis and Abatement Policy*, Vermont Agency of Transportation, dated July 13, 2011.
[19] *Procedures for Abatement of Highway Traffic Noise and Construction Noise*, Title 23 Code of Federal Regulation, Part 772, FR Volume 75, No.133 page 39820 dated July 13, 2010.

Table 3.11-2 Noise Abatement Criteria (NAC) One-Hour, A-Weighted Sound Levels in Decibels (dB(A))

Activity Category	L_{eq}(h)*	Description of Activity Category
A	57 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purposes.
B	67 (Exterior)	Residential
C	67 (Exterior)	Active sports areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings
D	52 (Interior)	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios
E	72 (Exterior)	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F
F		Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing
G		Undeveloped lands that are not permitted

*L_{eq}(h) is an energy averaged, one hour, A-weighted sound level in decibels (dB(A)).
Source: 23 CFR 772 - *Procedures for Abatement of Highway Traffic Noise and Construction Noise,* July 13, 2010.

3.11.2 Methodology

The NAC guidelines apply to areas of regular human activity, where lowered noise levels are desired. For roadway projects, such areas are typically located between the highway and the exterior areas of frequent human use. For this study, Common Noise Environments (CNE) were defined to represent these noise sensitive areas. CNEs are groups of receptors within the same NAC category that are exposed to similar noise sources and levels. Monitoring and modeling receptors were located throughout the Study Area to represent the noise sensitive areas. Four noise monitoring sites were placed in locations that best represented the CNEs and nineteen receptor locations were located between the highway right of way and the exterior areas of frequent human use, or at specific locations of special concern. The monitoring and receptor locations within the three CNEs are shown in **Figure 3.11-1**. Noise monitoring data are included in **Appendix E**.

Since highway noise can be determined accurately through computer modeling, both existing and design year sound levels were determined by modeling with the FHWA's Traffic Noise Model (TNM) Version (2.5).[20] TNM accounts for such factors as ground absorption, roadway geometry, receiver/site distance, shielding from local terrain and structures, vehicle volume, operating speed, and traffic volumes. Future roadway and traffic conditions were applied to the TNM program to calculate future sound levels at each receptor location and the results were compared to the VTrans and FHWA noise impact criteria. If sensitive receptor locations were determined to be impacted, noise mitigation measures were evaluated.

A review of the traffic data provided in **Section 3.2** revealed that the weekday evening peak hour generally experiences the highest traffic volumes throughout the study area. Existing noise levels were measured in the field during the weekday evening peak period to verify the accuracy of the TNM. While observing and recording traffic volumes, four separate monitoring sites were selected to establish noise model validation values. At each site, field noise levels were recorded using a sound level meter, and compared to the TNM calculated sound level. In order to confirm model accuracy, the four validation sites were verified to be within 3 dB(A) of the TNM prediction model. Additional information with respect to TNM calibration and output is included in **Appendix E**.

3.11.3 Affected Environment

The northerly portion of the study area, identified as CNE-1 between North Main Street and Federal Street (to the east and west) and Lower Newton Street and Hudson Street (to the north and south), is primarily residential with a few commercial properties. Under the Proposed Action, additional turn lanes and signalized traffic control would be provided at the intersections of North Main Street at Upper and Lower Newton Streets, and Federal Street at Lower Newton Street. This would result in minor widening and realignment to the Federal Street Corridor (Federal Street and Lower Newton Street).

The central portion of the Study Area, identified as CNE-2 between North/South Main Street and Federal Street through Lemnah Drive (to the east and west) and Hudson Street and Locke Terrace (to the north and south), is a mix of residential and commercial properties. Under the Proposed Action, additional turn lanes and on-street parking would be provided along Federal Street. A single lane roundabout at the intersection of Federal Street and Lower Welden Street, and a traffic signal (with a one-way street pair: Catherine Street northbound and Market Street southbound) at the intersection of Federal Street and Lake Street would accommodate future traffic demands.

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[20] *Traffic Noise Model Users Guide*, Federal Highway Administration, dated April 2004

The southern portion of the study area, identified as CNE-3 between South Main Street and Lemnah Drive (to the east and west) and Locke Terrace and Nason Street/Nason Street Connector (to the north and south), is primarily residential. Under the Proposed Action, the Federal Street Corridor would be modified with the construction of a new section of roadway known as the Nason Street Connector. This new roadway would connect the southern terminus of Lemnah Drive (at the intersection of (Nason Street) with the western terminus of the Interstate Access Road (at the intersection of South Main Street).

The noise model predicted existing peak hour noise levels for CNE-1 (the northerly portion of the study area) between 51 dB(A) to 65 dB(A). Predicted noise levels range from 60 dB(A) to 64 dB(A) for CNE-2 (the central portion of the study area) and 49 dB(A) to 65 dB(A) for CNE-3 (the southern portion of the study area). These ranges of noise levels represent the existing noise conditions in these receptor locations. See **Table 3.11-3** for a summary of modeled noise levels.

3.11.4 Environmental Consequences

3.11.4.1 No Action

The 2030 No-Action alternative was not evaluated, but the increase in sound levels from a 2030 future year No Action to Proposed Action (i.e., Build) condition would be no greater than the increase in sound levels from the 2010 Existing to 2030 Proposed Action condition as reported in **Table 3.11-3**.

3.11.4.2 Proposed Action

Sound levels in the Study Area have been calculated for the 2030 Proposed Action. The TNM input files were developed to calculate sound levels that represent the worst noise hour, which is when the vehicle volume and operating speed combine to produce the highest noise conditions. The 2030 Proposed Action sound levels were determined based on the realignment of the Federal Street Corridor (Lower Newton Street, Federal Street, Catherine Street, Market Street, Allen Street, Lemnah Drive, and the Nason Street Connector), changes in topography and future year traffic volumes.

The highest sound levels generally occur during the weekday evening peak hour, which according to traffic data occurs at some intersections within the 4:00-5:00 PM peak hour and at others within the 4:30-5:30 PM peak hour. The noise model predicted that the receptor locations within CNE-1 (the northerly portion of the

Table 3.11-3 Sound Levels From Traffic Noise Model, Version 2.5 - Leq dB(A)

Site Number	Site Description	2010 Existing (A)	2030 Build (B)	Increase over Existing	NAC "Approach" Level	Impact Y or N
Common Noise Environment 1 (CNE-1)						
R1 - SE corner of Federal & Newton	Residential	64	65	1	66	No
R2 - SW corner of N Main & Newton	**Residential**	**65**	**66**	**1**	**66**	**YES**
R3 - Federal w/o Best	Residential	62	64	2	66	No
R4 - Best Ct	Residential	51	53	2	66	No
R5 - w/o Federal n/o Aldis	Residential	62	64	2	66	No
R6 - N Main n/o Hoyt	Residential	65	65	0	66	No
R7 - e/o Federal n/o Hoyt	Residential	63	65	2	66	No
R8 - e/o Federal n/o Hoyt	Residential	51	52	1	66	No
Common Noise Environment 2 (CNE-2)						
R9 - n/o Lake (Market-Catherine)	Commercial	62	64	2	71	No
R10 - w/o S Main St n/o Stowell	Residential	60	60	0	66	No
R11 - NE corner of Welden & Allen	Residential	60	61	1	66	No
R12 - S Main s/o Welden	Residential	64	64	0	66	No
Common Noise Environment 3 (CNE-3)						
R13 - NW corner of S Main & Nason	Residential	65	65	0	66	No
R14 - s/o Nason (Front Yard - West)	Residential	59	60	1	66	No
R15 - s/o Nason (Back Yard - West)	Residential	50	59	9	66	No
R16 - s/o Nason (Front Yard - Mid)	Residential	57	54	-3	66	No
R17 - s/o Nason (Back Yard - Mid)	Residential	49	56	7	66	No
R18 - s/o Nason (Front Yard - East)	Residential	58	55	-3	66	No
R19 - s/o Nason (Back Yard - East)	Residential	55	57	2	66	No

Sound levels are from a TNM, Version 2.5 noise model constructed by Vanasse Hangen Brustlin, Inc., March 2012.
Row in bold represent locations that have an NAC impact under 2030 Build conditions.

study area) would experience sound levels for the 2030 Proposed Action that vary from 52 dB(A) to 66 dB(A). Sound levels are expected to range from 60 dB(A) to 64 dB(A) for CNE-2 (the central portion of the study area) and 54 dB(A) to 65 dB(A) for CNE-3 (the southern portion of the study area) for the 2030 Proposed Action.

Only one receptor location (*R2 – SW corner of N Main & Federal in CNE-1)* of the nineteen receptor locations approach (come within 1 dB(A)) the NAC for an impacted location for Land Use Category C (67 dB(A)). This impacted receptor is in the urban downtown area located adjacent to the intersection of North Main Street and Lower Newton Street. All of the other eighteen receptor locations fall below the appropriate NAC threshold. It is important to note that sound level increases throughout the majority of the Study Area would be less than 2 dB(A), which is imperceptible to the human ear and well below the 15 dB(A) classification of a substantial noise increase.

Residents located along the south side of Nason Street in CNE-3 would experience the greatest sound level increases (no more than 9 dB(A)) in their back yards as a result of the construction of the Nason Street Connector Road. These sound level increases (between 1 and 9 dB(A)) fall below both the impact criteria for a substantial noise increase (15 dB(A)) and the NAC threshold. Furthermore, this increase in sound is isolated to the back yards of these residences along the south side of Nason Street; their front yards would actually experience a minor decrease (approximately 3 dB(A)) in sound levels as a result of the reduced traffic volumes on Nason Street.

Sound levels at the existing residence at the southwest corner of the intersection of the proposed Nason Street Connector and South Main Street (Parcel 1) are expected to be very similar to Noise Receptor Location 19 (*R19 - s/o Nason (Back Yard – East)*) in both the 2010 existing conditions and the 2030 Build conditions because of the comparable distances to the same noise sources (South Main Street, Nason Street Connector, and the Interstate Access Road) as well as similar topography. As documented in the noise evaluation, receptor "R19" is expected to experience sound levels of 55 dB(A) in the 2010 existing conditions and 57 dB(A) in the 2030 Build conditions, both of which are well below the NAC. Therefore, no additional noise receptor location at Parcel 1 was required for this evaluation.

3.11.5 Mitigation

FHWA noise regulations require consideration of noise abatement measures wherever a project is found to have noise impacts. Typical abatement measures include the alteration of vertical or horizontal alignments, management of traffic, and construction of noise barriers. The alteration of the horizontal and vertical roadway alignments as a means to reduce or eliminate impacts is not feasible because the Project is a roadway widening. Traffic management measures were considered as part of the Project and included low design speeds to reduce highway noise. The construction of noise barriers was considered at the impacted location but was determined to not be feasible or reasonable because of numerous access driveways, which prevent the construction of a continuous noise barrier of sufficient length to achieve appropriate sound level reductions.

Based on the noise analysis, the properties along the Nason Street Connector would not experience a noise impact and therefore mitigation is not required. However, the City is proposing to address the construction of the new roadway section at the Nason Street Connector. During the design of the Proposed Action, a privacy fence and/or dense landscaping with trees and/or shrubs would be incorporated into the plans. Specifically, such features would be implemented to provide a visual barrier between the proposed Nason Street Connector and the backyards of the residences along Nason Street and that at the southwest corner of the proposed intersection of the Nason Street Connector with Main Street. The existing natural vegetative buffer between at this location should be maintained to the extent feasible. The City would work with the property owners for those lots backing onto the Nason Street

Connector to evaluate what treatment options may be possible and to develop a mutually agreeable solution.

3.12 Parks, Recreation and Conservation Land

This section identifies public parks, wildlife refuges, and public recreation land located within, or in the vicinity of, the Study Area. Potential impacts on public parks and recreation land from the No-Action Alternative and the Proposed Action are evaluated and measures to avoid, minimize or mitigate potential impacts are discussed.

3.12.1 Regulatory Context

Public parks, wildlife refuges, and public recreation land are subject to protection under the *US Department of Transportation Act* of 1966 [Section 4(f)] and may be subject to the *Land and Water Conservation Fund (LWCF) Act* of 1964 [Section 6(f)].

3.12.2 Methodology

Consultation with the City of St. Albans Planning and Zoning was initiated to determine whether public parks, recreation areas, and/or conservation lands occur within, or in the vicinity of the Study Area. Consultation with the Vermont Department of Forests, Parks, and Recreation was also initiated to determine whether LWCF projects occur in, in the vicinity of the Study Area.

A search of the Vermont Conserved Lands Database, produced by the University of Vermont Spatial Analysis Laboratory and distributed by the VCGI was also conducted to determine whether conserved public lands occur within, or in the vicinity of, the Study Area.

3.12.3 Affected Environment

Public lands and recreational areas are shown on **Figure 3.12-1**. There are no such resources within the Study Area. Taylor Park on North Main Street between Fairfield and Bank Streets was enhanced with LWCF monies. This park lies outside the Study Area. No other Section 6(f) properties and/or public recreation areas are located within or near the Study Area.

3.12.4 Environmental Consequences

3.12.4.1 No Action

The No-Action Alternative would not require the use of land from any public park, wildlife refuge, or public recreation land as no additional public lands would be cleared or built upon.

3.12.4.2 Proposed Action

The Proposed Action would have no direct effect on Taylor Park as it lies outside of the Study Area. No other public recreation areas or Section 6(f) properties occur in the Study Area, thus there would be no direct impacts to any of these recreational resources.

The Proposed Action may have an indirect beneficial effect on Taylor Park by improving congestion and mobility within the vicinity of the Park.

3.12.5 Mitigation

Given the absence of impacts to parks, recreation, or conservation lands, no mitigation is necessary.

3.13 Historic Resources

3.13.1 Regulatory Context

Cultural resources are resources that are listed in or eligible for listing in the National Register of Historic Places (National Register). To be eligible for listing, a resource (building, site, structure, object, or district) must be at least 50 years old (unless it meets Criteria Consideration G: Properties That Have Achieved Significance within the Past Fifty Years) and possess integrity of location, design, setting, materials, workmanship, feeling, and association. Historic resources must possess a quality of significance in American history, architecture, engineering, and culture. In addition, the resource must meet at least one of the four Criteria for Evaluation defined by the National Park Service.[21] The four evaluation criteria are:

A. Association with events that have made a substantial contribution to the broad patterns of our history.

B. Association with the lives of persons significant in our past.

[21] 36 Code of Federal Regulations § 60.4 (Criteria for Evaluation), Chapter I. National Park Service. 1 July 2003.

C. Embodiment of the distinctive characteristics of a type, period, or method of construction, or representation of the work of a master, or possession of high artistic values, or representation of a substantial and distinguishable entity whose components may lack individual distinction.

D. Yielding or demonstrating the potential to yield information important in prehistory or history.

Section 106 of the National Historic Preservation Act of 1966, as amended (36 CFR Part 800), requires federal agencies to consider the effects of their undertakings on properties in or eligible for inclusion in the National Register. Compliance with Section 106 requires consultation with the Advisory Council on Historic Preservation (ACHP) and the State Historic Preservation Officer (SHPO) if there are possible effects to historic properties (properties that have been determined eligible for listing or are already listed in the National Register). In Vermont, Section 106 review is conducted under alternative procedures provided for in 36 CFR 800. A Programmatic Agreement among FHWA, VTrans, the ACHP and the Vermont SHPO allows VTrans to conduct reviews of its own projects, using qualified historic preservation and archeological professionals on VTrans staff, without further review or input by the Vermont SHPO or the ACHP except in infrequent instances.

Additionally, Section 4(f) of the Department of Transportation Act of 1966 also protects cultural resources. A Section 4(f) discussion is included in this EA as **Chapter 4**.

3.13.2 Affected Environment

The Area of Potential Effects (APE) is defined as the area bounded by the parcels that front on the streets where physical improvements are proposed. The APE includes two historic districts and two individual properties which are individually listed in the National Register. Additionally, through the studies conducted as part of this EA, one new historic district and two new individual properties were identified that have since been determined eligible for listing in the National Register (see **Appendix F**). Each of these historic properties is described in this section, beginning with the listed properties, followed by those determined eligible for the National Register. Historic properties are mapped on **Figure 3.13-1**.

3.13.2.1 Properties Formally Listed in the National Register of Historic Places

Districts

The Central Vermont Railroad Headquarters Historic District

The CVR Headquarters Historic District was listed in the National Register in 1974. The district is recognized as the most intact 19th century railroad complex surviving

in Vermont, which included passenger facilities, freight stations, repair and fabricating shops, and the general offices. The historic district nomination states that the district consists of 12 major structures along the main line and yard tracks; however, the nomination's written boundary description circumscribes a much larger area (see **Figure 3.13-1** for the boundaries) which encompasses a number of non-related buildings which are not historic. These boundaries are not clearly justified in relationship to the complex's significance and the 12 buildings discussed in the nomination.[22] There are five properties within the district that are affected by the Project, but only two of which are contributing:

- The CVR General Office building at the northwest corner of Federal and Lake Streets. This is the only building of those potentially affected that is mentioned in the National Register nomination; and
- The Giroux Furniture Company building at the southwest corner of Federal and Lake Streets.

The CVR General Office building is a 2-½ story brick Second Empire style structure with two flanking three-story mansard-roofed corner towers and fenestration featuring narrow paired and single round-arched windows, with a grass-covered lawn in front. Sidewalks are present on both the Lake and Federal Street sides of the parcel.

The Giroux Furniture Company building at 10-18 Catherine Street, a 2-story brick-veneered wood frame structure dating from 1892 and 1905, is also individually listed in the National Register and is further described below. The Giroux Building is not mentioned in the nomination for the CVR Headquarters Historic District. However, the building is considered as contributing to the district because it is related to the activities of the CVR; railroad shipping to and from the building did occur and it falls within the district's period of significance.

St. Albans Historic District

The St. Albans Historic District (**Figure 3.13-1**), which includes the central business area, Taylor Park, and the buildings to the east of the park on Fairfield and Church Streets and Maiden Lane, was listed in the National Register in 1980. The western boundary of the district is contiguous to sections of the eastern boundary line of the CVR Headquarters Historic District. The district is composed of many of the City's most prominent institutional and commercial buildings, which date from 1812 to 1932. Centered around Taylor Park, a large open park established in 1792, the district is significant for its association with the City's growth as a major commercial and

[22] The written boundary description for the Central Vermont Railroad Headquarters Historic District encompasses a much larger area than is discussed in the nomination. Vermont's nomination reviewer from the National Register office in Washington DC determined that the written boundary as stated in the nomination cannot be changed or re-worded (Devin Colman, Vermont Division for Historic Preservation, personal communication, 1/16/2011). Buildings located within that boundary, even if they are not described in the nomination, should be considered to be listed in the National Register provided they meet the following criteria: 1) Based on the dates listed for the buildings, the period of significance would be ca. 1862–1924; 2) The areas of significance are architecture, engineering, and transportation.

governmental center in northern Vermont and the prosperity engendered by the establishment of the CVR here in the 1850s.

There are two buildings within the St. Albans Historic District that are potentially affected by the Project at the intersection of Federal and Lake Streets. The first building is the St. Albans Foundry and Implement Company Building at 1 Federal Street, a two-story brick and frame building dating to *ca.* 1870 that has been converted to a restaurant use. The second building is the 1840 St. Albans House at 60 Lake Street, on the southeast corner of the Federal, Lake and Catherine Street intersection. The four-story structure of brick and wood frame construction features a mansard roof, added with the two upper wood frame stories in the 1870s to the original Greek Revival building.

Individual Properties

Willard Manufacturing Company Building

The Willard Manufacturing Company at 25 Stowell Street was individually listed in the National Register in 2007. The large, flat-roofed two-story timber-framed industrial building from 1896 housed a garment factory and other later industries that were dependent on the CVR line for shipping. Its significance lies in its association with the City's industrial history and its ties with several prominent manufacturing companies in the City and with the CVR. The building's front setback is next to the sidewalk, although this section is a one-story, three-car garage section of the larger main building behind it.

Giroux Furniture Company Building

The Giroux Furniture Company Building at 10-18 Catherine Street, at the southwest corner of Lake and Catherine Streets was individually listed in the National Register in 2006. The building is a large two-story brick-veneered wood frame commercial building, which was built in two sections in 1896 and 1905. The building's north elevation contains a projecting full-width glass-enclosed storefront space that dates to *ca.* 1950-1960. A small number of pull-in parking spaces are located at the storefront's west end.

3.13.2.2 Properties Determined Eligible for the National Register of Historic Places

Within the APE, there is one potentially affected district and two individual properties that were determined by consensus determination to be Eligible for Listing on the National Register by consensus determination.

District

Federal/Lake/Catherine Streets Intersection Historic District

The four buildings and the intersection noted above were evaluated as an entity at the request of the VTrans Historic Preservation Officer as the area had not been evaluated for its collective historic association with the CVR and corollary commercial/industrial activities. The area was determined eligible for the National Register by the VTrans Historic Preservation Officer for its significance as a small, cohesive district that conveys a strong association with the CVR and the attendant commercial activities that resulted from the railroad's location just west of this intersection. No other buildings exist within this eligible district.

All four corners of this irregularly-configured intersection contain buildings that are already either individually listed in the National Register or are within an established National Register historic district. The intersection is included in one of the district listings – the CVR Headquarters Historic District – although the boundaries of this district are not clearly justified in relationship to the complex's significance and the buildings discussed in the nomination. The four buildings are the General Office building of the CVR at the northwest corner, the St. Albans Foundry and Implement Company building at 1 Federal Street at the northeast corner, the St. Albans House at 60 Federal Street at the southeast corner and the Giroux Furniture Company building at 10-18 Catherine Street at the southwest corner.

The General Office building of the CVR is the most visible and prominent of the complex's structures and is one of the earliest buildings that remain. The St. Albans House at the southeast corner of Lake and Federal streets, although originally built in 1840 to serve travelers on the stage road that would become Lake Street, was greatly expanded in the 1870s and thrived for decades due to its proximity to the railroad. The two remaining structures associated with the St. Albans Foundry – one of the most extensive industrial concerns in the City – are on the intersection's northeast corner at 1 Federal Street. The *ca.* 1890 corner building was part of the foundry until 1911 when it closed and became a cigar-making shop. There is no doubt that the product's shipment via the railroad line contributed to its location here. Two other buildings associated with the foundry were located on the east side of Catherine Street as late as 1980 and were included in the St. Albans Historic District boundaries, but the buildings have since been demolished. The 1980 St. Albans Historic District nomination noted that the buildings in this area were not associated with Taylor Park, the focus of most of the buildings within the district, but with the industrial growth of the community after the railroad line was established here.

The more recent National Register nomination of the Giroux Furniture Company building, the fourth building at the intersection, recognized the strong association of this building with the railroad line. The Giroux Furniture Company/City Feed Store building at 10-18 Catherine Street was originally erected in 1896 to replace an earlier group of buildings that had the same function and owner. The building originally had a Market Street address, signifying the dominance of this street. The flour, feed,

and phosphate store and warehouse function is documented here as early as 1884, and likely existed earlier in the 1870s. Although the building did not have its own railroad siding connection to the railroad until after 1920, its long-term occupation of this corner next to Market Square and the freight operations also demonstrates its significant association with the railroad line.

Individual Properties

163 Federal Street – Old Newton House/ Bilodeau House

This 1½ story side hall front gable house is dated *ca*. 1860 according to the Federal Street survey form. The house was determined eligible for the National Register by the VTrans Historic Preservation Officer as a rare example of brick construction for the modest vernacular houses constructed on Federal Street for railroad workers' housing.

The house was owned by "D. Newton" on the 1871 Beers Atlas of St. Albans. Short-return boxed cornices are typical of the houses on the north end of Federal Street, but its brick exterior marks this house as the only extant example of this construction material on the street. The facade has three bays on the first story and two centered windows above, with a south entrance. A front porch that was enclosed in the 20th century with a shed roof and paired windows, which appears in the photograph of the house on the Federal Street survey form, has been removed recently; it has been replaced by a small porch deck with a concrete floor and metal porch rail. There is a small addition in the rear of the house, dating to the original construction. While an internal brick chimney in the roof ridge is still extant, the windows have been replaced with aluminum 1/1 sash, and the roof has been covered in new sheet metal roofing. An entrance porch on the east side of the south elevation dates to *ca*. 1945, and a gable dormer on the north elevation with paired 2/2 sash windows was added *ca.* 1915. Decorative vergeboards were added under the front gable *ca.* 1970, at the same time that an attached garage was constructed in the rear of the house.

174 Federal Street – Wagner House

This three-bay house is 1 ½ stories tall, and was recorded on the Federal Street survey form as dating to *ca.* 1870. The house was determined eligible for the National Register by the VTrans Historic Preservation Officer as a relatively intact example of the modest housing built on Federal Street in the mid-to-late 19th century for employees of the CVR.

The house has a side hall plan, with an original side ell and an enclosed glazed porch with 3/1 sash placed in the space between the main block and the ell. A brick end chimney is visible at the rear of the house. A one-story Queen Anne porch with a hip roof, turned posts, and diagonal brackets extends the full width of the façade. The house retains Italianate details such as a boxed cornice with short returns on the front gable, as well as an Italianate style door with round arched windows. Despite the

addition of clapboard siding, original clapboards remain underneath. Likewise, original 2/2 sash windows are extant behind added storm windows.

3.13.3 Environmental Consequences

3.13.3.1 No Action

The No-Action Alternative would have no direct impacts to historic properties. However, some impact to historic resources within the Study Area may occur due to private redevelopment ventures, although the extent of these potential impacts cannot be quantified in the absence of a specific development plan. It is important to note that further development in the Study Area may require approval through the Act 250 process and state historic preservation laws, which would require consideration of impacts to cultural resources.

3.13.3.2 Proposed Action

Impacts to each of the historic properties in the Study Area that would result from the Proposed Action are discussed in this section.

The Central Vermont Railroad Headquarters Historic District

The Proposed Action has several impacts to the historic district. A roundabout at the intersection of Lower Welden, Allen Street and Lemnah Drive requires shifting the centerline of Allen Street to the west to minimize impacts to residential properties on the east side of Allen Street and to achieve appropriate geometry to connect Lemnah Drive on the south to Allen Street on the north of the intersection. This action requires taking a small portion of the west side parcel within the historic district on Allen Street.

Within this district, the Proposed Action also involves the demolition of three non-contributing buildings in the block bounded by Lake, Catherine, Stebbins and Market Street for a municipal parking lot. North of the three buildings in the same block, the Giroux Furniture Company Building parcel would only be impacted by the Proposed Action through the taking of ROW from the east (Catherine Street) side of the historic property parcel and would have minor re-grading on the south side of the parcel to reconfigure the existing parking spaces.

At the northwest corner of the intersection of Federal and Lake Streets, the Proposed Action would involve a ROW taking of the parcel that contains the CVR General Office building in order to construct a required three-lane approach to the intersection from the north. No buildings would be affected. A portion of Market Street within the Study Area would change ownership from NECR to public ownership.

North of this intersection, at 60-68 Federal Street there would be minor re-grading of the parcel opposite Center Street on the west side of Federal Street for installation of new curbing and sidewalks and some new parking spaces that would help define the street edge. Further north of this area, new sidewalks would be added to the front of the parcels on the west side of Federal Street, which currently have no such amenities.

St. Albans Historic District

The Proposed Action would involve changes at the intersection of Lake and Catherine Streets and along the east side of Federal Street near Center Street. At the St. Albans House parcel on the southeast corner of Lake, and Catherine Streets, there would be minimal use of the property during construction to reconstruct the existing sidewalk along the property's west (Catherine Street) and north (Lake Street) sides. Between Kingman and Center Streets, there would be a minor impact to the district to build streetscape improvements.

Federal/Lake/Catherine Street Intersection Historic District

The Proposed Action would substantially reconfigure the Federal/Lake/Catherine Street Intersection, but there would be no full acquisition or demolition of any building within this district. A permanent ROW acquisition would affect the CVR General Office building on the northwest corner in order to construct a three-lane approach to the intersection from the north. The Proposed Action would also involve re-grading the south end of the Giroux Furniture Company parcel to reconfigure an existing parking lot. Additionally, there would be a minor permanent ROW acquisition along Catherine Street on the east side of the Giroux Furniture Company parcel in order to obtain acceptable geometry at the intersection.

Willard Manufacturing Company Building

The Proposed Action would add streetscape improvements in front (west) of the building; there would be no ROW impact to the parcel. The sidewalk that is currently in front of the building would remain, but would be rebuilt as part of the Project.

Giroux Furniture Company Building

As discussed under the CVR Headquarters Historic District and the eligible Federal/Lake/Catherine Street Intersection District, the Proposed Action would take a relatively small amount of ROW from the east (Catherine Street) side of the historic property parcel. Additionally, there would be minor slope impacts to re-grade the existing parking lot on the south side of the parcel to reconfigure the existing parking spaces.[23]

[23] Note that initial design concepts for the reconstructed Federal/Lake/Catherine Street Intersection involved demolition of the Giroux Furniture Company building. Recognizing the historic nature of this building, additional design

163 Federal Street

The Proposed Action would involve minor re-grading of the existing driveway of this property to tie into the new grade of the reconstructed Federal Street. There could also be a temporary use of a small portion of the front of the property in order to reconstruct the existing sidewalk adjacent to the parcel.

174 Federal Street

The Proposed Action would make no changes to this property.

Determination of Effect

Based on the results of on-going coordination, the VTrans Historic Preservation Officer has indicated that the Proposed Action would have No Adverse Effect on historic structures or districts. A Conditional No Adverse Effect determination is included in **Appendix G**.

3.13.4 Mitigation

The Conditional No Adverse Effect determination for the Proposed Action contains the following conditions (**Appendix G**):

- The City of St. Albans agrees to include the VTrans Historic Preservation Officer in the discussions regarding the balance of parking spaces and green spaces within the area south of the Giroux Furniture Company building.
- The City of St. Albans agrees that the VTrans Historic Preservation Officer will review and approve the final plans and will not proceed with the proposed work until the VTrans Historic Preservation Officer provides written approval to the plans.

3.14 Archeological Resources

This section describes the archeological resources within the Study Area as identified by a review of available background information at the Vermont Division for Historic Preservation (DHP), field work, and the preparation of an Archeological Resources Assessment (ARA), including Archeological Sensitivity modeling using a Geographic Information System (GIS). Potential impacts on archeological resources from the No-Action Alternative and the Proposed Action are discussed, as well as mitigation actions for Project construction. The APE for the ARA included the five roadway segments described in **Section 2.4** of this EA, and included the existing ROW and areas beyond where takings or easements would be required by the Project

alternatives were developed to avoid direct impacts to the building, one of which was subsequently designated as the Proposed Action. Further discussion of these alternatives is provided in Chapter 2.

alternatives. At the location of the proposed Nason Street Connector, the APE consisted of a 150-ft. wide corridor along the proposed road centerline.

3.14.1 Regulatory Context

Archeological resources are the material remains of past human activity; an archeological site is the place or places where the remnants of a past culture survive in a physical context that allows for the interpretation of these remains (NPS 2000). To be eligible for listing, an archeological property must meet at least one of the four Criteria for Evaluation defined by the National Park Service (NPS 2000). These are summarized in **Section 3.13.1**, along with the requirements of Section 106 of the National Historic Preservation Act of 1966, as amended (36 CFR Part 800).

3.14.2 Methodology

An ARA was conducted in the spring of 2011 (VHB 2011) and is contained in **Appendix H**. It includes the following components.

Background Research

Documentary and map research was conducted at the DHP, including an examination of:

- Archeological and cultural resource reports within the Project vicinity;
- Archeological site file search for recorded sites within or adjacent to the APE;
- National Register listed archeological sites and standing structures or historic districts located within or adjacent to the APE;
- Archeological sites being considered for the National Register;
- Town files for information on archeological sites and standing structures;
- Reference to Burial Grounds of Vermont for the existence of any cemeteries within or adjacent to the Study Area.
- In addition, US Department of Agriculture (USDA) soil maps, prior Federal Street Corridor studies (NRPC 1995; RSG 2005), various survey area reports, an online databases were reviewed.

Historic Site File Research and Sensitivity

The DHP site file search revealed that there are no previously identified archeological sites or cemeteries located within the APE. The closest known site is located about 1 mile northwest of the intersection of Lower Newton and Federal Streets and consists of prehistoric debris (chipped stone scatter, flakes, and one scraper). The site period for these resources is unknown. Additional information regarding previously reported sites within 3 miles of the Study Area can be found in

the ARA in **Appendix H**. None of the sites studied contained particularly high densities of prehistoric debris.

Site Inspection

A walkover of the Study Area was conducted by a professional archaeologist qualified under the Secretary of the Interior Guidelines. The walkover was done in October 2010, under good field conditions. The focus of the fieldwork was the area of the proposed Nason Street Connector, as this area has the greatest potential for intact soils and the presence of pre-contact sites. Other segments of the Study Area have been previously disturbed, developed, and redeveloped over time, both within the ROW and in areas beyond the ROW limits into which the Project alternatives may extend.

Phase I Archeological Site Identification Survey

The currently undeveloped and southernmost portion of the Federal Street corridor where the Nason Street Connector is proposed was identified during Project scoping as being archeologically sensitive. For this reason, a Phase I Archeological Site Identification Survey was completed in June 2012 and supplemental testing completed in July 2012. These surveys included the excavation of a total of 49 test pits oriented along 11 linear transects that bisected the proposed route of the Nason Street Connector.

3.14.3 Affected Environment

The area of the proposed Nason Street Connector was subjected to a judgmental walkover consisting of a traverse of the Study Area between the rear fencelines of Nason Street parcels and a point 100 ft south of the proposed centerline of the road alignment (see "Archeological Survey Area" on **Figure 3.14-1**). As described in **Section 3.3**, jurisdictional wetlands are present in the western portion of the proposed road segment. Secondarily deposited debris is scattered across the wetlands and adjacent areas. Some of the debris may be transported to the area via a stormwater outfall, which is present at about the midpoint location of the segment; however, much of it appears to have originated from the houses that back onto the corridor from the north.

A single archeological feature was noted during the walkover: a pile of building debris, probably a collapsed outbuilding. The feature is associated with miscellaneous trash including plastic gas cans, various metal objects, and rope and it may have originally functioned as a utility shed of some sort.

The valley slope, which is relatively gradual, offers easy access to the lower wetland areas and it is marked by occasional flat benches. The proximity of potable water in the basal wetlands and the presence of a channelized stream rising at the stormwater outfall suggest that the valley slope would have been attractive for Native American

use. The historic period houses are located nearer to the crest of the ridge but have outbuildings located on the valley slope as well. The presence of the collapsed outbuilding suggests that the dry slope was utilized for various purposes in the historic era.

3.14.3.1 Archeological Sensitivity

Outside of the proposed Nason Street Connector, the Proposed Action would be confined to existing ROW. For this reason, a full archaeological sensitivity assessment was not implemented. However, proximity to potable water was mapped using available surface water mapping from the Vermont Hydrography Dataset (Stevens and Rugg Brooks and their tributaries) and mapped wetlands. A 90-meter buffer, applied to these resources, suggests that the portion of the proposed Nason Street Connector on the west-facing valley slope (i.e., east half of the proposed roadway segment) should be identified as a location of archaeological sensitivity.

Two other locations of possible archaeological concern were determined to be along the grassy strip on Allen Street (an area that once hosted historic era warehouses), and Market Street between the railroad and the existing building complex south of Lake Street. Due to the disturbed or developed condition of these locations, the likelihood of identifying intact archaeological features in either of these areas is considered low to moderate. For this reason, additional studies are not deemed to be warranted.

3.14.3.2 Results of Archeological Site Identification Survey

Of the 38 test pits excavated during the Phase I Archeological Site Identification survey (each 20 inches by 20 inches in size), only one test pit was positive, returning a single piece of lithic debitage (a by-product of stone tool making or refurbishment) at a depth between 16 and 20 inches below ground surface. This test pit was located near the proposed centerline of the Nason Street Connector.

In an attempt to determine if the positive test pit was indicative of a larger and potentially significant site, 4 additional close interval test pits were completed during the Phase I survey, each of which was negative. Supplemental Phase I testing was performed in July 2012 to better define the extent, context and integrity of the site. This testing included the excavation of 7 additional test pits and expansion of the original positive test pit to a dimension of 3.3 ft by 3.3 feet. All additional test pits were negative. One additional specimen of lithic debitage was produced from the expanded pit, indicating that minimal lithic reduction activities occurred within this portion of the APE.

The conclusions of the supplemental Phase I testing was that the limited artifact density and negative pits excavated within the proposed Project area indicate that the portion of the archeological site within the APE is not significant. These finds

may relate to a larger site area outside of the proposed corridor to the south and west. Based on the results of the Phase I and Supplemental Phase I study, no further archeological work is recommended at the location of the positive test pit and the construction of the Project would have no adverse effect on archeological resources. The VTrans Archeology Officer has reviewed and concurs with the findings of the Phase I and Supplemental Phase I Archeological Site Identification Surveys.

3.14.4 Environmental Consequences

This section describes the environmental consequences of the No-Action Alternative and the Proposed Action.

3.14.4.1 No Action

As indicated in **Section 3.14.3.2**, archeological surveys of the proposed ROW for the Nason Street Connector determined that the portion of the archeological site within the APE is not significant. Therefore, the No-Action Alternative would have no adverse effect on archaeological resources.

3.14.4.2 Proposed Action

As indicated in **Section 3.14.3.2**, archeological surveys of the proposed ROW for the Nason Street Connector determined that the portion of the archeological site within the APE is not significant and that the Project would have no adverse effect on archaeological resources.

3.14.5 Mitigation

The Phase I and Supplemental Phase I Archeological Site Identification Surveys evaluated a significant portion of the proposed Nason Street Connector and it was determined that no significant archeological sites are present. Nevertheless, unanticipated archaeological sites may be discovered during construction at the proposed Nason Street Connector and elsewhere within the Project limits. In such an event, construction in the vicinity of the discovery would be stopped immediately until such time that the resources are identified and documented and, if the resources cannot be preserved in situ, an appropriate mitigation strategy developed in consultation with the VTrans Archeology Officer. Relevant laws, regulations, guidelines and procedures to be implemented are described in detail in the following sections of the Vermont Statewide Federal Aid Highway Programmatic Agreement (see **Appendix H**):

- Section 4(I): Discovery of Archaeological Sites During Project Construction; and
- Section 4(J): Treatment of Human Remains.

3.15 Acquisitions (Right-of-Way)

This section identifies the type and location of properties that would be acquired as a result of the Proposed Action as well as any businesses and residences that would be relocated. It has been determined that relocation costs would be incurred for tenants located in the block between Market Street and Catherine Street. Along with specific properties identified for acquisition, partial acquisitions of land affected by slope impacts have also been estimated.

3.15.1 Regulatory Context

Acquisition of real property and/or displacement of persons must comply with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Uniform Act), as amended (49 CFR 24).

3.15.2 Methodology

The ROW impacts for this Project were calculated by overlaying the slope limits and ROW needs for the Proposed Action on the existing ROW limits/boundaries for the Study Area. Parcel boundaries were field surveyed and were used as a base layer for this analysis. In addition to the surveyed parcel boundaries, property ownership and tax map identifiers were generated. Assessing records from the City were also acquired and used in this analysis. At the southern end of the Project, the ROW for the proposed Nason Street Connector is considered as part of the total Project impact, even through the majority of the ROW has already been acquired by the City.

3.15.3 Affected Environment

The Study Area is located within a portion of the City that is relatively urban in character. As such, the affected environment is a highly developed infrastructure that includes residences, commercial buildings, railroads, streets and related infrastructure. Buildings located within the block between Market Street and Catherine Street are commercial use buildings. The majority of this building space is currently vacant with the exception of two tenants that are currently renting. The tenants are Comcast and Franklin Central Supervisory Union.

3.15.4 Environmental Consequences

For purposes of this discussion, three categories of ROW impact were defined:

- **ROW Acquisitions** represent areas of new permanent public ROW for use in construction of new or improved roadways as well as their future maintenance. It should be recognized that most of the ROW for the Nason Street Connector located at the southern end of the Study Area was recently acquired by the City. These areas would be used for new pavement,

sidewalks, crosswalks, drainage, utilities, landscaping *etc.* and are represented with a red dashed line on **Figures 2.6-3** through **2.6-9**. ROW acquisitions can include business and residential relocations.

- **Permanent Easements** would be required for locating new traffic control and stormwater infrastructure outside of the permanent ROW. For this Project, there are only two areas of permanent ROW easement. Permanent ROW would be needed for the installation of a traffic signal pole and utility box, located on the northwest corner of the Federal/Lake/Catherine Streets Intersection. An additional permanent ROW easement is needed for the installation of stormwater drainage outlet at the proposed drainage basin, located at the southwest corner of the Nason Street/Lemnah Drive Intersection. These areas are represented as a purple dashed line on **Figures 2.6-4** and **2.8-1.**
- **Temporary Easements** are those areas outside of the existing ROW that would be used for regrading, landscaping and temporary construction access but would not be subject to additional permanent use by the public in maintaining the roadway facility. For purposes of the EA, temporary easements are not shown but were estimated by incorporating a zone that extends 5 ft beyond the Project slope limits into the Project plans.

3.15.4.1 No Action

The No-Action Alternative would not involve the relocation of residences or businesses or result in the acquisition of any new ROW or easements.

3.15.4.2 Proposed Action

The Proposed Action would result in the total acquisition of three commercial parcels (shown in **Figure 3.15-1**), one undeveloped parcel along the proposed Nason Street Connector (shown in **Figure 2.6-3**), and partial acquisition of an additional 37 parcels throughout the Study Area. The total area for ROW acquisition is 129,082 sq ft (3.0 ac). In addition, approximately 96,550 sq ft (2.2 ac) of land was previously purchased by the City for construction of the Nason Street Connector. These acquisitions are considered to be Project impacts and also subject to the Uniform Act, as they were purchased for the construction of the Project. Land acquisition by the City from landowners occurred on a voluntary basis during the early planning phase of this Project.

In addition, there would be temporary easements on as many as 91 properties, totaling approximately 95,617 sq ft (2.2 ac). Anticipated ROW impacts are summarized in **Table 3.15-1**. Additional detail on ROW and easements associated with the Proposed Action can be found in **Appendix I**, which contains data on each property affected.

Table 3.15-1 Anticipated ROW Impacts

Impact Classification	No. Properties	Impact Area (sq ft)	Impact Area (ac)
ROW Acquisition (Full/Partial)	4/37	225,632	5.2
Permanent Easement	2	1,200	0.028
Temporary Easement	91	95,617	2.2

One of the full acquisitions (Acquisition #1) is the parking lot for the Giroux Furniture Company building. Three commercial buildings on Acquisition #2 and Acquisition #3 would be demolished. Tenants that currently reside in the buildings that would be demolished (Comcast and Franklin Central Supervisory Union) qualify for relocation assistance under the Uniform Act.

Table 3.15-2 Full ROW Acquisitions

Acquisition ID	Owner Name	ROW Acquisition (Square Feet)	Property Type	# Buildings
Acquisition #1	N/F Americanadian, LLC	2,762	Commercial	0
Acquisition #2	N/F Bevins Property #3, LLC	22,956	Commercial	2
Acquisition #3	N/F B.A. Gage, LLC	5,291	Commercial	1
Acquisition #4	N/F Luneau Family Trust	7,881	Undeveloped Residential Area	0

3.15.5 Mitigation

The *Uniform Relocation Assistance and Real Property Acquisition Policies Act,* as amended, requires that property owners affected by ROW acquisitions for the Proposed Action would be eligible for a variety of compensation measures, including the following:

- Just compensation for acquired property.
- Relocation assistance advisory services.
- Payments for moving and relocation costs.
- Replacement housing payment for home owners.
- Residential mortgage interest differential payments and closing costs.

- Replacement housing payments for tenants.

Specifically, the acquisition and relocation program would be conducted in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended. Furthermore, relocation resources are available to all relocated residential and businesses without discrimination.

3.16 Environmental Justice

This Environmental Justice (EJ) analysis discusses the presence of minority and low-income populations and determines if the impacts of the Project would result in disproportionately high and adverse effects on these populations.

3.16.1 Regulatory Context

This report was prepared to address the requirements of the statutes, regulations, and guidance documents listed below.

- Title VI of the Civil Rights Act of 1964 states "No person in the United States shall, on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal assistance."
- *Executive Order 12898, Federal Actions to Address Environmental Justice in Minority and Low-income Populations* requires agencies to identify and address potential disproportionate high and adverse impacts on minority and low-income populations.
- USDOT Order 5610.2(a), Environmental Justice in Minority and Low-Income Populations requires all USDOT agencies to determine whether activities will have an adverse impact on minority and low-income populations. This procedure was established by USDOT to implement Executive Order 12898.
- FHWA Order 6640.23 defines FHWA's responsibilities and procedures with respect to considering environmental justice communities, promulgated for purposes of complying with Executive Order 12898 and USDOT Order 5610.2.

Under these authorities, FHWA actions may not have a *"disproportionately high and adverse effect on minority and low-income populations,"* meaning *"an adverse effect that:*

> *(1) is predominately borne by a minority population and/or a low-income population; or*
> *(2) will be suffered by the minority population and/or low-income population and is appreciably more severe or greater in magnitude than the adverse effect that will be suffered by the non-minority population and/or non-low-income population."*

3.16.2 Methodology

The following methodologies were used to determine if the Project would result in disproportionately high and adverse impacts to minority or low-income populations in the Study Area.

3.16.2.1 Identify Environmental Justice Populations

CEQ[24] guidance states that environmental justice populations should be identified where:

- The environmental justice population of the affected area exceeds 50 percent, or;
- The environmental justice population percentage of the affected area is *meaningfully greater* than the minority population percentage in the general population or other appropriate unit of geographic analysis.[25]

However, regionally-defined thresholds are more sensitive to specific conditions and provide a better metric for identifying minority and low-income populations. Therefore, the City averages for minority and low-income populations were used for this analysis. Minority and low-income populations were identified using 2000 and 2010 US Census Data.

Minority populations were identified using 2010 census block data, the smallest unit for which population data are available. Low-income populations were identified using 2000[26] census block group data, the smallest unit for which income data are available. Census blocks are a subset of census block groups.

All census blocks and census block groups that fell within or partially within the "footprint" (i.e., the limits of the proposed grading or ROW acquisition for any of the alternatives) were selected to determine the total population of the Study Area and identify individual census units that contain minority or low-income populations. The analysis considered the entire population within an affected census block or block group, even if only a portion of the census unit would be actually impacted.

[24] Congress established CEQ within the Executive Office of the President as part of the National Environmental Policy Act of 1969 (NEPA). The Council on Environmental Quality coordinates federal environmental efforts and works closely with agencies and other White House offices in the development of environmental policies and initiatives, including developing policy for implementation of NEPA.

[25] Environmental Justice: Guidance under the National Environmental Policy Act. Council on Environmental Quality, p.25, December 10, 1997. Website: http://ceq.eh.doe.gov/nepa/regs/EJ/justice.pdf.

[26] Though FHWA Executive Order 12898 defines "low-income" as "a person whose household income is at or below the Department of Health and Human Services (HHS) poverty guidelines," these guidelines are based on the number of persons in the household and this information is currently not available for the Study Area. The 2000 Census was used for the low-income analysis because the 2010 Census did not include a long form questionnaire and American Community Survey data for 2010 were not available at the time this analysis was conducted. Based on anecdotal information from City officials, it is unlikely that any appreciable change has occurred in population dynamics within the Study Area.

Population data from the census blocks and block groups was then compared to the averages for the City using statistical testing (i.e., chi-square test for independence) to determine if the minority or low-income population of the individual unit is meaningfully greater than the minority or low-income population percentage in the general population.

3.16.2.2 Determine if Impacts Disproportionately Affect Environmental Justice Populations

Since environmental justice considerations depend on the potential for environmental or community impacts,[27] the area of analysis for environmental justice is the area of potential impacts for other community and environmental impact categories. A disproportionate impact would occur if the adverse effects on environmental justice populations would be appreciably more severe or greater in magnitude than the adverse effects experienced by the non-minority or non-low-income populations.

For purposes of this analysis, ROW impacts (i.e., the acquisition of private property) were used as one indicator of impact, but other forms of impact were also considered. It is important to note that CEQ and FHWA guidance stipulates that impacts relevant to EJ analysis include a range of potential impacts such as, among others: air, noise, water pollution and soil contamination, impacts to natural resources, aesthetic impacts, and disruption of community cohesion or a community's economic vitality. Of those potential impacts, the Federal Street Project includes a noise impact at one receptor location and the aesthetic (visual) impact of the Nason Street Connector. These were considered in the analysis presented below. The remaining impact topics have no impact or show an improvement (e.g., air quality).

3.16.3 Affected Environment

This section identifies whether environmental justice populations exist within the area of potential impacts.

3.16.3.1 Minority Populations in the Study Area

The City average of minorities (including persons of Black or African American, American Indian and Alaska Native, Asian, Native Hawaiian and Other Pacific Islander, some other race, or two or more races) is 5.9 percent. Any census block with

[27] According to the DOT Order 5610.2(a) and FHWA Order 6640.23, “Adverse Effects” means the “totality of significant individual or cumulative human health or environmental effects.” Impacts which are not significant are not considered “adverse” for the purposes of EJ analyses.

an average population meaningfully greater than 5.9 percent minorities was therefore considered a minority community for the purposes of this analysis.

There are a total of 25 census blocks in the Study Area comprising a total population of 1,928 persons, with a total minority population of 132 persons as of the 2010 census. The minority populations within these blocks range from 0 to 22.9 percent minority (see **Figure 3.16-1**). Of these 25 blocks, only three were determined to contain minority populations meaningfully greater than the surrounding area, including:

- Census Tract 107, Block Group 3, Block 3009;
- Census Tract 107, Block Group 4, Block 4000; and
- Census Tract 107, Block Group 4, Block 4006. [28]

The total population and minority population for each of these blocks is provided in **Table 3.16-1**.

3.16.3.2 Low-Income Populations in the Study Area

Based on available census information, the City low-income population average is 9.6 percent. Any census block group with meaningfully greater than 9.6 percent low-income persons would be considered a low-income community. Analysis of US Census Bureau data from 2000 determined that there are a total of eight block groups located within the Study Area, with low-income populations ranging from 4.4 to 21.7 percent (see **Figure 3.16-2)**. These block groups comprise a total population of 7,602 persons of which 733 fall below the federal poverty level.[29] Of these eight census block groups, only two were determined to have low-income populations that are meaningfully greater than the surrounding area including:

- Census Tract 107, Block Group 1; and
- Census Tract 107, Block Group 4. [30]

These two block groups also lie within a qualifying tract for the New Markets Tax Credit program, created by Congress in 2000 to spur investment of private capital for economic development in both rural and urban low-income communities.

The total population and low-income population for each of these block groups is shown in **Table 3.16-2**.

[28] These three populations were determined to be statistically different from the remainder of the City population by means of the chi-square test at a significance level of $p<0.05$.
[29] Since census block groups include several census blocks, the estimate of the total low-income population within the Study Area would be higher than for minority populations even if the project footprint is the same.
[30] These two populations were determined to be statistically different from the remainder of the City population by means of the chi-square test at a significance level of $p<<0.01$.

Table 3.16-1 Minority Populations in the Study Area[1]

Tract	Block Group	Block	Total Population	Total Minority	Percent Minority	Impacts[3]
107	1	1000	58	4	6.9%	ROW
107	1	1001	44	7	15.9%	None
107	1	1008	6	0	0.0%	ROW
107	1	1014	63	5	7.9%	ROW, Noise
107	1	1015	43	0	0.0%	ROW
107	1	1017	43	5	11.6%	ROW
107	1	1018	268	5	1.9%	None
107	1	1019	34	0	0.0%	None
107	1	1020	28	4	14.3%	None
107	1	1021	15	1	6.7%	None
107	1	1022	122	9	7.4%	None
107	3	3003	480	33	6.9%	None
107	**3**	**3009**	**35**	**8**	**22.9%[2]**	**None**
107	**4**	**4000**	**70**	**10**	**14.3%[2]**	**None**
107	4	4001	0	0	-	ROW
107	4	4002	0	0	-	ROW
107	4	4003	54	2	3.7%	None
107	4	4005	52	2	3.8%	ROW
107	**4**	**4006**	**26**	**5**	**19.2%[2]**	**None**
107	4	4007	0	0	-	ROW
107	4	4008	0	0	-	None
107	4	4009	209	13	6.2%	None
107	4	4010	57	3	5.3%	ROW, None
108	1	1009	73	7	9.6%	None
108	1	1010	148	9	7.4%	None
		Total	**1,928**	**132**	**6.8%**	

Notes:
1. This table shows minority population data for each of the 14 census blocks in the Study Area. Data provided by the US Census Bureau - 2010 Census Redistricting Data (Public Law 94-171) Summary File. Obtained online April 12, 2011.
2. This census block (in bold) was determined to have a minority population that is meaningfully greater than the surrounding area (i.e., meaningfully greater than the City's 5.9% minority population) as determined by the chi-square test at a significance level of $p<0.05$.
3. None of the resource impacts are significant in the NEPA sense. Rather, impacts identified are either minor or negligible.

Table 3.16-2 Low-income Populations in the Study Area[1]

Tract	Block Group	Total Population	Low-income Population	Percent Low-income	Resource Impacts
107	**1**	**949**	**148**	**15.6%[2]**	**ROW, Noise**
107	2	1,169	114	9.8%	ROW
107	3	986	110	11.2%	ROW
107	**4**	**672**	**146**	**21.7%[2]**	**ROW, Visual Impacts**
108	1	875	43	4.9%	
108	2	930	45	4.8%	
108	3	1,068	85	8.0%	
108	4	953	42	4.4%	
	Total	**7,602**	**733**	**9.6%**	

Notes:
1. Data provided by the US Census Bureau - Census 2000 Summary File 3 (SF 3) - Sample Data. Obtained online April 12, 2011.
2. This census block group (in bold) was determined to have a low-income population that is meaningfully greater than the surrounding area (i.e., meaningfully greater than the City's 9.6% low-income population.)

3.16.4 Environmental Consequences

The distribution of Project impacts among the various census units was examined to determine whether the Project would create *"disproportionately high and adverse effect on minority and low-income populations."* Potential impacts to the human environment, social or economic conditions, such as property acquisition were considered.[31] For this EJ analysis, the location and amount of land acquisition was used as one available indicator of impacts to the human environment. As described elsewhere in this EA, the Project would also result in minor impacts to a noise receptor. In addition, construction of the Nason Street Connector introduces a visual impact to existing residences on the south side of Nason Street. Because there are only negligible and/or beneficial impacts to other resources such as air quality, wetlands, surface waters, floodplains and floodways, and community resources, etc., they are not considered below.

A brief description of the Project impacts is presented below, followed by a discussion of how these impacts are distributed among EJ protected populations.

ROW Impacts

With regard to ROW acquisition, as discussed in **Section 3.15** of this EA, properties or portions of properties would need to be acquired in order to construct the Proposed Action. In some cases, these "takings" would be limited to small "strip takings" (*i.e.*, limited, narrow land acquisition of only the portion of a property

[31] Effects of the Proposed Action on wetlands, water quality, and other natural resources would mostly occur in the ROW and would not have an impact on adjacent communities. However, these impacts were considered in this analysis.

directly adjacent to the proposed new or modified roadway). In a few cases, the land acquisition is substantial enough that the entire property is impacted. The roadway construction would require the removal of three existing buildings on two parcels at 26 to 36 Catherine Street. All of these categories of land acquisition were treated as an impact for purposes of this EJ analysis.

Land acquisition was/will be required in the following locations:

- at the intersection of Federal Street with Lower Newton Street;
- on the west side of Federal Street from Kingman Street to Lake Street;
- on the west side of Catherine Street from Lake Street to Stebbins Street (includes demolition of three buildings);
- on both sides of Allen Street from Stowell Street to Lower Welden Street;
- on the west side of Lemnah Drive from Lower Welden Street to the south;
- on the southwest corner of the intersection of Lemnah Drive with Nason Street; and
- all parcels necessary for the proposed Nason Street Connector.

Noise

As discussed in Section 3.11 of this EA, a minor noise impact would occur in order to construction the Proposed Action. A single noise receptor (R2), located at the Lower Newton St/North Main St Intersection exceeded the noise threshold.

Visual Impacts

The proposed Nason Street Connector would introduce a source of visual impact to the backyards of the existing residences along the south side of Nason Street between South Main Street and Lemnah Drive.

3.16.4.1 Effect on Minority Populations

Reviewing the data in **Table 3.16-1**, it becomes apparent that there are no adverse human or environmental effects on the three census blocks which contain minority populations in the Study Area.

3.16.4.2 Effect on Low-income Populations

Inspection of the data in **Table 3.16-2** indicates that two low-income populations exist within the Study Area. Census Tract 107, Block Groups 1 and 4 contain virtually the entire Project extent. Impacts to Block Group 1 include ROW acquisition and noise impacts. Impacts to Block Group 4 include ROW acquisition as well as visual impacts associated with the Nason Street Connector.

While these impacts are important, they do not rise to the level of significance in the sense defined by NEPA, and therefore are not considered "high adverse impacts" as defined in federal EJ policies. In fact, the Project would have no adverse impact for the following reasons:

- as discussed in **Section 3.11.4.2**, the increase in sound levels at the single receptor [1 dB(A)] would be imperceptible to the human ear and well below the 15 dB(A) classification of a substantial noise increase;
- ROW acquisition for the Nason Street Connector was coordinated with the property owners who participated on a voluntary basis, with the City currently negotiating the remaining necessary ROW acquisition for this new roadway in the same fashion; and
- ROW acquisition, including parcels where building demolition would be required, would be subject to just compensation in accordance with the Uniform Act.

Accordingly, because there are no adverse impacts associated with the Project, there would be no disproportionate impact on low-income populations.

3.16.4.3 Environmental Justice Finding

The Proposed Action would not have a disproportionate and adverse effect on minority and low-income populations.

3.16.5 Mitigation

The Proposed Action would not have a disproportionate and high adverse effect on minority and low-income populations. Therefore, specific environmental justice mitigation measures are not required. Just compensation would be provided for instances of ROW acquisition in accordance with the Uniform Act.

The Proposed Action does, however, incorporate measures to minimize impacts on the adjacent community. As part of mitigating such impacts, the Proposed Action would incorporate "streetscape" design elements as appropriate, such as wider sidewalks, landscaping and benches, which would be further evaluated during the final design effort in coordination with the City and the residents of the affected neighborhoods. The goal of the streetscape would be to create a safer and more livable environment for neighborhood residents.

Additionally, public outreach efforts are recommended during future planning and design phases of the Project to provide meaningful access to public information concerning the Project impacts and soliciting input from the EJ population.

3.17 Hazardous Materials

This section describes potential and confirmed sources of subsurface contamination and/or waste materials within the Study Area, and evaluates the potential impacts that subsurface contamination and/or waste materials would have on construction of the Proposed Action. Assessments of measures to avoid and minimize the impacts of subsurface contamination and waste materials are also included. The precise boundaries of potential contamination sites are not yet known and thus, this section does not attempt to quantify the degree and extent of contaminated material that potentially may be encountered. Accordingly, approaches to mitigate the risks posed by potentially encountering contaminated sites during the construction process are discussed in general terms.

3.17.1 Regulatory Context

Subsurface contamination and waste materials are regulated under several federal and state statutes, including EPA regulations under the *Clean Water Act* (administered by DEC); *Resource Conservation and Recovery Act* (RCRA); *Comprehensive Environmental Response, Compensation and Liability Act* (CERCLA), and regulations concerning Asbestos Containing Materials (ACM). The Occupational Safety and Health Administration (OSHA) regulates the protection of worker safety and health at the workplace. OSHA regulations, including regulations pertaining to *Hazardous Waste Operations and Emergency Response* (HAZWOPER), asbestos, and lead based paint, may apply to workers involved in construction. The DEC regulations regarding hazardous and solid waste management, underground storage tanks, petroleum cleanup, and groundwater discharge are applicable to the construction of the Proposed Action.

3.17.2 Methodology

A preliminary Initial Site Assessment (ISA) on the Study Area was performed to identify any constraints or issues posed by environmental contamination.[32] Multiple sources of information were evaluated to assess the confirmed and potential presence of subsurface contamination and oil or hazardous material use and storage areas. Efforts were taken to obtain the most recent and best available data during the preparation of this EA. All assessments and conclusions were made based on the information obtained from the sources described in this section. A computer database search was conducted for the Study Area and immediately adjacent properties to evaluate reported releases that could potentially be within the Study Area.

[32] Such a study is intended to reveal obvious issues associated with multiple properties, and is not to be confused with the detailed site-specific study contained in an ASTM Phase I Environmental Assessment, which is typically performed prior to a property transfer.

A review of federal, state, and proprietary environmental databases was conducted to identify properties in the vicinity of the Study Area that have had a release of oil and/or hazardous materials (OHM). Information from these databases were compiled by Environmental Data Resources, Inc. and provided in a report dated April 25, 2011[33]. VHB confirmed and updated the findings of this report in April 2012.

Numerous environmental databases were reviewed, including: National Priorities List (NPL); Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS); RCRA Treatment, Storage, and Disposal (TSD) facilities list; RCRA generators; RCRA corrective action sites (CORRACTS); state list of hazardous waste sites; state list of spills sites; Active Solid Waste Landfill (SWL) facilities; Leaking Underground Storage Tanks (LUST); Leaking Above Ground Storage Tanks (LAST); and registered underground storage tanks (USTs) and aboveground storage tanks (ASTs). Database search radii were chosen generally in accordance with the ASTM E 1527-05 Standard Practice for Environmental Site Assessments, as shown in **Table 3.17-1**.

The online DEC environmental database was also reviewed to identify reports regarding releases within and near the Study Area.

Table 3.17-1 Results of OHM Computer Database Search

Database	ASTM Search Radius	Number of Sites within Search Radii	Number of Sites within Study Area
NPL sites	1 mile	0	0
CERCLIS sites	0.5 mile	2	0
RCRA TSD	1 mile	0	0
RCRA Generators	0.25 mile	35	18
RCRA CORRACTS	1 mile	1	0
State Hazardous Waste Sites*	1 mile	19	17
State Spills**	0.25 mile	39	15
LUST	0.25 mile	15	6
LAST	0.50 mile	3	3
SWL facilities	0.5 mile	0	0
Registered UST/ASTs	0.25 mile	49	5

*includes brownfield sites

**State Spills are not georeferenced within the DEC database and were reviewed and determined to be in the search radius based on available address information. An estimated 15 spills are located within the Study Area.

[33] Databases in the 4/25/2011 EDR report were updated as follows: CERCLIS, 11/30/2010; CORRACTs, 5/25/2010; RCRA, 2/17/2010; SWHS, LUST, LAST, 3/15/2011; UST, 3/4/2011; AST 12/31/2009; Brownfields, 3/1/2011;US Brownfields, 12/29/2010; MANIFEST 3/29/2010.

3.17.3 Hazardous Sites Database Results

Based on the results of the database searches, several potentially hazardous material sites were identified within and adjacent to the Study Area. A summary of the results is provided in the following sections. **Appendix J** presents five tables which contain additional information on these potential sites identified within the Study Area. **Figure 3.17-1** shows the locations of known sites in the Study Area.

Additionally, City utility plans indicate that the majority of the existing stormwater piping within the Study Area is constructed of asbestos containing concrete. Construction activities that involve the disturbance or removal of the existing stormwater infrastructure would need to be conducted according to state and federal regulations.

3.17.3.1 State Listed Hazardous Waste Database Results

Thirteen of the 17 State Hazardous Waste Sites and Brownfields sites were determined to be of potential concern in the Study Area (**Tables I-1** and **I-2** in **Appendix J**). Based on locations of the remaining non-geocoded sites (per their locations as derived from local maps), along with information obtained from the database search, and distance from the Study Area, the remaining sites are considered unlikely to be of environmental concern to the Study Area.

Two of the 17 State Hazardous Wastes Sites are also listed in the Federal CERCLIS list but these properties are not located immediately adjacent to or within the Study Area.

3.17.3.2 UST/LUST and AST/LAST Database Results

The database search identified 49 active and inactive registered UST facilities within a 0.25 mile radius. Of these, five active USTs facilities have been determined to be located within the Study Area (**Table J-3** in **Appendix J**). The remaining facilities are either not directly located within the Study Area or they no longer have active USTs. Of the 15 LUST sites identified within the specified search radius, five have been linked to hazardous waste sites located within the Study area and are summarized in the **Table J-1** of **Appendix J**. All three LAST sites have been designated as hazardous waste sites due to the release of a hazardous substance and are summarized in **Table J-1** of **Appendix J**.

3.17.3.3 RCRA Database Results

The database search identified 35 RCRA small quantity generators within a 0.25 mile search radius of the Study Area. Eighteen of these generators were determined to be in the Study Area (**Table J-4** in **Appendix J**). Eight releases have been reported at seven of these generator facilities. These include Amtrak at 2 Federal Street, Central Vermont Railway at 2 Federal Street, Clarence Brown at 93 Federal Street and Federal Street (no number provided), Leader Evaporator Co Inc. at 25 Stowell Street, S B Collins Bulk Facility at 54 Lower Welden Street, St. Albans Cooperative at 140 Federal Street, and Franklin Federal Court. Note that several of these sites with releases are included on the list of active State Hazardous Waste Sites and Brownfields sites identified above and in **Tables I-1** and **I-2** of **Appendix J**.

One additional location, the Town and Country Autobody facility, has had past RCRA violations but no releases have been reported for this facility. A RCRA violation can indicate poor hazardous material handling procedures. As a result, it is possible that a previously unidentified release is present at the property.

One RCRA–CORRACTS site was identified within the specified 1-mile search radius. This facility is considered unlikely to be of environmental concern to the Study Area due to its distance from the Study Area (approximately 0.78 miles).

3.17.3.4 DEC SPILLS Database Results

Spills of over two gallons are reported to the DEC along with a description of the cleanup action. Reports for 39 spills within the search radius were identified on the DEC online environmental database, with an estimated 15 spills occurring or potentially occurring within the Study Area. A summary of these releases is provided in **Table J-5** of **Appendix J**. Five of these spills have occurred at two facilities that have necessitated action by the DEC Sites Management Section, and were therefore classified as a hazardous waste site. Four spills have been reported at the Clarence Brown property on Federal Street and one spill has been reported for the SB Collins Bulk Facility at 54 Lower Welden Street. Spills that have not necessitated action by the DEC Sites Management Section, and therefore have not been classified as a hazardous waste site, are considered unlikely to be of environmental concern to the Study Area.

3.17.3.5 Summary of Results

Based on the results of the database searches, summarized in **Tables I-1** through **I-5** of **Appendix J**, the following potential environmental concerns were identified within the Study Area:

- Soil and/or groundwater contamination may remain in the vicinity of the following releases in the Study Area:

- Central Vermont Railway Inc., 2 Federal Street
- Leader Evaporation Co. In., 25 Stowell Street
- Lewis Autobody, 22 Stebbins Street
- Former Fonda Container Company, 15-21 Lower Newton Street
- Brickyard Tavern Building, 29-33 Federal Street
- St. Albans Municipal Parking Lot No. 1, Lake, Federal, and Kingman Streets
- Courthouse, 45 Kingman Street
- SB Collins Bulk Facility, 54 Lower Welden Street
- J&L Service Center, 171 South Main Street
- Clarence Brown Inc., 96 Federal Street
- St. Albans Exxon, Route 7
- Clarence Brown Inc., 8 Aldis Street
- St. Albans Cooperative Creamery, 140 Federal Street
- Town and Country Autobody facility, 23 Stebbins Street (no releases have been reported but Facility has had RCRA violations)

- Five existing UST Facilities (in total, containing 28 USTs) were identified within the Study Area during the database search. USTs that have not been removed are considered to be a potential source of soil and/or groundwater contamination. Existing USTs may require proper management and removal during the construction of the Proposed Action.
- Stormwater piping within the Study Area is known to be constructed of asbestos containing concrete.

3.17.4 Environmental Consequences

The identification of confirmed or potential subsurface contamination and/or waste materials related to the Proposed Action is an important element of environmental assessment for the following reasons:

- direct and indirect effects to human health, welfare, and the environment;
- potential financial and long-term environmental liability associated with the acquisition of contaminated property;
- potential delays during construction from the discovery of unanticipated subsurface contamination;

- unexpected or late-stage design changes that may be required as a result of subsurface contamination;
- defining appropriate DEC and/or EPA response actions that may be required to remediate contamination;
- defining appropriate health and safety provisions to protect construction workers and sensitive receptors during construction; and
- removal and management of other special and hazardous wastes, including oil and/or hazardous materials storage tanks, electrical transformers, and solid waste/demolition debris.

3.17.4.1 No Action

Under the No-Action Alternative, there would be incremental redevelopment of portions of the Federal Street corridor and the installation or repair or subsurface utilities. Such actions may encounter contaminated materials depending on the location within the corridor. The highest density of hazardous material sites lies in the 0.3-mile stretch of Federal Street between Lake Streets on the south and Deal Street on the north.

3.17.4.2 Proposed Action

The sites identified in **Section 3.17.3.5** represent a potential for encountering contamination under the Proposed Action. Without information from subsurface investigations, the likelihood of such encounters cannot be characterized. Such investigations as well as other mitigating actions are discussed in the subsequent **Section 3.17.5**. However, it is notable that the stretch of the corridor with the highest potential for contamination, the 0.3-mile stretch between Lake Street and Deal Street, represents just 14% of the total overall Project length of 2.1 miles.

3.17.5 Mitigation

To determine the limits of soil and/or groundwater contamination at sites along the Study Area, and to quantify amounts and concentrations of contamination that Project construction may encounter, further investigation is recommended including review of contaminant concentration maps on-file with the Vermont DEC for sites where such information exists, and conducting site specific testing where data do not exist. Additional steps are recommended to further evaluate these areas including the following:

- Update the Study Area Initial Site Assessment (ISA) prior to construction to discover any new spills or OHM sites that have been created since the EA.
- Perform site-specific ISAs for the individual properties that are included within the Study Area.

- Based on the ISA results, perform Preliminary Site Investigations (PSIs) if needed. Properties that are identified as currently being monitored for contamination (Active Hazardous Sites) may require further sampling and analysis but would likely not require a full PSI.
- Subsurface investigation would be performed to collect soil and groundwater samples for laboratory analysis if needed. Identification and characterization of each contamination area prior to construction would reduce potential construction schedule delays, logistical problems, and cost concerns of managing the contamination concurrently with construction activities.

In addition to these steps to minimize construction-related impacts, the following mitigation measures would also be implemented:

- Determine responsibility/liability issues in advance of construction so that they may be included in the development of a remedial or Corrective Action Plan (described below).
- Based on the location of confirmed or potential areas of concern, measures that entirely avoid direct impacts from subsurface contamination or waste materials for the Proposed Action would be evaluated. However, in most cases, a remedial plan to contain and/or remove the contamination would be developed in consultation with the DEC and EPA. If necessary, a Corrective Action Plan would be developed, which would specify the procedures to be used in handling any hazardous, contaminated, or special wastes generated through excavation of contaminated soils, and dewatering of contaminated groundwater.
- Stormwater piping from within the Study Area is known to be constructed of asbestos containing concrete. A Corrective Action Plan developed in accordance with state and federal regulations would need to be developed prior to construction to ensure proper handling and disposal of the asbestos containing materials.

3.18 Cumulative Impacts

3.18.1 Cumulative Impact Framework

For purposes of NEPA, a comprehensive evaluation of the impacts of federal actions on the environment must consider not only the direct impacts of the Proposed Action, but must also disclose past, present, and reasonably foreseeable indirect effects and cumulative impacts.

The direct and indirect effects of the Proposed Action are discussed in depth in the preceding sections of this Chapter. The purpose of this section of the EA is to discuss

other actions that contribute to cumulative impacts on the resources affected by the Federal Street Multimodal Connector Project.

Cumulative impacts are "*environmental impacts resulting from the incremental effects of an activity when added to other past, present and reasonably foreseeable future activities regardless of what entities undertake such actions. Cumulative effects can result from individually minor but collectively significant activities taking place over time and over a broad geographic scale, and can include both direct and indirect impacts.*" (40 CFR §1508.7)

FHWA and CEQ guidance states that the purpose of a cumulative impacts analysis is to look for impacts that may be minimal and therefore neither significant nor adverse when examined within the context of the Proposed Action, but that may accumulate and become both significant and adverse over a large number of actions. Cumulative impacts are not causally linked to the federal action, but are of interest where other actions may impact the same resources which are impacted by the federal action.

A cumulative impacts evaluation is therefore resource specific and performed for the environmental resources directly impacted by a federal action under study. However, not all of the resources directly impacted by a project will require a cumulative impact analysis.

For purposes of this EA, a review of other potential actions within and adjacent to the Study Area revealed that the following three projects would contribute to cumulative impacts:

- **St. Albans Downtown Streetscape Project**, which commenced construction in 2012, includes a variety of improvements to sidewalks, pedestrian accommodations, landscaping, lighting, municipal utilities, wayfinding (signage), and roadway intersections.
- **Expansion of the St. Albans Cooperative Creamery**, scheduled to commence construction in 2012.
- A **multimodal transit center**, positioned at the location of the existing Amtrak station.

3.18.2 St. Albans Downtown Streetscape Project

3.18.2.1 Project Description

The City has begun an effort to reconstruct and improve the sidewalks, landscape, lighting, roadway, utilities, and visitor amenities in the downtown area, starting at the north with the intersection of Main Street with Hudson Street and running south to the intersection of Main Street and Stebbins Street. Its purpose is to revitalize the City's economic core, providing physical improvements to the historic downtown that communicate a more compelling sense of place, encourage pedestrian activity

and attract outside investment. Funding for the Project is being obtained from multiple sources. Construction commenced in 2012 and is scheduled to be completed in 2013.

This Project will include:

- reconstructed sidewalks;
- a new sidewalk along Taylor Park;
- new street lighting with historic fixtures;
- new pedestrian amenities, such as benches;
- realigned and rebuilt pedestrian crosswalks;
- new accessibility amenities in compliance with ADA;
- resurfacing Main Street with new striping for automobiles and bicycles;
- replacement of the existing traffic signal system within the intersection of Main, Fairfield and Lake Street;
- new tree plantings along the sidewalk;
- new way-finding signage for visitors and other aesthetic details, such as public art;
- new ways of managing stormwater along Main Street, including low impact development techniques (rain garden); and
- improvements to the municipal utilities under the road and sidewalks.

3.18.2.2 Potential Resource Impacts

The Downtown Streetscape Project would consist entirely of the redevelopment of previously developed, impervious surfaces, including roadways, sidewalks, curbing, and stormwater management systems. No natural resources would be affected by the Project. The Project would provide a number of benefits, including enhanced stormwater treatment and associated water quality improvements in the impaired Stevens Brook watershed, safer pedestrian crossings via enhanced lighting, and realigned and rebuilt crossings,

The Downtown Streetscape Project is currently advancing through the VTrans Local Transportation Facilities project development process, which includes public outreach and environmental compliance such as coordination with the VTrans Historic Preservation Officer (most of the Project occurs within the St. Albans Historic District). Project implementation is expected to require a construction phase stormwater permit from the DEC Watershed Management Division.

3.18.3 St. Albans Cooperative Creamery

3.18.3.1 Project Description

The St. Albans Cooperative Creamery is currently developing plans to expand their existing facility on Federal Street, including:

- a 13,732 sq ft expansion of the existing plant in a southerly direction;
- the construction of a new 17,992 sq ft retail store and warehouse at the southwest corner of the intersection of Deal Street and Federal Street;
- an area of proposed outdoor storage at the northwest corner of the intersection of the Hoyt Street Extension and Federal Street;
- 30 paved parking spaces located between the store/warehouse and storage area; and
- paved areas around the proposed buildings.

The retail store and warehouse project is expected to be constructed in 2012 and the manufacturing addition is expected to be constructed in 2013.

3.18.3.2 Potential Resource Impacts

Traffic

No traffic projections are available for the proposed development. Local traffic circulation would change somewhat, as a new in/out access drive would be established onto Federal Street at the location of the proposed retail store / warehouse. The Hoyt Street extension is currently used for both residential access and access to the Creamery. As proposed, traffic from the retail store/warehouse would be allowed to exit via the Hoyt Street Extension. Deal Street would remain an in/out drive. The City considered traffic impacts in issuing their planning approval for the Project.

Hazardous Materials

The St. Albans Cooperative Creamery is listed as a hazardous waste site with an open file at the DEC Waste Management Division. The contaminant listed is heating oil, and aboveground and underground storage tanks are present. The site priority is listed as low. Approximately 30 cubic yards of potentially contaminated material are noted as being present at the site. In addition, the property at 96 Federal Street is listed as a medium priority hazardous waste site with an open file at the DEC Waste Management Division. The contaminant noted is heating oil, waste oil, and some dissolved metals and the groundwater plume is moving toward the west (into the proposed area of development).

It is possible that the construction of the proposed improvements, including the installation of utilities and building foundations, would encounter contaminated materials during site excavation. Site remediation may be required. Also, the proposed demolition of nine residential buildings and associated outbuildings may involve the handling and disposal of hazardous materials such as ACM.

Environmental Justice / ROW

Nine residences are scheduled to be demolished to construct the proposed development. The buildings have already been acquired and are vacant. St. Albans Cooperative Creamery negotiated the land acquisition process privately with landowners. No City or federal funds are earmarked for the property acquisition or project development process. Therefore, these acquisitions are not subject to either the Uniform Act or EJ.

Historic Resources

A review of residences within the Federal Street Corridor determined that none of the buildings proposed for demolition are eligible for listing on the National Register (see **Section 3.13-1**). The proposed development lies outside any historic district.

3.18.4 Multimodal Transit Center

3.18.4.1 Project Description

A multimodal transit center within the Federal Street Corridor was first recommended in the St. Albans Traffic Circulation Study (NRPC 2002). In the 2005 Federal Street Corridor Study, this center was envisioned to provide an efficient connection between different modes of transportation, including highway traffic, intercity rail and bus service (stations for which are currently separated by approximately one mile), and local pedestrian/bicycle traffic. A study and conceptual plan for the multimodal transit center was drafted in 2006 (NRPC 2006).

The proposed location for the multimodal transit center would be the existing Amtrak station on Federal Street just north of Lake Street (see **Figures 2.6-1** and **2.6-6**). This station is the northern terminus of the Amtrak Vermonter line that makes daily trips to Washington, DC. This location is already served by existing sidewalks, though many of the curb ramps and sidewalk surfaces currently do not meet the ADAAG standards for public sidewalks. Sidewalk and pedestrian improvements are included in the Proposed Action, including ADAAG compliance. The 2005 Study indicated that reasonable bicycle access is currently provided to the location of the multimodal transit center.

The 2005 Study suggested that, in addition to providing centralized facilities for efficient transfers between bus, rail, and other potential future transit services, as well as parking for such uses, the multimodal transit center could provide other amenities such as showers, information kiosks, and communication services. The conceptual design for the facility included in the 2006 Study includes berthing for five buses, a plaza which would include bicycle parking, on-site parking, a covered waiting area for car-pool and shuttle service, a drop-off lane, and landscaping and lighting.

Currently, there is no plan to develop the multimodal transit center in the near future. Its realization is tied in large part to the future development of a commuter rail project between Essex and St. Albans, which has yet to progress past the planning stage.

3.18.4.2 Potential Resource Impacts

Traffic

The 2006 Study (NRPC 2006) provided estimated daily usage for the multimodal transit center broken down into the various modes of transportation. These are summarized in **Table 3.18-1** below.

Table 3.18-1 Potential Use of & Parking at the St. Albans Multimodal Transit Center

Mode	Daily Use	Annual Use	Parking Spaces Required	Parking Duration
LINK Express	90	23,400	80	Long Term
Future St. Albans – Essex Commuter Rail	60	15,600	54	Long Term
Amtrak Vermonter	20	5,200	4	Short Term
NETWORK Local Transit Service	50	13,000	8	Long Term
Missisquoi Valley Rail Trail*	50	13,000	10	Short Term
Vermont Transit / Greyhound	10	2,600	4	Short Term
Total Potential Users	**280**	**72,800**	**160**	

Source: NRPC 2006
* contingent upon implementation of the Northerly Connector

The multimodal transit center as described in the 2006 Study would require approximately 160 parking spaces (150 without the Missisquoi Valley Rail Trail component, see **Table 3.18-1**). Portions of this parking need would be provided in the off-street lot behind the NECR office building and via on-street parking immediately adjacent the facility, with the bulk of the spaces located in a parking facility on the east side of Federal Street where an existing off-street lot is present. Structured parking may be required at this location to provide the long-term spaces required.

The 2006 Study for the multimodal transit center did not assess the potential impact of the facility on traffic within the Federal Street Corridor. It is possible that vehicular

traffic within the corridor and beyond may experience a slight drop in response to alternative means of transportation being made available at a centralized location. Traffic in the immediate vicinity of the facility may increase, reflecting the change in land use from single mode to multi-mode.

Historic Resources

The location of the multimodal transit center and off-site parking area proposed in the 2006 Study are located in the CVR Headquarters Historic District and St. Albans Historic District, respectively. Accordingly, coordination with the VTrans Historic Preservation Officer would be required to determine if the proposed facilities would have any effect on these districts.

Environmental Justice

A facility offering multimodal connectivity at a location adjacent to a low-income population would provide a positive impact; enhancing personal mobility and diminishing the dependency on and costs of personal transportation, including gas, vehicular maintenance, and parking. Public transportation provides dependable access to job opportunities.

Hazardous Materials

At the location of the multimodal transit center, the Amtrak station is listed as a fully regulated generator of small quantities of hazardous waste (see **Table J-4** of **Appendix J**). The location of the existing off-site parking (St. Albans Municipal Parking Lot No. 1) is a former brownfield site listed as having site management activity completed and closed in July 2011. The contaminants present at the parking lot were noted to be polycyclic aromatic hydrocarbons (PAHs) in soil and metals in groundwater. The depth to which site remediation efforts were carried out is not currently known. Construction of the multimodal transit center and any required structured parking would require excavation for utilities and foundations. Contamination may be encountered at the parking lot depending on the depth of remediation. Contamination is possible at the Amtrak station based on the prior land use, although there is no record of such contamination.

3.18.5 Conclusion

The incremental effects of the Federal Street Multimodal Connector Project, when considered in combination with that of the past, present, and reasonably foreseeable actions noted above constitutes only a minor cumulative impact. They do not rise to a significant level and each project would mitigate its individual impacts. In fact, coupled with the Downtown Streetscape Project and multimodal transit center, the Project would result in positive impacts with respect to Traffic, Bicycle and Pedestrian access and Surface Water quality.

Based on this finding, no additional mitigation or action is warranted beyond that provided for the direct and indirect impacts.

3.19 Summary of Mitigation and Project Commitments

The following commitments have been or would be made by the City of St. Albans, to avoid or mitigate possible impacts associated with the Proposed Action.

Surface Water

1. The Proposed Action would implement stormwater BMPs to offset the increase in impervious surface area created by the Project improvements.
2. As part of the stormwater discharge permitting requirements associated with construction phase activities, an EPSC Plan consistent with the Vermont Stormwater Management Manual (Vermont ANR, April 2002), would be implemented to minimize potential for sediment laden runoff to reach surface waters or wetlands.

Acquisitions (Right-of-Way)

3. Since the required acquisition of property necessary for this Project may result in displacement of businesses, the acquisition and relocation of affected businesses would be conducted in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended. Furthermore, relocation resources would be made available to all relocated business without discrimination.
4. Privacy fencing and/or dense landscaping using trees and/or shrubs will be installed to provide a visual barrier between the proposed Nason Street Connector and the backyards of the residences along Nason Street and that at the southwest corner of the proposed intersection of the Nason Street Connector with Main Street. The existing natural vegetative buffer at these locations will be maintained to the extent feasible. The City will work with the property owners for those lots backing onto the Nason Street Connector to evaluate what treatment options may be possible and to develop a mutually agreeable solution.
5. Specifically, the owners of the affected properties would be compensated for the impacts and eligible for relocation benefits which could include:

   - Just compensation for acquired property
   - Relocation advisory assistance services
   - Payments for moving and relocation costs

Hazardous Materials

6. The Study Area Initial Site Assessment (ISA) would be updated prior to construction to discover any new spills or OHM sites that may have been created since publication of the EA.

7. Site specific ISAs would be compiled for the individual properties that are included within the Study Area.

8. Based on the individual ISA results, Preliminary Site Investigations (PSIs) would be performed if needed. These investigations would include subsurface investigations to collect soil and groundwater samples for laboratory analysis as required.

9. If an individual PSI finds the presence of subsurface contamination or waste materials above action levels, a remedial plan to contain and/or remove the contamination would be developed in consultation with the DEC and EPA. If necessary, a Hazardous Waste and Special Waste Management Plan would be developed, which would specify the procedures to be used in handling any hazardous, contaminated, or special wastes generated through excavation of contaminated soils, dewatering of contaminated groundwater, and building demolition activities.

Archeological Resources

10. It would be made necessary that the contractor responsible for Project construction be familiar with the content and requirements of the following sections of the Vermont Statewide Federal Aid Highway Programmatic Agreement:

    - Section 4(I) Discovery of Archaeological Sites During Project Construction; and
    - Section 4(J) Treatment of Human Remains.

Construction Impacts

11. Traffic Control Plans that specify minimum lane use, hours of operation, and maintenance of driveways to abutting properties would be developed during final design.

12. The contractor would be required to install temporary traffic signs to inform and direct motorists within work zones. In high traffic locations the contractor may be required to maintain variable message signs that alert motorists to the construction activities and/or detours.

13. As part of stormwater discharge permitting requirements associated with construction phase activities, EPSC measures would be designed and

implemented to minimize potential for sediment laden runoff to reach receiving waters (Stevens Brook, Wetland B, etc.).

14. The EPSC would include routine monitoring and maintenance (replacement/ repair) of erosion control BMPs.

15. Areas disturbed by construction activities within the proposed Nason Street Connector area would be revegetated using native plantings to supplement and enhance local ecological values and prevent the establishment of invasive species. A qualified botanist would determine the seed mix to be used for temporary erosion control during construction.

16. Temporary fences would be erected around construction areas to prevent disturbance to adjacent upland and wetland communities.

17. In order to minimize the potential for construction-related dust emissions construction specifications would include the following:

    - Areas of disturbed soils and areas of open excavation will be minimized to the extent possible.

    - Stockpiling will be minimized by coordinating excavation and spreading throughout compaction and importation activities. Stockpiles will be located outside hazardous areas.

    - Stockpiles will be stabilized to minimize wind erosion (e.g. water sprays and covering of stockpiles).

    - Water and/or calcium chloride will be applied to active earthwork areas, stockpiles and loads of soil being transported to reduce dust as required.

4

Section 4(f) Resources

4.1 Introduction and Purpose of this Chapter

Under Section 4(f) of the Department of Transportation Act as amended by the Federal-Aid Highway Act of 1968 (Public Law 90-495, 49 USC 1653), the Secretary of Transportation shall not approve any program or project which:

> *"requires the use of any publicly owned land from a public park, recreation area, or wildlife and waterfowl refuge of national, state, or local significance as so determined by federal, state, or local officials having jurisdiction thereof, or any land from a historic site of national, state or local significance as so determined by such officials unless (1) there is no feasible and prudent alternative to the use of such land, and (2) such program includes all possible planning to minimize harm to such park, recreation area, wildlife and waterfowl refuge, or historic site resulting from such use."*

In 2005, Section 6009(a) of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), made the first substantive revision to Section 4(f) since the Department of Transportation Act, simplifying the process and approval of projects that have only a *de minimis* impact on Section 4(f) resources.

The degree of use of Section 4(f) properties resulting from the construction of the Federal Street Project has been found to result in a *de minimis* impact. The purpose of this chapter is to document the Section 4(f) resources within the Study area, characterize the impacts and explain why they are considered *de minimis*, present the measures to minimize harm, and document the degree of coordination with state and federal agencies.

4.1.1 Definition of "Use"

Per 23 CFR 774.17 (and with the certain exceptions noted in 23 CFR 774.11 and 774.13), the use of Section 4(f) resources occurs

- when land is permanently incorporated into a transportation facility;
- when there is a temporary occupancy of land that is adverse in terms of the statute's preservationist purposes as determined by the criteria in 774.13(d); or
- when there is a constructive use of land as described in 774.15.

Per 771.15:

> *A constructive use occurs when the transportation project does not incorporate land from a Section 4(f) property, but the project's proximity impacts are so severe that the protected activities, features, or attributes that qualify the property for protection under Section 4(f) are substantially impaired. Substantial impairment occurs only when the protected activities, features, or attributes of the property are substantially diminished.*

Section 4(f) protects several types of resources including public parks, recreation areas, wildlife and waterfowl refuges and land from historic sites. However, for the Federal Street Project, only **historic sites** would be affected.

4.2 Proposed Action

The Proposed Action would reconstruct the Federal Street Corridor to improve its use by automobiles, trucks, pedestrians, bicyclists, and public transit, alleviating heavy north-south passenger and commercial traffic and congestion on Main Street by providing a parallel urban collector route to divert through and truck traffic from the City's downtown and create an alternative access to I-89. The Proposed Action includes the reconstruction of pavement and related, bike and pedestrian enhancements, lighting, landscape and utility improvements throughout the corridor. To satisfy the Project's Purpose and Need with respect to realizing the potential of multiple transportation modes in close proximity to one another (see **Sections 1.4 and 1.5**), the typical roadway section for the Project corridor includes the following elements:

- 11-ft. wide travel lanes for each direction of vehicular traffic;
- 4-ft. wide bicycle lanes (5-ft. wide where on-street parking is provided);
- 2- to 4-ft. wide grass utility strips; and
- 5-ft. wide sidewalk (on both sides of the road along Federal Street, on one side elsewhere).

Additional information about the Proposed Action, including details for the reconfiguration of specific intersections, is contained in **Chapter 2: Proposed Action and Alternatives**.

4.3 Description of Section 4(f) Resources

Section 4(f) protects several types of resources including public parks, recreation areas, wildlife and waterfowl refuges and land from historic sites. The following sections describe these resources with respect to the Federal Street Project.

4.3.1 Public Parks, Recreation Areas, Wildlife and Waterfowl Refuges

No public parks or recreation areas are present within the Federal Street corridor (see **Figure 3.12-1**). The nearest public park is Taylor Park just east of Main Street. Also, no state or federal wildlife or waterfowl refuges are present within the corridor.

4.3.2 Archeological Resources

As described in Section 3.14 Archeological Resources, the currently undeveloped and southernmost portion of the Federal Street corridor where the Nason Street Connector is proposed was identified during Project scoping as being archeologically sensitive. A Phase I Archeological Site Identification Survey performed in May and June, 2012 and supplemental field testing in July 2012 determined that no significant archeological resources are present within the APE for the Project. Accordingly, a determination of No Adverse Effect on archeological resources was made and therefore no archeological resources worthy of protection under Section 4(f) are present within the Federal Street corridor.

4.3.3 Historic Properties

For the Federal Street Project, a Section 4(f) use of land is proposed only for historic properties, including:

- Willard Furniture Manufacturing Company – Listed
- Giroux Furniture Company – Listed
- 163 Federal Street – Determined Eligible
- 174 Federal Street – Determined Eligible
- Central Vermont Railroad Headquarters Historic District – Listed
- St. Albans Historic District – Listed
- Federal/Lake/Catherine Streets Intersection Historic District – Determined Eligible

Each of these resources is described in detail in **Section 3.13** of the EA.

4.4 Use of Historic Properties

This section discusses the use of land from historic properties associated with the Proposed Action. Use of land from each individually listed or eligible property, as well as each of the contributing resources within each of the three affected districts, are presented in **Figures 4.4-1** through **4.4-8**. These drawings were produced by overlaying the proposed ROW and slope limits for the Proposed Action onto the property or district boundaries to measure the area affected. All areas of new permanent ROW were included in impact calculations, including slope impacts in the relatively few occurrences where the permanent slope limits extend beyond the permanent ROW.

4.4.1 Central Vermont Railroad Headquarters Historic District

Because of its large size, acquisition from the CVR Headquarters Historic District would occur in three of the five Project design segments.[34] Impacts to the District are summarized by segment in **Table 4.4-1** and shown on **Figures 4.4-1** through **4.4-3**.

Table 4.4-1 Impacts to the Central Vermont Railroad Headquarters Historic District

Segment	Permanent ROW Impacts (sq ft)	Slope Impacts (sq ft)
Segment 1 - Proposed Nason Street Connector (South Main St. to Nason St.)	0	0
Segment 2 - Lemnah Drive and Allen Street (Nason St. to Stowell St.)	20,877	4,155
Segment 3 - Allen / Catherine / Federal St. (Stowell St. to Kingman St.)	82,445	12,179
Segment 4 - Federal St. (Kingman St. to Lower Newton St.)	1,164	4,731
Segment 5 - Lower Newton St. (Federal St. to North Main St.)	0	0
Total	104,486	21,065

4.4.2 St. Albans Historic District

The St. Albans Historic District spans two of the five design segments (i.e., Segments 2 and 3). Use of land from the District is summarized by segment in **Table 4.4-2** and shown on **Figure 4.4-4**. No permanent ROW impacts are proposed.

[34] For a definition of the five design segments, see **Section 2.4** of this EA.

Table 4.4-2 Impacts to the St. Albans Historic District

Segment	Permanent ROW Impacts (sq ft)	Slope Impacts (sq ft)
Segment 1 - Proposed Nason Street Connector (South Main St. to Nason St.)	0	0
Segment 2 - Lemnah Drive and Allen Street (Nason St. to Stowell St.)	0	0
Segment 3 - Allen / Catherine / Federal St. (Stowell St. to Kingman St.)	0	2,324
Segment 4 - Federal St. (Kingman St. to Lower Newton St.)	0	500
Segment 5 - Lower Newton St. (Federal St. to North Main St.)	0	0

4.4.3 Willard Furniture Manufacturing Company

No direct ROW impacts to the Willard Furniture Manufacturing Company property would result from the Proposed Action. There would be approximately 2,347 sq ft of slope impact to this property (see **Figure 4.4-5**), consisting of minor grading and construction phase access in order to install streetscape improvements in front (west) of the building. The sidewalk that is currently in front of the building would remain, but would be rebuilt as part of the Project.

4.4.4 Giroux Furniture Company

Use of land from the Giroux Furniture Company property is outlined in **Table 4.4-3** and depicted on **Figure 4.4-6**. Avoiding impact to this property was a critical parameter in developing and evaluating Project alternatives. Initial design concepts for the reconstructed Federal/Lake/Catherine Street Intersection involved demolition of the Giroux Furniture Company building. Recognizing the historic nature of this building, additional design alternatives were developed to avoid direct impacts to the building.

The Proposed Action would avoid demolition of the Giroux building, but would require some minor ROW acquisition from the east (Catherine Street) side of the parcel, totaling 636 sq ft. Additionally, there would be slope impacts totaling 6,597 sq ft to re-grade the existing parking lot on the south side of the parcel to reconfigure the existing parking spaces.

Table 4.4-3 Impacts to the Giroux Furniture Company Building Parcel

	ROW Impacts (sq ft)	Slope Impacts (sq ft)	Requires Demolition of Giroux Bldg
Proposed Action	636	6,597	No

4.4.5 Federal/Lake/Catherine Streets Intersection Historic District

This Historic District is not yet listed on the National Register, but was determined eligible by the VTrans Historic Preservation Officer during Section 106 consultations for this Project. The entire District, which consists of four properties on the corners of the intersection of Federal, Lake and Catherine Streets, lies within either the CVR Headquarters Historic District or the St. Albans Historic District, use of which is discussed in the preceding sections. Use of land from this eligible Historic District is shown in **Figure 4.4-7**.

4.4.6 163 Federal Street

The Proposed Action would not result in any permanent incorporation of land from the National Register eligible property at 163 Federal Street and therefore no use of a Section 4(f) resource. The Proposed Action would involve minor re-grading of the existing driveway of this property to tie into the new grade of the reconstructed Federal Street. There would also be a temporary use of a small portion of the front of the property in order to reconstruct the existing sidewalk adjacent to the parcel. These slope impacts would total 471 sq ft. See **Figure 4.4-8**.

4.4.7 174 Federal Street

The Proposed Action would make no changes to this National Register eligible property and therefore there would be no use of a Section 4(f) resource. See **Figure 4.4-8**.

4.5 Section 4(f) De Minimis Determination

In order for the Federal Street Multimodal Connector Project to qualify as a *de minimis* impact in accordance with 23 CFR 774.3(b), it must satisfy the three requirements contained within question 2A of the FHWA's Final Guidance for Determining De Minimis Impacts to Section 4(f) Resources, dated December 13, 2005. Each requirement and the determinations made (**in bold**) are provided below.

Question A: What are the requirements for a finding of *de minimis* impact on a historic site?

Answer: A finding of *de minimis* impact on a historic site may be made when:

1) The process required by Section 106 of the National Historic Preservation Act results in the determination of "no adverse effect" or "no historic properties affected" with the concurrence of the SHPO and/or THPO, and ACHP if participating in the Section 106 consultation;

Per the terms of the April 5, 2000 Programmatic Agreement among FHWA, VTrans, ACHP, and the Vermont SHPO, qualified professionals within VTrans are authorized to implement the Federal-Aid Highway Program in Vermont, to document and make Section 106 determinations of effect for transportation projects on behalf of the Vermont SHPO. The VTrans Historic Preservation Officer and VTrans Archaeology Officer have concurred on a Conditional No Adverse Effect Determination, dated November 20, 2012 and included in Appendix G.

2) The SHPO and/or THPO, and ACHP if participating in the Section 106 consultation, is informed of FHWA's or FTA's intent to make a *de minimis* impact finding based on their written concurrence in the Section 106 determination; and

   Under the terms of the April 5, 2000 Programmatic Agreement, VTrans provides copies of Section 106 determinations of effect and supporting documents to the Vermont SHPO. The SHPO has been informed of the intent to make a *de minimis* finding under Section 4(f) based on the Conditional No Adverse Effect determination.

3) FHWA or FTA has considered the views of any consulting parties participating in the Section 106 consultation.

   The City of St. Albans conducted three public meetings to present the Purpose and Need for the Project and Project alternatives (see Section 5.2 of this EA). At each of these meetings, information was disclosed with respect to potential impacts to historic resources. The Proposed Action was endorsed by the attendees of a Project alternatives presentation public meeting on November 29, 2011. It was subsequently endorsed by the St. Albans City Council during a public City Council meeting on December 28, 2011.

4.6 Measures to Minimize Harm

Based on coordination with the VTrans Historic Preservation Officer and the VTrans Archeology Officer, it has been determined that the Project will have no adverse effect on above-ground historic properties and no adverse effect on archeological resources that meet the Section 4(f) provisions of preservation in place. The finding is that there is only a *de minimis* effect on historic properties.

In order to make the determination of no adverse effect on above-ground historic properties, the VTrans Historic Preservation Officer requires the following conditions be met (see **Appendix J**):

- The City of St. Albans agrees to include the VTrans Historic Preservation Officer in the discussions regarding the balance of parking spaces and green spaces within the area south of the Giroux Furniture Company building.

- The City of St. Albans agrees that the VTrans Historic Preservation Officer will review and approve the final plans and will not proceed with the proposed work until the VTrans Historic Preservation Officer provides written approval to the plans.

4.7 Coordination

Coordination and consultations among federal, state, and local agencies with jurisdiction over historic properties has occurred both prior to and during the preparation of this EA. A summary of these coordination meetings is provided in **Chapter 5** of this EA.

4.8 Section 4(f) Conclusion

The Proposed Action involves *de minimis* impacts to three of the seven Section 4(f) resources determined to be present within the Study area:

- Giroux Furniture Company – Listed
- Central Vermont Railroad Headquarters Historic District – Listed
- Federal/Lake/Catherine Streets Intersection Historic District – Determined Eligible

No public parks, recreation areas, wildlife or waterfowl refuges are present within the Project corridor. No archeological sites that are eligible for protection under Section 4(f) are present within the Project corridor.

Impacts to Section 4(f) resources are restricted to ROW impacts and impacts caused by regrading within the Project slope limits where such regrading extends beyond the ROW. Measures to minimize harm include the conditions imposed by the VTrans Historic Preservation Officer (**Appendix G**) as well as Project mitigation and commitments as described in **Section 3.19** of this EA, which include measures to minimize construction related impacts.

5

Agency Coordination/Public Participation

5.1 Agency Coordination

The dates and topics of agency coordination meetings are provided in **Table 5.1-1** below.

Table 5.1-1 Agency Coordination

Date	Location	Agency Present	Topic
April 14, 2011	Project Corridor	USACE	Wetland Delineation, Confirmation

Coordination between the City, VTrans (including Historic Preservation and Archaeology Officers), and other state agencies is ongoing and will continue through final design of the Project.

5.2 Public Meetings

Three Public Meetings were held during development of this Project, one of which being with the St. Albans City Council. A list of the meetings along with the date, locations and topics are provided in **Table 5.2-1** below.

Table 5.2-1 Public and City Council Meetings

Meeting Forum	Date / Location	Topic
Public Meeting	November 10, 2010 Library, Bellows Free Academy	Local Concerns Meeting to introduce Project limits and proposed intersection improvements and solicit public comment.
Public Meeting	November 29, 2011 Library, Bellows Free Academy	Alternatives Presentation Meeting to provide residents, business owners, City officials, VTrans, and regulatory and consulting agencies with the proposed alternatives and to solicit feedback in order to identify an alternative to move forward as the Proposed Action.
City Council	December 28, 2011 St. Albans City Hall	Description of the Project Alternatives formulated through the refinement of conceptual designs, the public outreach process, and coordination with City officials, VTrans and FHWA.

5.3 Permit Requirements

The Federal Street Multimodal Connector (the Proposed Action) would require permitting by state and federal entities. **Table 5.3-1** lists the anticipated permits that would be required prior to implementing the Proposed Action.

Table 5.3-1 Anticipated Permit Requirements and Agreements

Permitting Agency	Anticipated Permit Requirement
US Army Corps of Engineers	Department of the Army Vermont General Wetland Permit[1] (Section 404 of the Clean Water Act)
Vermont Department of Environmental Conservation	Vermont Individual Wetland Permit
Vermont Department of Environmental Conservation	Water Quality Certification[2] (Section 401 of the Clean Water Act)
Vermont Department of Environmental Conservation	Stream Alteration General Permit[3]
Vermont Department of Environmental Conservation	Individual Construction Phase Stormwater Discharge Permit (INDC)
Vermont Department of Environmental Conservation	Individual Operational Phase Stormwater Discharge Permit (INDS)
District 6 Environmental Commission	Act 250 Land Use Permit (or amendment to #6F0277-8 for Lemnah Drive extension)

1 While direct impacts to jurisdictional wetlands and streams fall within the threshold for a non-reporting activity (Category 1), indirect impacts to wetland buffer areas may prompt the USACE to require authorization under a Category 2 permit (greater than 3,000 square feet and less than 1 acre of impact).
2 Required only if the USACE requires issuance of a Section 404 permit.
3 The degree of work required to replace the abutments to the Stevens Brook bridge is subject to additional design work. Should work require the excavation of greater than 10 cubic yards within the cross-sectional limits of the stream, a Stream Alteration Permit will be required.

6
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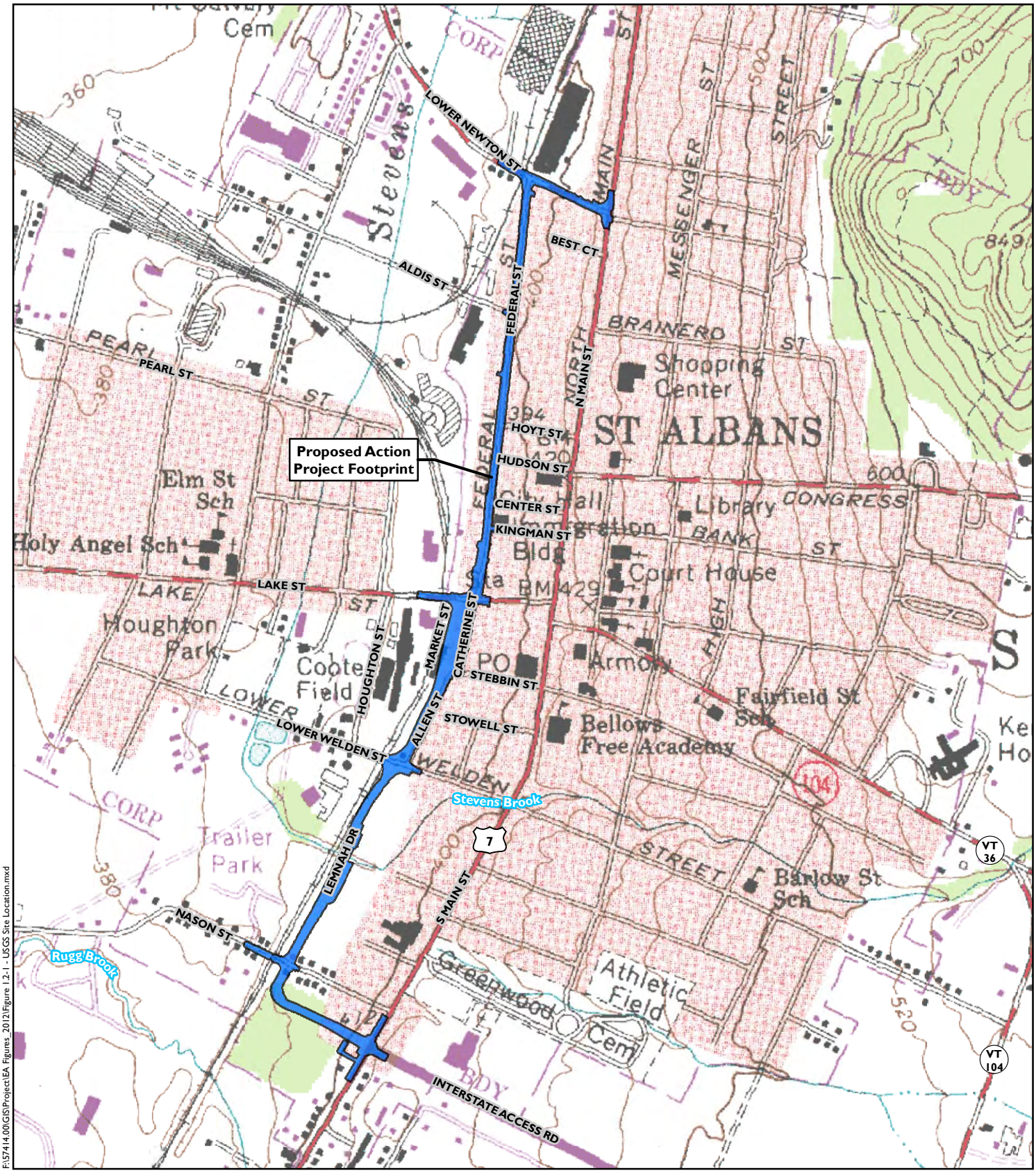
Figures

Figure No.	Description
1.2-1	Project Location Map (USGS)
1.2-2	Project Location Map (Aerial)
2.3-1	Proposed Alternatives Presented in the 2005 Corridor Study
2.4-1	Corridor Segment Designations
2.6-1	Proposed Action Overview (Sheet 1 of 2)
2.6-1	Proposed Action Overview (Sheet 2 of 2)
2.6-2	Typical Roadway Sections
2.6-3	Proposed Action – Nason St. Connector
2.6-4	Proposed Action – Nason St. Connector to Lemnah Dr. Segment
2.6-5	Proposed Action – Lemnah Dr. Segment
2.6-6	Proposed Action – Federal St. Segment
2.6-7	Proposed Action – Federal St. Segment
2.6-8	Proposed Action – Federal St. Segment to Lower Newton St. Segment
2.6-9	Proposed Action – Lower Newton St. Segment
2.7-1	Lower Welden St. Alternative 1 – Proposed Action
2.7-2	Lower Welden St. Alternative 2
2.8-1	Lake St. Alternative 1 – Proposed Action
2.8-2	Lake Street Alternative 2
2.8-3	Lake Street Alternative 3
2.8-4	Lake Street Alternative 4
3.2-1	Turning Movement Count Locations w. Existing Lane Use &Traffic Control
3.2-2	2010 Weekday Peak Hour Volumes – AM Peak Hour
3.2-3	2010 Weekday Peak Hour Volumes – PM Peak Hour
3.2-4	2010 Weekday Peak Hour Volumes – No-Action AM Peak Hour
3.2-5	2010 Weekday Peak Hour Volumes – No-Action PM Peak Hour
3.2-6	2030 Weekday Peak Hour Volumes – No-Action AM Peak Hour
3.2-7	2030 Weekday Peak Hour Volumes – No-Action PM Peak Hour
3.2-8	2010 Weekday Peak Hour Volumes – Proposed Action AM Peak Hour
3.2-9	2010 Weekday Peak Hour Volumes – Proposed Action PM Peak Hour
3.2-10	2030 Weekday Peak Hour Volumes – Proposed Action AM Peak Hour
3.2-11	2030 Weekday Peak Hour Volumes – Proposed Action PM Peak Hour
3.3-1	Wetlands Map
3.4-1	Surface Waters
3.4-2	Conceptual Stormwater Management Plan
3.4-3	Conceptual Stormwater Management Plan
3.4-4	Conceptual Stormwater Management Plan
3.4-5	Conceptual Stormwater Management Plan
3.4-6	Conceptual Stormwater Management Plan
3.5-1	Groundwater and Drinking Water Resources
3.6-1	Flood Hazard Areas
3.7-1	Prime Farmland and US Census Bureau Urbanized Centers
3.8-1	Wildlife Habitat
3.9-1	Special Species Status
3.10-1	Microscale Air Quality Analysis Intersections

3.11-1	Noise Monitoring & Receptor Locations – Sheet 1 of 3
3.11-1	Noise Monitoring & Receptor Locations – Sheet 2 of 3
3.11-1	Noise Monitoring & Receptor Locations – Sheet 3 of 3
3.12-1	Public Parks and Recreation Lands
3.13-1	Historic Districts and Sites
3.14-1	Archeological Resources
3.15-1	Right-of-Way Acquisitions
3.16-1	Minority Populations
3.16-2	Low-Income Populations
3.17-1	Hazardous Materials
4.4-1	Section 4(f) Impacts – CVR Headquarters Historic District
4.4-2	Section 4(f) Impacts – CVR Headquarters Historic District
4.4-3	Section 4(f) Impacts – CVR Headquarters Historic District
4.4-4	Section 4(f) Impacts – St. Albans Historic District
4.4-5	Section 4(f) Impacts – Willard Manufacturing Company Building
4.4-6	Section 4(f) Impacts – Giroux Furniture Company Building
4.4-7	Section 4(f) Impacts – Federal/Lake/Catherine Streets Intersection Historic District
4.4-8	Section 4(f) Impacts – 163 and 174 Federal Street

Appendices

- Appendix A: Purpose and Need Statement Adopted by the St. Albans City Council
- Appendix B: Supplemental Traffic Report
- Appendix C: Request for Preliminary Jurisdictional Determination and USACE Correspondence
- Appendix D: Air Quality Analysis
- Appendix E: Noise Analysis
- Appendix F: National Register of Historic Places Eligibility Analysis
- Appendix G: Section 106 Determinations of Effect Memorandum
- Appendix H: Archeological Information
- Appendix I: Right-of-Way Acquisition Impacts
- Appendix J: Hazardous Materials
- Appendix K: Transcript of Public Hearing
- Appendix L: Response to Comments Received During Public Comment Period



F:\57414.00\GIS\Project\EA Figures_2012\Figure 1.2-1 - USGS Site Location.mxd

Legend

Proposed Action Project Footprint

0 1,000 2,000 Feet

VHB Vanasse Hangen Brustlin, Inc.

Figure #1.2-1 - Project Location Map (USGS)
Federal Street Multimodal Connector
City of St. Albans, Vermont

F:\57414.00\GIS\Project\EA Figures_2012\Figure 1.2-2 - Ortho Site Location.mxd

Legend

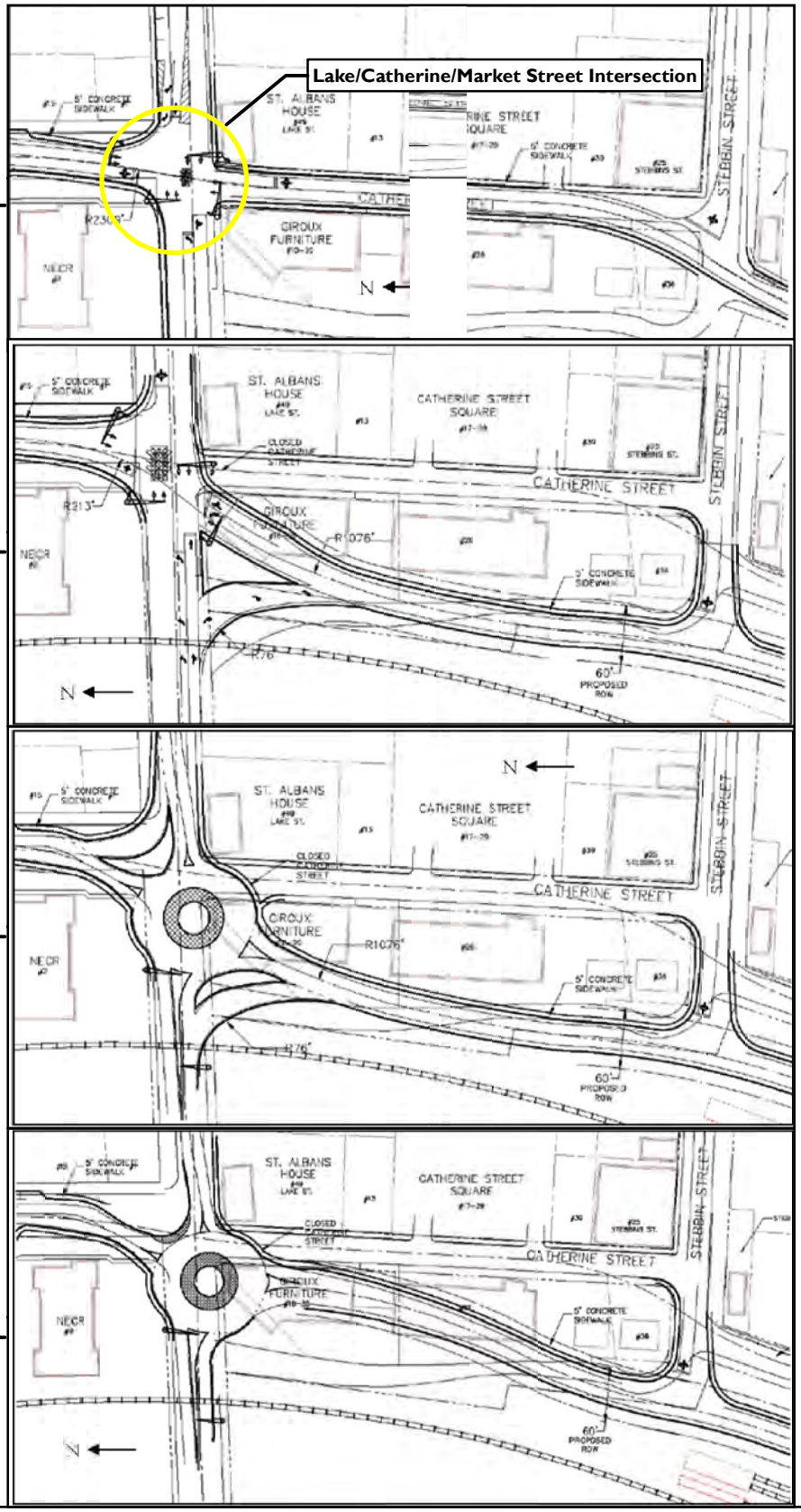
Proposed Action Project Footprint

Stream (VHD)

0 1,000 2,000 Feet

Vanasse Hangen Brustlin, Inc.

Figure #1.2-2 - Project Location Map (Aerial)
Federal Street Multimodal Connector
City of St. Albans, Vermont



E:\57414.00\GIS\Project\EA Figures 2012\Figure 2.5-1 - Proposed Alternatives Presented in the 2005 Corridor Study.mxd

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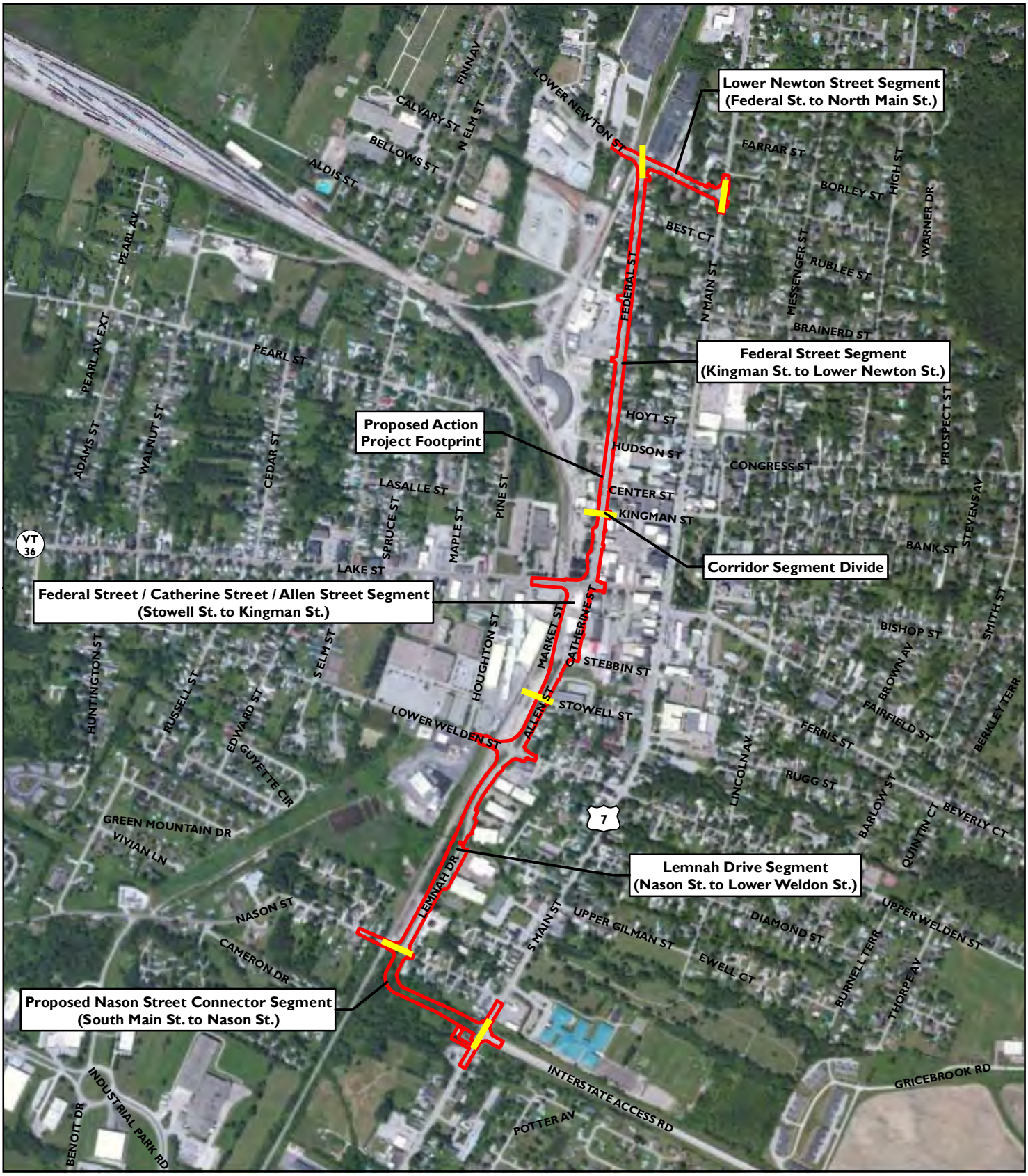
Figure #2.3-1 - Proposed Alternatives Presented in the 2005 Corridor Study
Federal Street Multimodal Connector
City of St. Albans, Vermont

NTS



Legend

Proposed Action Project Footprint

Segment Divide

0 1,000 2,000 Feet

VHB Vanasse Hangen Brustlin, Inc.

Figure # 2.4-1 Corridor Segment Designations
Federal Street Multimodal Connector
City of St. Albans, Vermont

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Legend

- Traffic Signal

Proposed Action

- Proposed Pavement
- Proposed Driveway
- Slope Limits
- Proposed Crosswalk
- Proposed Sidewalk
- At-Grade Crossing
- Proposed Concrete Island
- Proposed Granite Curb
- Stevens Brook
- Existing ROW

0 250 500 Feet

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Figure #2.6-1 - Proposed Action Overview
Sheet 1 of 2
Federal Street Multimodal Connector
City of St. Albans, Vermont

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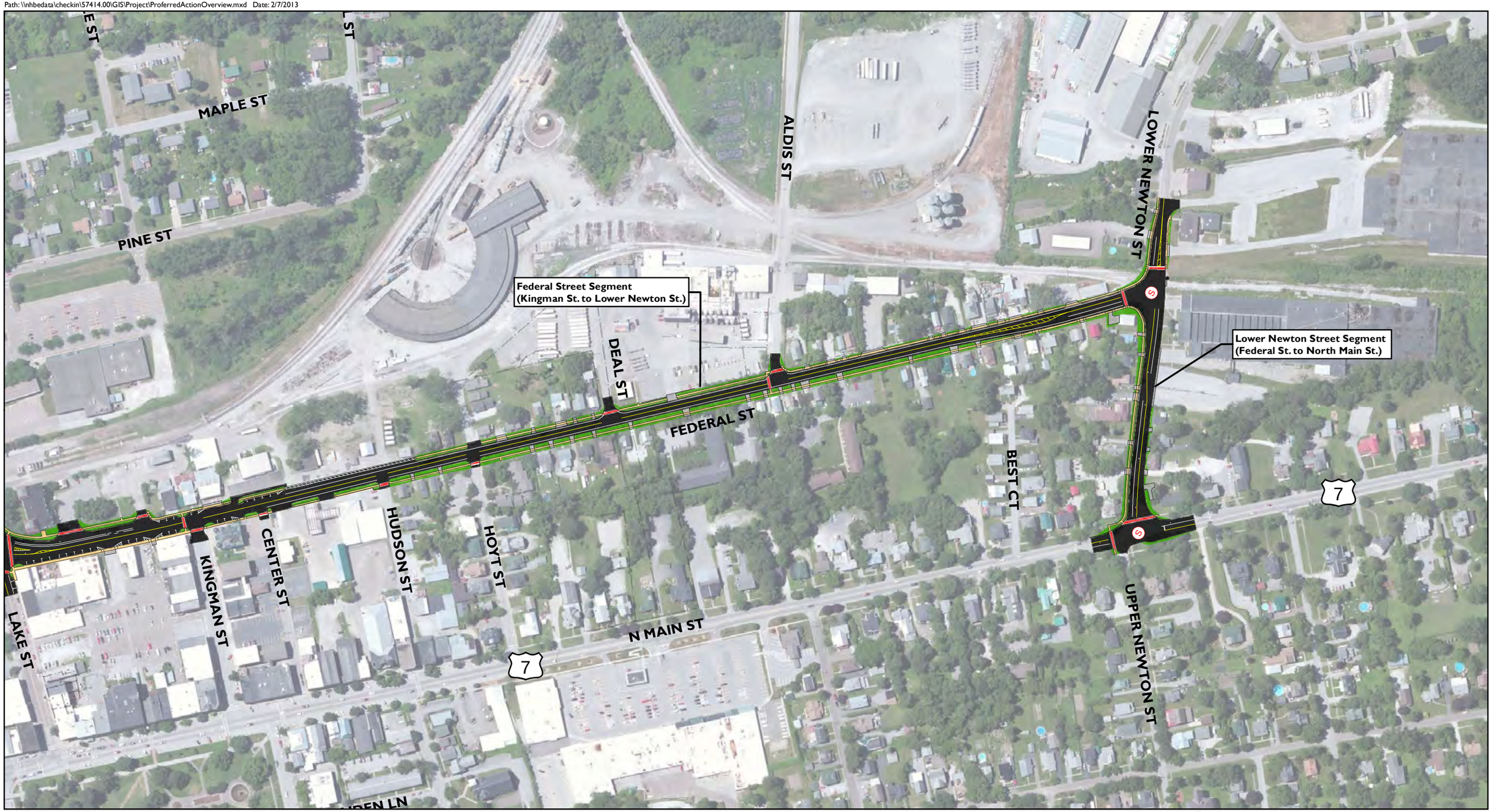

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Traffic Signal

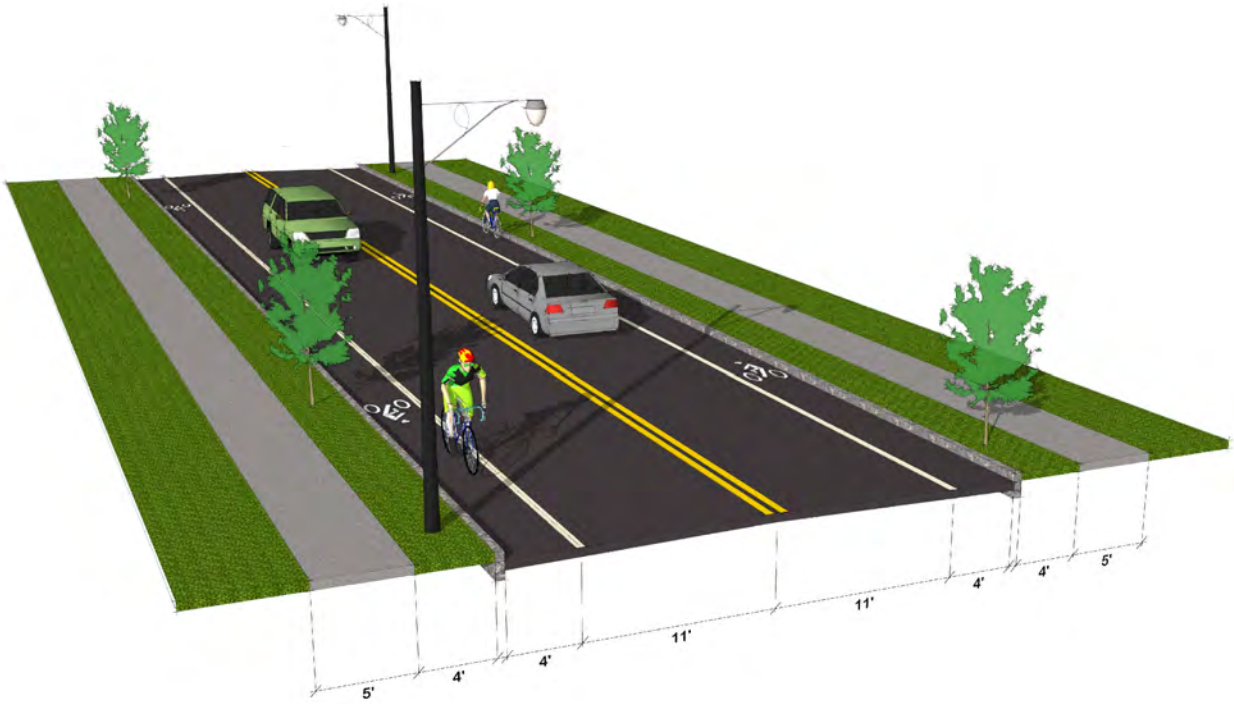
Proposed Action

- Proposed Pavement
- Proposed Driveway
- Slope Limits
- Proposed Crosswalk
- Proposed Sidewalk
- At-Grade Crossing
- Proposed Concrete Island
- Proposed Granite Curb
- Stevens Brook
- Existing ROW

0 250 500 Feet

Vanasse Hangen Brustlin, Inc.

Figure #2.6-1 - Proposed Action Overview
Sheet 2 of 2
Federal Street Multimodal Connector
City of St. Albans, Vermont



Federal Street

Lemnah Drive-Nason Street Extension

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Figure #2.6-2 Typical Roadway Sections
Federal Street Multimodal Connector
City of St. Albans, Vermont

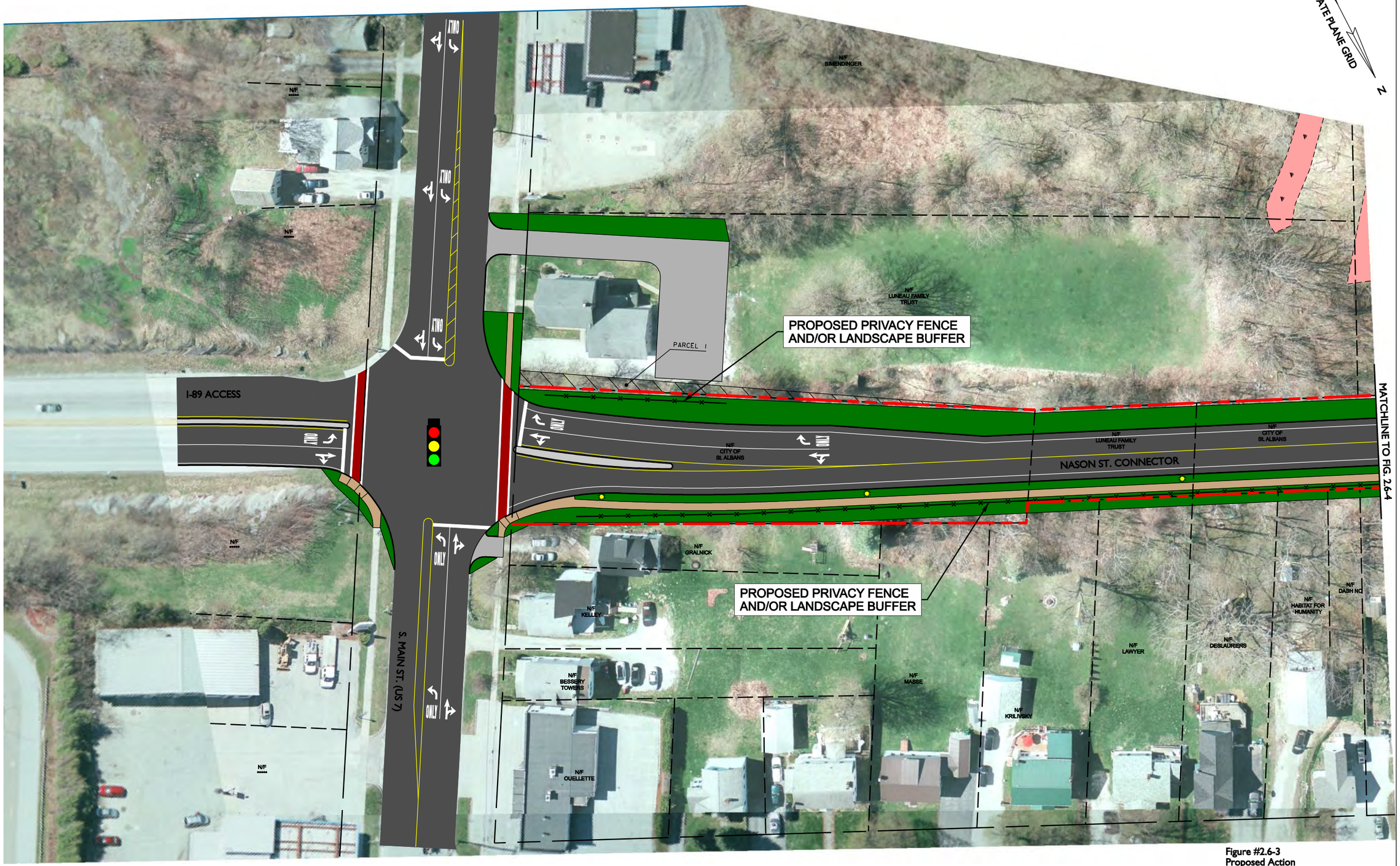

Figure #2.6-3
Proposed Action
Federal Street Multimodal Connector
City of Saint Albans, VT

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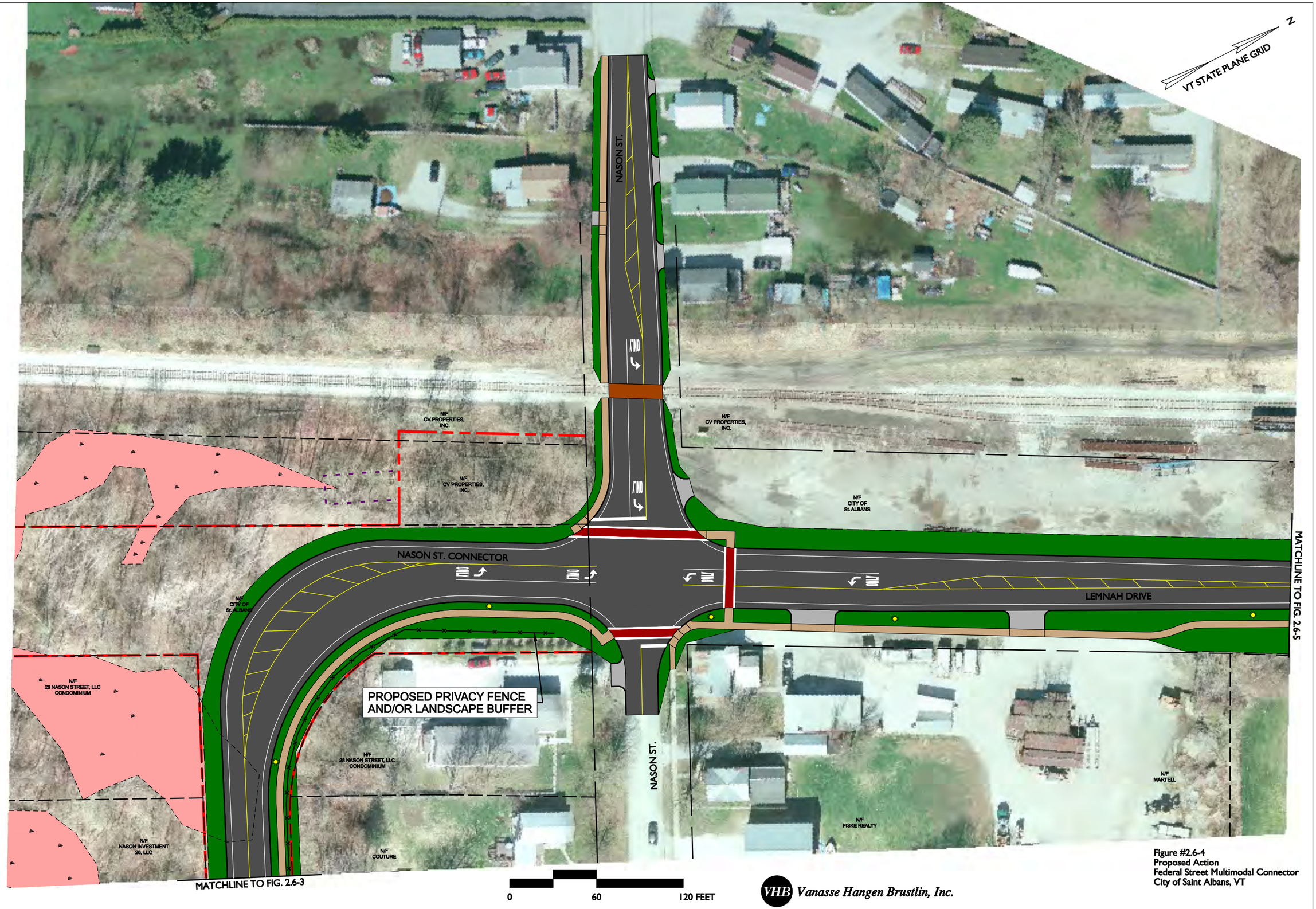

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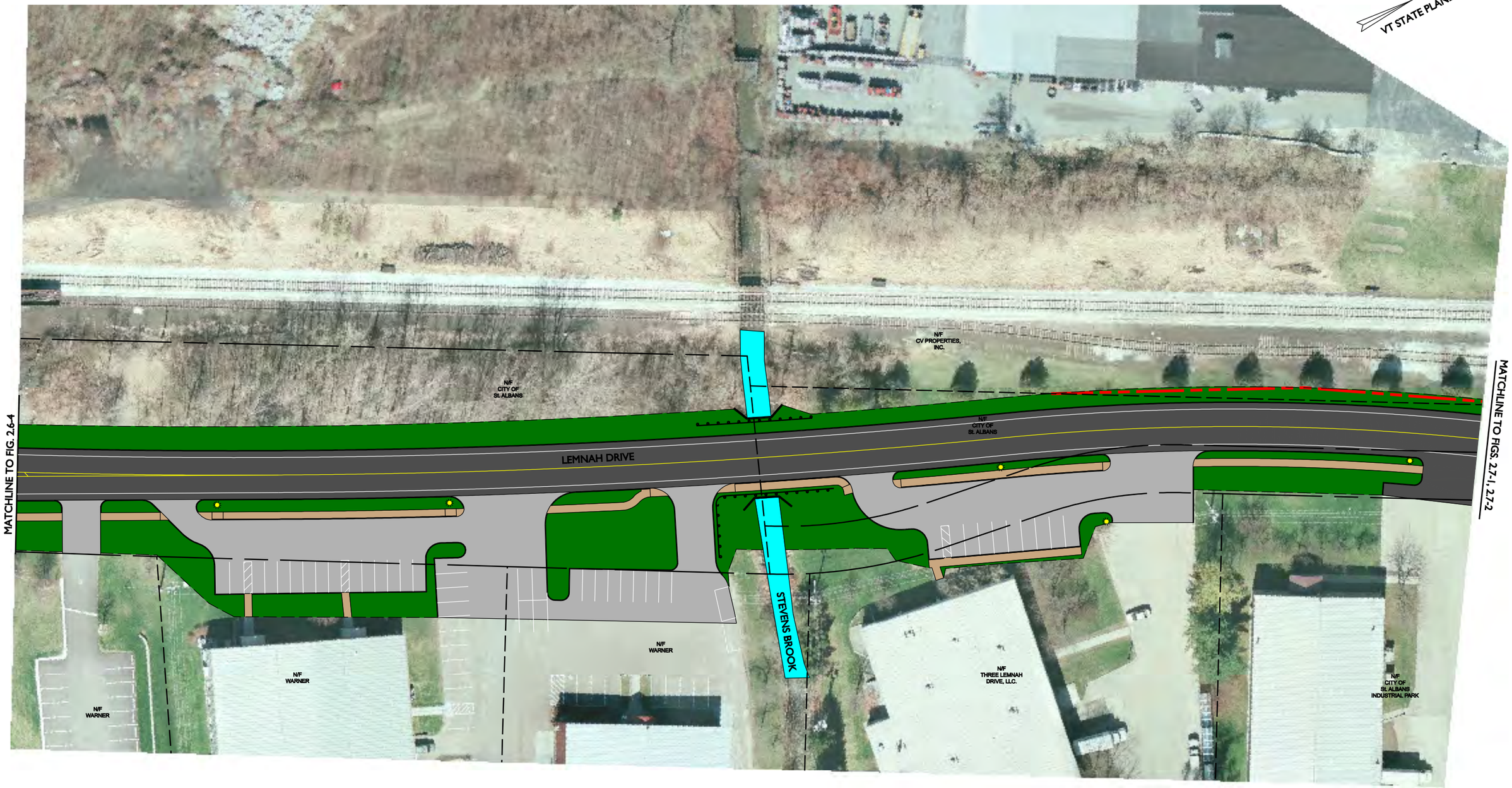
Figure #2.6-4
Proposed Action
Federal Street Multimodal Connector
City of Saint Albans, VT



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VHB Vanasse Hangen Brustlin, Inc.

Figure #2.6-5
Proposed Action
Federal Street Multimodal Connector
City of Saint Albans, VT

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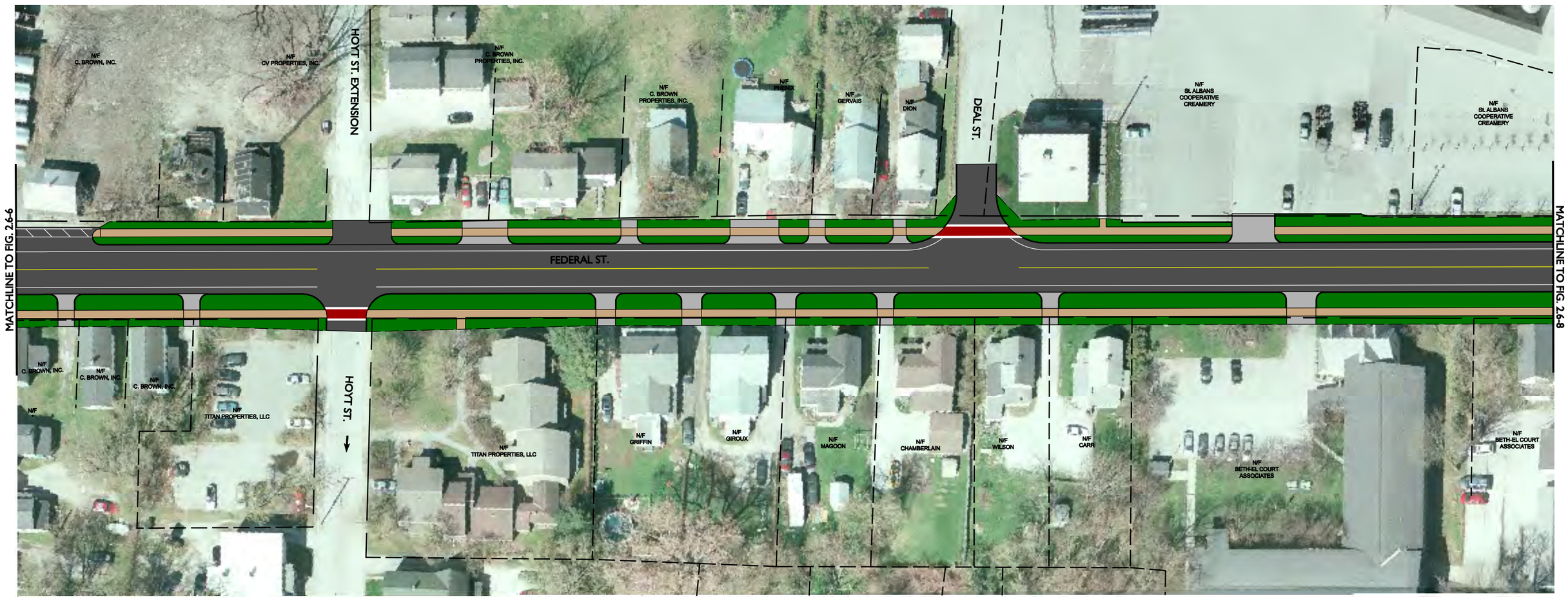
VHB Vanasse Hangen Brustlin, Inc.

Figure #2.6-6
Proposed Action
Federal Street Multimodal Connector
City of Saint Albans, VT



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VHB Vanasse Hangen Brustlin, Inc.

Figure #2.6-7
Proposed Action
Federal Street Multimodal Connector
City of Saint Albans, VT

0 60 120 FEET

VHB Vanasse Hangen Brustlin, Inc.

Figure #2.6-8
Proposed Action
Federal Street Multimodal Connector
City of Saint Albans, VT

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VHB Vanasse Hangen Brustlin, Inc.

Figure #2.6-9
Proposed Action
Federal Street Multimodal Connector
City of Saint Albans, VT

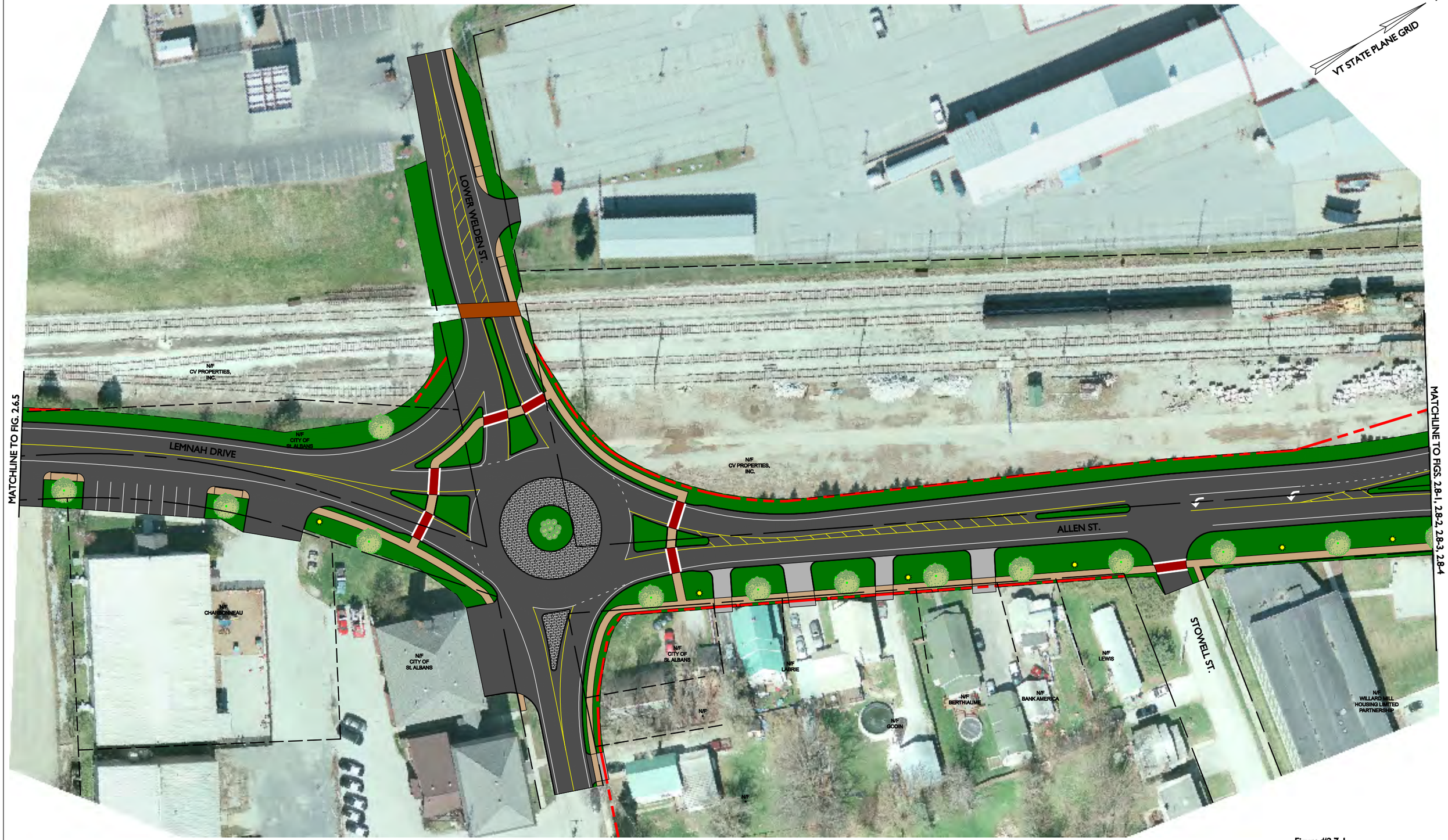

Figure #2.7-1
Lower Welden St. - Proposed Action
Federal Street Multimodal Connector
City of Saint Albans, VT

Figure #2.7-2
Lower Welden St. - Alternative 2
Federal Street Multimodal Connector
City of Saint Albans, VT

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Figure #2.8-1
Lake St. - Proposed Action
Federal Street Multimodal Connector
City of Saint Albans, VT

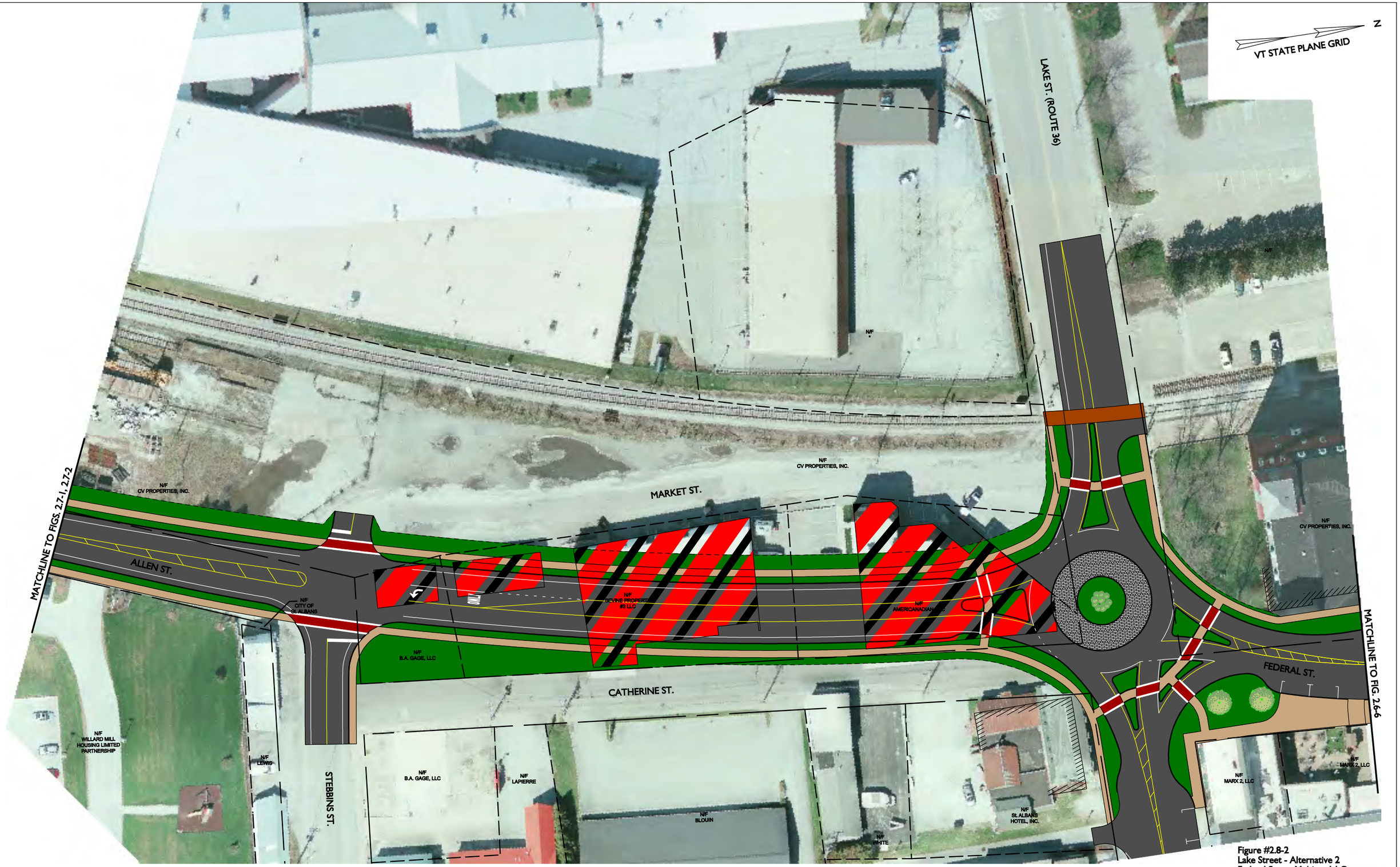

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Figure #2.8-2
Lake Street - Alternative 2
Federal Street Multimodal Connector
City of Saint Albans, VT

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Figure #2.8-3
Lake Street - Alternative 3
Federal Street Multimodal Connector
City of Saint Albans, VT

Figure #2.8-4
Lake Street - Alternative 4
Federal Street Multimodal Connector
City of Saint Albans, VT

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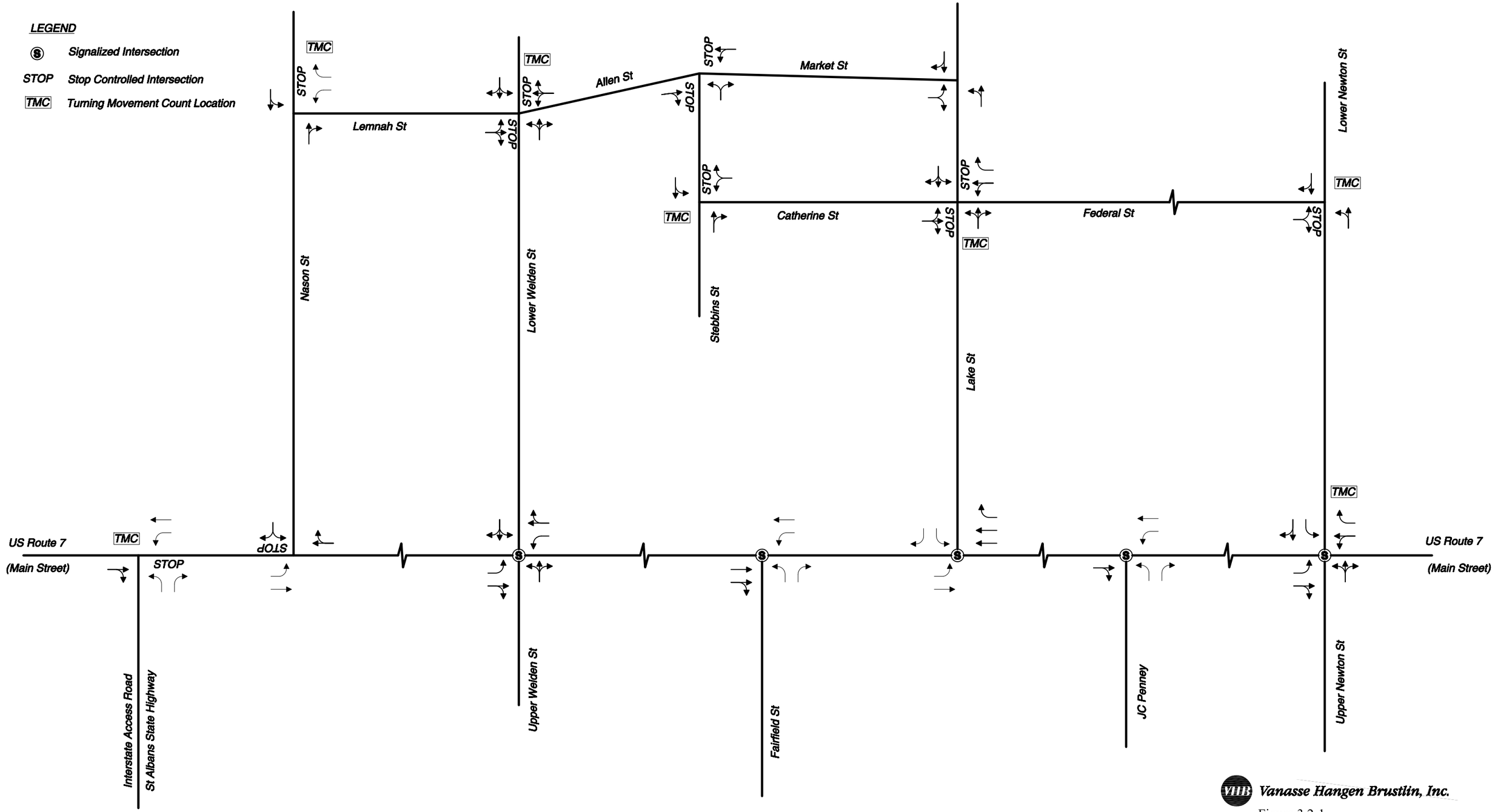

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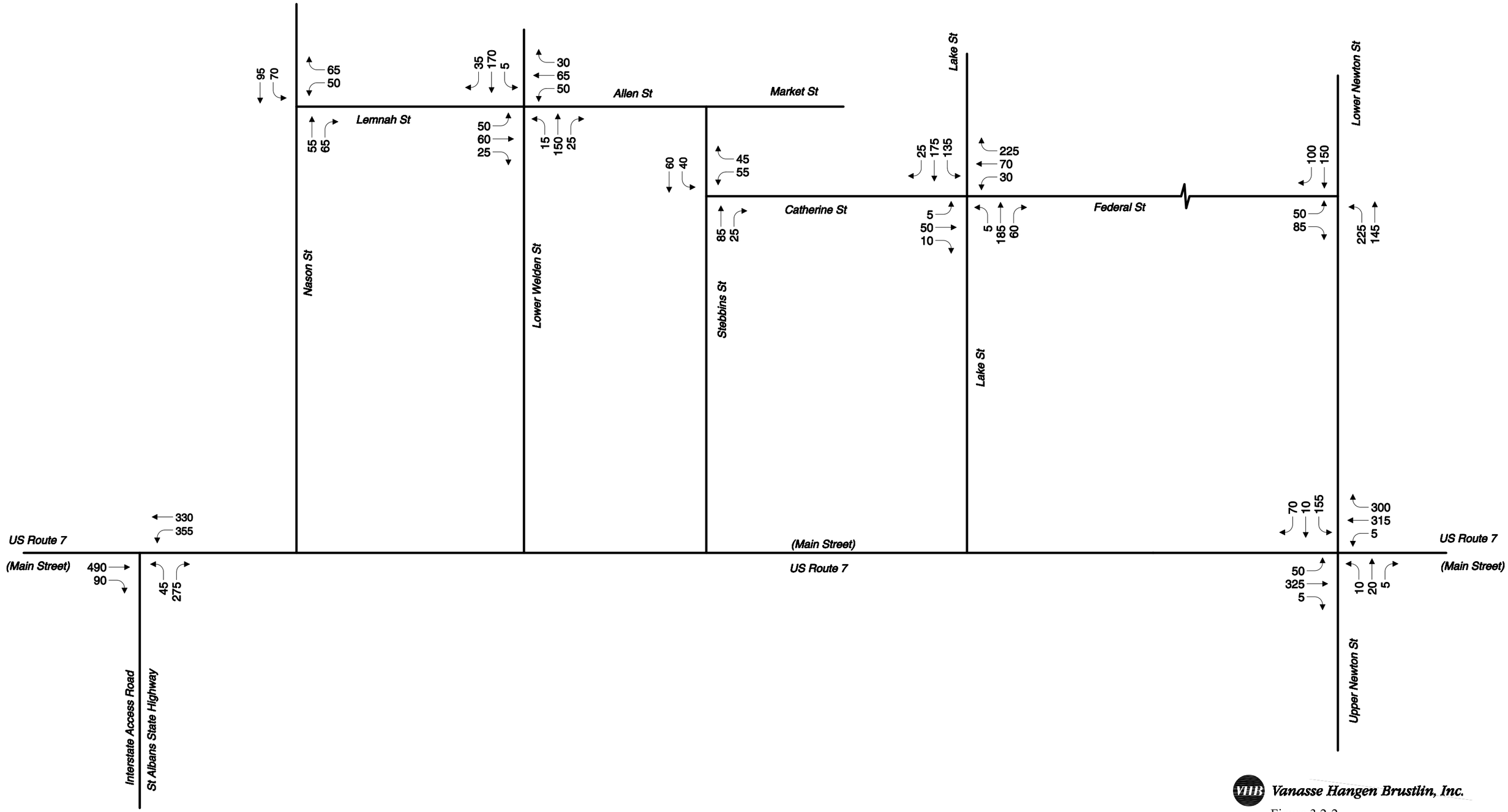
Figure 3.2-1

Existing Lane Use and Traffic Control
Federal Street Corridor

Not to Scale

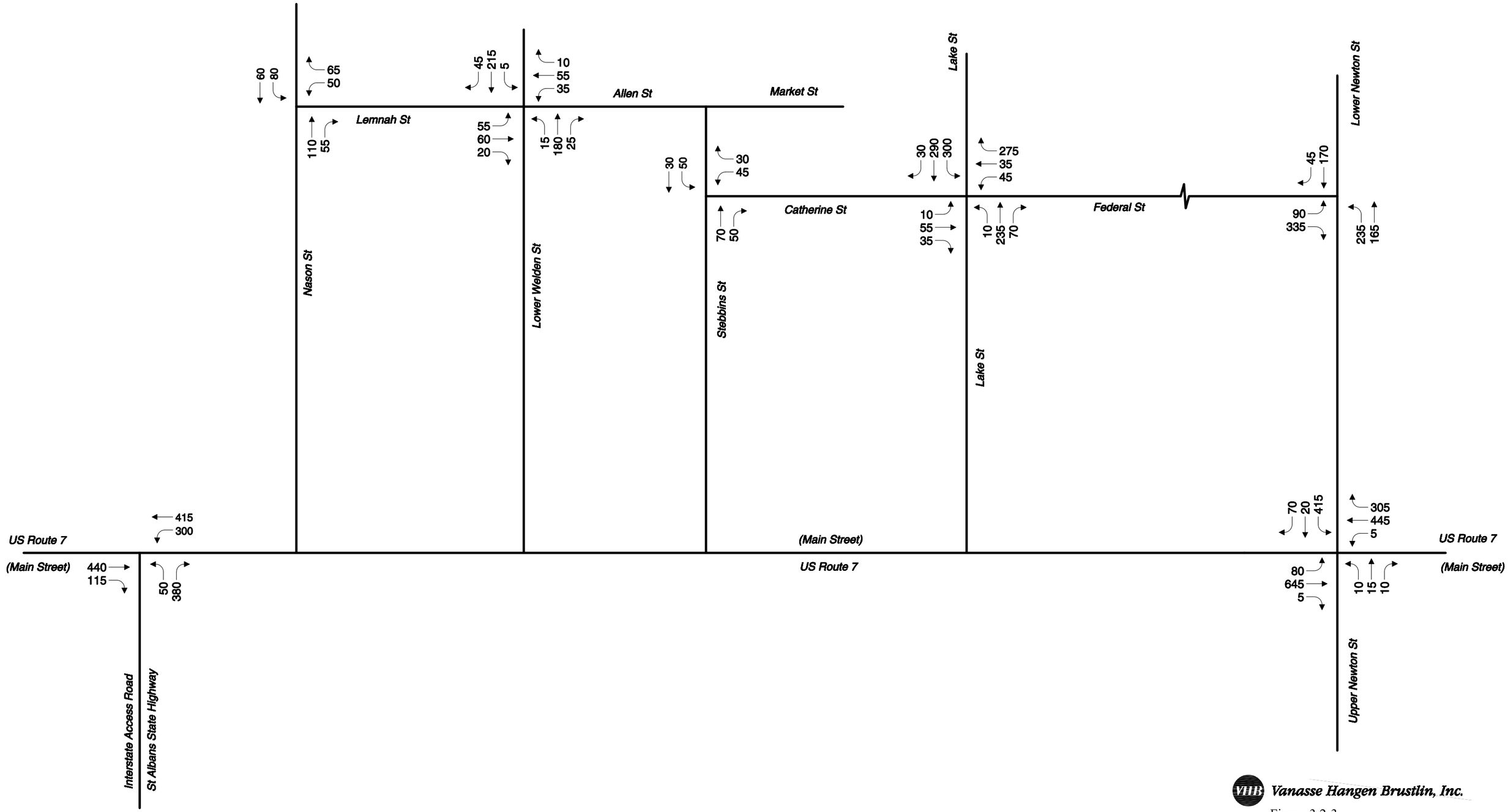


Vanasse Hangen Brustlin, Inc.

Figure 3.2-2

2010 Weekday Peak Hour Volumes
AM Peak Hour
Federal Street Corridor

Not to Scale

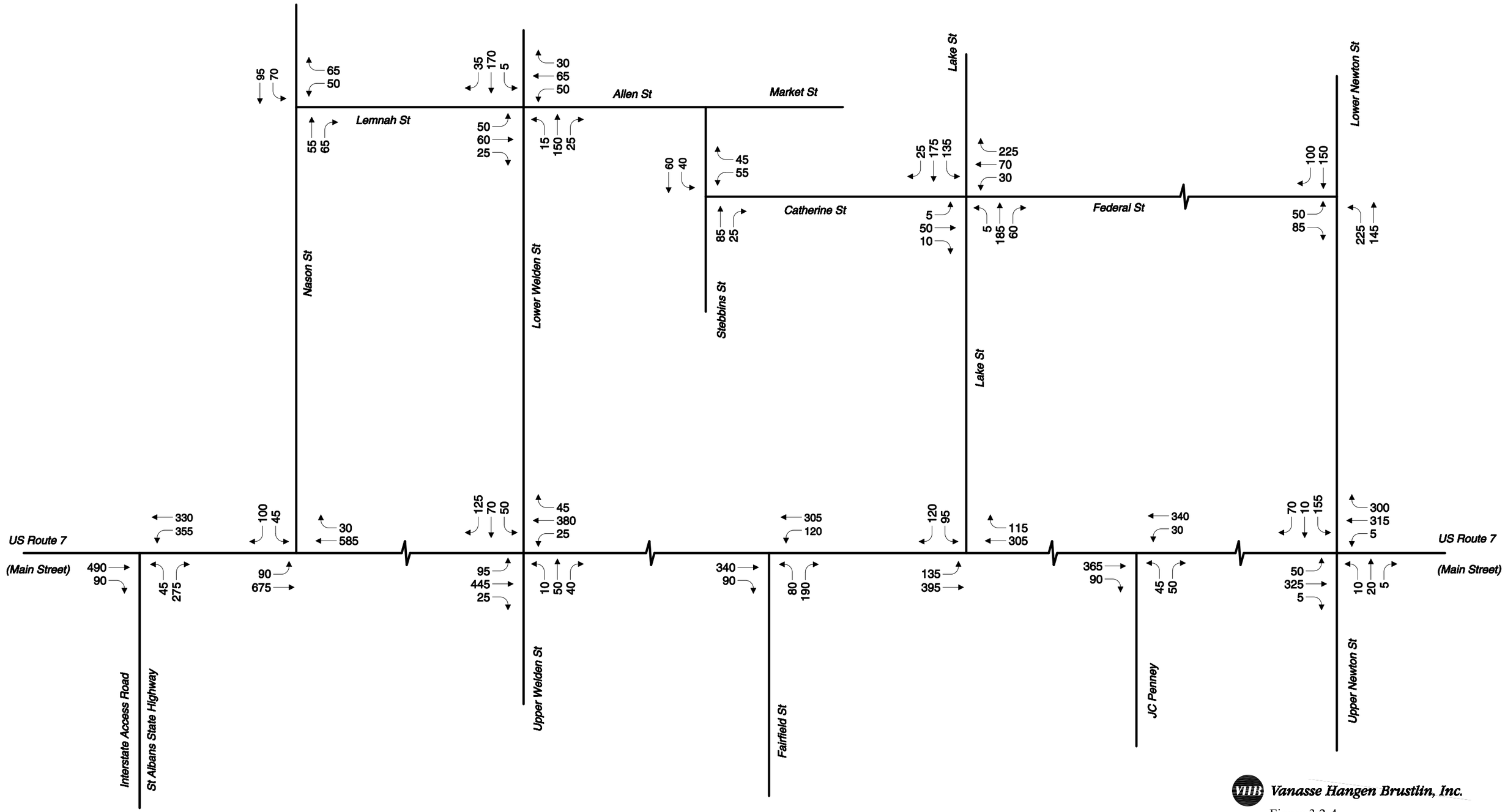


Vanasse Hangen Brustlin, Inc.

Figure 3.2-3

2010 Weekday Peak Hour Volumes
PM Peak Hour
Federal Street Corridor

Not to Scale

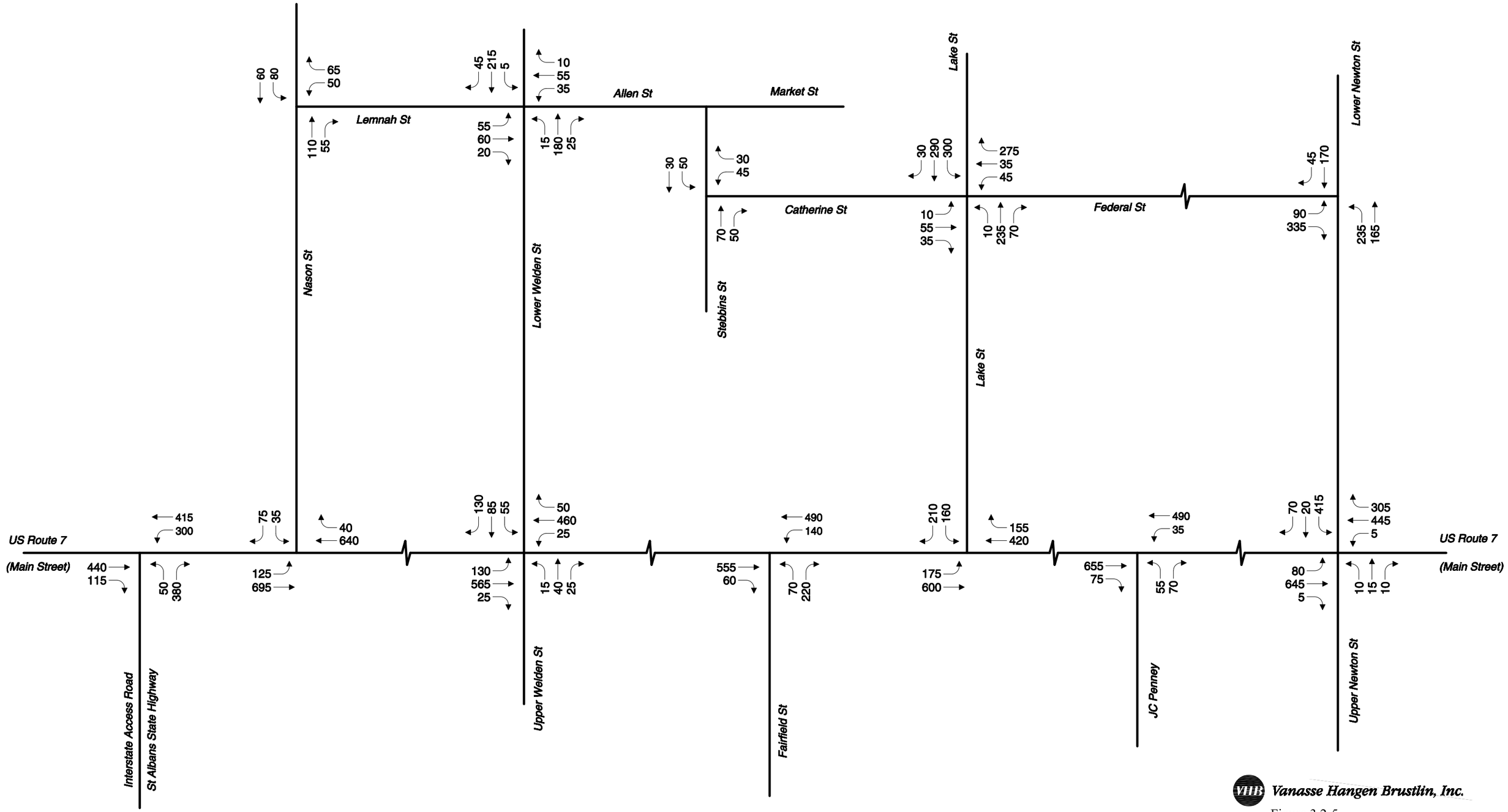


Vanasse Hangen Brustlin, Inc.

Figure 3.2-4

2010 Weekday Peak Hour Volumes
No-Action AM Peak Hour
Federal Street Corridor

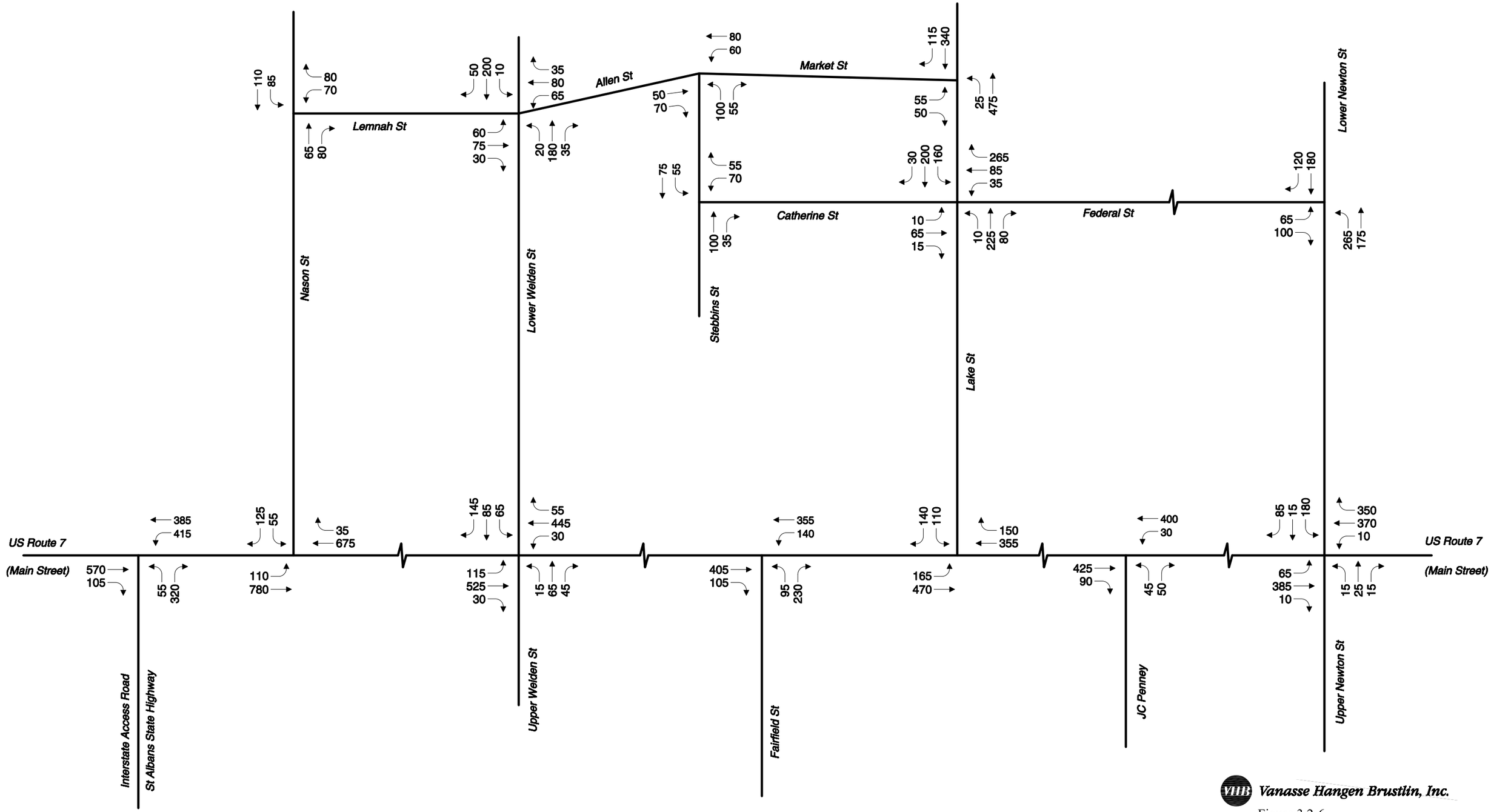
Not to Scale



Vanasse Hangen Brustlin, Inc.

Figure 3.2-5

2010 Weekday Peak Hour Volumes
No-Action PM Peak Hour
Federal Street Corridor

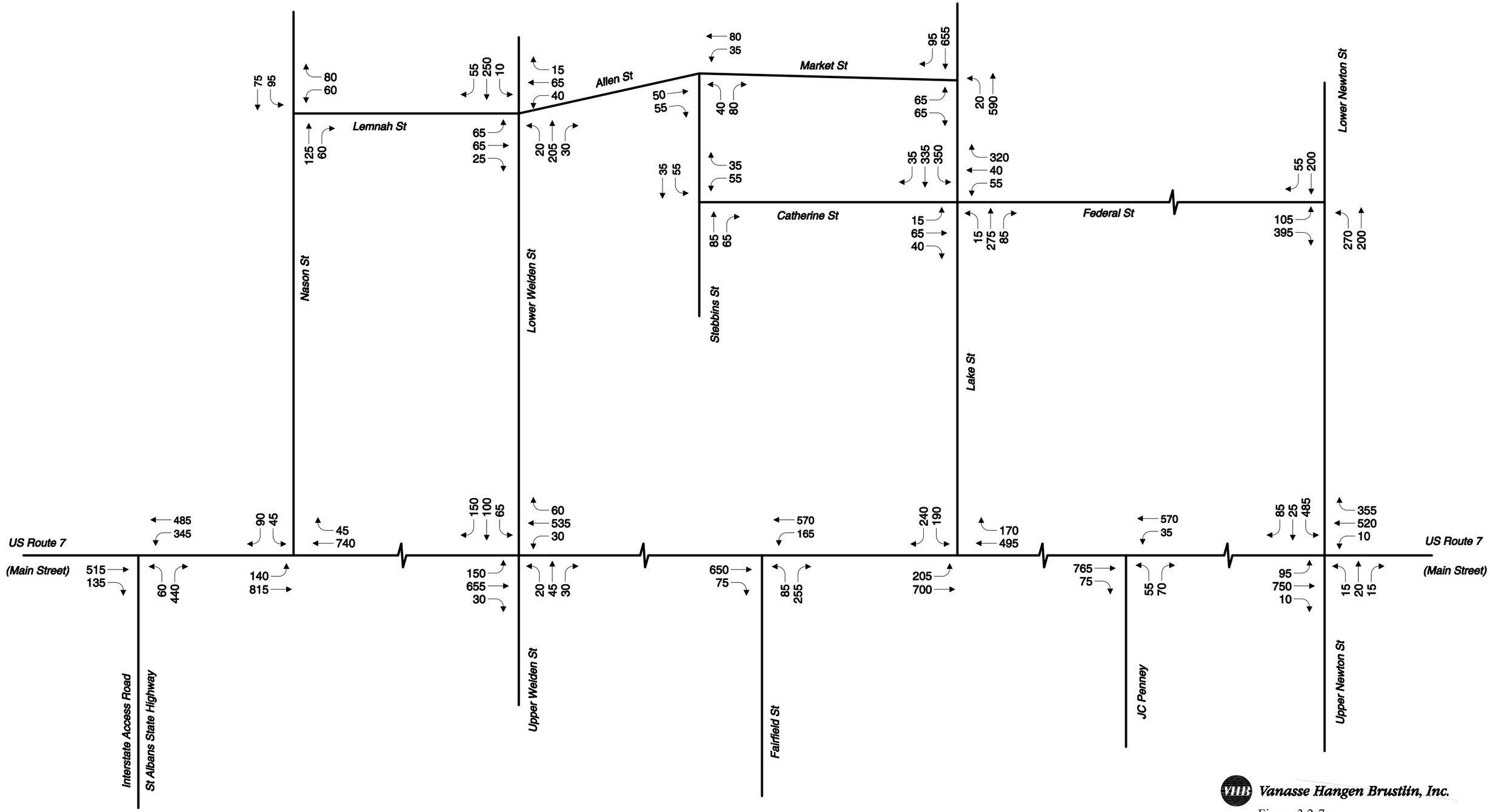


Vanasse Hangen Brustlin, Inc.

Figure 3.2-6

2030 Weekday Peak Hour Volumes
No-Action AM Peak Hour
Federal Street Corridor

Not to Scale

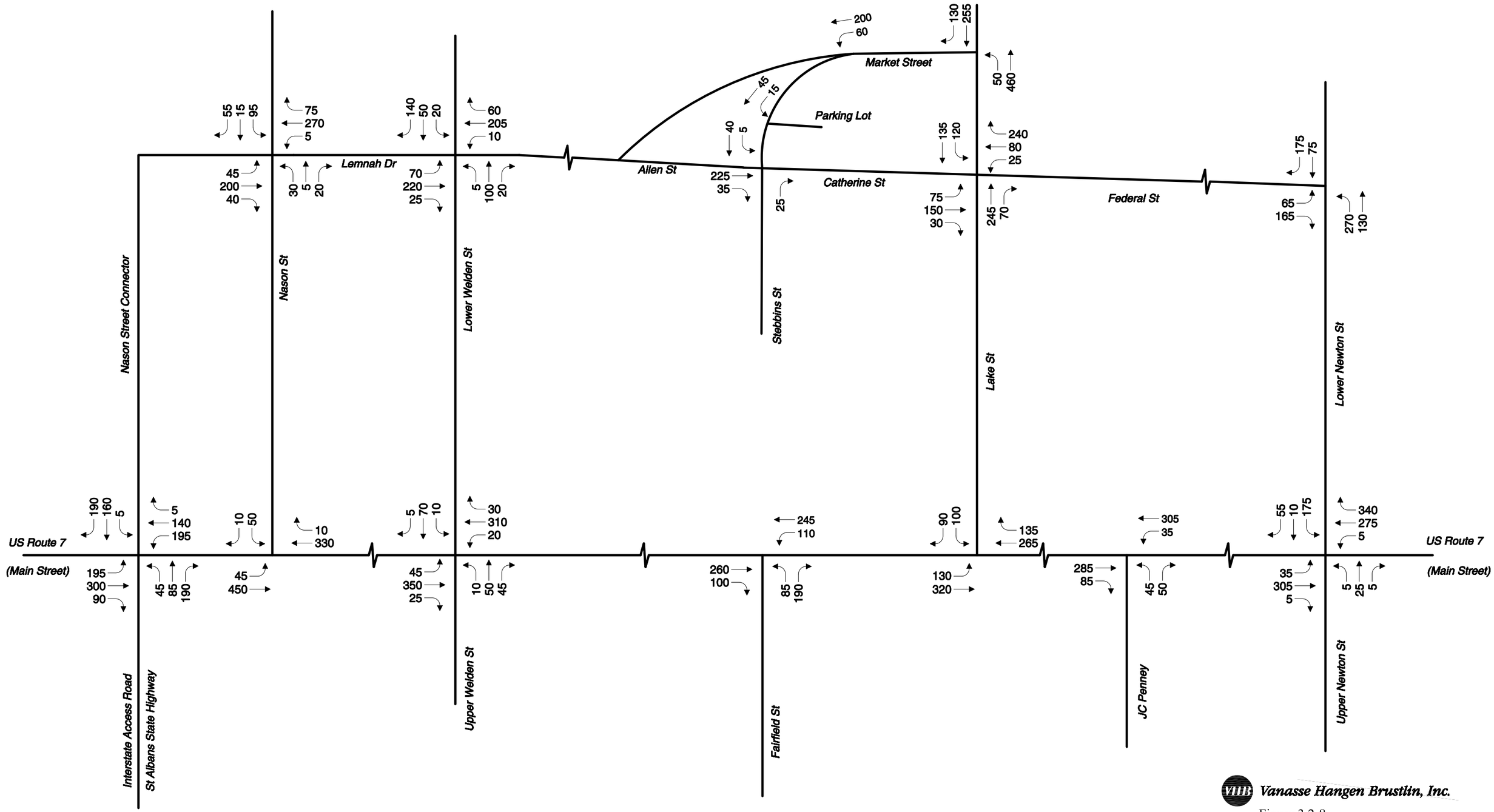


Vanasse Hangen Brustlin, Inc.

Figure 3.2-7

2030 Weekday Peak Hour Volumes
No-Action PM Peak Hour
Federal Street Corridor

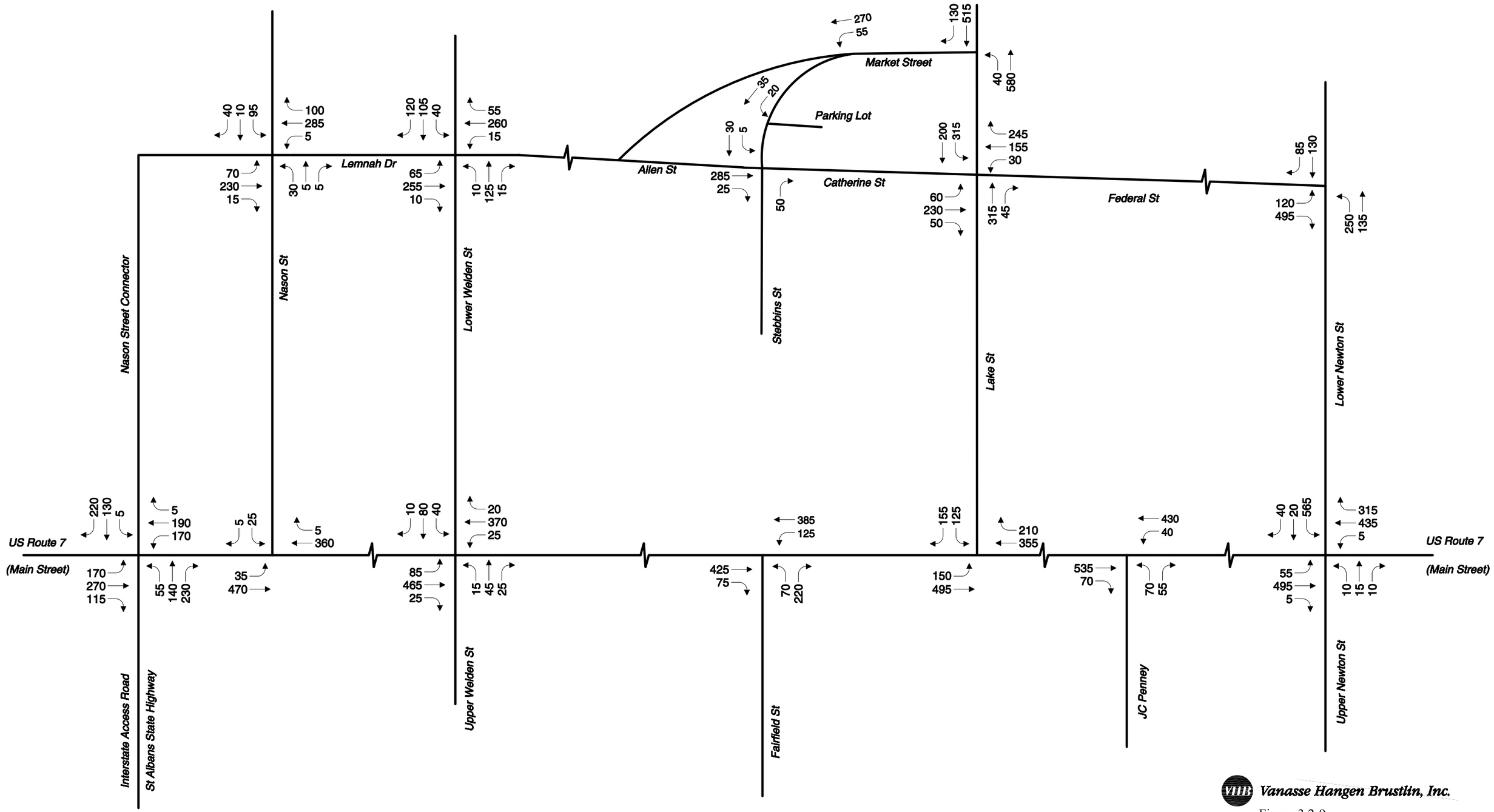
Not to Scale



Vanasse Hangen Brustlin, Inc.

Figure 3.2-8

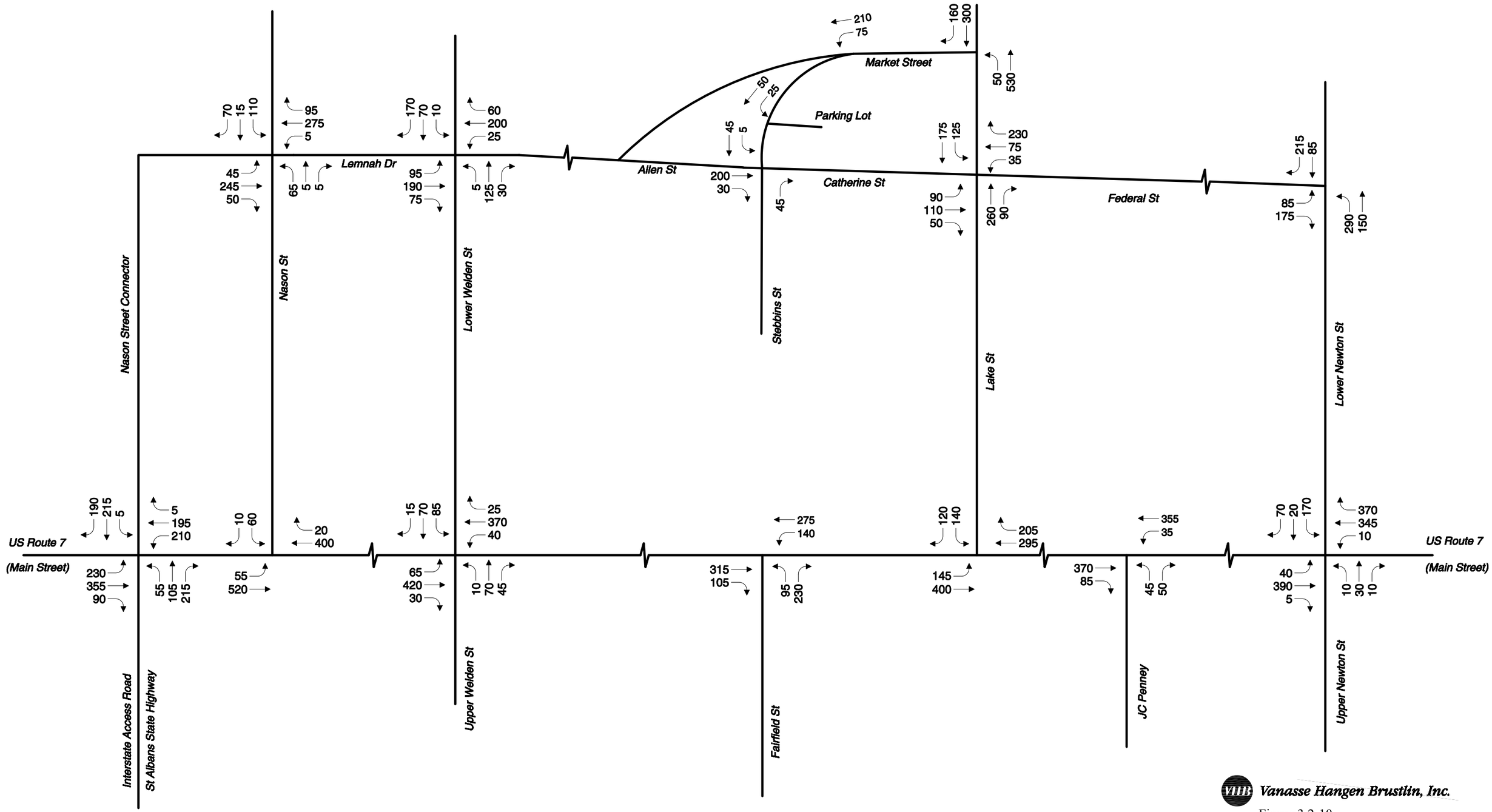
2010 Weekday Peak Hour Volumes
Proposed Action AM Peak Hour
Federal Street Corridor



Vanasse Hangen Brustlin, Inc.

Figure 3.2-9

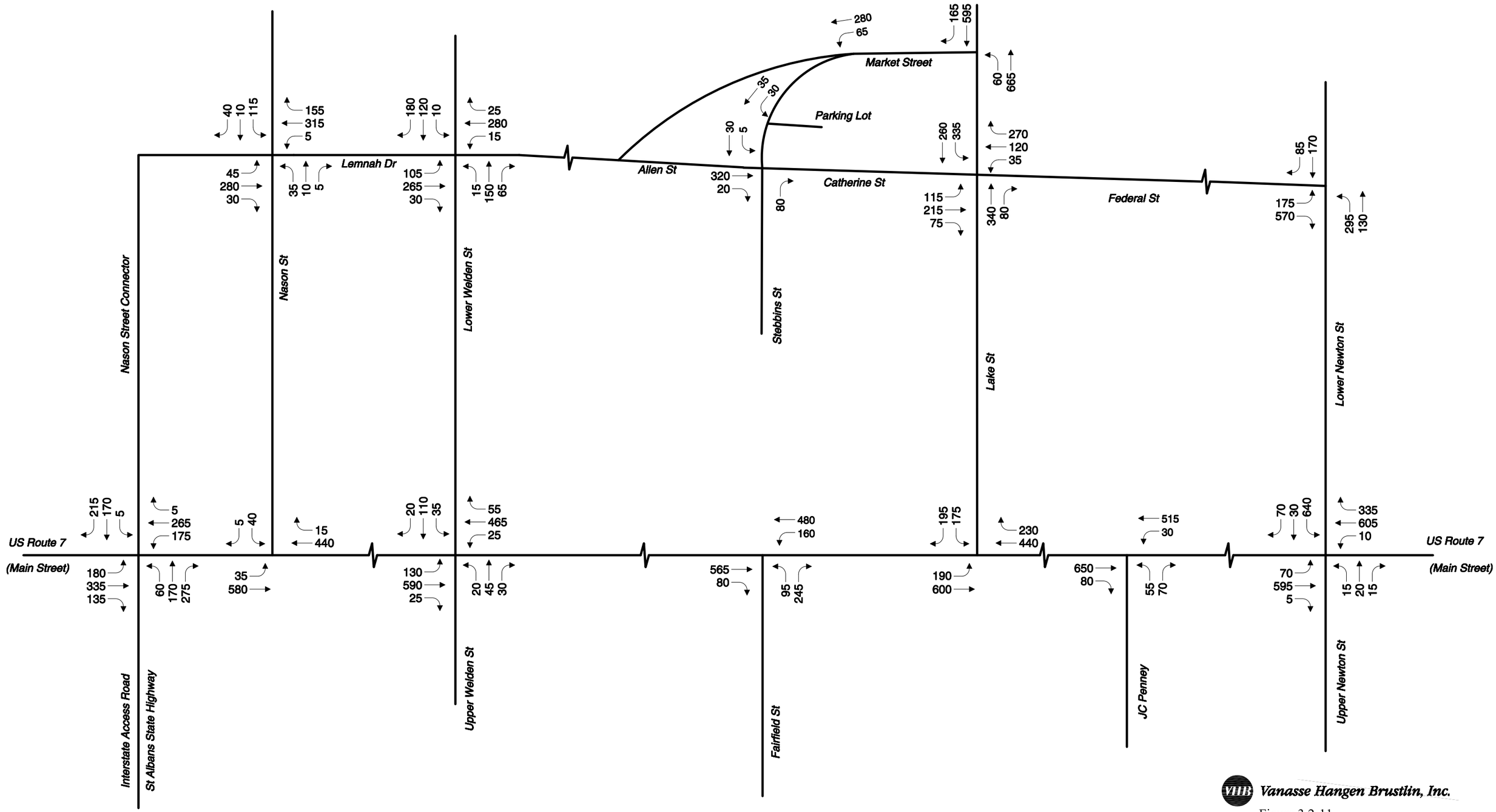
2010 Weekday Peak Hour Volumes
Proposed Action PM Peak Hour
Federal Street Corridor



Vanasse Hangen Brustlin, Inc.

Figure 3.2-10

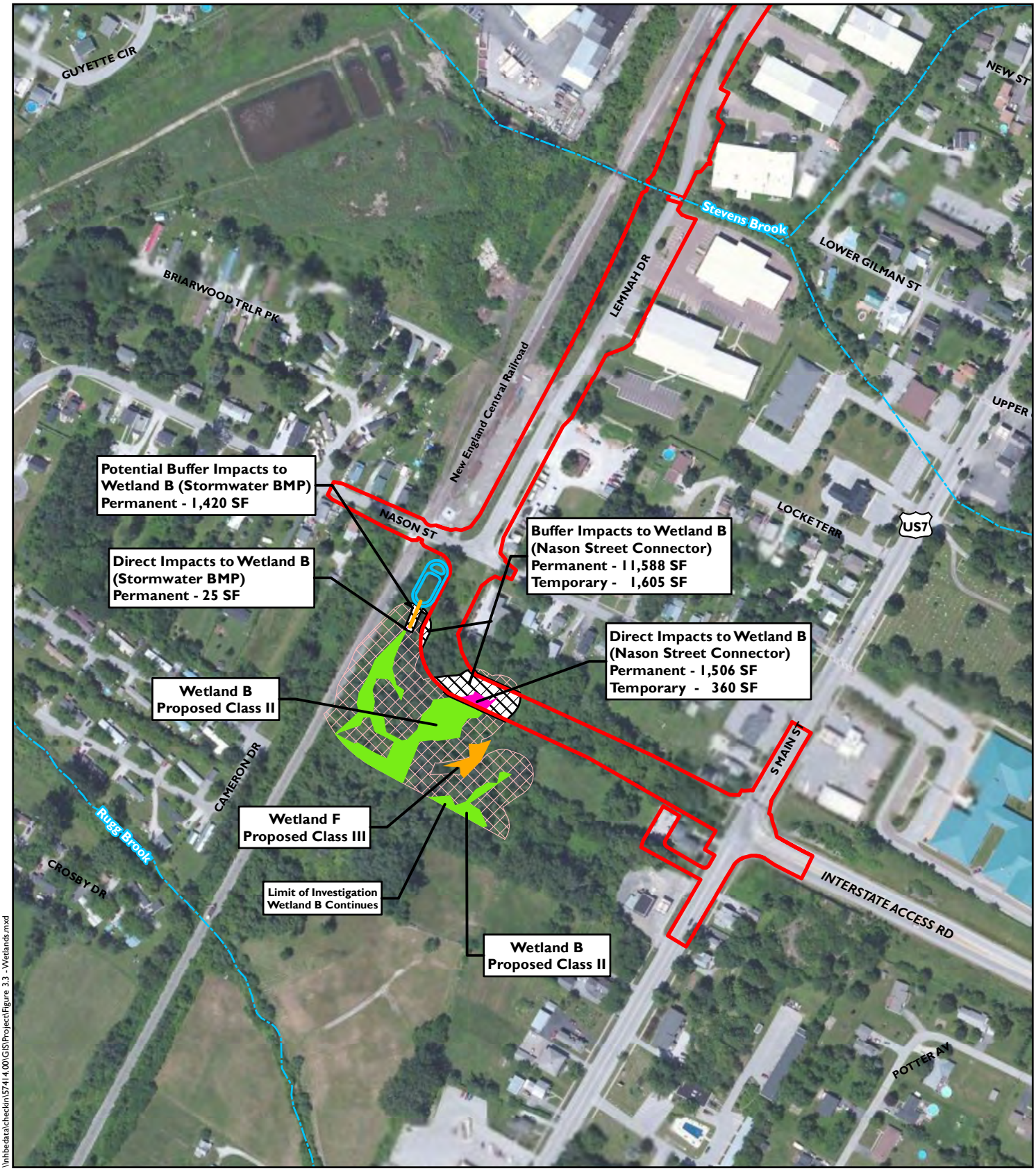
2030 Weekday Peak Hour Volumes
Proposed Action AM Peak Hour
Federal Street Corridor



Vanasse Hangen Brustlin, Inc.

Figure 3.2-11

2030 Weekday Peak Hour Volumes
Proposed Action PM Peak Hour
Federal Street Corridor



\\hhbdata\checkin\57414.00\GIS\Project\Figure 3.3 - Wetlands.mxd

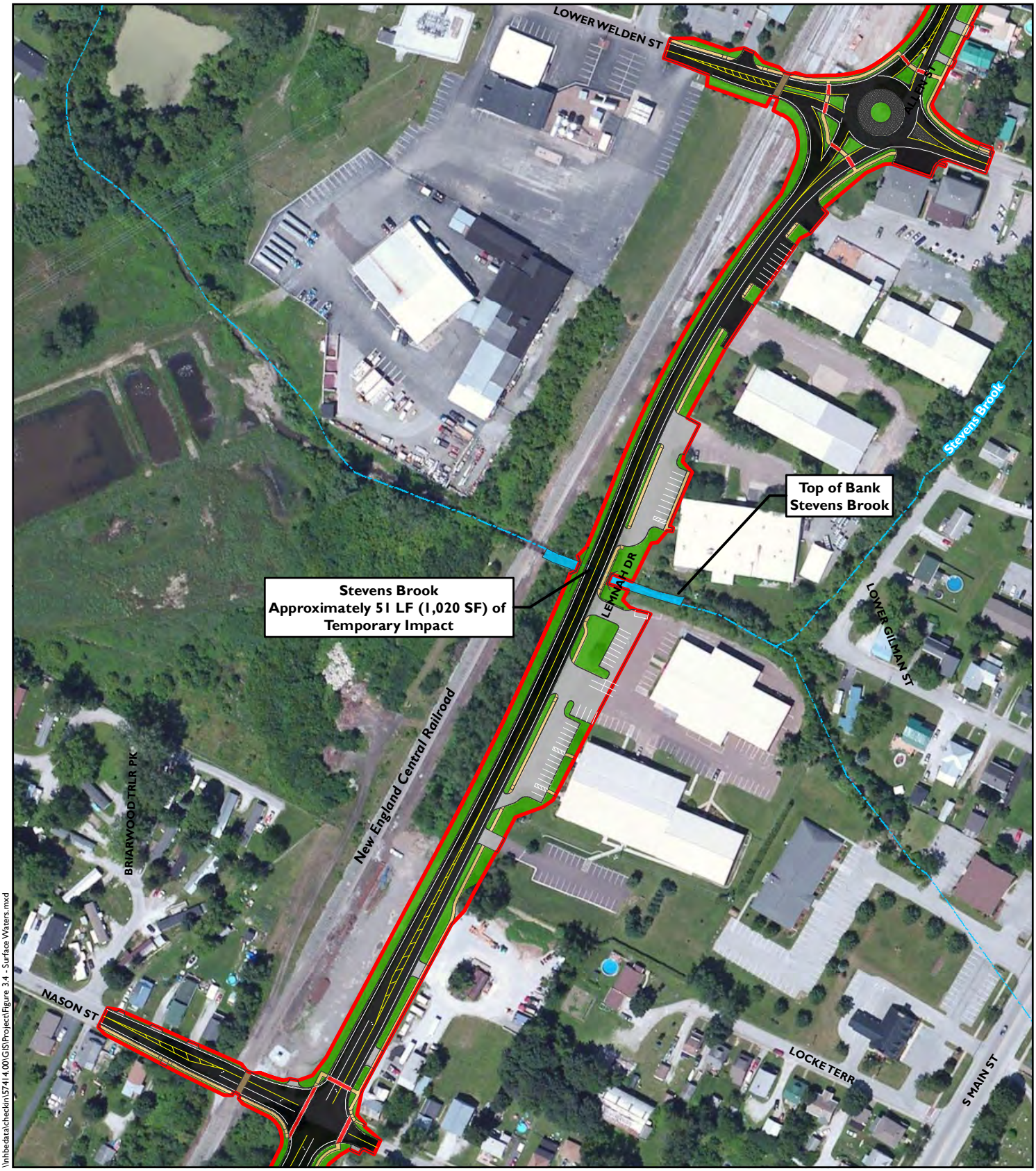
Legend

- Proposed Action Project Footprint
- Proposed Stormwater Discharge Pipe
- Proposed Stormwater BMP
- Delineated Wetland (VHB)
  - Proposed Class II (VHB)
  - Proposed Class III (VHB)
- Stream (VHD)
- Wetland Impact Area
- Wetland Buffer Impact
- Class II Wetland Buffer

0 300 600 Feet

VHB Vanasse Hangen Brustlin, Inc.

Figure #3.3-1 - Wetlands Map
Federal Street Multimodal Connector
City of St. Albans, Vermont



\\hhbedata\checkin\57414.00\GIS\Project\Figure 3.4 - Surface Waters.mxd

Legend

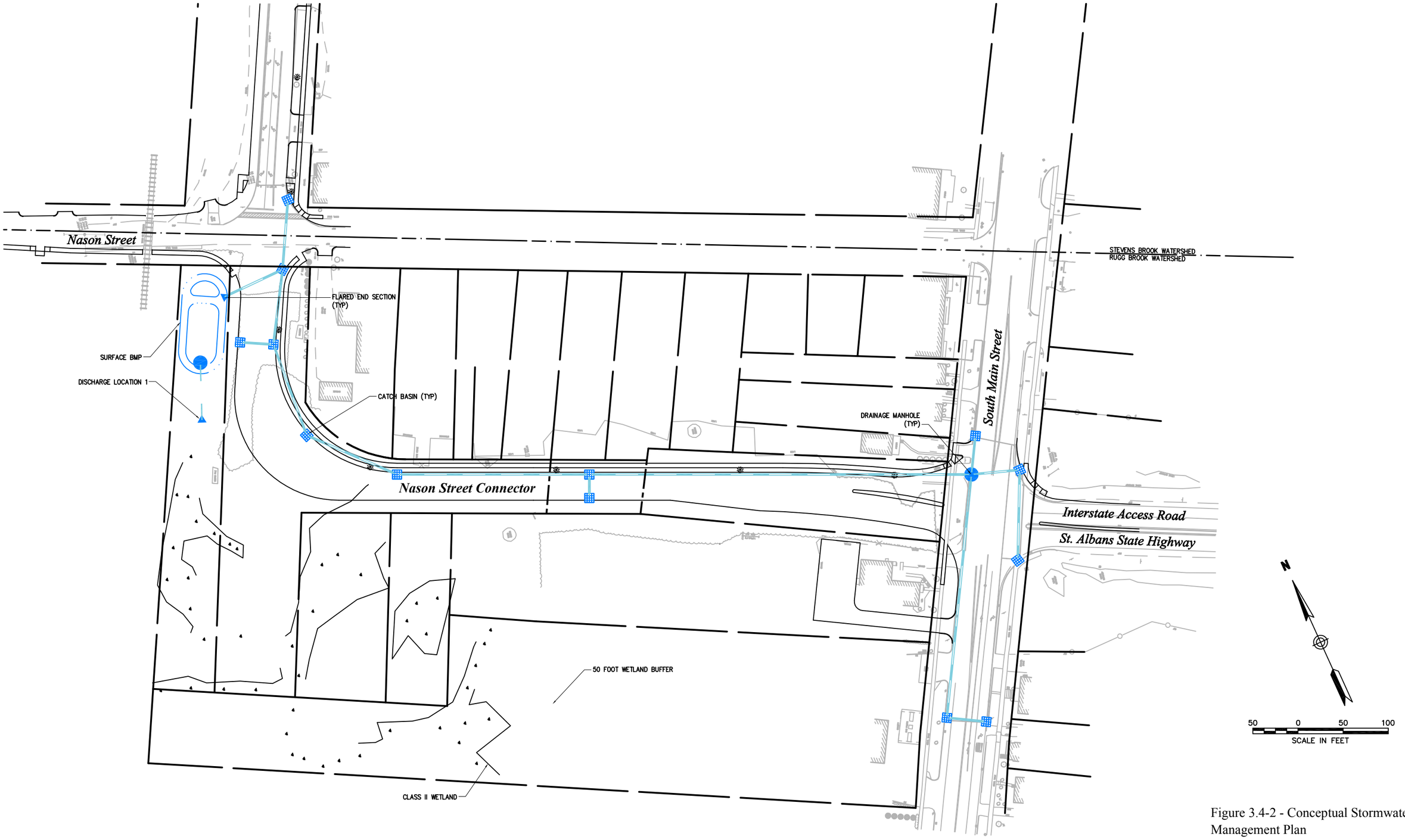
- Proposed Action Project Footprint
- Stevens Brook
- Stream (VHD)

0 200 400 Feet

VHB Vanasse Hangen Brustlin, Inc.

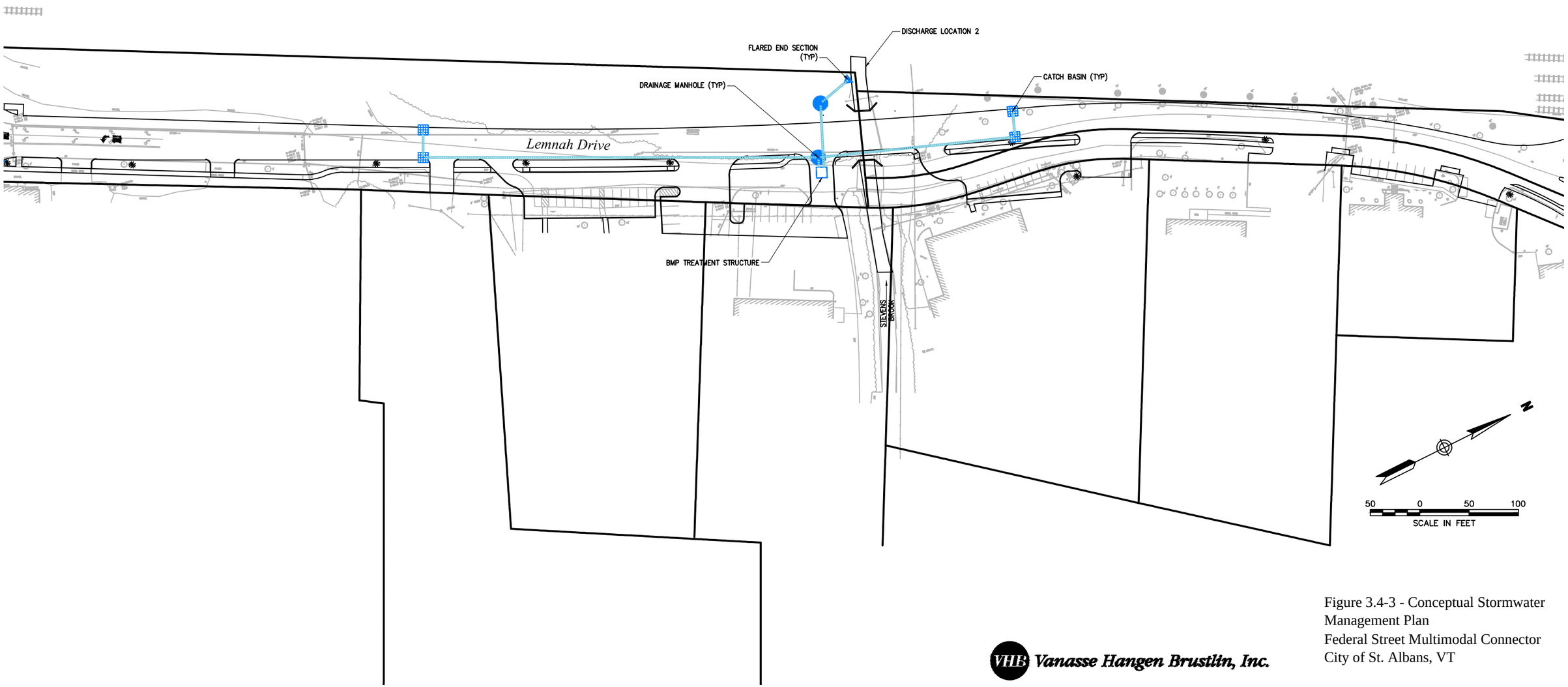
Figure #3.4-1 - Surface Waters
Federal Street Multimodal Connector
City of St. Albans, Vermont

F:\57414.00\cad\ld\Planset\57414.00_PRU.dwg



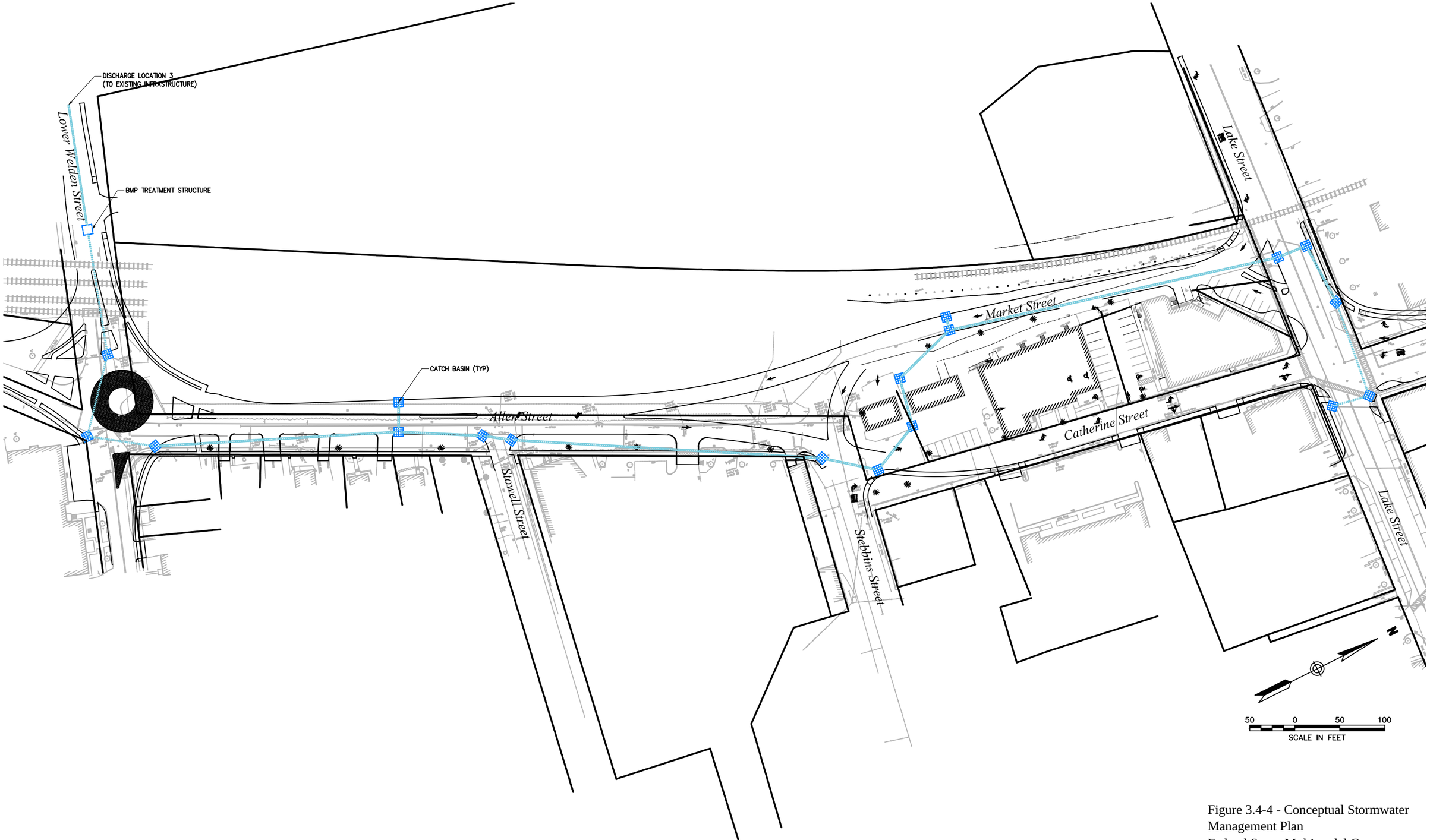
Vanasse Hangen Brustlin, Inc.

Figure 3.4-2 - Conceptual Stormwater Management Plan
Federal Street Multimodal Connector
City of St. Albans, VT



Vanasse Hangen Brustlin, Inc.

Figure 3.4-3 - Conceptual Stormwater Management Plan
Federal Street Multimodal Connector
City of St. Albans, VT



Vanasse Hangen Brustlin, Inc.

Figure 3.4-4 - Conceptual Stormwater Management Plan
Federal Street Multimodal Connector
City of St. Albans, VT

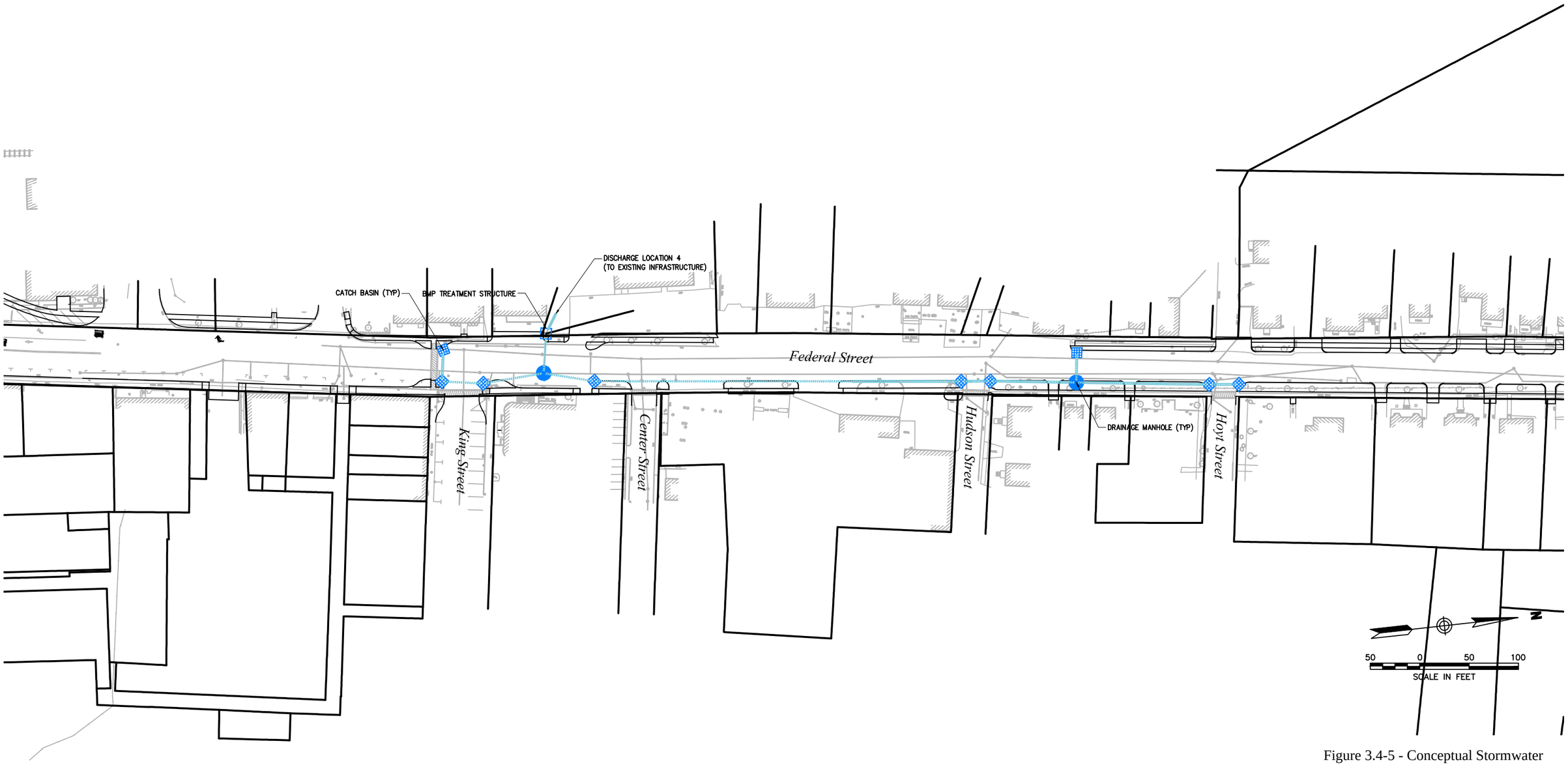


Figure 3.4-5 - Conceptual Stormwater Management Plan
Federal Street Multimodal Connector
City of St. Albans, VT

Vanasse Hangen Brustlin, Inc.

F:\57414.00\cad\ld\Planset\57414.00_PRU.dwg

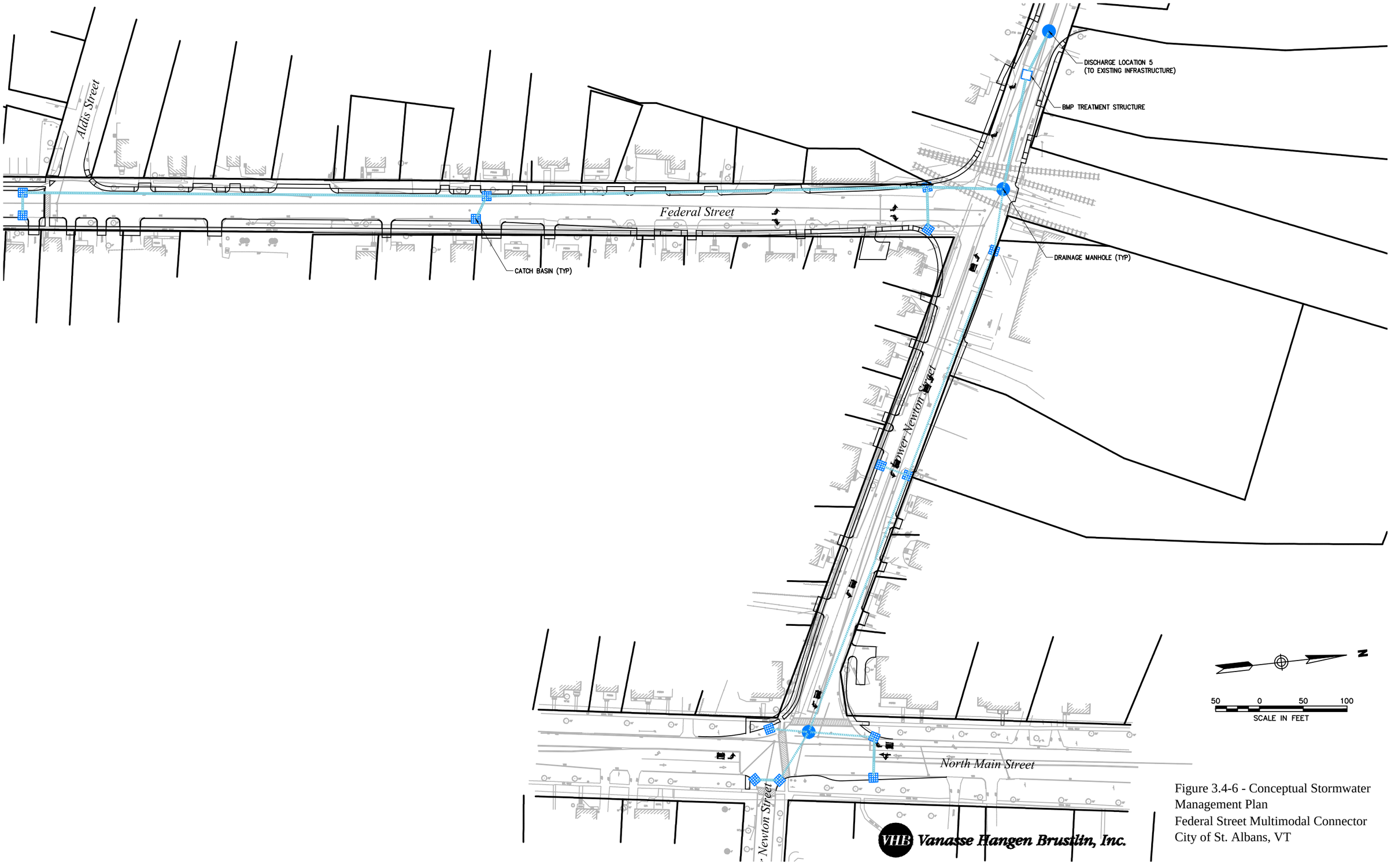
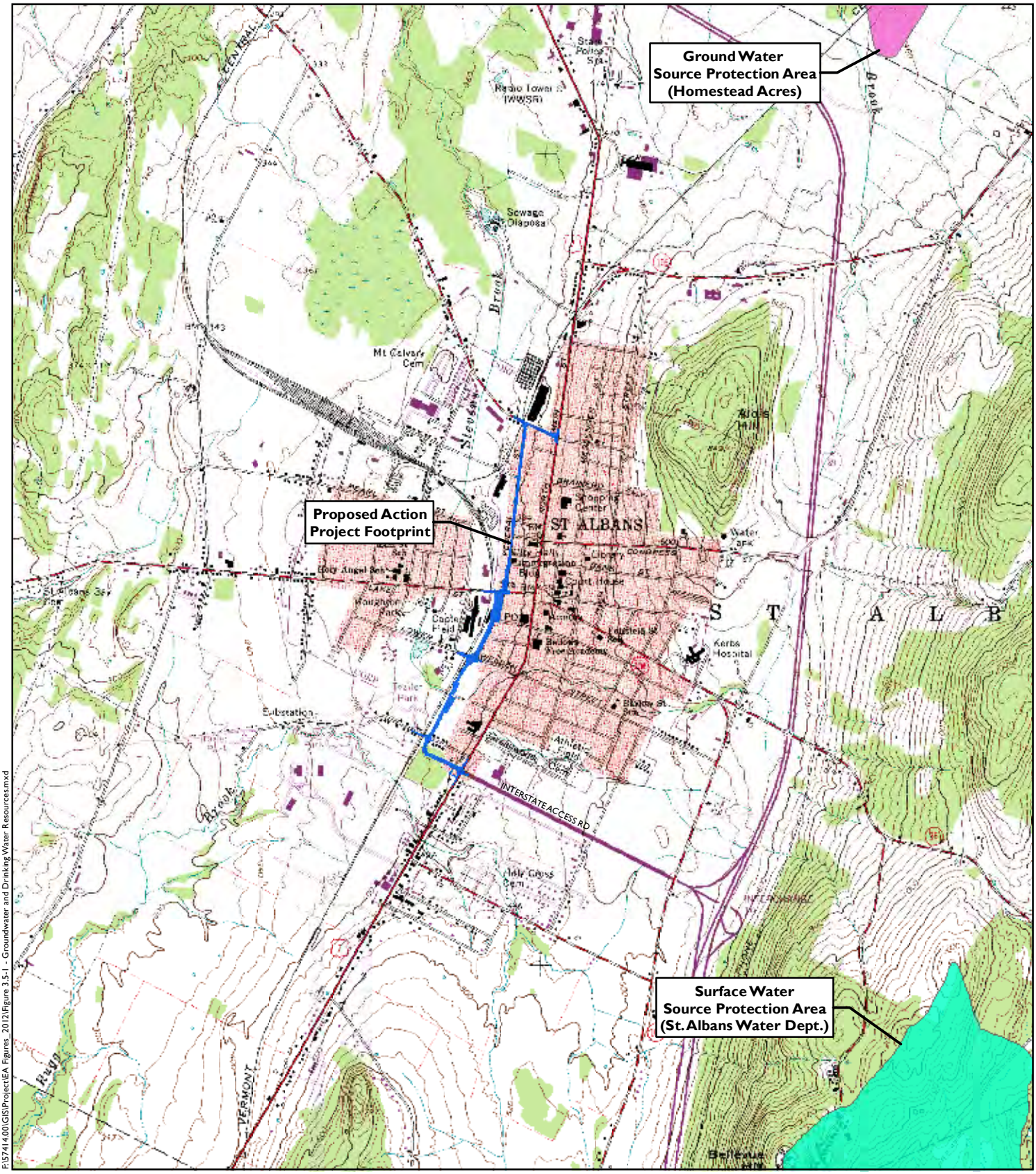


Figure 3.4-6 - Conceptual Stormwater Management Plan
Federal Street Multimodal Connector
City of St. Albans, VT



F:\57414.00\GIS\Project\EA Figures_2012\Figure 3.5-1 - Groundwater and Drinking Water Resources.mxd

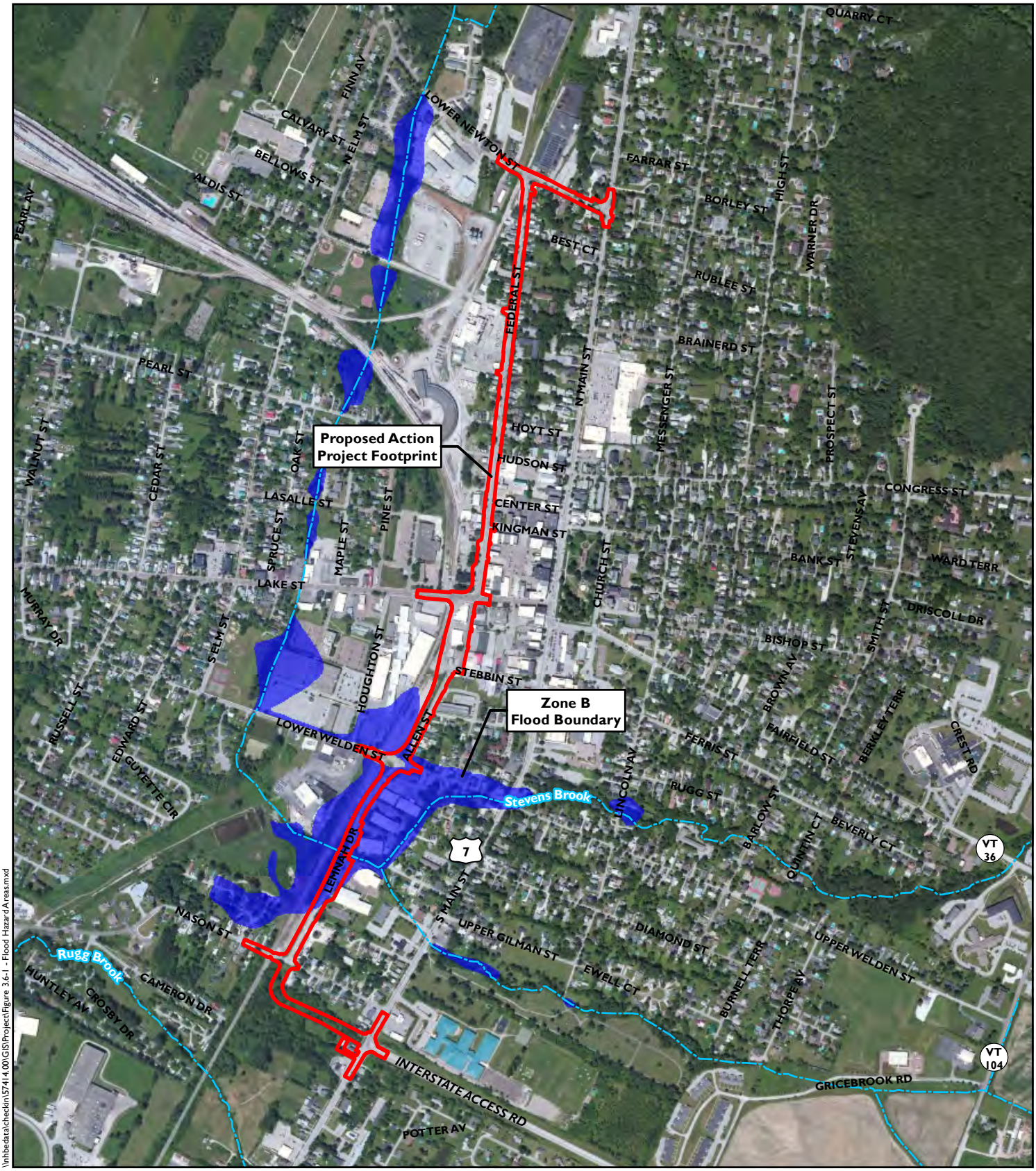
Legend

- Ground Water Source Protection Area (GW SPA)
- Surface Water Source Protection Area (SW SPA)

0 2,500 5,000 Feet

VHB Vanasse Hangen Brustlin, Inc.

Figure #3.5-1 - Groundwater and Drinking Water Resources
Federal Street Multimodal Connector
City of St. Albans, Vermont



\\hbdata\checkin\57414.00\GIS\Project\Figure 3.6-1 - Flood Hazard Areas.mxd

Legend

Proposed Action Project Footprint

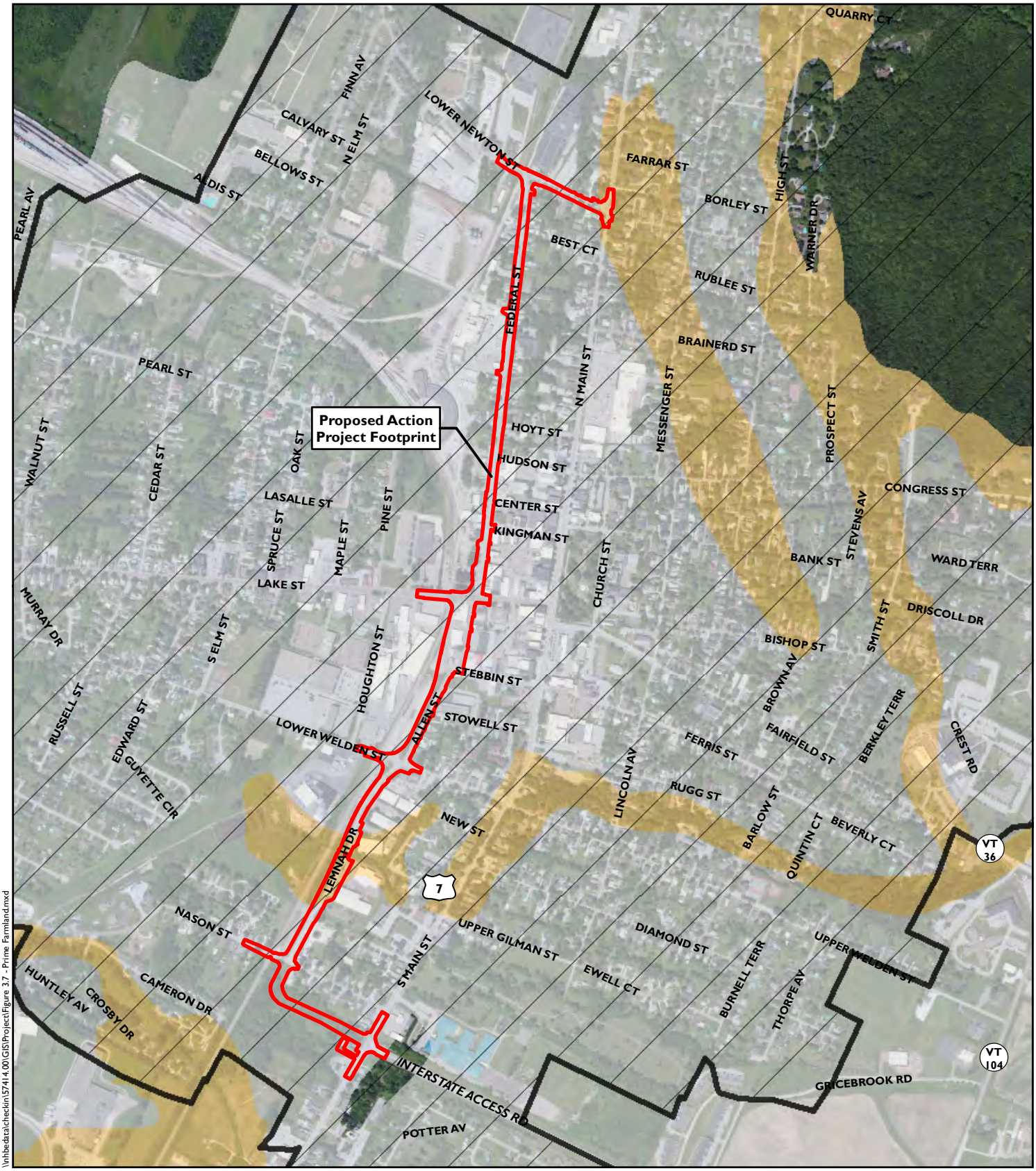
FEMA Flood Boundary

FEMA Zone B

0 1,000 2,000 Feet

VHB Vanasse Hangen Brustlin, Inc.

Figure #3.6-1 - Flood Hazard Areas
Federal Street Multimodal Connector
City of St. Albans, Vermont



\\hhbedata\checkin\57414.00\GIS\Project\Figure 3.7 - Prime Farmland.mxd

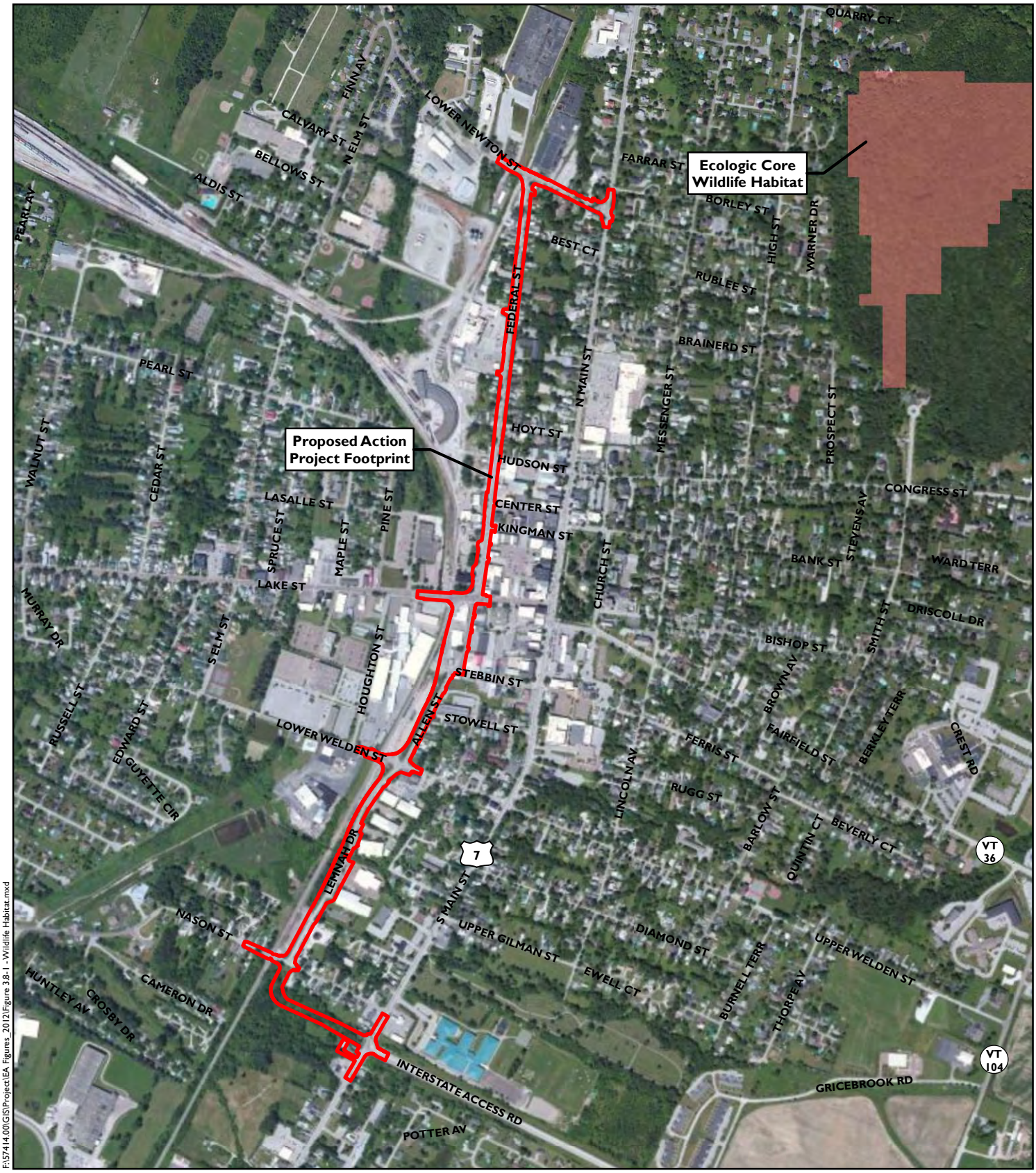
Legend

- Proposed Action Project Footprint
- Prime Agricultural Soils
- Statewide
- Urban Clusters (2000 Census)

0 1,000 2,000 Feet

VHB Vanasse Hangen Brustlin, Inc.

Figure #3.7-1 - Prime Farmland and US Census Bureau Urban Clusters
Federal Street Multimodal Connector
City of St. Albans, Vermont



F:\57414.00\GIS\Project\EA Figures_2012\Figure 3.8-1 - Wildlife Habitat.mxd

Legend

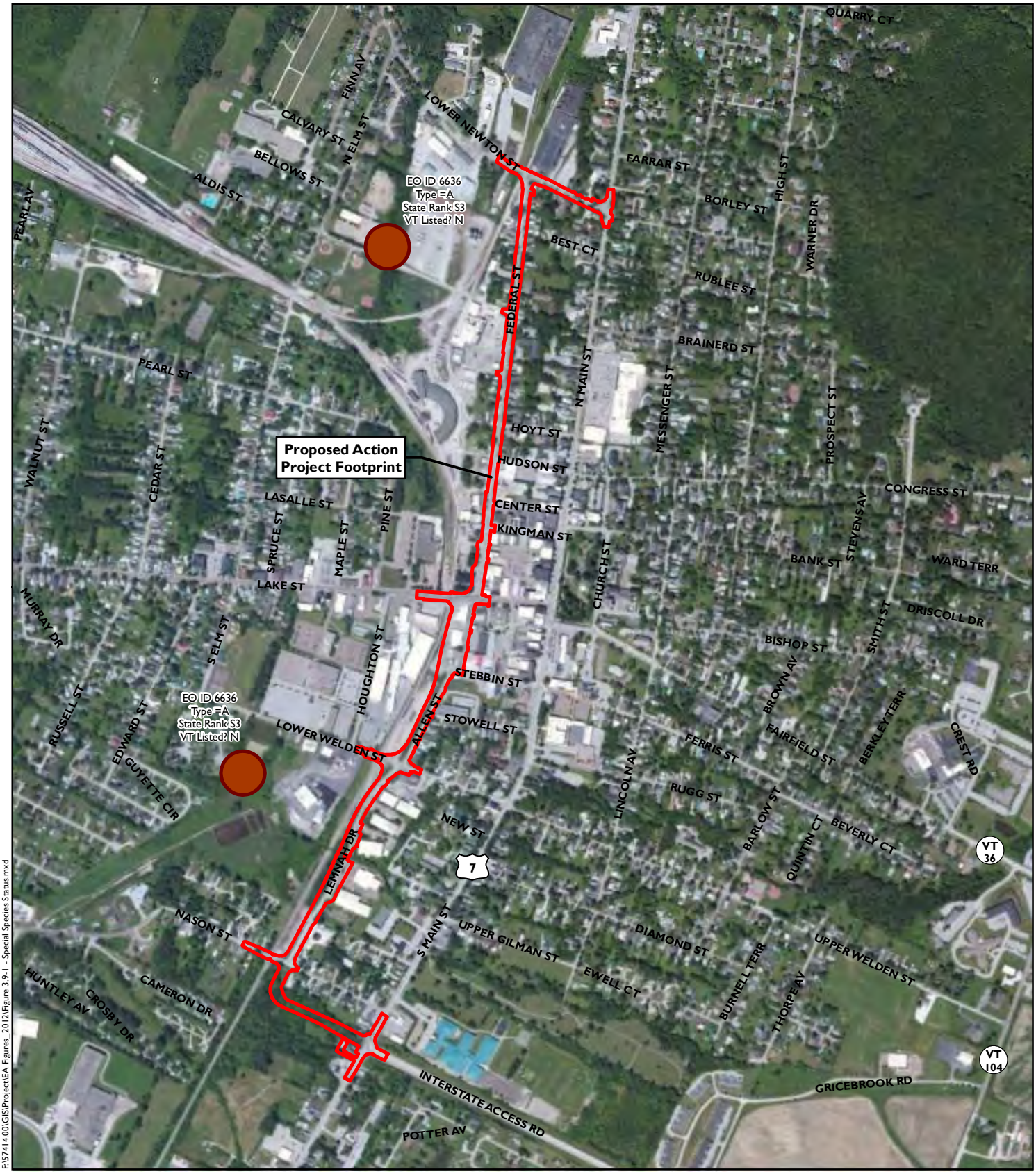
Proposed Action Project Footprint

Ecologic Core Wildlife Habitat (UVM Spatial Analysis Lab)

0 1,000 2,000 Feet

VHB Vanasse Hangen Brustlin, Inc.

Figure #3.8-1 - Wildlife Habitat
Federal Street Multimodal Connector
City of St. Albans, Vermont



F:\57414.00\GIS\Project\EA Figures_2012\Figure 3.9-1 - Special Species Status.mxd

Legend

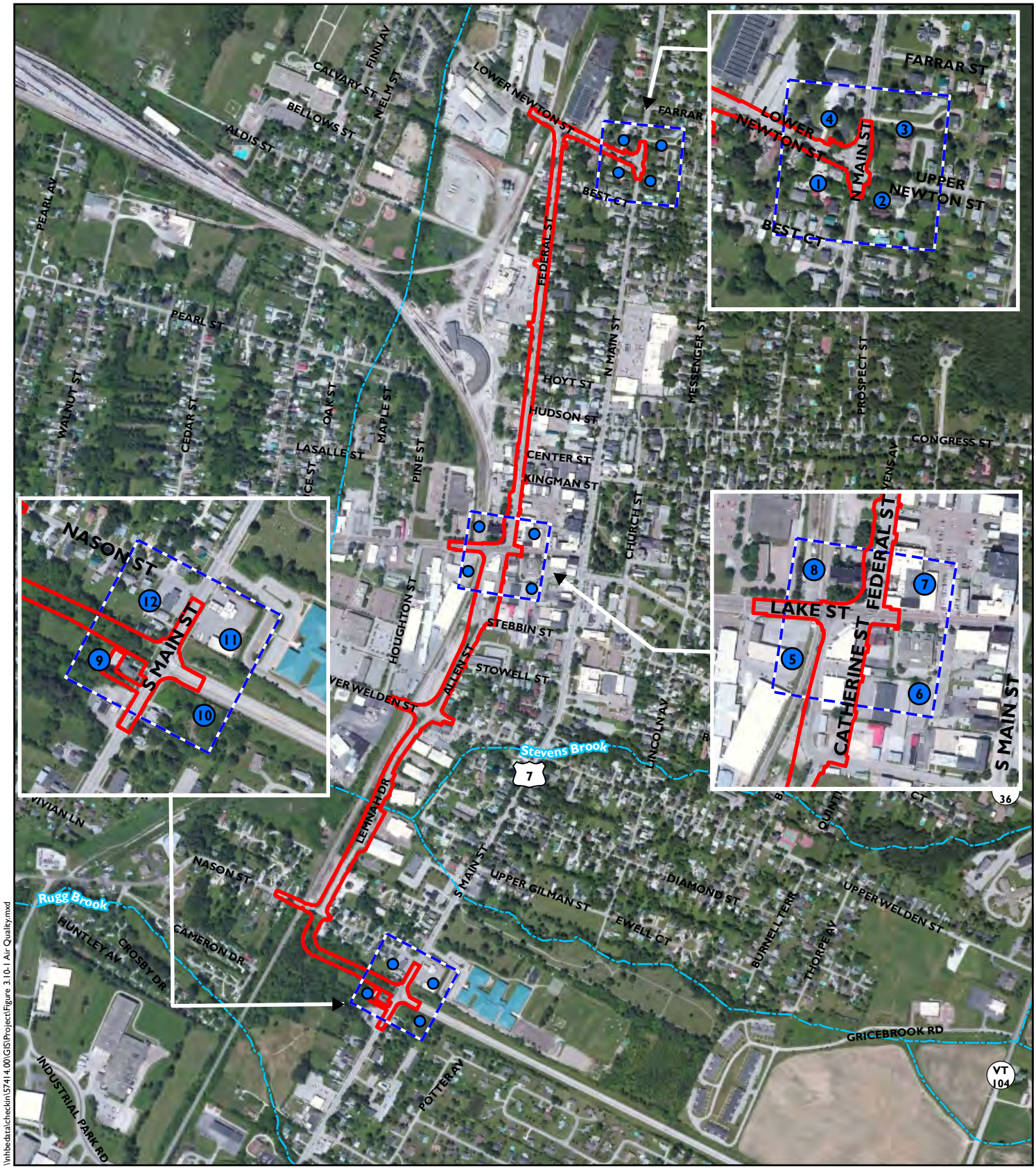
Proposed Action Project Footprint

Element Occurrences/Significant Natural Communities
(VT Dept. of Fish and Wildlife - NHIP)

0 1,000 2,000 Feet

VHB Vanasse Hangen Brustlin, Inc.

Figure #3.9-1 - Special Species Status
Federal Street Multimodal Connector
City of St. Albans, Vermont



\\hhbedata\checkin\57414.00\GIS\Project\Figure 3.10-1 Air Quality.mxd

Legend

- Proposed Action Project Footprint
- Receptor Location
- Microscale Air Quality Analysis Intersection

0 1,000 2,000 Feet

VHB Vanasse Hangen Brustlin, Inc.

Figure #3.10-1 - Microscale Air Quality Analysis Intersections
Federal Street Multimodal Connector
City of St. Albans, Vermont

\\hhbedata\checkin\57414.00\GIS\Project\Figure 3.11-1 - Noise Receptors.mxd

Legend

Proposed Action Project Footprint

Noise Monitoring Station

Noise Receptor Location

Common Noise Environments

CNE-1

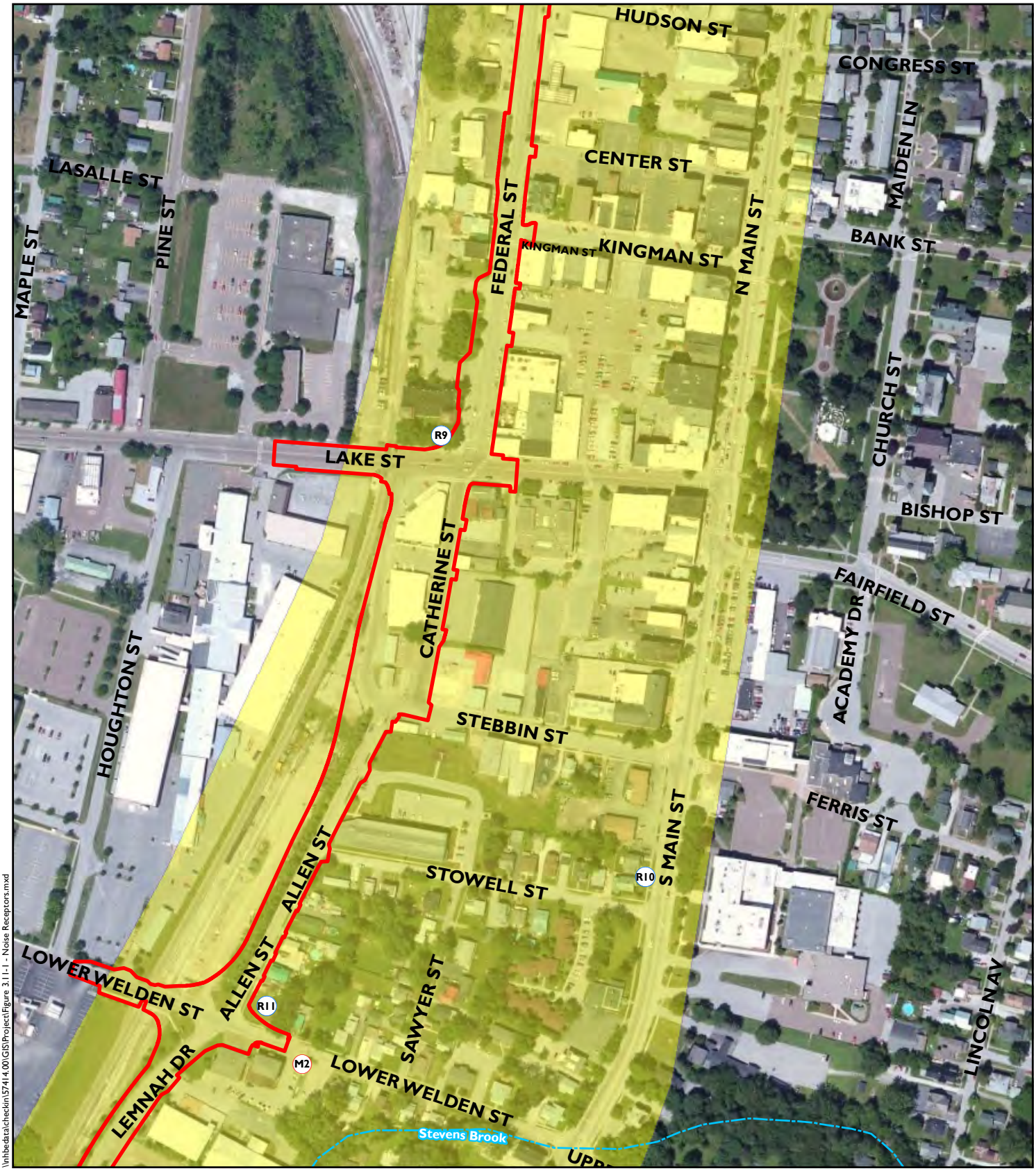
CNE-2

CNE-3

0 300 600 Feet

VHB Vanasse Hangen Brustlin, Inc.

Figure #3.11-1 - Noise Monitoring & Receptor Locations - Sheet 1 of 3
Federal Street Multimodal Connector
City of St. Albans, Vermont



\\hbdata\checkin\57414.00\GIS\Project\Figure 3.11-1 - Noise Receptors.mxd

Legend

Proposed Action Project Footprint

Noise Monitoring Station

Noise Receptor Location

Common Noise Environments

CNE-1

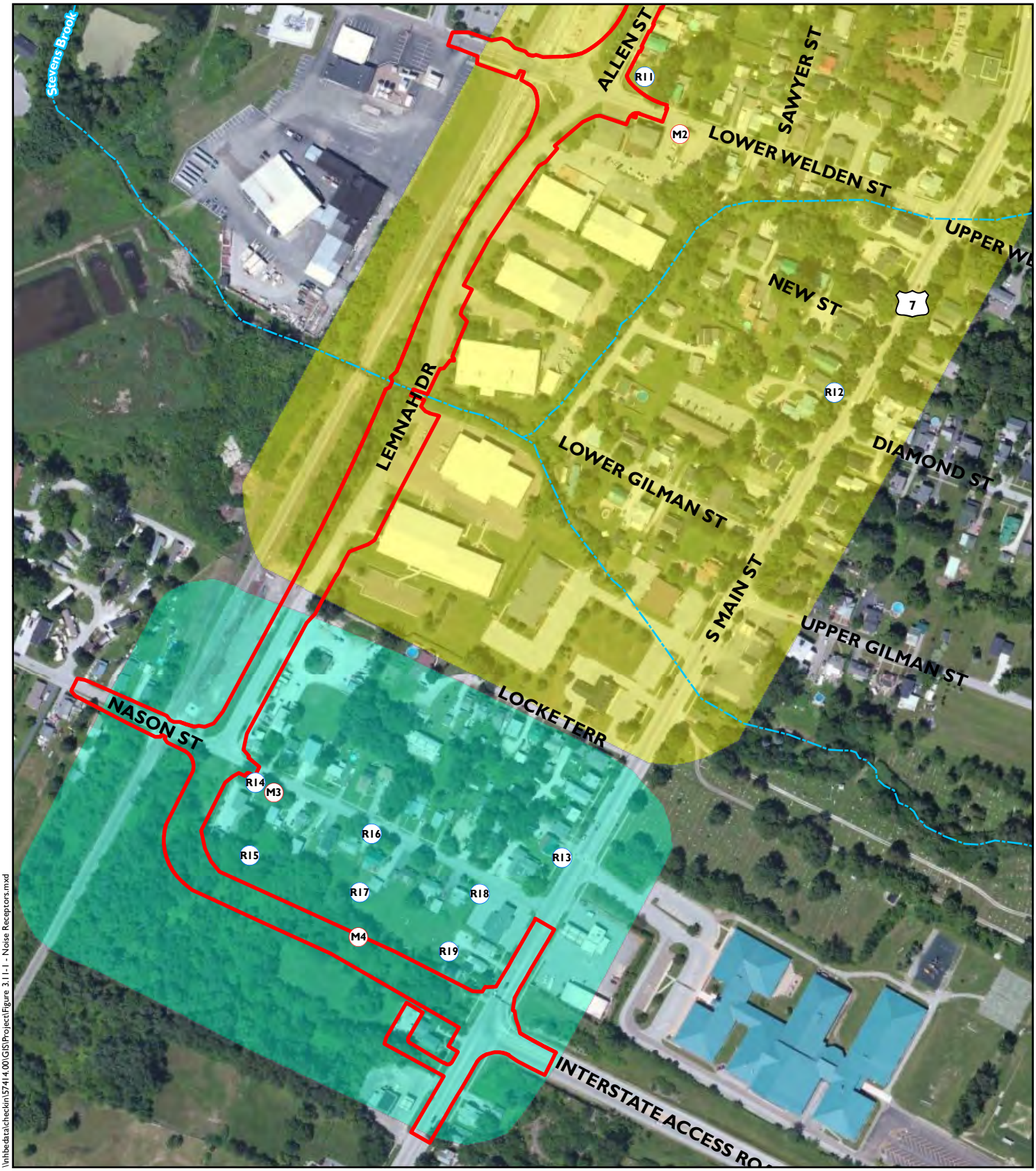
CNE-2

CNE-3

0 300 600 Feet

VHB Vanasse Hangen Brustlin, Inc.

Figure #3.11-1 - Noise Monitoring & Receptor Locations - Sheet 2 of 3
Federal Street Multimodal Connector
City of St. Albans, Vermont



\\hbdata\checkin\57414.00\GIS\Project\Figure 3.11-1 - Noise Receptors.mxd

Legend

Proposed Action Project Footprint

Noise Monitoring Station

Noise Receptor Location

Common Noise Environments

CNE-1

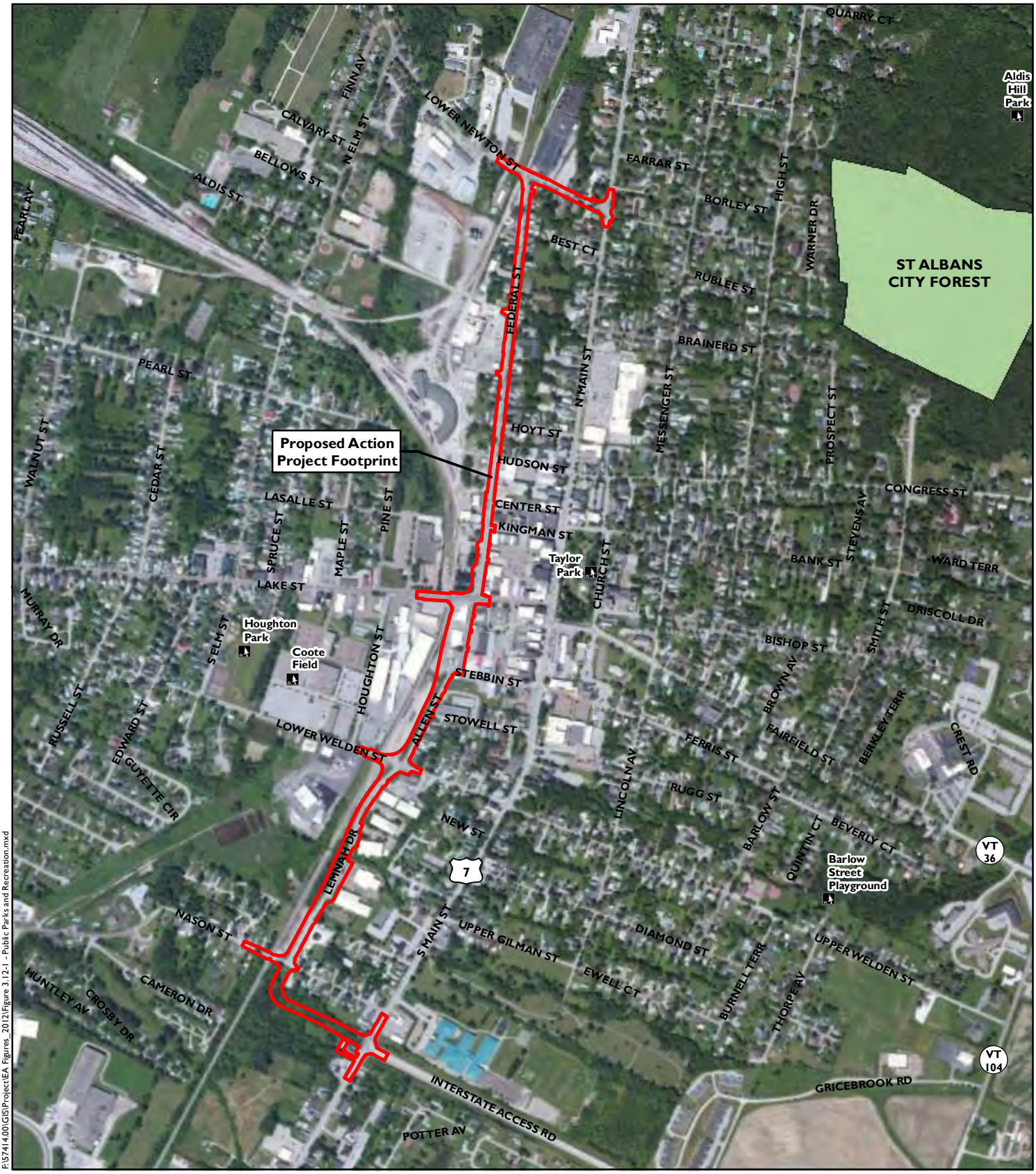
CNE-2

CNE-3

0 300 600 Feet

VHB Vanasse Hangen Brustlin, Inc.

Figure #3.11-1 - Noise Monitoring & Receptor Locations - Sheet 3 of 3
Federal Street Multimodal Connector
City of St. Albans, Vermont



F:\57414.00\GIS\Project\EA Figures_2012\Figure 3.12-1 - Public Parks and Recreation.mxd

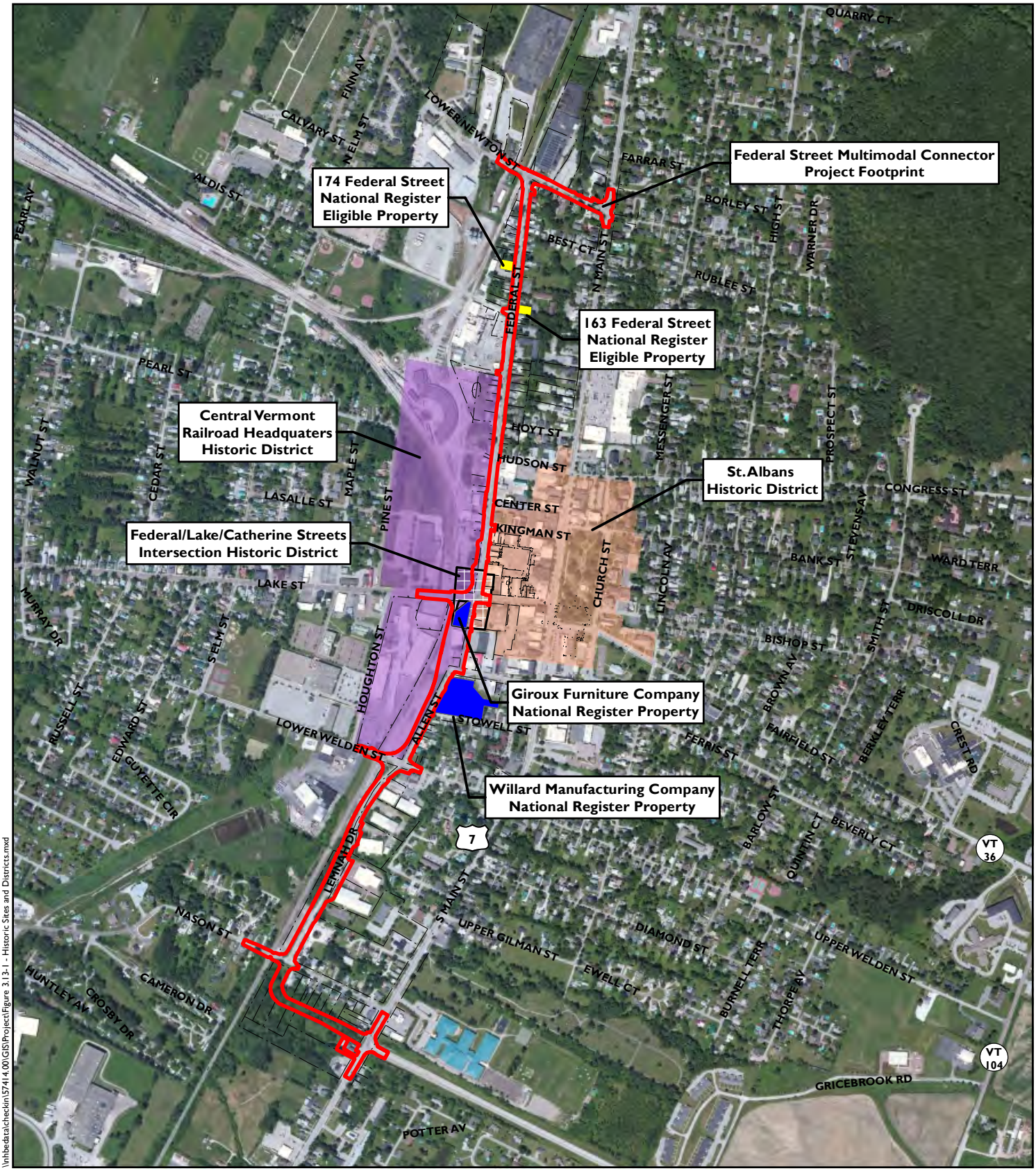
Legend

- Proposed Action Project Footprint
- Public Conserved Lands
- Park/Recreation Area

0 1,000 2,000 Feet

VHB Vanasse Hangen Brustlin, Inc.

Figure #3.12-1 - Public Parks and Recreation Lands
Federal Street Multimodal Connector
City of St. Albans, Vermont



\\hbdata\checkin\57414.00\GIS\Project\Figure 3.13-1 - Historic Sites and Districts.mxd

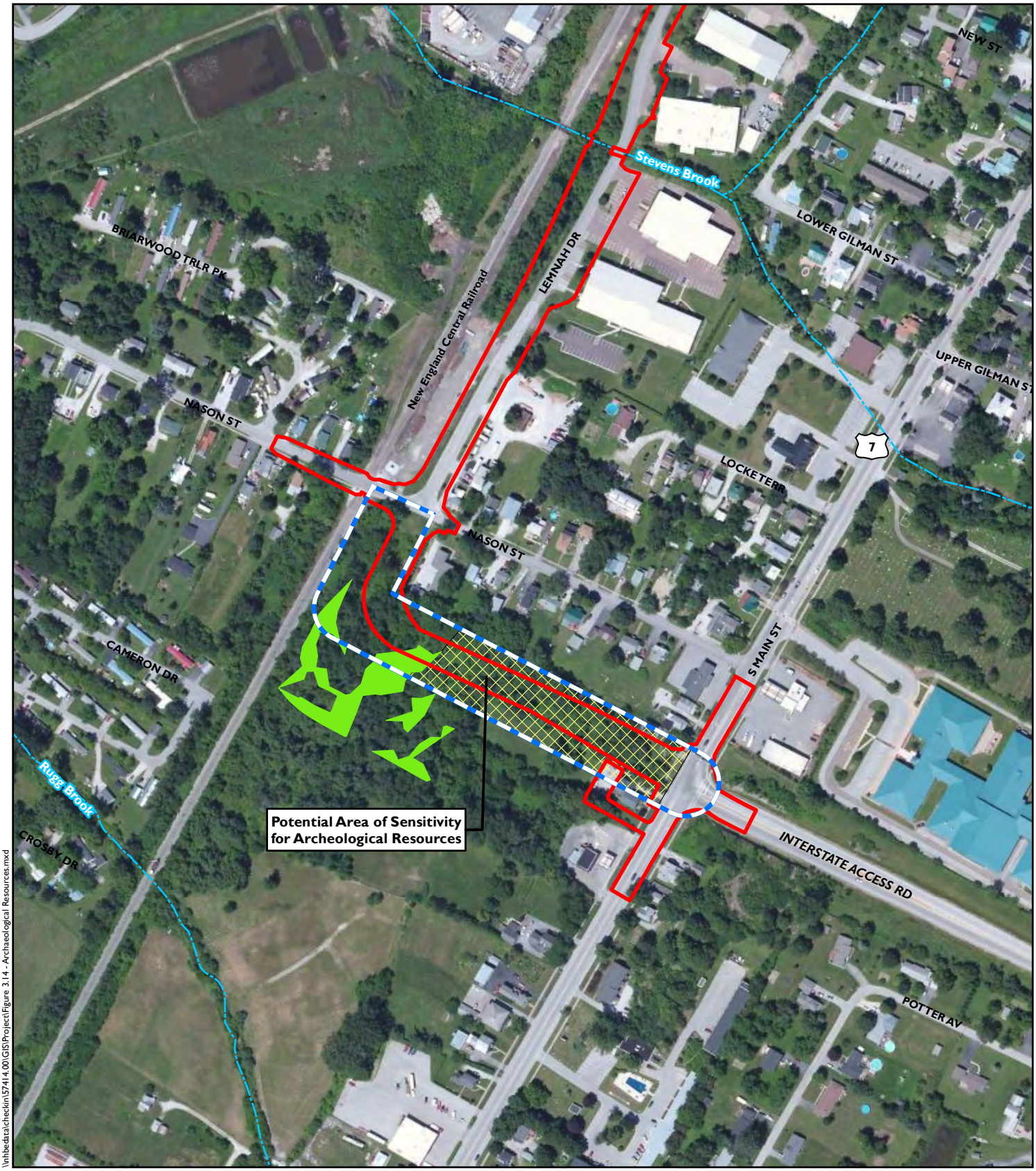
Legend

- Proposed Action Project Footprint
- NR Individually Listed Property
- NR Individually Eligible Property
- Central VT Railroad Headquarters NR Historic District
- St. Albans Historic District
- Federal/Lake/Catherine Streets Intersection Historic District (Eligible)

0 1,000 2,000 Feet

VHB Vanasse Hangen Brustlin, Inc.

Figure #3.13-1 - Historic Districts and Sites
Federal Street Multimodal Connector
City of St. Albans, Vermont



\\hbedata\checkin\57414.00\GIS\Project\Figure 3.14 - Archaeological Resources.mxd

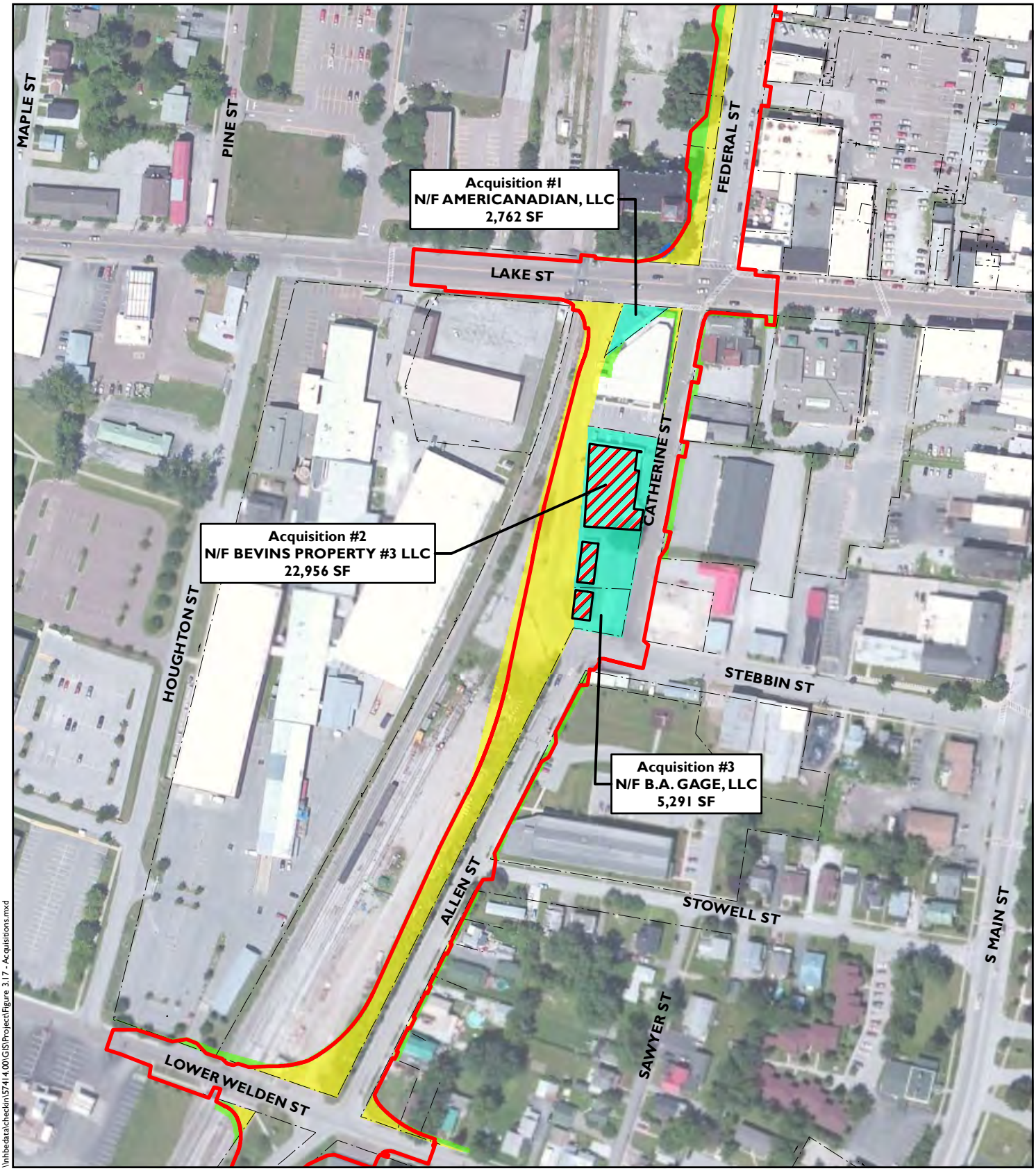
Legend

- Proposed Action Project Footprint
- Potential Area of Sensitivity
- Archeological Resources Assessment Survey Corridor
- Delineated Wetland (VHB)
- Stream (VHD)

0 300 600 Feet

VHB Vanasse Hangen Brustlin, Inc.

Figure #3.14-1 - Archeological Resources
Federal Street Multimodal Connector
City of St. Albans, Vermont



\\hhbedata\checkin\57414.00\GIS\Project\Figure 3.17 - Acquisitions.mxd

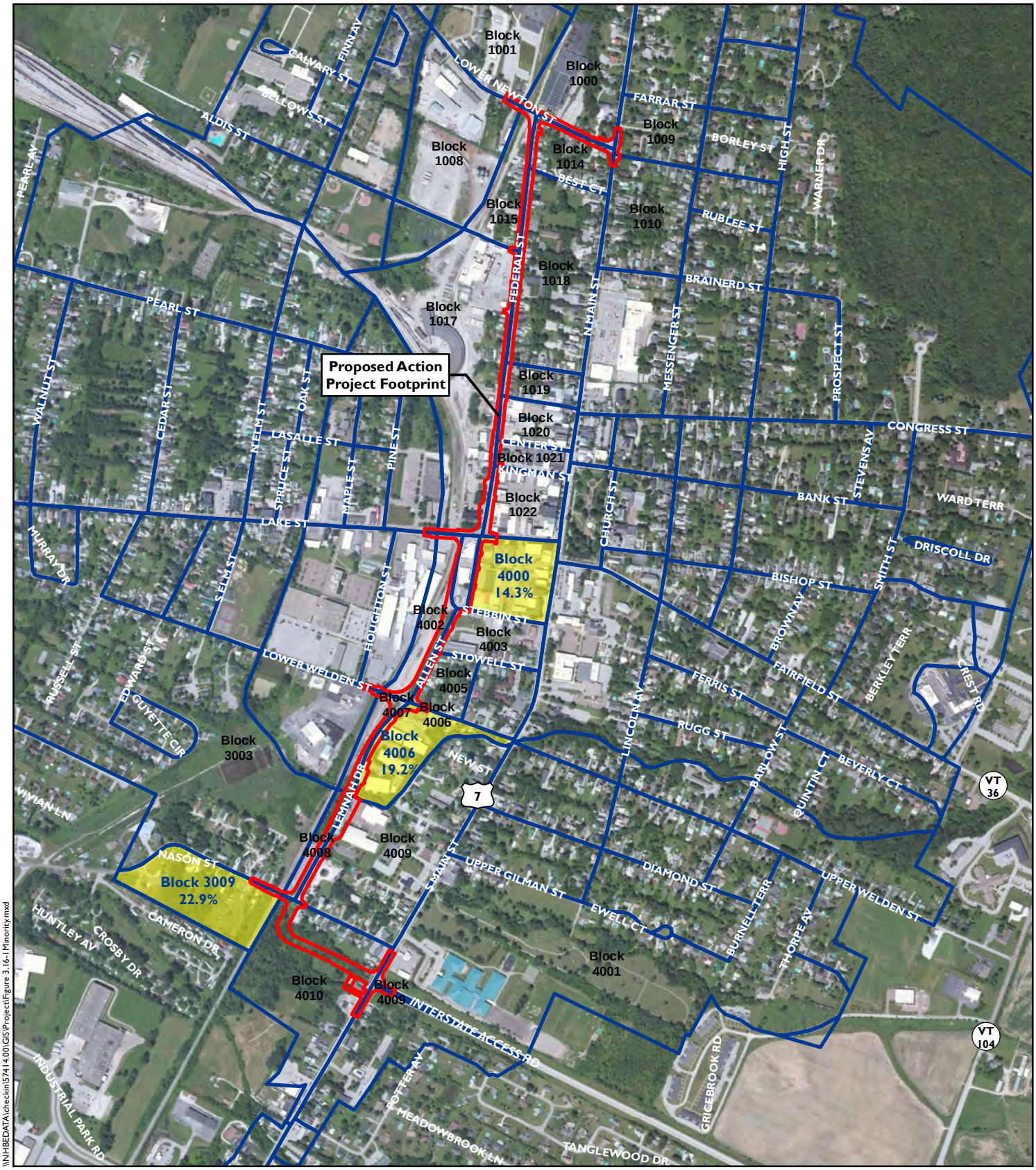
Legend

- Proposed Action Project Footprint
- Building Demolition
- Proposed Take (Full Acquisition
- Proposed Take (Partial Acquisition)
- Permanent ROW Easement
- Temporary ROW Easement
- Existing ROW

0 200 400 Feet

VHB Vanasse Hangen Brustlin, Inc.

Figure #3.15-1 - Right of Way Acquisitions
Federal Street Multimodal Connector
City of St. Albans, Vermont



\\NHBEDATA\checkin\57414.00\GIS\Project\Figure 3.16-1 Minority.mxd

Source: 2010 US Census

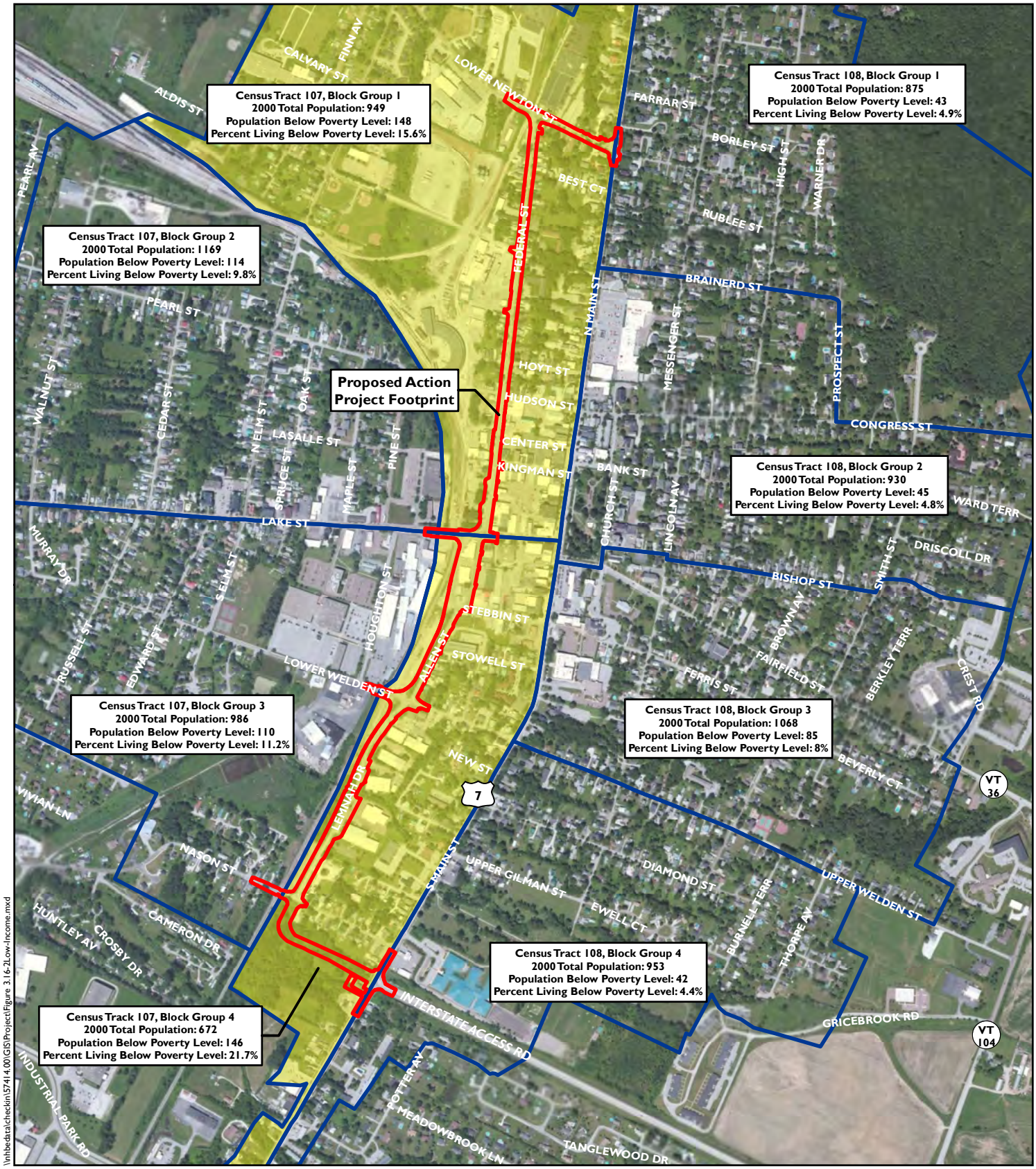
Legend

- Proposed Action Project Footprint
- 2010 Census Blocks
- Minority Protected Population

0 1,000 2,000 Feet

VHB Vanasse Hangen Brustlin, Inc.

Figure #3.16-1 - Minority Populations
Federal Street Multimodal Connector
City of St. Albans, Vermont



\\hhbedata\checkin\57414.00\GIS\Project\Figure 3.16-2Low-Income.mxd

Source: 2000 Census

Vanasse Hangen Brustlin, Inc.

Legend

- Proposed Action Project Footprint
- 2010 Census Block Groups
- Low Income Protected Population

0 1,000 2,000 Feet

Figure #3.16-2 - :Low-Income Populations
Federal Street Multimodal Connector
City of St. Albans, Vermont

F:\57414.00\GIS\Project\EA Figures_2012\Figure 3.17-1 - Hazardous Materials_11x17.mxd

Legend

- Hazardous Waste Generator
- Brownfields
- USTs (Operational)

Hazardous Waste Site

- Active
- Closed
- Proposed Action Project Footprint

0 500 1,000 Feet

VHB Vanasse Hangen Brustlin, Inc.

Figure #3.17-1 - Hazardous Materials
Federal Street Multimodal Connector
City of St. Albans, Vermont

LEGEND

- EXISTING PROPERTY LINES
- EXISTING R.O.W.
- INDIVIDUAL HISTORIC PROPERTY (LISTED OR ELIGIBLE FOR LISTING)
- CENTRAL VERMONT RAILROAD HEADQUARTERS HISTORIC DISTRICT BOUNDARY
- PROPOSED R.O.W.
- SLOPE IMPACTS
- ROW IMPACTS
- ### PROPERTY ID #
- PROPOSED SLOPE WORK
- PROPOSED PAVEMENT
- PROPOSED SIDEWALK
- PROPOSED PAVED DRIVEWAY
- PROPOSED BUILDING DEMOLITION

N

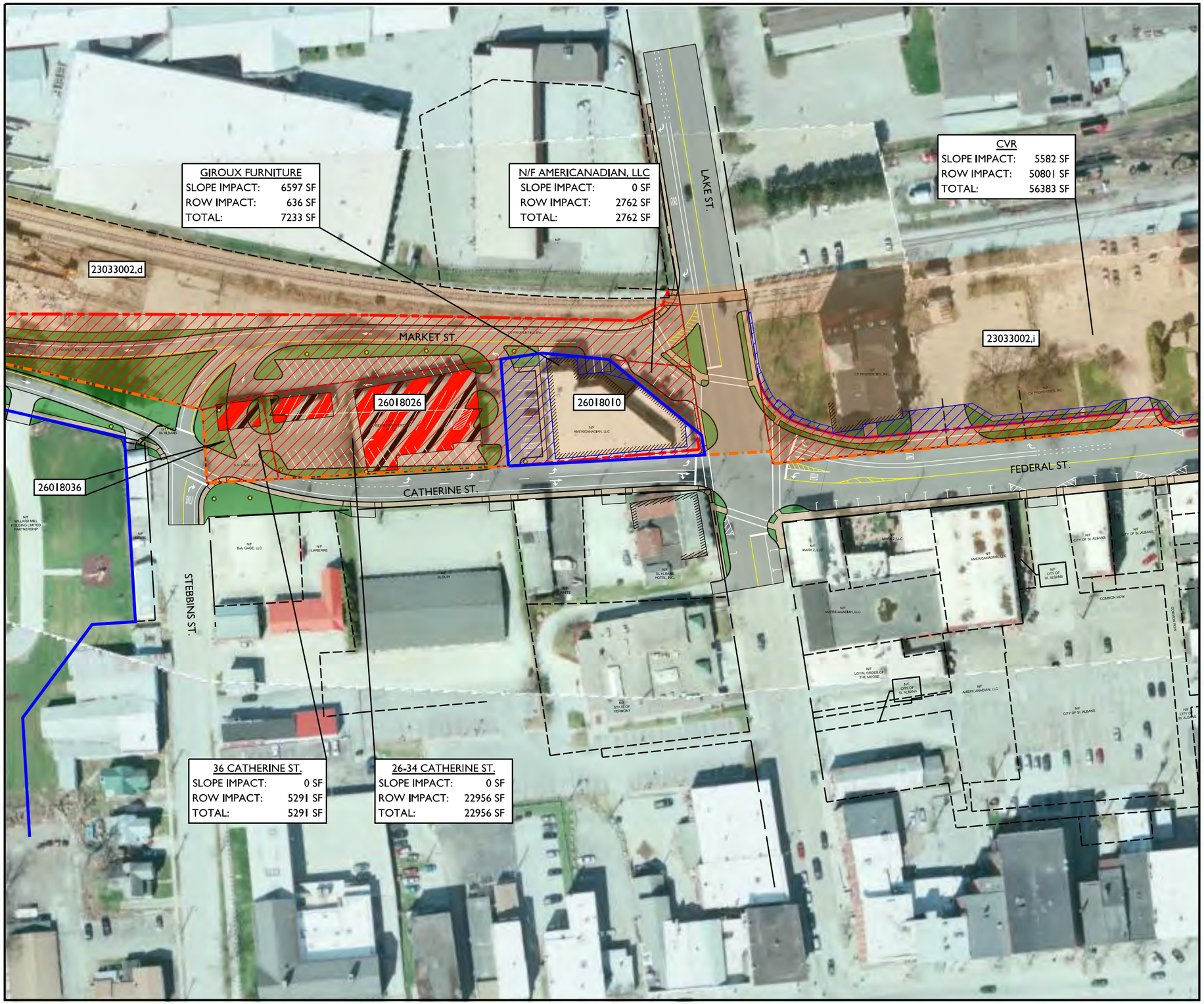
VT STATE PLANE GRID

0 100 200 Feet

VHB *Vanasse Hangen Brustlin, Inc.*

Figure #4.4-1
Section 4(f) Impacts
Federal Street Multimodal Connector
Central Vermont Railroad Headquarters Historic District
City of St. Albans, VT

NOTE: BASE MAP PHOTOGRAPHY IS NOT ORTHOCORRECTED AND IS THEREFORE SUBJECT TO DISTORTION AND NOT A TRUE REPRESENTATION OF HORIZONTAL POSITION. IT IS INCLUDED TO PROVIDE ADDITIONAL INFORMATION FOR THE REVIEWER.



LEGEND

- EXISTING PROPERTY LINES
- EXISTING R.O.W.
- INDIVIDUAL HISTORIC PROPERTY (LISTED OR ELIGIBLE FOR LISTING)
- CENTRAL VERMONT RAILROAD HEADQUARTERS HISTORIC DISTRICT BOUNDARY
- PROPOSED R.O.W.
- SLOPE IMPACTS
- ROW IMPACTS
- ### PROPERTY ID #
- PROPOSED SLOPE WORK
- PROPOSED PAVEMENT
- PROPOSED SIDEWALK
- PROPOSED PAVED DRIVEWAY
- PROPOSED BUILDING DEMOLITION

N

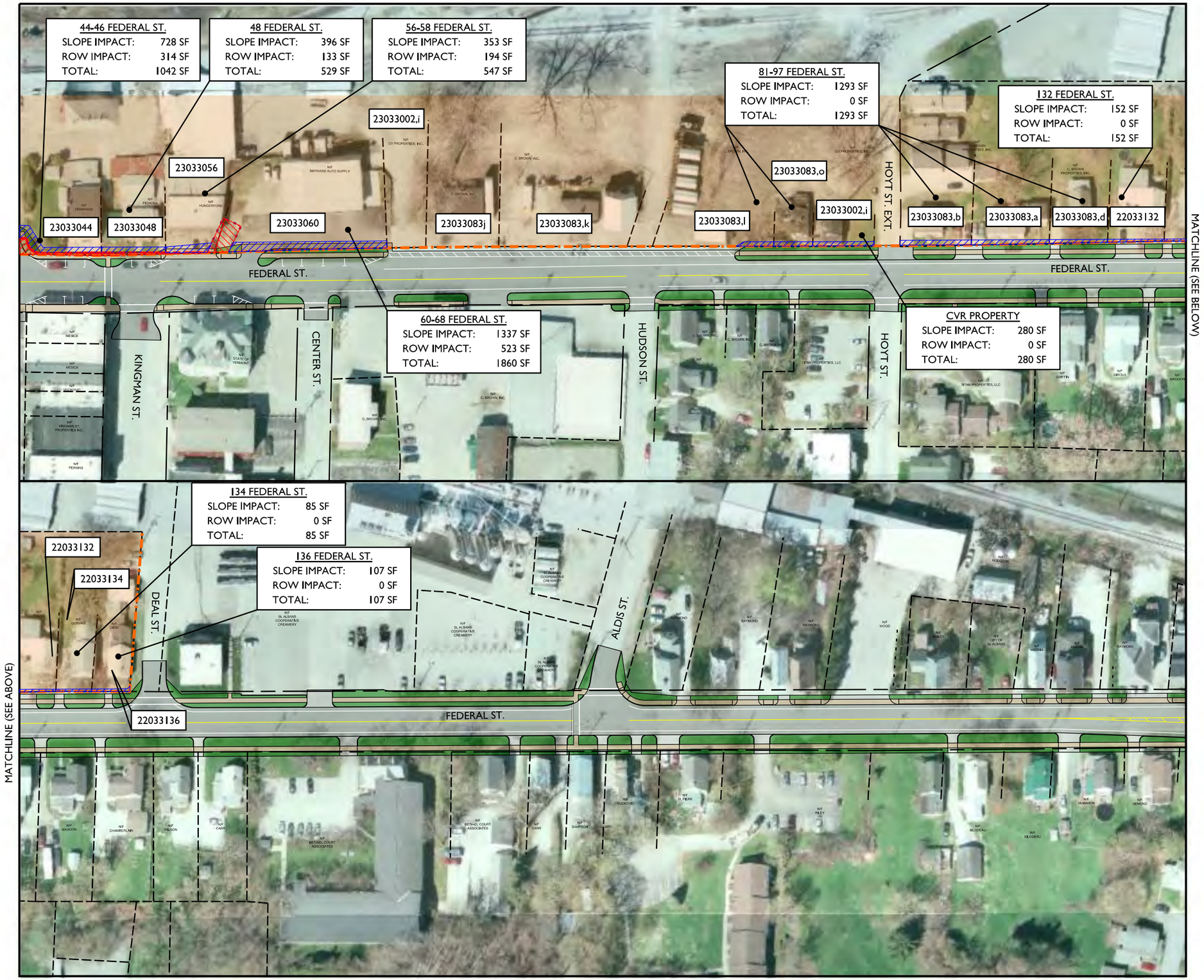
VT STATE PLANE GRID

0 100 200 Feet

VHB Vanasse Hangen Brustlin, Inc.

Figure #4.4-2
Section 4(f) Impacts
Federal Street Multimodal Connector
Central Vermont Railroad Headquarters Historic District
City of St. Albans, VT

NOTE: BASE MAP PHOTOGRAPHY IS NOT ORTHOCORRECTED AND IS THEREFORE SUBJECT TO DISTORTION AND NOT A TRUE REPRESENTATION OF HORIZONTAL POSITION. IT IS INCLUDED TO PROVIDE ADDITIONAL INFORMATION FOR THE REVIEWER.



LEGEND

- EXISTING PROPERTY LINES
- EXISTING R.O.W.
- INDIVIDUAL HISTORIC PROPERTY (LISTED OR ELIGIBLE FOR LISTING)
- CENTRAL VERMONT RAILROAD HEADQUARTERS HISTORIC DISTRICT BOUNDARY
- PROPOSED R.O.W.
- SLOPE IMPACTS
- ROW IMPACTS
- ### PROPERTY ID #
- PROPOSED SLOPE WORK
- PROPOSED PAVEMENT
- PROPOSED SIDEWALK
- PROPOSED PAVED DRIVEWAY
- PROPOSED BUILDING DEMOLITION

N
VT STATE PLANE GRID

0 100 200 Feet

Vanasse Hangen Brustlin, Inc.

Figure #4.4-3
Section 4(f) Impacts
Federal Street Multimodal Connector
Central Vermont Railroad Headquarters Historic District
City of St. Albans, VT

NOTE: BASE MAP PHOTOGRAPHY IS NOT ORTHOCORRECTED AND IS THEREFORE SUBJECT TO DISTORTION AND NOT A TRUE REPRESENTATION OF HORIZONTAL POSITION. IT IS INCLUDED TO PROVIDE ADDITIONAL INFORMATION FOR THE REVIEWER.

LEGEND

- EXISTING PROPERTY LINES
- EXISTING R.O.W.
- INDIVIDUAL HISTORIC PROPERTY (LISTED OR ELIGIBLE FOR LISTING)
- SAINT ALBANS HISTORIC DISTRICT BOUNDARY
- PROPOSED R.O.W.
- SLOPE IMPACTS
- ROW IMPACTS
- ### PROPERTY ID #
- PROPOSED SLOPE WORK
- PROPOSED PAVEMENT
- PROPOSED SIDEWALK
- PROPOSED PAVED DRIVEWAY
- PROPOSED BUILDING DEMOLITION

N

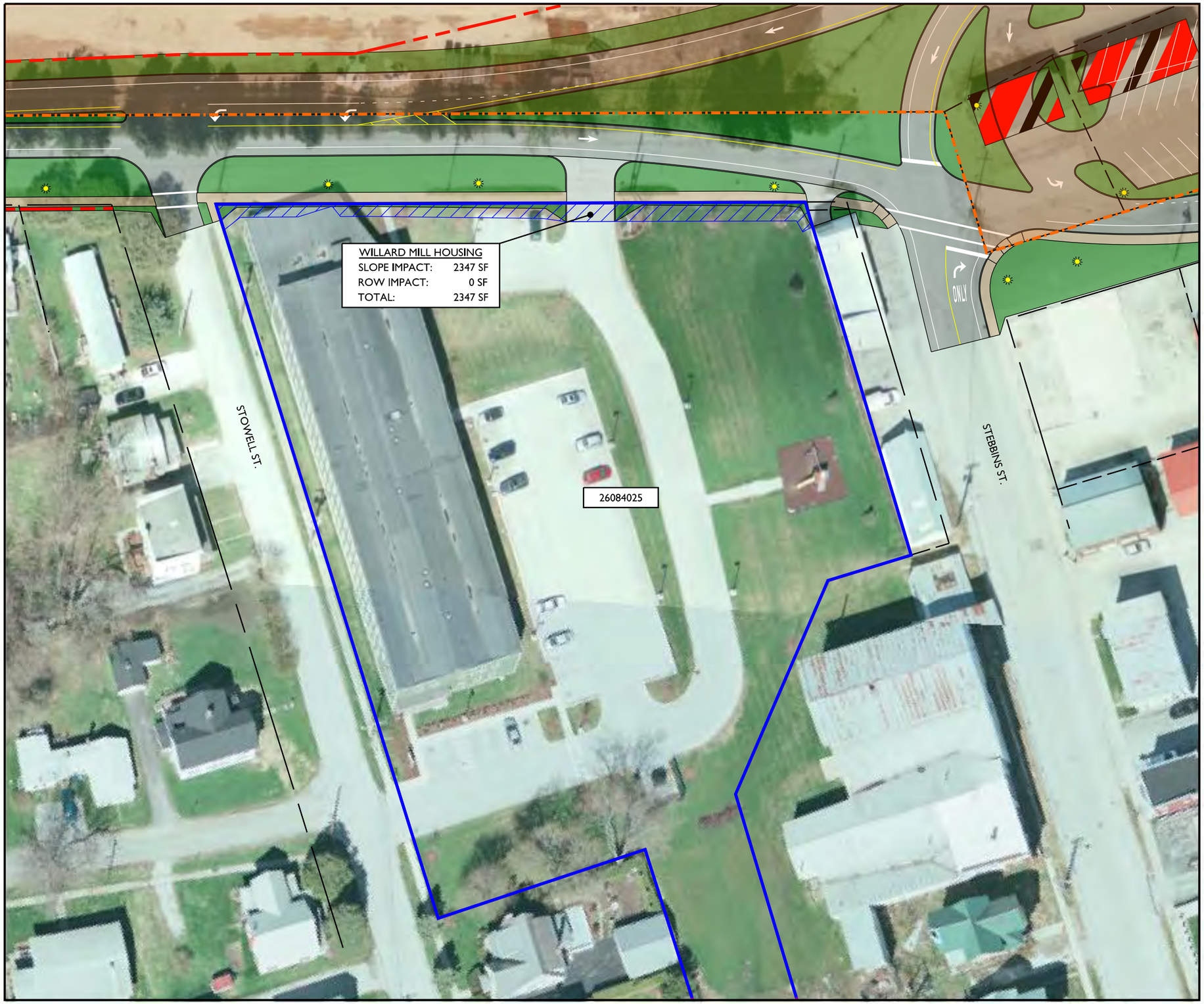
VT STATE PLANE GRID

0 100 200 Feet

VHB Vanasse Hangen Brustlin, Inc.

Figure #4.4-4
Section 4(f) Impacts
Federal Street Multimodal Connector
Saint Albans Historic District
City of St. Albans, VT

NOTE: BASE MAP PHOTOGRAPHY IS NOT ORTHOCORRECTED AND IS THEREFORE SUBJECT TO DISTORTION AND NOT A TRUE REPRESENTATION OF HORIZONTAL POSITION. IT IS INCLUDED TO PROVIDE ADDITIONAL INFORMATION FOR THE REVIEWER.



LEGEND

- EXISTING PROPERTY LINES
- EXISTING R.O.W.
- INDIVIDUAL HISTORIC PROPERTY (LISTED OR ELIGIBLE FOR LISTING)
- CENTRAL VERMONT HEADQUARTERS RAILROAD HISTORIC DISTRICT BOUNDARY
- PROPOSED R.O.W.
- SLOPE IMPACTS
- ROW IMPACTS
- ### PROPERTY ID #
- PROPOSED SLOPE WORK
- PROPOSED PAVEMENT
- PROPOSED SIDEWALK
- PROPOSED PAVED DRIVEWAY
- PROPOSED BUILDING DEMOLITION

N

VT STATE PLANE GRID

0 50 100 Feet

VHB Vanasse Hangen Brustlin, Inc.

Figure #4.4-5
Section 4(f) Impacts
Federal Street Multimodal Connector
Willard Manufacturing Company Building
25 Stowell Street (Property ID: 26084025)
City of St. Albans, VT

NOTE: BASE MAP PHOTOGRAPHY IS NOT ORTHOCORRECTED AND IS THEREFORE SUBJECT TO DISTORTION AND NOT A TRUE REPRESENTATION OF HORIZONTAL POSITION. IT IS INCLUDED TO PROVIDE ADDITIONAL INFORMATION FOR THE REVIEWER.

LEGEND

- EXISTING PROPERTY LINES
- EXISTING R.O.W.
- INDIVIDUAL HISTORIC PROPERTY (LISTED OR ELIGIBLE FOR LISTING)
- CENTRAL VERMONT HEADQUARTERS RAILROAD HISTORIC DISTRICT BOUNDARY
- PROPOSED R.O.W.
- SLOPE IMPACTS
- ROW IMPACTS
- ### PROPERTY ID #
- PROPOSED SLOPE WORK
- PROPOSED PAVEMENT
- PROPOSED SIDEWALK
- PROPOSED PAVED DRIVEWAY
- PROPOSED BUILDING DEMOLITION

N

VT STATE PLANE GRID

0 30 60 Feet

VHB Vanasse Hangen Brustlin, Inc.

Figure #4.4-6
Section 4(f) Impacts
Federal Street Multimodal Connector
Giroux Furniture Company Building
10-18 Catherine Street (Property ID: 26018010)
City of St. Albans, VT

NOTE: BASE MAP PHOTOGRAPHY IS NOT ORTHOCORRECTED AND IS THEREFORE SUBJECT TO DISTORTION AND NOT A TRUE REPRESENTATION OF HORIZONTAL POSITION. IT IS INCLUDED TO PROVIDE ADDITIONAL INFORMATION FOR THE REVIEWER.

LEGEND

- EXISTING PROPERTY LINES
- EXISTING R.O.W.
- INDIVIDUAL HISTORIC PROPERTY (LISTED OR ELIGIBLE FOR LISTING)
- FEDERAL / LAKE / CATHERINE STREETS INTERSECTION HISTORIC DISTRICT BOUNDARY
- PROPOSED R.O.W.
- SLOPE IMPACTS
- ROW IMPACTS
- ### PROPERTY ID #
- PROPOSED SLOPE WORK
- PROPOSED PAVEMENT
- PROPOSED SIDEWALK
- PROPOSED PAVED DRIVEWAY
- PROPOSED BUILDING DEMOLITION

N

VT STATE PLANE GRID

0 50 100 Feet

Vanasse Hangen Brustlin, Inc.

Figure #4.4-7
Section 4(f) Impacts
Federal Street Multimodal Connector
Federal / Lake / Catherine Streets Intersection Historic District
City of St. Albans, VT

NOTE: BASE MAP PHOTOGRAPHY IS NOT ORTHOCORRECTED AND IS THEREFORE SUBJECT TO DISTORTION AND NOT A TRUE REPRESENTATION OF HORIZONTAL POSITION. IT IS INCLUDED TO PROVIDE ADDITIONAL INFORMATION FOR THE REVIEWER.

LEGEND

- EXISTING PROPERTY LINES
- EXISTING R.O.W.
- INDIVIDUAL HISTORIC PROPERTY (LISTED OR ELIGIBLE FOR LISTING)
- CENTRAL VERMONT HEADQUARTERS RAILROAD HISTORIC DISTRICT BOUNDARY
- PROPOSED R.O.W.
- SLOPE IMPACTS
- ROW IMPACTS
- ### PROPERTY ID #
- PROPOSED SLOPE WORK
- PROPOSED PAVEMENT
- PROPOSED SIDEWALK
- PROPOSED PAVED DRIVEWAY
- PROPOSED BUILDING DEMOLITION

N

VT STATE PLANE GRID

0 50 100 Feet

VHB Vanasse Hangen Brustlin, Inc.

Figure #4.4-8
Section 4(f) Impacts
Federal Street Multimodal Connector
163 Federal St. (Property ID: 22022163)
174 Federal St. (Property ID: 22033174)
City of St. Albans, VT

NOTE: BASE MAP PHOTOGRAPHY IS NOT ORTHOCORRECTED AND IS THEREFORE SUBJECT TO DISTORTION AND NOT A TRUE REPRESENTATION OF HORIZONTAL POSITION. IT IS INCLUDED TO PROVIDE ADDITIONAL INFORMATION FOR THE REVIEWER.

Appendix A – Purpose and Need Statement Adopted by the St. Albans City Council

Purpose and Need Statement
Revised Nov 14, 2011

Federal Street Multi Modal Connector
St. Albans, VT

Submitted to VTrans on _____, 2011
VT State Project # St. Albans HPP 8000 (17)

PURPOSE:

The purpose of the Federal Street Multi-Modal Connector project in the City of St. Albans, VT is three fold:

1) To increase economic competitiveness and livability in Downtown St. Albans by providing an efficient and convenient alternate north-south route for truck and automobile traffic currently using Main Street (US Route 7);

2) To resolve long-standing traffic flow problems that have impacted the competitiveness of commercial and industrial properties using Complete Street design principles where appropriate; and

3) To harness the economic power of multiple transportation modes located in close proximity to one another in an environment containing commercial, residential, and industrial uses.

The northern limit of the study area would be the intersection of Main Street (US Route 7) at Lower Newton Street westerly to the intersection of Lower Newton Street at Federal Street. The southern limit would be a two-lane extension of the Interstate Access Road (St. Albans State Highway) westerly to the intersection of Lemnah Drive and Nason Street. The existing roadways between the northerly and southerly ends of the corridor are Federal Street, Catherine Street, Allen Street, and Lemnah Drive.

Alternatives to be evaluated include roadway widening, dedicated bicycle lanes, sidewalks on both sides of the corridor, and realigning or reconfiguring select intersections. The alternatives could improve access to the downtown for destination traffic, facilitate the passage of through traffic, improve access to the adjacent industrial areas, and create potential development and redevelopment opportunities. These types of improvements should also improve overall operations of Lake Street at Federal Street/Catherine Street and Lower Newton at Federal Street intersections, accommodate transit routes, and provide access to a possible multi modal facility or other redevelopment opportunities.

Any improvements should be consistent with the objectives of the City's Comprehensive Master Plan as amended. The Plan's corridor and city-wide objectives for transportation are based on traffic circulation, encouragement of alternative modes

of transportation, and improvement of pedestrian and bicycle access.

NEED:

The project need is defined by the concerns and deficiencies identified in the following areas:

Traffic Circulation and Mobility

Main Street (US Route 7) is the primary north-south corridor through the City. Heavy truck and commuter traffic often create congestion and delay through the downtown, most notably at the intersections of Main Street (US Route 7) at Lake Street and Fairfield Street (VT Route 36). Motor vehicle congestion has a negative impact on the livability and safety of the otherwise pedestrian-focused commercial downtown.

To avoid vehicular congestion on Main Street, motorists often seek relief by traveling on adjacent residential streets. This is detrimental to the livability and pedestrian safety of those residential neighborhoods. The Federal Street corridor includes a mix of residential, commercial, and industrial land uses. Its current function as an informal bypass for Main Street traffic is documented through existing vehicle turn movement counts and origin-destination studies that show that during critical peak hours, motorists that are familiar with the local street network are bypassing the aforementioned congested Main and Lake Street/Fairfield Street intersection. However, the Federal Street Corridor has inherent problems and in its current configuration it is inadequate as a bypass. These problems are due primarily to the corridor's piecemeal construction history and are exacerbated by the informally routed overflow traffic. Problems along the Federal Street corridor include:

- inconsistent and deficient roadway geometrics
- inconsistent pedestrian accommodations
- poor access management
- lack of provision for turning movements at key intersections
- lack of direct connection to Interstate 89 (I-89)
- generally poor state of repair

Prior studies have shown that points south via Catherine Street or Market Street, Allen Street, and Lemnah Drive have fewer vehicles using the corridor as a bypass route, due to inconsistent roadway geometrics (see chart below). Motorists unfamiliar with the area will follow the posted routes - US Route 7, VT Route 36, VT Route 104, VT Route 105 and VT Route 207 and are most likely to continue through the congested downtown area.

In addition to deficiencies in existing pavement widths, the Federal Street Corridor is not presently suitable as a bypass route because key intersections are

not configured to best accommodate through or bypassing turn movements and do not have pedestrian crossings that meet current standards. Examples include Lake Street at Federal/Catherine Streets and Federal Street at Lower Newton Street. These intersections experience long vehicles delays and congestion due to pre-existing bypass traffic. Moreover, vehicular delays are compounded because the corridor does not have direct access to I-89 via the Interstate Access Road. Therefore, vehicles must travel on residential streets to gain access to Main Street (US Route 7), Federal Street, and the Interstate Access Road.

Roadway Widths

Roadway	*Approximate Existing Width*
Catherine Street	28′ with 5′ sidewalk
Allen Street	24′
Lemnah Drive	26′ with 4′ grass strip & 4′ sidewalk (total 34′)

The need exists to manage access and through traffic along the Federal Street corridor in ways that improve mobility and follow current roadway standards, while protecting and enhancing the economic vitality of the corridor. The need extends beyond vehicular traffic to include improved access, safety, and experience for pedestrians and cyclists. These combined actions are entirely consistent with the downtown master plan.

Roadway

The Federal Street corridor does not have a direct link to the Interstate Access Road (St. Albans State Highway) and would require a new roadway segment from Lemnah Drive to South Main Street to make the corridor a viable alternate route to Main Street (US Route 7). This proposed roadway link would complete the corridor and provide direct access to the Amtrak station and the commercial/industrial area within the Federal Street corridor, provide an alternate route for commuter traffic and truck deliveries, reduce vehicle delay in the downtown area and enrich the downtown experience, and thus increase the economic competitiveness of development and redevelopment opportunities in both the downtown and the Federal Street corridor.

Bicycle and Pedestrian Accommodations

The corridor does have an extensive sidewalk system in place, however many of these facilities do not meet the Americans with Disabilities Act Accessibility Guidelines (ADAAG) for public sidewalks. Overall the corridor does not meet "Complete Street" standards. Pedestrians are hindered from traveling within the corridor and crossing to businesses and residences due to the poor existing sidewalk conditions, the lack of designated crosswalks, the long pedestrian crossing caused by the wide roadway width on Federal Street, and because the sidewalk does not continue south on Lemnah Drive. Bicyclists also are not well accommodated on Catherine Street, Allen Street, and Lemnah Drive due to the

existing roadway width of 24′ to 34′. The minimum standard for travel lanes, pedestrian, and bicycle accommodations is 35′ without parking, 43′ with parking on one side, and 51′ with parking on both sides. In all cases, the existing roadway width does not meet these minimum standards, and safety and livability are hindered with the current configuration.

Intersections

The intersections south of the intersection of Lake Street at Federal/Catherine Street do not have enough roadway width for a tractor trailer (WB-50 or 64) to complete a turn or travel through the intersection without occupying some of the opposing lane. The Right-of-Way width on Catherine Street does not have adequate width to construct a sidewalk, a bicycle lane on both sides of the street, and two travel lanes. The majority of the existing pedestrian facilities do not meet the current ADAAG for public sidewalks and in some locations sidewalks do not exist at all.

The intersection geometry of Lake Street at Federal/Catherine Streets is not well-defined due to Federal Street and Catherine Street being offset, the excessive extra pavement, missing sidewalk sections, and driveways that are not distinct. These issues, during peak periods, cause congestion, delay, and conflicts between all modes of travel. The sight distance is obstructed by utility poles, buildings, and vehicles parked on the north side of Lake Street. Pedestrians have a long way to travel to progress from one side of the street to the other on the southerly side of Lake Street, due to the lack of pedestrian facilities.

The intersection of Allen Street, Catherine Street, Market Street, and Stebbins Street has excess pavement that is not well-defined due to existing geometry, driveways that are not distinct, and sight distance which is constrained by the geometry and an existing building location.

The intersection of the Interstate Access Road (St. Albans State Highway) and South Main Street (US Route 7) lacks pedestrian or bicycle accommodations. It resembles a highway on/off-ramp due to the roadway width and geometry and lacks appropriate traffic control relative to the amount of vehicular traffic traveling through this intersection.

Overall, none of the intersections along this corridor meet "Complete Streets" standards.

Bridge

The existing Lemnah Drive Bridge is posted for 12,000 pounds, which does not meet the current AASHTO LRFD Bridge Design Specification for HL-93 loading (25 Ton). This proposed loading would accommodate truck traffic (i.e. WB 64) on the bridge for those vehicles traveling through St. Albans to another

destination and those trucks stopping at commercial and industrial businesses, such as the St. Albans Cooperative Creamery, Inc. and New England Central Railroad. The existing roadway width across the bridge of approximately 29′ will not accommodate pedestrian and bicycle facilities, which require a minimum width of 39′ (2-12 travel lanes, 2 – 5′ bicycle lanes and 1 – 5′ sidewalk).

Lighting

The Federal Street corridor lacks consistent adequate street lighting. Like the roads, the street lighting has been developed in segments over time and there are gaps where adequate lighting levels are not currently achieved. Appropriate lighting levels are important for pedestrian and motorist safety and this would be based on the VTrans Roadway Light Policy (0.5 to 2.0 foot-candles) and the standards from the Illuminating Engineering Society of North America.

Drainage

Portions of the Federal Street corridor are very flat and reportedly experience periodic minor flooding.

Access Management

Many of the existing residential and commercial driveways within the project corridor lack clear definition or do not conform to current driveway design standards. This results in inefficient parking and unmanaged vehicle and pedestrian conflict points, and it detracts from the overall character, safety and efficiency of the corridor.

Parking

The existing on-street parking is relatively informal and uncontrolled within the corridor. A portion of Federal Street is close enough to Main Street and the City parking lots that it should be considered part of the overall downtown parking scheme.

Aesthetics and Community Character

This corridor contains a mix of residential, commercial, and industrial land uses with a varied roadway width, non-standard sidewalks and pedestrian crossings, poor roadway and intersection geometry, lack of access control, and varied or missing streetscape amenities. The result is that the corridor does not have an attractive, consistent, livable identity that would attract people to it for either residential or commercial purposes.

The City of St. Albans completed a downtown master plan in September 2009, which describes their vision for the section of the City bordered by Main, Federal, Lake, and Kingman Streets. The plan describes how this core area should look and feel when it is completed, and any development and investment in public infrastructure should reflect the City's vision.

This Purpose and Need Statement was reviewed and approved by the City Council for the City of St. Albans, Vt this 22 day of November, 2011.

By: _____
Martin Manahan, Mayor

Appendix B – Supplemental Traffic Report

1 Introduction

The Federal Street Multimodal Connector Project, proposed by the City of St. Albans, Vermont, would reconstruct the Federal Street Corridor to improve its use by automobiles, trucks, pedestrians, bicyclists, and public transit. Currently, US Route 7 (North and South Main Street) bisects the City's downtown which results in heavy north-south passenger and commercial traffic and congestion that detracts from the downtown human environment. The proposed Federal Street Multimodal Connector is intended to provide a parallel urban collector route to divert through and truck traffic from the City's downtown and create an alternative access to Interstate 89 (I-89).

An Environmental Assessment (EA), dated May 2012, was prepared to describe and assess the environmental consequences that may result from the proposed Federal Street Multimodal Connector (i.e., "the Project" or "the Proposed Action"). This traffic report has been prepared to supplement the information provided in the EA and focuses on documenting traffic operational comparisons between the "No Action" and "Proposed Action" alternatives. The EA should be consulted for more detailed information about the Project. The analyses presented herein have been prepared in conformance with guidelines and standards of the Vermont Agency of Transportation (VTrans). A description of the Project and the Study Area for the traffic operations assessment are presented below.

Project Description

The Project, also referred to as the Proposed Action, encompasses the Federal Street Corridor. The Federal Street Corridor, currently functioning as the informal bypass for Main Street traffic through the City of St. Albans, includes a mix of residential, commercial, and industrial land uses. The Federal Street Corridor has inherent problems and, in its current configuration, it is inadequate to effectively serve as a bypass. Other north-south routes through the City are limited by terrain, land use or lack of connection to the downtown, the railroad and the commercial industrial zones to be considered viable alternatives to the Federal Street Corridor.

The Project creates an attractive and effective alternative bypass route of Main Street. For description purposes, the Project has been broken into five segments as follows:

- Proposed Nason Street Connector (South Main Street to Nason Street);
- Lemnah Drive and Allen Street (Nason Street to Stowell Street);
- Allen / Catherine / Federal Street Segment (Stowell Street to Kingman Street);
- Federal Street (Kingman Street to Lower Newton Street); and
- Lower Newton Street (Federal Street to North Main Street).

These five segments total approximately 2.1 miles and are depicted in **Figure 1.** The existing condition of each segment is described in detail in Chapter 2. With the exception of Lemnah Drive, all of the existing Federal Street Corridor segments are classified as urban collectors. With the completion of this Project it is anticipated that a single urban collector functional classification would apply to the entire corridor. The typical roadway section for the Project corridor includes the following elements:

- 11-foot wide travel lanes for each direction of vehicular traffic;
- 4-foot wide (min.) bicycle lanes (5-foot wide where on-street parking is provided);
- 2 to 4-foot wide grass utility strips; and
- 5-foot wide sidewalk (on both sides of the road along Federal Street, on one side elsewhere).

Depending on the age and condition of the road surface and the need to repair or relocate buried utilities, full depth reconstruction may be required. In areas where recent roadwork has been performed, road surface rehabilitation may be possible. Street trees would be planted in the grass utility strip where appropriate, and energy efficient street lights would also be provided. Access management improvements such as driveway formalization and consolidation would be implemented, and traffic and wayfinding signage would be added and improved as appropriate.

The Nason Street Connector is a proposed new two-lane roadway that would extend the Interstate Access Road westerly past South Main Street across City-owned property to the intersection of Lemnah Drive and Nason Street. Improvements along the proposed Nason Street Connector would include bicycle lanes on both sides of the street, a sidewalk on the north side of the road and dedicated right turning lane at the intersection with South Main Street. The intersection would become signalized, with the addition of left turn lanes on South Main Street. All pedestrian crossings within the signalized intersection would be marked and properly signed, and controlled by pedestrian signals.

In addition to the corridor-wide improvements, the Project includes improvements at existing intersections. Reconstruction of the Lower Welden Street /Allen Street /Lemnah Drive intersection includes installation of a roundabout. The Proposed Action at the Lake Street / Catherine Street / Federal Street intersection is a signalized intersection with Catherine Street and Market Street converted to one-way

legs of the intersection. The signalized improvement includes pedestrian accommodations.

Study Area

The study area for traffic operational assessment encompasses the roadway network generally bound by: Lower Newton Street from North Main Street to Federal Street to the north; Federal, Market, and Allen Streets, and Lemnah Drive to the west; Nason Street to south; and US Route 7 (North and South Main Street) from Upper and Lower Newton Streets to the Interstate Access Road to the east. For traffic operations evaluation purposes, the following intersections were included in the traffic analysis model:

- US Route 7 (North Main Street) at Upper Newton/Lower Newton Street
- Lower Newton Street at Federal Street
- Lake Street at Federal Street/Catherine Street
- Lake Street at Market Street
- Catherine Street/Allen Street at Stebbins Street/Market Street
- Lower Welden Street at Allen Street/Lemnah Drive
- Nason Street at Lemnah Drive
- US Route 7 (South Main Street) at Interstate Access Road
- US Route 7 (South Main Street) at Nason Street
- US Route 7 (South Main Street) at Upper and Lower Welden Street
- US Route 7 (South Main Street) at Fairfield and Lake Streets
- US Route 7 (North Main Street) at JC Penney

An inventory of the existing conditions within the study area is provided in the following section.

2

Existing Conditions

Evaluation of the traffic impacts associated with the Project requires a thorough understanding of the transportation network in the study area. Existing conditions observed in the study area include roadway geometrics, traffic control devices, and peak hour traffic volumes. This chapter summarizes the existing conditions observed within the study area.

Existing Roadway Network

The following provides a general description of the existing conditions of the roadway segments that form the Federal Street Corridor. **Figure 2** shows lane use and traffic control at key intersections within the Study Area to graphically display the roadway system with regard to the physical conditions.

Lemnah Drive and Allen Street

This 0.43-mile segment includes Lemnah Drive from Nason Street to Lower Welden Street and Allen Street from Lower Welden Street to Stowell Street. Lemnah Drive has one lane in each direction and a posted speed limit of 25 miles per hour (MPH). There is no on-street parking in this segment and sidewalks are provided only on the east side of Allen Street and on a short (320 foot) stretch of Lemnah Drive along the east side of the road running north from Nason Street. Lemnah Drive is stop-controlled at both Lower Welden Street and Nason Street, as both of these streets require free east/west movement due to the lack of available queuing space between the Federal Street Corridor and the railroad crossings. The northern terminus of Lemnah Drive meets Lower Welden Street obliquely, resulting in poor roadway geometry.

Lemnah Drive is a recently improved street; it was extended in 1999 to connect Nason Street to Lower Welden Street. It was extended over three acres of land previously owned by New England Central Railroad (NECR) and it now provides continuous access to commercial / industrial properties including the City's municipal complex. Buildings are restricted to the eastern side of the road, with undeveloped lands adjacent to the NECR railroad line lying to the west acting as open air storage yards. The only bridge in the Study Area is located within this reach,

crossing over Stevens Brook about midway between Lower Welden Street and Nason Street.

Allen / Catherine / Federal Streets

This 0.36 mile roadway segment begins at Stowell Street and extends north to Kingman Street. Federal Street has designated on-street parking on both sides of the street, whereas Catherine Street has only a few spaces and Allen Street has no on-street parking. Sidewalks are present on the east side of Allen Street and Catherine Street. The posted speed limit is 25 MPH.

This segment is more urban in character and considered a portion of the downtown area of the City of St. Albans. Land use is varied in this segment. The headquarters of the NECR is located within this segment at the intersection of Federal Street with Lake Street. Immediately opposite and to the south of the headquarters is the Giroux Furniture Company building, currently a furniture store. Catherine and Allen Streets are fronted by a mixture of high-density residential and commercial/industrial properties. Between Stowell Street and Stebbins Street, the west side of the road is lined with trees, separating the traveled way from a railroad siding and open air storage yard; the east side of the road is characterized by high-density residential buildings.

This road segment, located near the center of the Study Area, is characterized by the intersection of the south terminus of Federal Street with Lake Street and with Catherine Street. Lake Street has free movement east/west, whereas Catherine and Federal Street are stop-controlled. There are a number of deficiencies in this intersection, leading to conflicts between all modes of travel:

- The Federal Street and Catherine Street alignments are offset through this intersection, leading to motorist confusion, increased congestion, and increased collisions, as evidenced by the intersection being categorized as a high accident location.
- Motor vehicle delay on the stop controlled side streets can lead to impatience and risk-taking during peak periods.
- The amount of pavement in the intersection and lack of traffic controls and pavement markings or other visual keys adds to the confusion.
- Sight distances are obscured by utilities, buildings, and on street parking.
- There is a general lack of pedestrian accommodations, and the distance required to travel by foot without a sidewalk along the south side of Lake Street between Market Street and Catherine Street (front of the Giroux Furniture Company building) is overly long.

Farther south in this segment, the intersection of Allen Street, Catherine Street, Market Street and Stebbins Street is equally deficient, possessing complicated

geometry and poor sight lines due to building interference. There is a significant offset in the alignment between Allen Street and Catherine Street (the principal north/south route) through this intersection. Moreover, because Market Street offers another north/south route, this can complicate the motorist decision-making process. These deficiencies, coupled with the fact that Allen Street and Catherine Street are stop-controlled, whereas Stebbins Street through Market Street has free east/west movement, contributes to the intersection of Stebbins Street with Allen Street being identified as a high-crash location in the Long Range Transportation Plan 2003-2008 (NRPC 2003).

Federal Street (Kingman Street to Lower Newton Street)

The Federal Street segment commences at Kingman Street and runs north for 0.61 miles along Federal Street to Lower Newton Street. This segment has one lane in each direction with informal on-street parking on both sides of the road and a sidewalk that runs along the east side of the road. The posted speed limit is 25 MPH. There are five minor side streets between Kingman Street and Lower Newton Street, two of which are one-way. Each side street is stop controlled, whereas Federal Street has free north/south movement. There are no signalized intersections within this segment.

Land use in this segment is mostly a mix of single-family residential with some high-density residential and some notable commercial and industrial land uses being present, such as the St. Albans Cooperative Creamery north and west of Hudson Street. Commercial and institutional uses, such as the District Courthouse at the corner of Federal Street and Kingman Street, also front onto Federal Street.

Lower Newton Street

The Lower Newton Street segment (0.17 miles) represents the northern limit of the Study Area. It commences at the intersection of Lower Newton Street and Federal Street and runs east to North Main Street. This segment has one lane in each direction and a sidewalk running along the south side of the road. The posted speed limit is 25 MPH. The intersection with North Main Street is signalized in an offset four-way configuration. Federal Street is stop-controlled at Lower Newton Street, whereas Lower Newton Street has free east/west movement.

Land use is predominantly single-family residential with the notable exception being the recently demolished factory, formerly known as the Fonda Group Property, just north of the intersection of Federal Street and Lower Newton Street.

An inactive at-grade crossing of Lower Newton Street across the NECR line is present just west of this intersection. In its inactive status, the crossing has no adverse effect on traffic operations, though in the future it could revert to active rail use or it could be rail banked and converted to a rail trail that would connect to the

Missisquoi Valley Rail Trail that currently terminates at North Main Street, less than a mile north of the Federal Street Corridor.

Existing Traffic Volumes

A traffic volume data collection program was conducted on Wednesday, September 1, 2010 and Thursday, September 2, 2010 to establish the existing traffic flow characteristics within the Study Area. The traffic volume counts consisted of weekday morning (7:00 – 9:00 AM) and weekday evening (4:00 – 6:00 PM) manual turning movement counts (TMC) at seven study area intersections. Copies of the detailed count data are provided in the Appendix, which is included on the attached CD. The TMC locations are depicted in **Figure 2** and include the following locations:

- US Route 7 (North Main Street) at Upper Newton Street/Lower Newton Street
- Lower Newton Street at Federal Street
- Lake Street at Federal Street/Catherine Street
- Catherine Street/Allen Street at Stebbins Street/Market Street
- Lower Welden Street at Allen Street/Lemnah Drive
- Nason Street at Lemnah Drive
- US Route 7 (South Main Street) at the Interstate Access Road

As recommended in a Policy on Geometric Design of Highways and Streets[1] and by VTrans, the appropriate volume condition for analysis and design considerations is the 30th highest hour of the year. Given the economic considerations involved in the planning and design of street facilities, this design criterion is selected since the 30th highest hourly volume generally reflects a "point of diminishing return" in that a substantial increase in design requirements would accommodate only very few periods of higher traffic volumes. In fact, VTrans guidelines for traffic studies require that traffic volumes be adjusted to reflect the 30th highest hour, commonly referred to as Design Hourly Volume (DHV).

Historical traffic data obtained from the nearby VTrans Permanent Count Station P6F029 located on US Route 7, 1.7 miles north of I-89 in Georgia indicate that the 30th highest hour typically occurs during the weekday evening peak hour and is approximately nine percent higher than the September weekday evening peak hour volume. Therefore, the September 2010 weekday evening peak hour traffic volumes collected to establish the existing conditions were increased by nine percent to

[1] American Association of State Highway and Transportation Officials, A Policy on Geometric Design of Highways and Streets 6th Edition, Washington, D.C., 2011.

represent the DHV (the 30th highest hour). To determine an appropriate adjustment factor for the weekday morning peak hour condition, the weekday morning volume from Station P6F029 closest to the 30th highest hour was selected for comparison purposes; this weekday morning volume was also found to be nine percent higher than the September weekday morning peak hour volume. Therefore, the September 2010 weekday morning peak hour volumes were also adjusted by nine percent. The adjusted 2010 weekday morning and evening peak hour traffic volume networks are presented in **Figure 3** and **Figure 4,** respectively. Copies of the DHV adjustment calculations are provided in the Appendix.

Crash History

Historical crash data obtained from VTrans for the five-year period from 2005 to 2009 were reviewed to identify existing high crash locations (HCL) within the Project area. Table 1 provides a general summary of the crash evaluation; a more detailed summary of the data and crash rate calculations is provided in the Appendix. As shown below, two intersections within the Project area were found to be HCLs. These intersections include the signalized intersection of US Route 7 (North Main Street) at Upper Newton Street/Lower Newton Street and the unsignalized intersection of Lake Street at Federal Street/Catherine Street.

Table 1 Crash Summary

Intersections	Number of Crashes*	Actual Rate**	Critical Rate**	Actual/Critical Ratio	HCL
US 7 at Upper and Lower Newton St	23	1.286	1.135	1.133	Yes
Lower Newton St at Federal St	6	0.552	1.291	0.427	No
Lake St at Federal St and Catherine St	29	1.891	1.182	1.600	Yes
Catherine St at Stebbins St	2	0.422	1.567	0.269	No
Lower Welden St at Allen St and Lemnah Dr	3	0.351	1.371	0.256	No
Nason St at Lemnah Dr	0	0.000	1.558	0.000	No
US 7 at Nason St	6	0.252	1.054	0.239	No
US 7 at Interstate Access Road	17	0.815	1.091	0.747	No
Intersection Total	86				
Segments					
Lower Newton St	4	3.163	10.345	0.306	No
Federal St	28	5.079	7.104	0.715	No
Nason St	3	6.322	12.837	0.493	No
US 7 from Nason St to St. Albans State Hwy	1	0.363	8.468	0.043	No
Segment Total	36				
Grand Total	122				

* Number of crashes January 1, 2005 through December 31, 2009

** Rates expressed in crashes per million vehicles.

Existing Traffic Operations

Measuring the volume of traffic at Study Area intersections indicates the importance of these intersections to the regional transportation system, but does not necessarily give an indication of the quality of traffic flow. To assess the quality of traffic flow, capacity analyses were conducted to determine how well these intersections serve the traffic demands placed upon them. The traffic performance measures and the evaluation criteria used in the operational analyses are based on the methodology presented in the 2000 Highway Capacity Manual.[2] Proposed roundabouts were evaluated using two analysis tools: SIDRA Intersections[3] software and the National Cooperative Highway Research Program (NCHRP) 572 Roundabout Analysis worksheet.

A primary result of capacity analysis is the assignment of level of service (LOS), which is a qualitative measure describing operational conditions at a given facility under specific traffic volume demands. LOS is dependent on the effect of a number of factors including roadway geometrics, travel speed, delay, freedom to maneuver, and safety. Six levels of service are defined ranging in letter designation from LOS A to LOS F, with LOS A representing the best operating condition and LOS F representing the worst. LOS C describes a stable flow condition and is considered desirable for design hour traffic flow. LOS D is generally considered acceptable where the cost and impacts of making improvements to provide LOS C are deemed unjustifiable. LOS E reflects a condition of longer delay, but can be considered acceptable in a congested area, particularly in cases where traffic control devices and other measures are taken to improve safety or physical/geometric improvements are not considered to avoid environmental, historical, or property impacts.

The results of the 2010 existing condition operational analyses, which were conducted for the signalized and unsignalized intersections within the Study Area, are summarized in **Tables 2 and 3**, respectively. Copies of the existing conditions analyses are provided in the Appendix.

The analysis results indicate that the signalized intersection of US Route 7 at Upper Newton Street/Lower Newton Street operates at LOS B with an average delay of 10 seconds and a volume to capacity ratio (v/c) of 0.39 under the 2010 existing weekday morning peak hour volume. Operations are more congested under the 2010 existing weekday evening peak hour volume where the intersection operates at LOS E with an average delay of 61 seconds and a v/c of 0.82.

[2] 2000 Highway Capacity Manual, Special Report 209, Transportation Research Board, Washington, D.C.

[3] SIDRA Intersection Software, Version 5.1, Akcelik and Associates Pty Ltd.

Table 2 2010 Existing Signalized Intersection Analysis Summary

	Weekday AM Peak Hour			Weekday PM Peak Hour		
Intersection	**v/c[1]**	**Delay[2]**	**LOS[3]**	**v/c[1]**	**Delay[2]**	**LOS[3]**
US 7 at Upper Newton St/Lower Newton St	0.39	10	B	0.82	61	E

1 Volume to capacity ratio
2 Average delay per vehicle expressed in seconds
3 Level of service

As shown in Table 3, two of the six unsignalized study area intersections experience long delays and operate at poor levels of service during the 2010 weekday morning and evening peak hours. Vehicles exiting from the unsignalized approaches of the Interstate Access Road and Nason Street to US Route 7 (Main Street) operate at LOS F during both peak hours. Vehicles exiting from the unsignalized approaches of Catherine Street and Federal Street at the Lake Street intersection operate at LOS F during the evening peak hour.

The Federal Street unsignalized approach to the Lower Newton Street intersection also experiences moderate delays under the 2010 weekday evening hour volume, operating at LOS F; under the weekday morning peak hour volume the approach operates at LOS C. The remaining three unsignalized study area intersections of Catherine Street/Allen Street at Stebbins Street/Market Street, Lower Welden Street at Allen Street/Lemnah Drive, and Nason Street at Lemnah Drive operate with minor delays (LOS C or better) during the 2010 weekday morning and evening peak hours.

Table 3 2010 Existing Unsignalized Intersection Analysis Summary

	Weekday AM Peak Hour			Weekday PM Peak Hour		
Intersection	**Demand[1]**	**Delay[2]**	**LOS[3]**	**Demand[1]**	**Delay[2]**	**LOS[3]**
US 7 at Interstate Access Road						
WB lefts from Interstate Access Road	45	72	F	50	99	F
SB lefts from US 7	355	12	B	300	12	B
US 7 at Nason St						
EB movements from Nason St	145	85	F	110	132	F
NB lefts from US 7	90	10	A	125	10	B
Nason St at Lemnah Dr						
EB movements from Nason St	165	4	A	140	5	A
SB lefts from Lemnah Dr	50	13	B	50	13	B
SB rights from Lemnah Dr	65	9	A	65	10	A
Lower Welden St at Allen St/Lemnah Dr						
EB movements from Lower Welden St	210	1	A	265	1	A
WB movements from Lower Welden St	190	1	A	220	1	A
NB movements from Lemnah Dr	135	19	C	135	19	C
SB movements from Allen St	145	18	C	100	18	C
Stebbins St at Catherine St						
EB movements from Stebbins St	100	3	A	80	5	A
SB movements from Catherine St	100	12	B	75	10	B
Lake St at Federal St/Catherine St						
EB movements from Lake St	335	4	A	620	6	A
WB movements from Lake St	250	1	A	315	1	A
NB movements from Catherine St	65	29	D	100	287	F
SB left/through from Federal St	325	20	C	355	433	F
Lower Newton St at Federal St						
WB movements from Lower Newton St	370	6	A	400	6	A
NB movements from Federal St	135	17	C	425	37	F

1 Demand expressed in vehicles per hour
2 Average delay per vehicle expressed in seconds
3 Level of service

3

Future Conditions

The 2010 and 2030 traffic forecasts for the No Action and Proposed Action alternatives were derived using modeling efforts previously conducted for the 2005 update to the Federal Street Corridor Study (NRPC 2005). This chapter summarizes the development of the 2010 and 2030 traffic volume networks and resulting traffic operational analyses for the No Action and Proposed Action alternatives.

Peak Hour Traffic Volume Networks

In 2005, the NRPC, the City of St. Albans, and the Town of St. Albans retained the services of a consultant (Resource Systems Group, Inc.) to assist in the development of the Federal Street Corridor Study – 2005 Update (NRPC 2005). As part of that study, a travel demand model was developed to assist with estimating future traffic volumes. The model was created using Paramics software, a micro-simulation program that estimates the behavior of individual vehicles traveling on the transportation network. The model area encompasses the roadway network surrounded by: US Route 7 from the Interstate Access Road to Upper and Lower Newton Streets, Lower Newton Street from US Route 7 to Federal Street; and Federal, Catherine, Market, Allen, and Lemnah Streets. The 2005 Paramics model was updated and recalibrated to reflect the 2010 existing weekday morning and evening peak hours (described in the previous chapter) for the purposes of evaluating the effect of the Proposed Action on the peak hour volumes within the Study Area and forecasting traffic to the year 2030.

With a base year condition of 2010 for the existing conditions, a twenty year forecast to 2030 was selected for analysis purposes. The 2030 No Action traffic volumes were estimated by reviewing recent traffic growth trends recorded along US Route 7 by the VTrans Permanent Count Station P6F029 located in Georgia, combined with the 2009 to 2029 twenty year growth factor by regression analysis group prepared by VTrans for this same segment of US Route 7. Both the historical data and projected growth factors target an average annual growth rate of 0.5 percent per year. To provide a slightly conservative estimate of 2030 traffic volumes, an average annual growth rate of 1.0 percent was used to forecast for the first ten years of growth (2010 to 2020) and an average annual rate of 0.5 percent was used to forecast for the second ten years (2020 to 2030). This slightly conservative approach was taken to account

for potential unidentified site-specific development or redevelopment projects that could occur near or within the Study Area and affect traffic growth.

It is important to note that the Paramics traffic model includes more US Route 7 intersections than the two intersections (Upper Newton Street/Lower Newton Street and the Interstate Access Road) where TMC data was collected. These intersections include the US Route 7 signalized intersections of Lower Welden Street, Fairfield Street, Lake Street, and JC Penney Plaza and the unsignalized intersection of Nason Street. Volumes at these locations were estimated based on output provided from the 2005 Paramics model update and have been included in the network development for informational purposes. The 2010 No Action traffic volume networks were previously established (as the existing condition) and are shown in **Figures 3** and **4**. The 2030 No Action traffic volume networks for the weekday morning and evening peak hours are shown in **Figures 5** and **6,** respectively.

Once calibrated to the existing condition, the Paramics model was modified to reflect the Proposed Action and to assess the sensitivity of traffic volume assignments under various improvement options for the intersections of Lake Street at Federal Street/Catherine Street and Lower Welden Street at Lemnah Drive/Allen Street. The raw Paramics model output volumes were adjusted through the typical traffic modeling pivoting procedure to forecast and estimate weekday peak hour volumes for the Proposed Action. The 2010 and 2030 Proposed Action traffic volume networks for the weekday morning and evening peak hour conditions are shown in **Figures 7** through **10**.

Signal Warrant Analyses

Signal warrants were evaluated for several of the intersections along the Federal Street Corridor using the Peak Hour Volume Warrant criteria outlined in the Manual on Uniform Traffic Control Devices[4]. These included the intersections of US Route 7 at the Interstate Access Road, Federal Street with Lower Welden Street, Federal Street with Lake Street, and Federal Street with Lower Newton Street. The peak hour warrants indicated that the intersections of US Route 7 at the Interstate Access Road, Lake Street at Federal Street/Catherine Street, and Lower Newton Street at Federal Street would meet peak hour traffic signal warrants. However, the intersection of Federal Street at Lower Welden Street did not meet the peak hour warrant for a traffic signal.

[4] Manual on Uniform Traffic Control Devices, US Department of Transportation, Federal Highway Administration, 2009.

Additional Analysis Assumptions

It is important to note that there were a series of assumptions made and incorporated into the traffic operational analysis with regard to the Proposed Action that adversely affect intersection capacity results, but promote overall safer operations for pedestrians and motorists. Items, such as modified signal timing and phasing plans to accommodate split phases where vehicle conflicts can be eliminated or the incorporation of an exclusive pedestrian phase, reduce the overall capacity of an intersection and increase delay, but improve the overall quality of travel. Specific locations where such items were included in the traffic operational analysis include:

- US Route 7 at Upper Newton Street/Lower Newton Street would have new signal controller equipment with coordination and an exclusive pedestrian phase. In addition, it is assumed that the Upper and Lower Newton Street approaches would be split-phased due to the alignment of the intersection (presently running concurrently).
- US Route 7 at the Interstate Access Road would be a new four-way signalized intersection with the Nason Street Connector. This intersection is assumed to have an actuated exclusive pedestrian phase. In addition, the Interstate Access Road and Nason Street Connector approaches are assumed to be split phased to minimize vehicle conflicts.
- Lake Street at Federal Street/Catherine Street would be signalized with coordination to Main Street and an actuated exclusive pedestrian phase. In addition, the Lake Street approaches are assumed to be split-phased to avoid vehicle conflicts through this elongated intersection. Split-phasing is less efficient than other possible intersection configurations at this location, but necessary to avoid roadway widening and property impacts.
- Federal Street at Lower Newton Street would be signalized with coordination and an actuated exclusive pedestrian phase.
- The existing signalized Main Street (US Route 7) intersections with JC Penney Plaza, Lake Street, Fairfield Street, and Upper Welden Street/Lower Welden Street would operate under coordination with exclusive pedestrian phases. Although these intersections are not part of the Study Area, they were included in the analysis to provide a system-wide review of the Project's impacts (i.e., the entire Main Street corridor is assumed to operate under coordination and the signal vehicle detection improvements currently in progress for the intersections of Main Street with Lake Street and Fairfield Street are assumed to be complete).

2010 and 2030 No Action and Proposed Action Traffic Operations

This section describes the results of the traffic operational analyses that were conducted for the 2010 No-Action and Proposed Action, and the 2030 No-Action and Proposed Action conditions. **Table 4** summarizes the results of the traffic operational analyses for the existing and proposed signalized intersections. **Tables 5 and 6** summarized the 2010 and 2030 analysis results, respectively, for the unsignalized intersections. **Tables 7 and 8** summarize the 2010 and 2030 roundabout analysis results for 2010 and 2030 under the Proposed Action.

2010 No-Action and Proposed Action

The signalized intersection of North Main Street with Upper Newton Street and Lower Newton Street is expected to degrade slightly from LOS B to LOS C under the 2010 weekday morning peak hour as a result of the Project, and remain unchanged at LOS E under the weekday evening peak hour. As discussed previously herein, the incorporation of an actuated exclusive pedestrian phase and split phasing of the off-set side streets under the Proposed Action partially contribute toward the minor change in operations. This intersection was classified as a High Crash Location (HCL) by VTrans, based on crash data for the five-year period from 2005 to 2009. Based on historical crash trends at this location, the inclusion of the split phasing and the exclusive pedestrian phase could potentially reduce crashes at this location by 33 percent (addressing 8 out of 24 crashes over the five-year period).

The remaining existing signalized intersections along the Main Street US Route 7 corridor (JC Penney, Lake Street, Fairfield Street, and Upper Welden Street/Lower Welden Street) are projected to operate at the same or slightly better levels of service with the Proposed Action; all intersections operating at LOS C or better. It is important to point out that the peak hour traffic volume reductions along the US Route 7 corridor associated with the Proposed Action result in an average reduction of 30 percent in the v/c ratios at these existing signalized intersections, due to diversion to Federal Street Corridor.

The three new signalized intersections included under the Proposed Action include South Main Street at the Interstate Access Road/Nason Street Connector, Lake Street at Federal Street/Catherine Street, and Lower Newton Street at Federal Street. All three of these locations experience LOS F operations under their existing unsignalized 2010 No-Action condition. Under the 2010 Proposed Action condition, the signalized intersection of South Main Street at Interstate Access Road/Nason Street Connector is projected to operate at LOS D during the weekday morning and evening peak hours and the intersection of Lower Newton Street at Federal Street is projected to operate at LOS C.

The proposed signalized intersection of Lake Street at Federal Street/Catherine Street is projected to operate at LOS D under the weekday morning peak hour and LOS E under the weekday evening peak hour. The longer delays incurred at this location are a result of selecting a Proposed Action that is focused on minimizing property impacts and providing exclusive pedestrian phases. In addition, it should be pointed out that the anticipated LOS E signalized intersection delay (69 seconds) is substantially lower than the LOS F unsignalized delay (287 seconds from Catherine Street and 433 seconds from Federal Street). As discussed previously, LOS E can be considered acceptable in congested areas where safety improvements are made that reduce potential intersection capacity and/or at locations where physical improvements are not considered due to environmental, historical, or property impacts.

The proposed single lane roundabout at the intersection of Lower Welden Street and Allen Street/Lemnah Drive is projected to operate at LOS A under the 2010 Proposed Action condition during the weekday morning and evening peak hours.

The unsignalized intersection of South Main Street and Nason Street substantially improves under the Proposed Action with vehicle delays exiting from Nason Street improving from LOS F to LOS B during both peak hours. This improvement is a result of motorists using the new signalized intersection at South Main Street and the Nason Street Connector, resulting in lower through and turning movement volumes at the unsignalized Nason Street intersection. The remaining unsignalized intersections of Nason Street at Lemnah Drive and Stebbins Street at Catherine Street are projected to operate at acceptable levels of service under the 2010 No-Action and Proposed Action conditions during both peak hours.

2030 No-Action and Proposed Action

Similar to the 2010 condition, the intersection of North Main Street with Upper Newton Street and Lower Newton Street would be expected to degrade slightly from LOS B to LOS C during the 2030 weekday morning peak hour as a result of the Proposed Action. Traffic operations during the 2030 weekday evening peak hour would be expected to degrade from LOS E (67 seconds delay) to LOS F (91 seconds delay) during the weekday evening peak hour as a result of the Proposed Action. As discussed previously, these changes in level of service are partially attributed to incorporating safety measures and pedestrian phases into the intersection's operations. The other factor contributing toward the change in LOS is the diversion of traffic from US Route 7 northbound under the Proposed Action condition utilizing Federal Street and Lower Newton Street to access US Route 7 north of the Study Area.

The other existing signalized intersections along the US Route 7 corridor (JC Penney, Lake Street, Fairfield Street, and Upper Welden Street/Lower Welden Street) are projected to operate at the same or slightly better LOS with the Proposed Action

(LOS C or better). Similar to the 2010 condition, these intersections would experience substantially lower v/c ratios (10 to 30% lower) as a result of the Proposed Action.

Two of the three proposed signalized intersections, South Main Street at Interstate Access Road/Nason Street Connector and Lake Street at Federal Street/Catherine Street, are projected to operate at LOS E under the 2030 Proposed Action condition during the peak hours. As discussed previously, the longer delays at these locations are attributed to the incorporation of safety measures and exclusive pedestrian phases. It should be noted that the v/c ratios at these locations indicate that the intersections are operating well below capacity for the 2030 forecast year. The third proposed signalized intersection of Lower Newton Street and Federal Street is projected to operate at LOS C.

The proposed single lane roundabout at the intersection of Lower Welden Street and Allen Street/Lemnah Drive is projected to operate at LOS B or better under the 2030 Proposed Action condition during the weekday morning and evening peak hours.

Similar to the 2010 conditions, traffic operations at the South Main Street and Nason Street unsignalized intersection are projected to substantially improve in 2030 with the Proposed Action. Delays for vehicles exiting from Nason Street are projected to decrease from 340 seconds and 526 seconds (LOS F) during the morning and evening peak hours respectively, to only 17 seconds (LOS C) with the Proposed Action.

All traffic movements at the unsignalized intersection of Stebbins Street at Catherine Street are projected to operate at LOS B or better under the 2030 No-Action and Proposed Action conditions. At the unsignalized intersection of Nason Street at Lemnah Drive, left-turns exiting from the stop-controlled side street approaches (Nason Street) are projected to operate at LOS E during the 2030 peak hours with moderate delays (40 seconds or less). Left-turns from Lemnah Drive are projected to operate at LOS A.

Table 4 2010 and 2030 Signalized Intersection Analysis Summary

		2010 No Action			2010 Proposed Action			2030 No Action			2030 Proposed Action		
Intersection	**Period**	**v/c[1]**	**Delay[2]**	**LOS[3]**	**v/c[1]**	**Delay[2]**	**LOS[3]**	**v/c[1]**	**Delay[2]**	**LOS[3]**	**v/c[1]**	**Delay[2]**	**LOS[3]**
US Route 7 @ Nason St Connector & St Albans State Highway	AM Peak	Unsignalized			0.66	44	D	Unsignalized			0.81	68	E
	PM Peak				0.71	48	D				0.87	73	E
Lake St @ Federal St & Catherine St	AM Peak	Unsignalized			0.61	43	D	Unsignalized			0.67	59	E
	PM Peak				0.80	69	E				0.90	65	E
Lower Newton St @ Federal St	AM Peak	Unsignalized			0.31	33	C	Unsignalized			0.34	31	C
	PM Peak				0.45	29	C				0.53	26	C
US Route 7 @ Upper Newton Street & Lower Newton Street	AM Peak	0.39	10	B	0.41	20	C	0.45	11	B	0.48	20	C
	PM Peak	0.82	61	E	0.85	58	E	0.91	67	E	1.11	91	F
US Route 7 @ JC Penney Plaza	AM Peak	0.42	11	B	0.32	7	A	0.47	11	B	0.38	7	A
	PM Peak	0.66	16	B	0.51	11	B	0.72	16	B	0.59	8	A
US Route 7 @ Lake Street	AM Peak	0.51	24	C	0.36	21	C	0.60	25	C	0.46	21	C
	PM Peak	0.79	28	C	0.57	29	C	0.92	33	C	0.70	25	C
US Route 7 @ Fairfield Street	AM Peak	0.46	26	C	0.33	22	C	0.54	29	C	0.38	25	C
	PM Peak	0.64	33	C	0.47	24	C	0.75	51	D	0.59	29	C
US Route 7 @ Upper Welden Street & Lower Welden Street	AM Peak	0.59	20	C	0.34	15	B	0.71	25	C	0.50	26	C
	PM Peak	0.83	31	C	0.55	24	C	0.98	49	D	0.69	16	B

1 Volume to capacity ratio
2 Average delay per vehicle expressed in seconds
3 Intersection level of service

Table 5 2010 Unsignalized Intersection Analysis Summary

	2010 No Action						2010 Proposed Action					
	Weekday AM			Weekday PM			Weekday AM			Weekday PM		
Intersection	Demand[1]	Delay[2]	LOS[3]	Demand[1]	Delay[2]	LOS[3]	Demand[1]	Delay[2]	LOS[3]	Demand[1]	Delay[2]	LOS[3]
US Route 7 at St Albans State Highway												
WB lefts from St Albans State Highway	45	72	F	50	99	F	Signalized			Signalized		
SB lefts from US Route 7	355	12	B	300	12	B						
US Route 7 at Nason St												
EB movements from Nason St	145	85	F	110	132	F	60	14	B	30	14	B
NB lefts from US Route 7	90	10	A	125	10	B	45	8	A	35	8	A
Nason St at Lemnah Dr												
EB movements from Nason St	165	4	A	140	5	A	-	-	-	-	-	-
EB lefts from Nason St	-	-	-	-	-	-	95	27	D	95	28	D
EB through/right from Nason St	-	-	-	-	-	-	70	13	B	50	13	B
WB movements from Nason St	-	-	-	-	-	-	55	19	C	40	21	C
NB lefts from Nason St Connector	-	-	-	-	-	-	45	8	A	70	9	A
SB lefts from Lemnah Dr	50	13	B	50	13	B	5	8	A	5	8	A
SB rights from Lemnah Dr	65	9	A	65	10	A	-	-	-	-	-	-
Lower Welden St at Allen St/Lemnah Dr												
EB movements from Lower Welden St	210	1	A	265	1	A	See Roundabout Table 3.2-6			See Roundabout Table 3.2-6		
WB movements from Lower Welden St	190	1	A	220	1	A						
NB movements from Lemnah Dr	135	19	C	135	19	C						
SB movements from Allen St	145	18	C	100	18	C						

1 Demand expressed in vehicles per hour
2 Average delay per vehicle expressed in seconds
3 Level of service

Table 5 (cont.) 2010 Unsignalized Intersection Analysis Summary

	2010 No Action						2010 Proposed Action					
	Weekday AM			Weekday PM			Weekday AM			Weekday PM		
Intersection	Demand[1]	Delay[2]	LOS[3]	Demand[1]	Delay[2]	LOS[3]	Demand[1]	Delay[2]	LOS[3]	Demand[1]	Delay[2]	LOS[3]
Stebbins St at Catherine St												
EB movements from Stebbins St	100	3	A	80	5	A	45	11	B	35	12	B
WB movements from Stebbins St	-	-	-	-	-	-	25	10	A	50	11	B
SB movements from Catherine St	100	12	B	75	10	B	-	-	-	-	-	-
Lake St at Federal St/Catherine St												
EB movements from Lake St	335	4	A	620	6	A						
WB movements from Lake St	250	1	A	315	1	A	Signalized			Signalized		
NB movements from Catherine St	65	29	D	100	287	F						
SB left/through from Federal St	325	20	C	355	433	F						
Lower Newton St at Federal St												
WB movements from Lower Newton St	370	6	A	400	6	A	Signalized			Signalized		
NB movements from Federal St	135	17	C	425	37	F						

1 Demand expressed in vehicles per hour
2 Average delay per vehicle expressed in seconds
3 Level of service

Table 6 2030 Unsignalized Intersection Analysis Summary

	2030 No Action						2030 Proposed Action					
	Weekday AM			Weekday PM			Weekday AM			Weekday PM		
Intersection	Demand[1]	Delay[2]	LOS[3]	Demand[1]	Delay[2]	LOS[3]	Demand[1]	Delay[2]	LOS[3]	Demand[1]	Delay[2]	LOS[3]
US Route 7 at St Albans State Highway												
WB lefts from SASH	55	~	F	60	~	F	Signalized			Signalized		
SB lefts from US Route 7	415	15	B	345	15	B						
US Route 7 at Nason St												
EB movements from Nason St	180	340	F	135	526	F	70	17	C	45	17	C
NB lefts from US Route 7	110	10	A	140	11	B	55	9	A	35	9	A
Nason St at Lemnah Dr												
EB movements from Nason St	195	4	A	170	5	A	-	-	-	-	-	-
EB lefts from Nason St	-	-	-	-	-	-	110	32	D	115	40	E
EB through/right from Nason St	-	-	-	-	-	-	85	14	B	50	14	B
WB movements from Nason St	-	-	-	-	-	-	75	37	E	50	24	C
NB lefts from Nason St Connector	-	-	-	-	-	-	45	9	A	45	9	A
SB lefts from Lemnah Dr	70	15	C	60	14	B	5	8	A	5	8	A
SB rights from Lemnah Dr	80	10	A	80	10	A	-	-	-	-	-	-
Lower Welden St at Allen St/Lemnah Dr												
EB movements from Lower Welden St	260	1	A	315	1	A	See Roundabout Table 3.2-7			See Roundabout Table 3.2-7		
WB movements from Lower Welden St	235	1	A	255	1	A						
NB movements from Lemnah Dr	165	33	D	155	28	D						
SB movements from Allen St	180	29	D	120	24	C						

1 Demand expressed in vehicles per hour
2 Average delay per vehicle expressed in seconds
3 Level of service

Table 6 (cont.) 2030 Unsignalized Intersection Analysis Summary

	2030 No Action						2030 Proposed Action					
	Weekday AM			Weekday PM			Weekday AM			Weekday PM		
Intersection	Demand[1]	Delay[2]	LOS[3]	Demand[1]	Delay[2]	LOS[3]	Demand[1]	Delay[2]	LOS[3]	Demand[1]	Delay[2]	LOS[3]
Stebbins St at Catherine St												
EB movements from Stebbins St	130	4	A	90	5	A	50	11	B	35	12	B
WB movements from Stebbins St	-	-	-	-	-	-	45	10	A	80	11	B
SB movements from Catherine St	125	13	B	90	11	B	-	-	-	-	-	-
Lake St at Federal St/Catherine St												
EB movements from Lake St	390	5	A	720	7	A						
WB movements from Lake St	315	1	A	375	1	A	Signalized			Signalized		
NB movements from Catherine St	90	97	F	120	~	F						
SB left/through from Federal St	385	39	E	95	~	F						
Lower Newton St at Federal St												
WB movements from Lower Newton St	415	6	A	470	6	A	Signalized			Signalized		
NB movements from Federal St	155	22	C	500	115	F						

1 Demand expressed in vehicles per hour
2 Average delay per vehicle expressed in seconds
3 Level of service

Table 7 2010 Roundabout Capacity Analysis Summary at Lower Welden Street

		2010 Proposed Action[1]		2010 Proposed Action[2]		2010 Proposed Action[3]		2010 Proposed Action[4]	
Period	**Approach**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**
AM Peak	NB	9	A	10	A	7	A	6	A
	WB	8	A	7	A	6	A	6	A
	SB	8	A	7	A	6	A	6	A
	EB	14	B	6	A	5	A	6	A
	Overall	10	A					6	A
PM Peak	NB	9	A	8	A	6	A	6	A
	WB	8	A	8	A	6	A	7	A
	SB	9	A	9	A	7	A	8	A
	EB	12	B	7	A	5	A	6	A
	Overall	10	A					7	A

1 Output from Sidra Intersection with HCM 2010 methodology
2 Output from Sidra Intersection with HCM 2000 lower methodology
3 Output from Sidra Intersection with HCM 2000 higher methodology
4 NCHRP spreadsheet

Table 8 2030 Roundabout Capacity Analysis Summary at Lower Welden Street

		2030 Proposed Action[1]		2030 Proposed Action[2]		2030 Proposed Action[3]		2030 Proposed Action[4]	
Period	**Approach**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**
AM Peak	NB	11	B	11	B	8	A	7	A
	WB	8	A	8	A	6	A	7	A
	SB	9	A	8	A	6	A	6	A
	EB	17	C	6	A	5	A	7	A
	Overall	12	B					7	A
PM Peak	NB	10	A	9	A	7	A	7	A
	WB	10	B	10	B	8	A	7	A
	SB	10	A	9	A	7	A	9	A
	EB	18	C	7	A	5	A	8	A
	Overall	12	B					8	A

1 Output from Sidra Intersection with HCM 2010 methodology
2 Output from Sidra Intersection with HCM 2000 lower methodology
3 Output from Sidra Intersection with HCM 2000 higher methodology
4 NCHRP spreadsheet

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4
Conclusions

Main Street (US Route 7) is the primary north-south corridor through the City of St. Albans. Heavy truck and commuter traffic often create congestion and peak hour delay through the downtown. Motor vehicle congestion has a negative impact on the livability and safety of the otherwise pedestrian-focused commercial downtown. The Federal Street Multimodal Connector Project would reconstruct the Federal Street Corridor to improve its use by automobiles, trucks, pedestrians, bicyclists, and public transit in order to create a parallel urban collector route to divert traffic from the City's downtown and create an alternative access to I-89.

Traffic evaluation of the 2010 existing conditions indicates that the signalized intersection of North Main Street with Upper and Lower Newton Streets and the unsignalized intersections of South Main Street with the Interstate Access Road, South Main Street with Nason Street, Lake Street with Federal Street and Catherine Street, and Lower Newton Street with Federal Street currently experience congestion and long delays during peak hour conditions. In addition, two of these intersections were found to be HCLs - the signalized intersection of North Main Street at Upper and Lower Newton Streets and the unsignalized intersection of Lake Street at Federal Street and Catherine Street.

The Proposed Action balances the need for traffic capacity and safety improvements with environmental, historical, and property impacts. As a result, lower levels of service may be considered acceptable in congested areas, particularly in cases where traffic control devices and other measures are taken to improve safety or where physical/geometric improvements are not considered to avoid sensitive impacts. Improvements such as providing split-phasing on side streets at signalized intersections and installing exclusive pedestrian phases have been incorporated into the Proposed Action to address existing and potential future safety concerns. It is important to note that these types of improvements adversely affect intersection capacity and increase delay, but improve the overall quality of travel. The provision of pedestrian amenities, and particularly exclusive pedestrian phases, at signalized intersections is a key component to creating the multimodal corridor envisioned by the City.

Under the Proposed Action, the intersection of North Main Street with Upper Newton Street and Lower Newton Street would be expected to degrade slightly from LOS B to LOS C during the 2030 weekday morning peak hour. Traffic operations

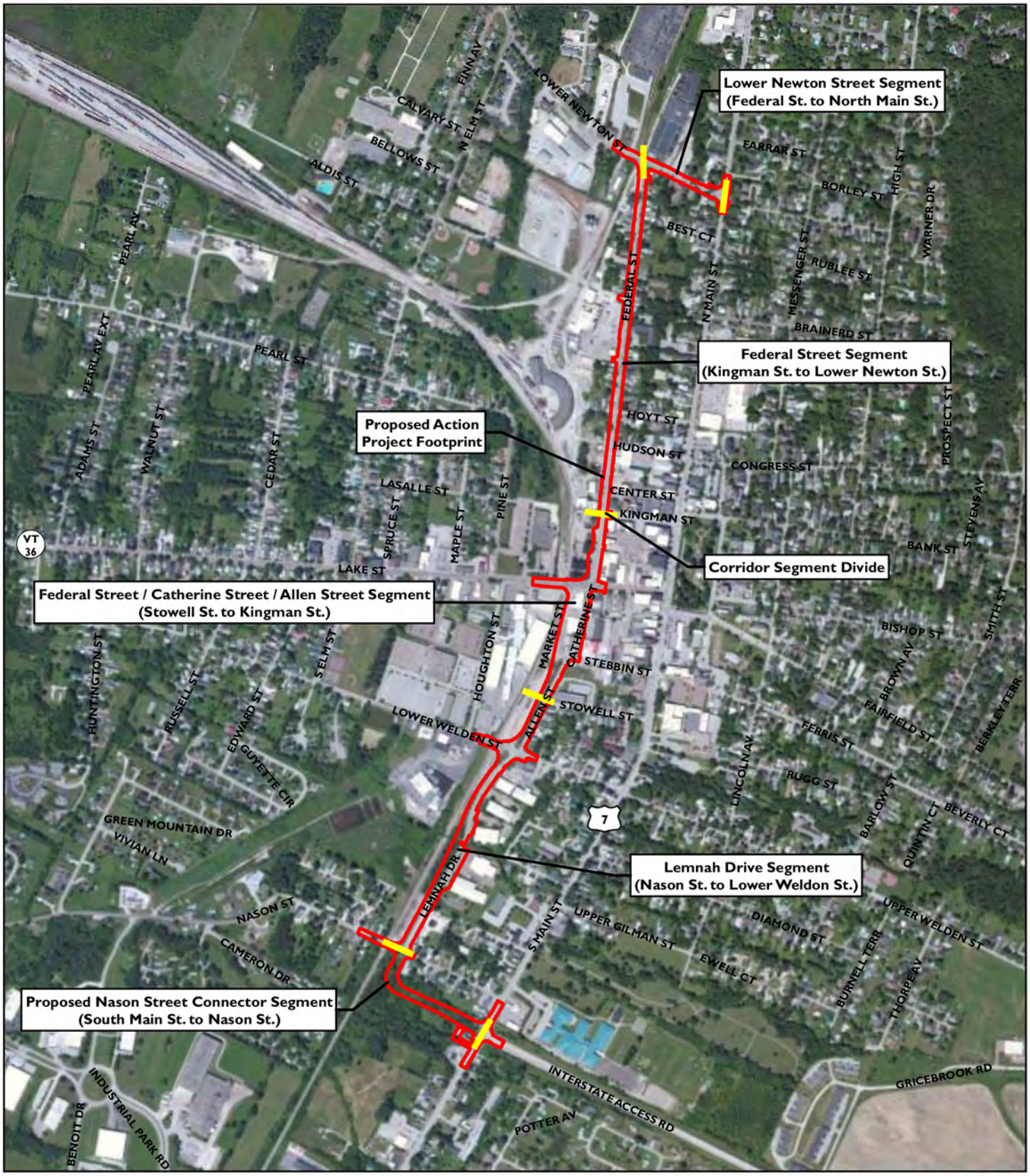
during the 2030 weekday evening peak hour would be expected to degrade from LOS E (67 seconds delay) to LOS F (91 seconds delay) during the weekday evening peak hour as a result of the Proposed Action. However, as discussed previously, these changes in level of service are partially attributed to incorporating safety measures and pedestrian phases into the intersection's operations. The other existing signalized intersections along the US Route 7 corridor (JC Penney, Lake Street, Fairfield Street, and Upper Welden Street/Lower Welden Street) are projected to experience substantially lower v/c ratios (10 to 30% lower) as a result of the Proposed Action.

Two of the three proposed signalized intersections, South Main Street at Interstate Access Road/Nason Street Connector and Lake Street at Federal Street/Catherine Street, are projected to operate at LOS E under the 2030 Proposed Action condition during the peak hours as a result of the incorporation of safety measures and exclusive pedestrian phases. It should be noted that the v/c ratios at these locations indicate that the intersections are operating well below capacity for the 2030 forecast year. The third proposed signalized intersection of Lower Newton Street and Federal Street is projected to operate at LOS C.

The proposed single lane roundabout at the intersection of Lower Welden Street and Allen Street/Lemnah Drive is projected to operate at LOS B or better under the 2030 Proposed Action condition during the weekday morning and evening peak hours.

Traffic operations at the South Main Street and Nason Street unsignalized intersection are projected to substantially improve in 2030 with the Proposed Action. Delays for vehicles exiting from Nason Street are projected to decrease from 340 seconds and 526 seconds (LOS F) during the morning and evening peak hours respectively, to only 17 seconds (LOS C) with the Proposed Action.

All traffic movements at the unsignalized intersection of Stebbins Street at Catherine Street are projected to operate at LOS B or better under the 2030 No-Action and Proposed Action conditions. At the unsignalized intersection of Nason Street at Lemnah Drive, left-turns exiting from the stop-controlled side street approaches (Nason Street) are projected to operate at LOS E during the 2030 peak hours with moderate delays (40 seconds or less). Left-turns from Lemnah Drive are projected to operate at LOS A.



Legend

Proposed Action Project Footprint

Segment Divide

0 1,000 2,000 Feet

VHB Vanasse Hangen Brustlin, Inc.

Figure 1
Corridor Segment Designations
Federal Street Multimodal Connector
City of St. Albans, Vermont

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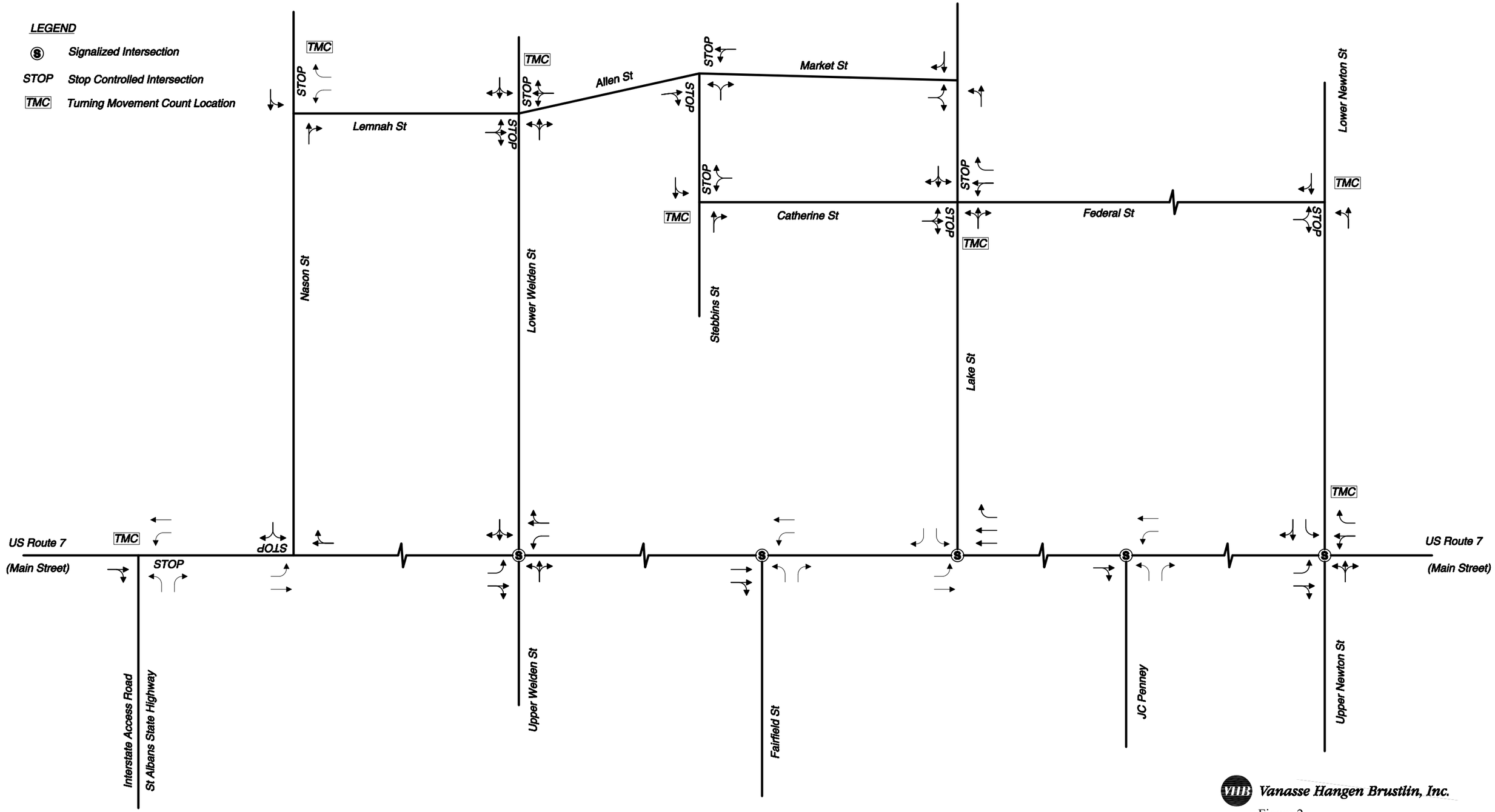

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Figure 2

Existing Lane Use and Traffic Control
Federal Street Corridor

Not to Scale

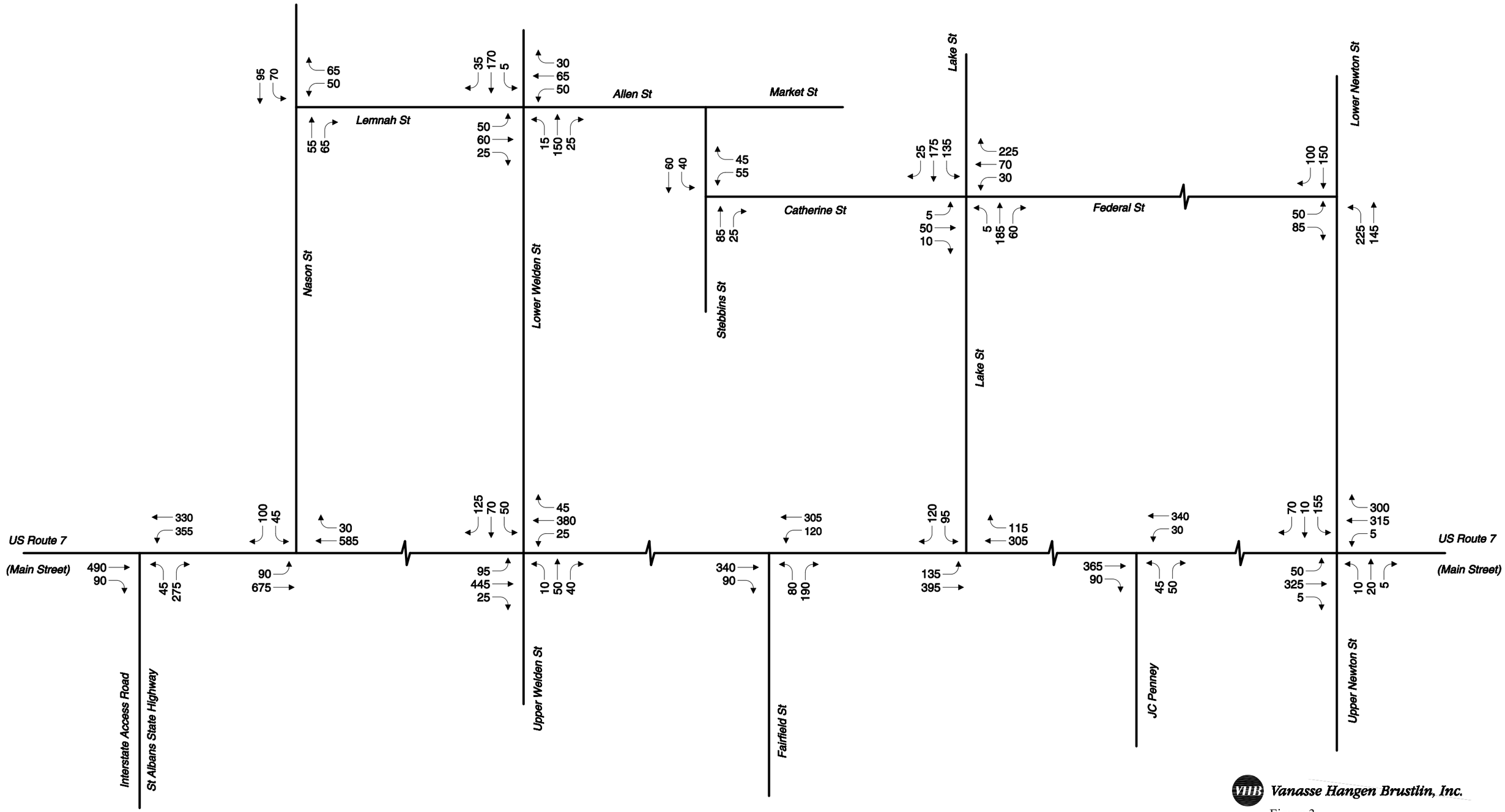

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Figure 3

2010 Weekday Peak Hour Volumes
No-Action AM Peak Hour
Federal Street Corridor

Not to Scale

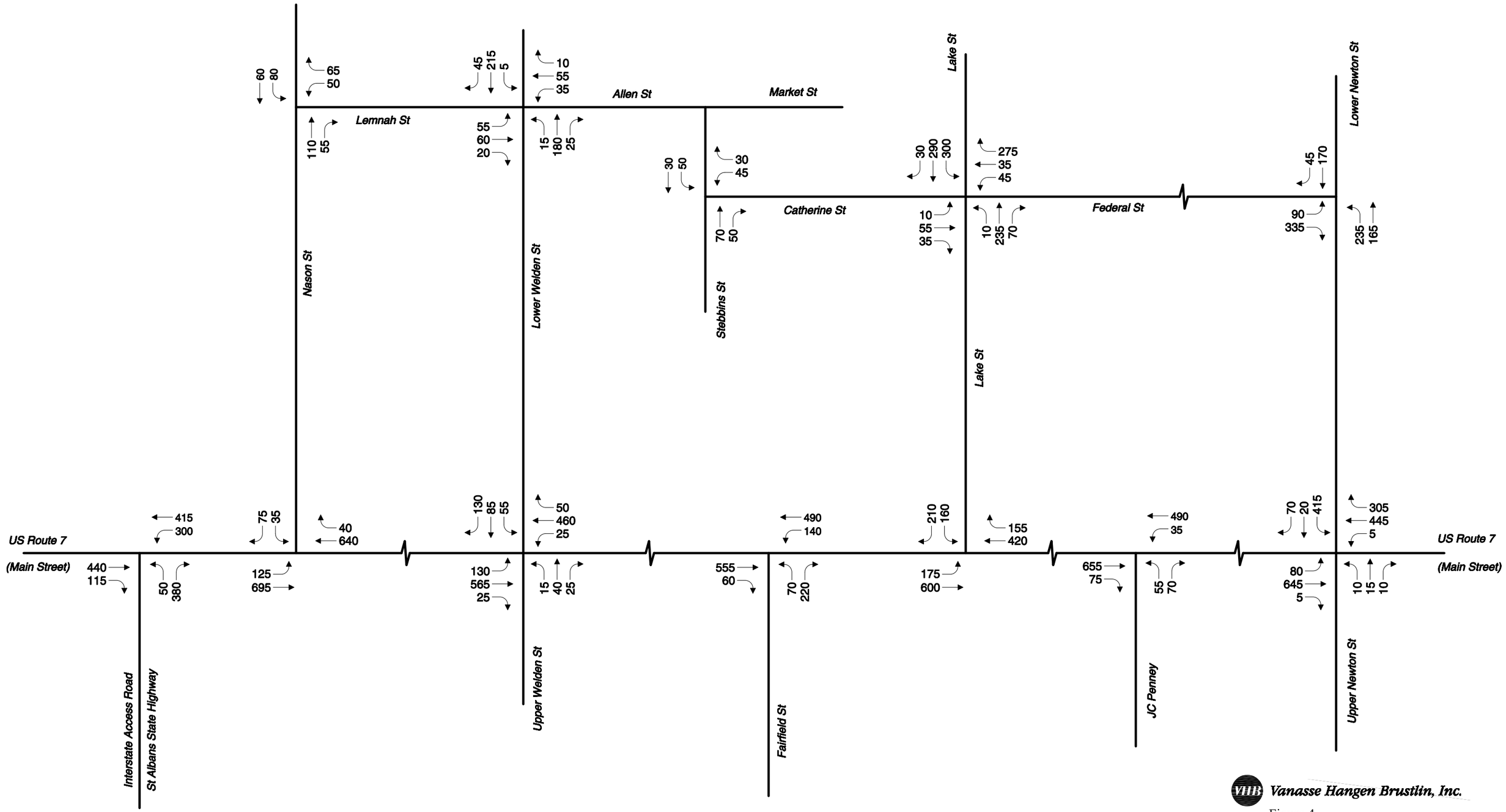

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Figure 4

2010 Weekday Peak Hour Volumes
No-Action PM Peak Hour
Federal Street Corridor

Not to Scale

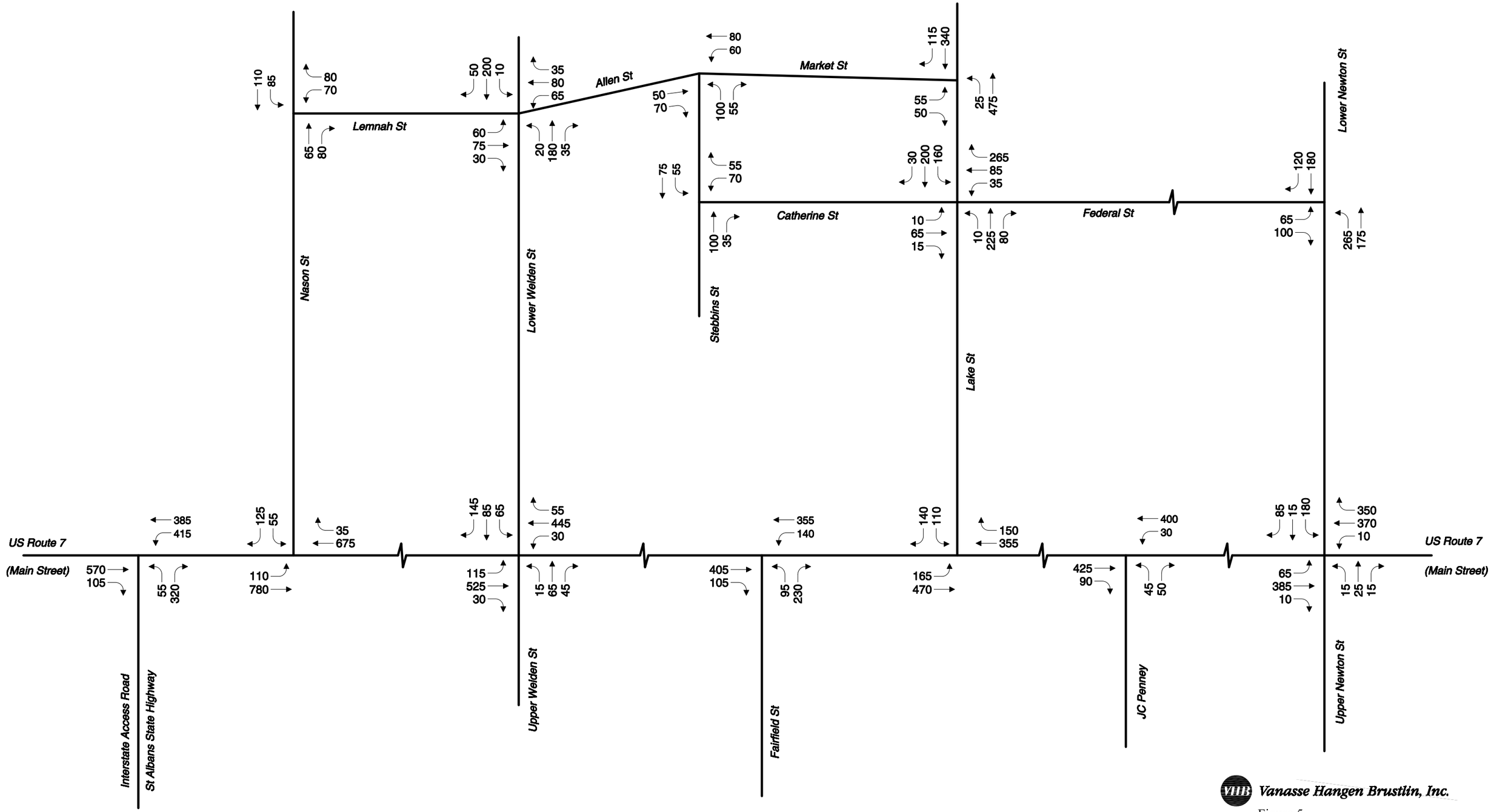

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Figure 5

2030 Weekday Peak Hour Volumes
No-Action AM Peak Hour
Federal Street Corridor

Not to Scale

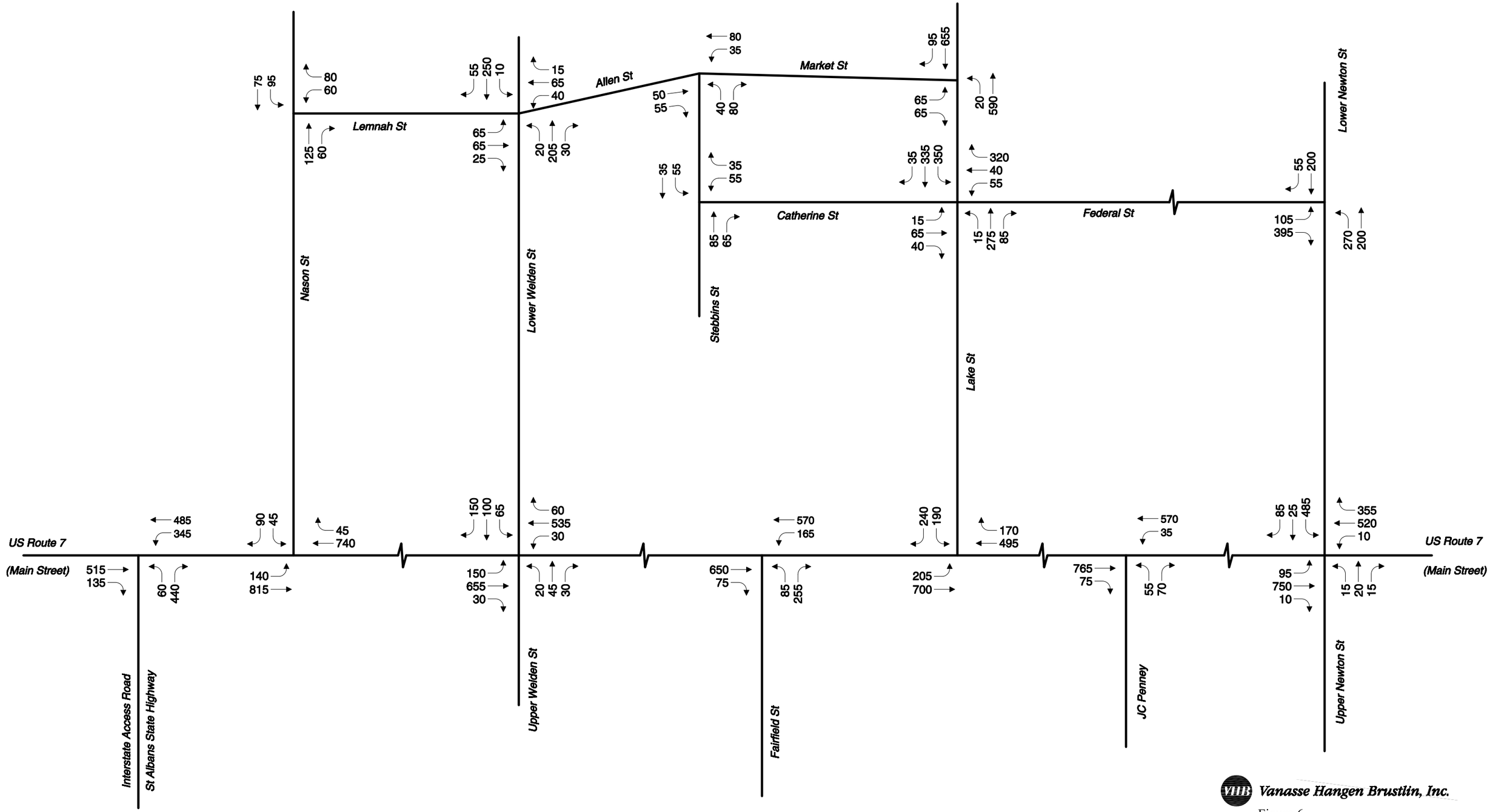

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Figure 6

2030 Weekday Peak Hour Volumes
No-Action PM Peak Hour
Federal Street Corridor

Not to Scale

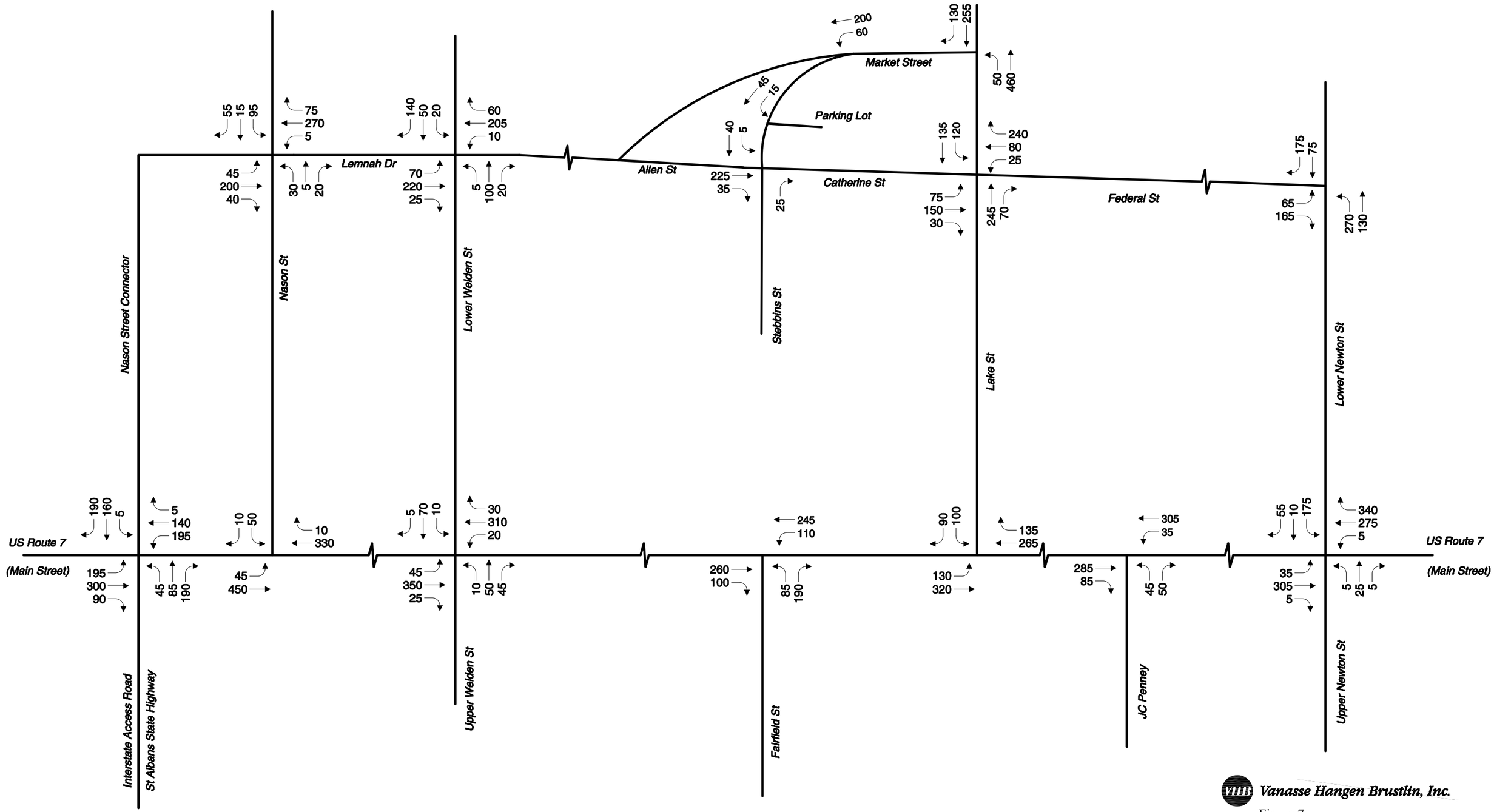

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Figure 7

2010 Weekday Peak Hour Volumes
Proposed Action AM Peak Hour
Federal Street Corridor

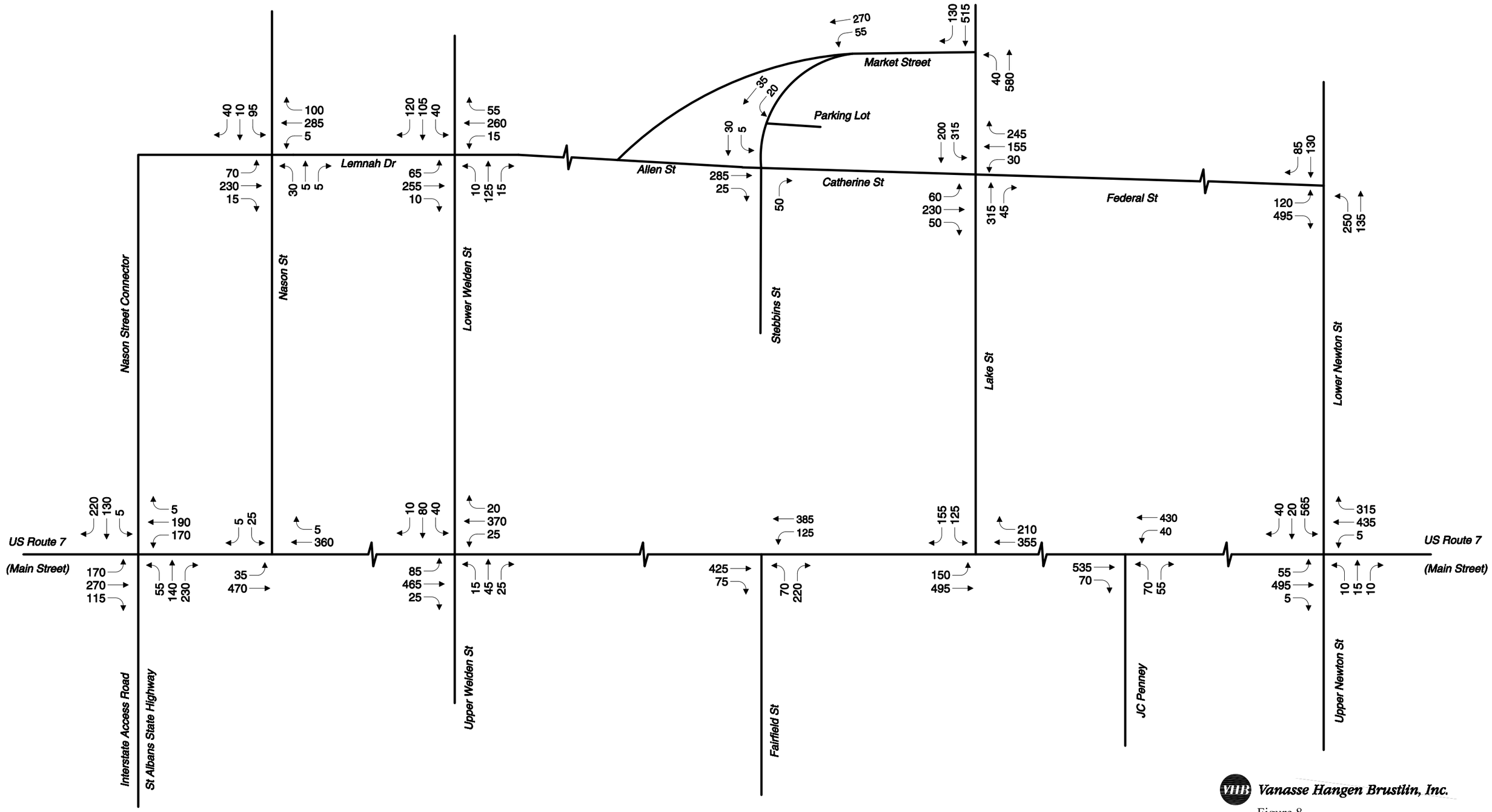

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Figure 8

2010 Weekday Peak Hour Volumes
Proposed Action PM Peak Hour
Federal Street Corridor

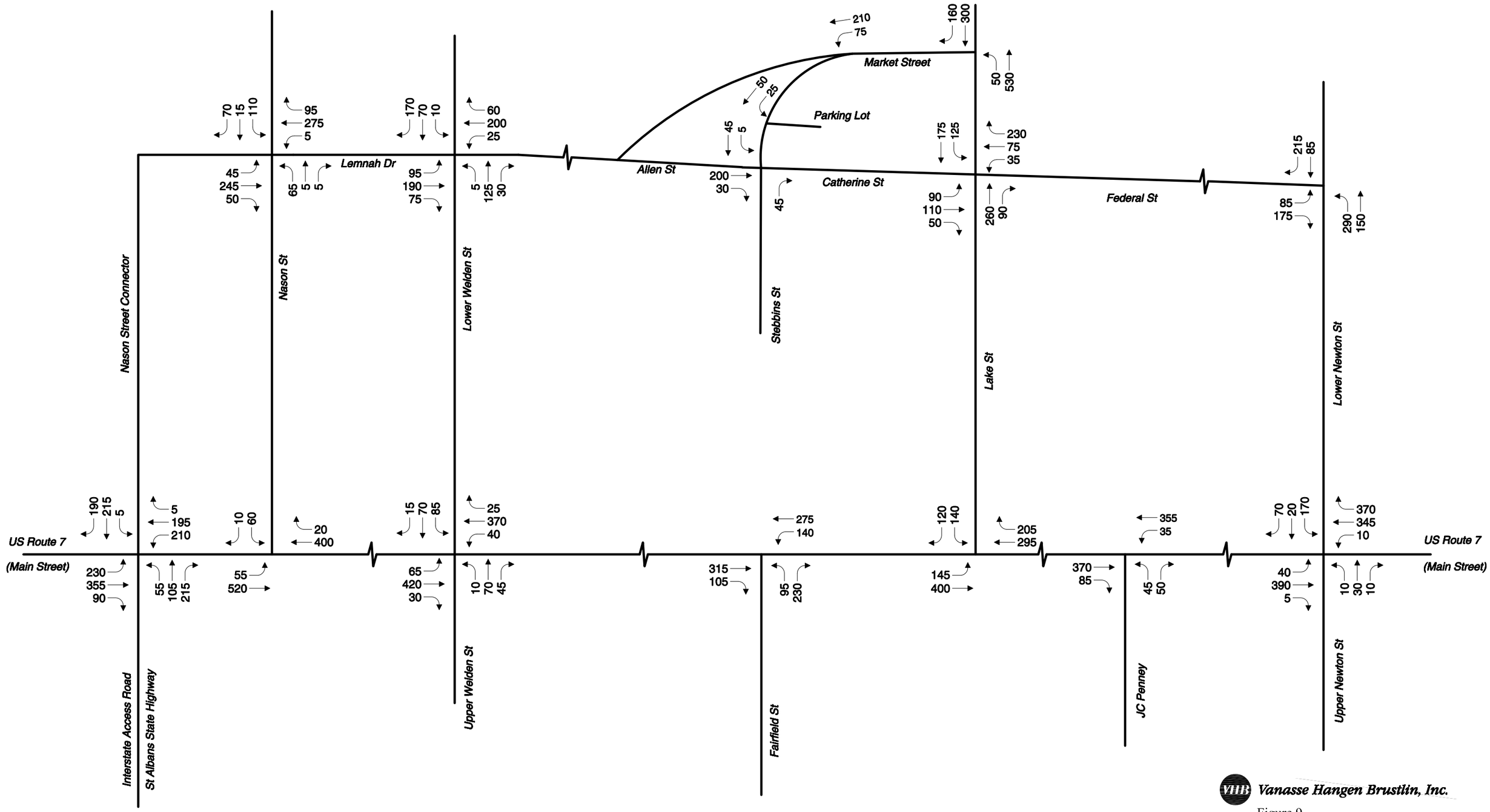

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Figure 9

2030 Weekday Peak Hour Volumes
Proposed Action AM Peak Hour
Federal Street Corridor

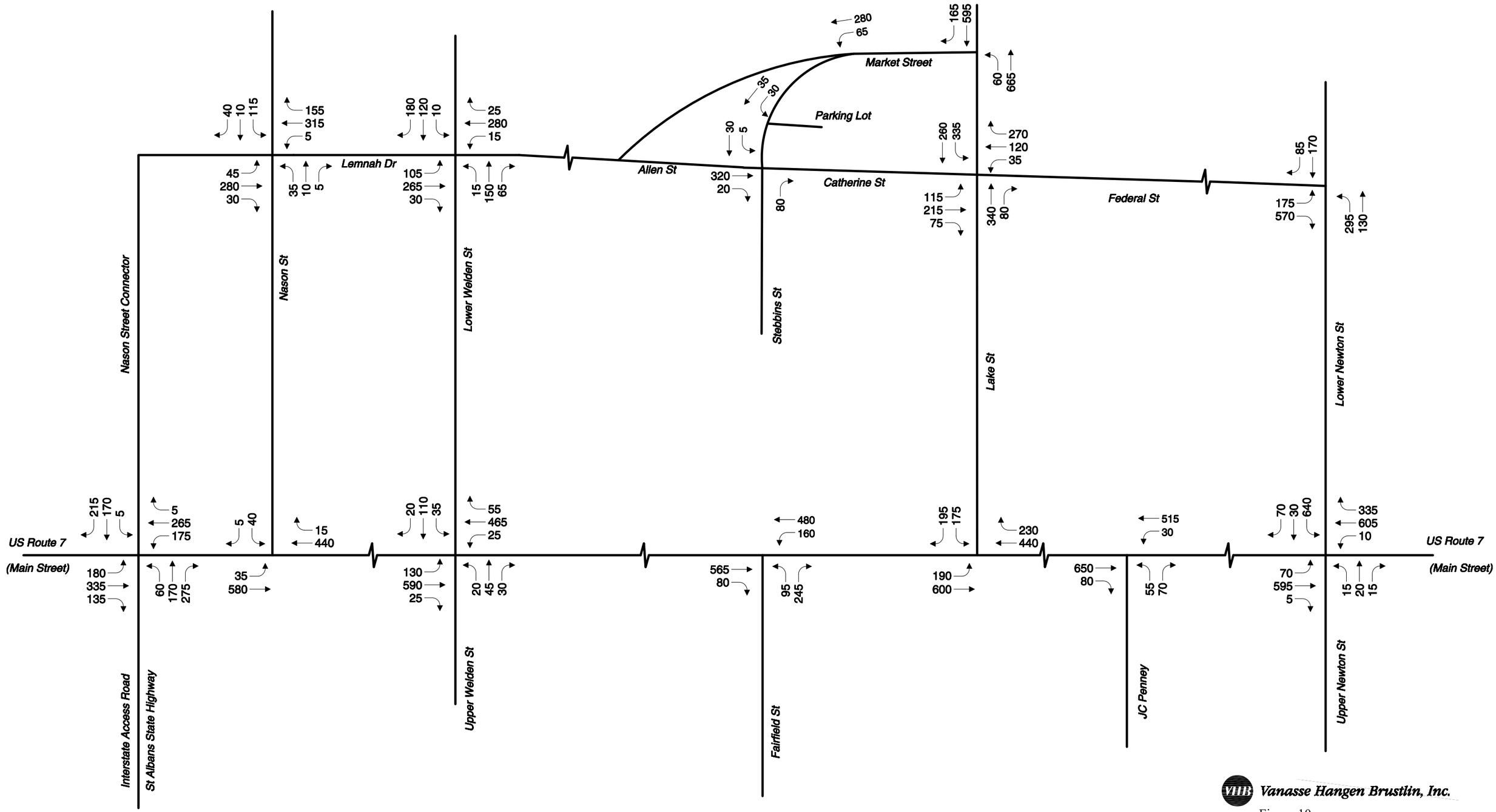

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Figure 10

2030 Weekday Peak Hour Volumes
Proposed Action PM Peak Hour
Federal Street Corridor

Appendix

- Turning Movement Count Data
- Design Hour Adjustment Calculations
- Crash Summaries
- Existing Conditions Intersection Capacity Analyses
- Growth Rate Calculations
- Traffic Signal Warrants
- 2010 No Action and Proposed Action Intersection Capacity Analyses
- 2030 No Action and Proposed Action Intersection Capacity Analyses

Turning Movement Count Data

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N/S: North Main Street (Route 7)
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City, State: St. Albans, VT
Client: VHB/ D. Finnigan

File Name : 102302 A
Site Code : TBA
Start Date : 9/2/2010
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	North Main Street (Route 7) From North			Upper Newton Street From East			North Main Street (Route 7) From South			Lower Newton Road (Route 38) From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
07:00 AM	55	77	1	0	4	3	1	65	10	13	1	17	247
07:15 AM	71	68	0	2	6	4	0	75	11	14	3	29	283
07:30 AM	76	80	0	1	3	2	3	70	7	20	1	32	295
07:45 AM	74	87	1	0	4	3	0	70	10	17	2	40	308
Total	276	312	2	3	17	12	4	280	38	64	7	118	1133
08:00 AM	52	52	0	1	7	2	0	84	16	14	2	40	270
08:15 AM	50	73	0	0	4	1	1	71	12	16	2	44	274
08:30 AM	62	58	2	1	2	0	0	76	5	14	3	38	261
08:45 AM	62	69	1	0	5	4	1	92	17	9	1	36	297
Total	226	252	3	2	18	7	2	323	50	53	8	158	1102
Grand Total	502	564	5	5	35	19	6	603	88	117	15	276	2235
Apprch %	46.9	52.7	0.5	8.5	59.3	32.2	0.9	86.5	12.6	28.7	3.7	67.6	
Total %	22.5	25.2	0.2	0.2	1.6	0.9	0.3	27	3.9	5.2	0.7	12.3	
Cars	477	539	5	5	35	19	6	570	78	109	14	264	2121
% Cars	95	95.6	100	100	100	100	100	94.5	88.6	93.2	93.3	95.7	94.9
Heavy Vehicles	25	25	0	0	0	0	0	33	10	8	1	12	114
% Heavy Vehicles	5	4.4	0	0	0	0	0	5.5	11.4	6.8	6.7	4.3	5.1

	North Main Street (Route 7) From North				Upper Newton Street From East				North Main Street (Route 7) From South				Lower Newton Road (Route 38) From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	71	68	0	139	**2**	6	**4**	**12**	0	75	11	86	14	**3**	29	46	283
07:30 AM	**76**	80	0	156	1	3	2	6	**3**	70	7	80	**20**	1	32	53	295
07:45 AM	74	**87**	**1**	**162**	0	4	3	7	0	70	10	80	17	2	**40**	**59**	**308**
08:00 AM	52	52	0	104	1	**7**	2	10	0	**84**	**16**	**100**	14	2	40	56	270
Total Volume	273	287	1	561	4	20	11	35	3	299	44	346	65	8	141	214	1156
% App. Total	48.7	51.2	0.2		11.4	57.1	31.4		0.9	86.4	12.7		30.4	3.7	65.9		
PHF	.898	.825	.250	.866	.500	.714	.688	.729	.250	.890	.688	.865	.813	.667	.881	.907	.938
Cars	260	276	1	537	4	20	11	35	3	285	39	327	61	8	138	207	1106
% Cars	95.2	96.2	100	95.7	100	100	100	100	100	95.3	88.6	94.5	93.8	100	97.9	96.7	95.7
Heavy Vehicles	13	11	0	24	0	0	0	0	0	14	5	19	4	0	3	7	50
% Heavy Vehicles	4.8	3.8	0	4.3	0	0	0	0	0	4.7	11.4	5.5	6.2	0	2.1	3.3	4.3

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Groups Printed- Cars

	North Main Street (Route 7) From North			Upper Newton Street From East			North Main Street (Route 7) From South			Lower Newton Road (Route 38) From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
07:00 AM	53	72	1	0	4	3	1	62	9	13	1	15	234
07:15 AM	67	66	0	2	6	4	0	73	8	14	3	29	272
07:30 AM	74	74	0	1	3	2	3	66	7	18	1	31	280
07:45 AM	72	86	1	0	4	3	0	66	8	15	2	40	297
Total	266	298	2	3	17	12	4	267	32	60	7	115	1083
08:00 AM	47	50	0	1	7	2	0	80	16	14	2	38	257
08:15 AM	45	71	0	0	4	1	1	64	11	14	1	42	254
08:30 AM	60	54	2	1	2	0	0	72	4	12	3	34	244
08:45 AM	59	66	1	0	5	4	1	87	15	9	1	35	283
Total	211	241	3	2	18	7	2	303	46	49	7	149	1038
Grand Total	477	539	5	5	35	19	6	570	78	109	14	264	2121
Apprch %	46.7	52.8	0.5	8.5	59.3	32.2	0.9	87.2	11.9	28.2	3.6	68.2	
Total %	22.5	25.4	0.2	0.2	1.7	0.9	0.3	26.9	3.7	5.1	0.7	12.4	

	North Main Street (Route 7) From North				Upper Newton Street From East				North Main Street (Route 7) From South				Lower Newton Road (Route 38) From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	67	66	0	133	**2**	6	**4**	**12**	0	73	8	81	14	**3**	29	46	272
07:30 AM	**74**	74	0	148	1	3	2	6	**3**	66	7	76	**18**	1	31	50	280
07:45 AM	72	**86**	**1**	**159**	0	4	3	7	0	66	8	74	15	2	**40**	**57**	**297**
08:00 AM	47	50	0	97	1	**7**	2	10	0	**80**	**16**	**96**	14	2	38	54	257
Total Volume	260	276	1	537	4	20	11	35	3	285	39	327	61	8	138	207	1106
% App. Total	48.4	51.4	0.2		11.4	57.1	31.4		0.9	87.2	11.9		29.5	3.9	66.7		
PHF	.878	.802	.250	.844	.500	.714	.688	.729	.250	.891	.609	.852	.847	.667	.863	.908	.931

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Groups Printed- Heavy Vehicles

	North Main Street (Route 7) From North			Upper Newton Street From East			North Main Street (Route 7) From South			Lower Newton Road (Route 38) From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
07:00 AM	2	5	0	0	0	0	0	3	1	0	0	2	13
07:15 AM	4	2	0	0	0	0	0	2	3	0	0	0	11
07:30 AM	2	6	0	0	0	0	0	4	0	2	0	1	15
07:45 AM	2	1	0	0	0	0	0	4	2	2	0	0	11
Total	10	14	0	0	0	0	0	13	6	4	0	3	50
08:00 AM	5	2	0	0	0	0	0	4	0	0	0	2	13
08:15 AM	5	2	0	0	0	0	0	7	1	2	1	2	20
08:30 AM	2	4	0	0	0	0	0	4	1	2	0	4	17
08:45 AM	3	3	0	0	0	0	0	5	2	0	0	1	14
Total	15	11	0	0	0	0	0	20	4	4	1	9	64
Grand Total	25	25	0	0	0	0	0	33	10	8	1	12	114
Apprch %	50	50	0	0	0	0	0	76.7	23.3	38.1	4.8	57.1	
Total %	21.9	21.9	0	0	0	0	0	28.9	8.8	7	0.9	10.5	

	North Main Street (Route 7) From North				Upper Newton Street From East				North Main Street (Route 7) From South				Lower Newton Road (Route 38) From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00 AM																	
08:00 AM	**5**	2	0	**7**	0	0	0	0	0	4	0	4	0	0	2	2	13
08:15 AM	5	2	0	7	0	0	0	0	0	**7**	1	**8**	**2**	**1**	2	5	**20**
08:30 AM	2	**4**	0	6	0	0	0	0	0	4	1	5	2	0	**4**	**6**	17
08:45 AM	3	3	0	6	0	0	0	0	0	5	**2**	7	0	0	1	1	14
Total Volume	15	11	0	26	0	0	0	0	0	20	4	24	4	1	9	14	64
% App. Total	57.7	42.3	0		0	0	0		0	83.3	16.7		28.6	7.1	64.3		
PHF	.750	.688	.000	.929	.000	.000	.000	.000	.000	.714	.500	.750	.500	.250	.563	.583	.800

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Page No : 1

Groups Printed- Peds and Bicycles

	North Main Street (Route 7) From North				Upper Newton Street From East				North Main Street (Route 7) From South				Lower Newton Road (Route 38) From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	3
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Total	1	1	0	0	0	0	0	1	0	0	0	1	0	0	1	0	5
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	1	4
08:30 AM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
08:45 AM	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Total	1	1	0	0	0	0	0	1	0	0	0	3	0	0	0	1	7
Grand Total	2	2	0	0	0	0	0	2	0	0	0	4	0	0	1	1	12
Apprch %	50	50	0	0	0	0	0	100	0	0	0	100	0	0	50	50	
Total %	16.7	16.7	0	0	0	0	0	16.7	0	0	0	33.3	0	0	8.3	8.3	

	North Main Street (Route 7) From North					Upper Newton Street From East					North Main Street (Route 7) From South					Lower Newton Road (Route 38) From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	**3**	**3**	0	0	0	**1**	**1**	**4**
08:30 AM	0	0	0	0	0	0	0	0	**1**	**1**	0	0	0	0	0	0	0	0	0	0	1
08:45 AM	**1**	**1**	0	0	**2**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Total Volume	1	1	0	0	2	0	0	0	1	1	0	0	0	3	3	0	0	0	1	1	7
% App. Total	50	50	0	0		0	0	0	100		0	0	0	100		0	0	0	100		
PHF	.250	.250	.000	.000	.250	.000	.000	.000	.250	.250	.000	.000	.000	.250	.250	.000	.000	.000	.250	.250	.438

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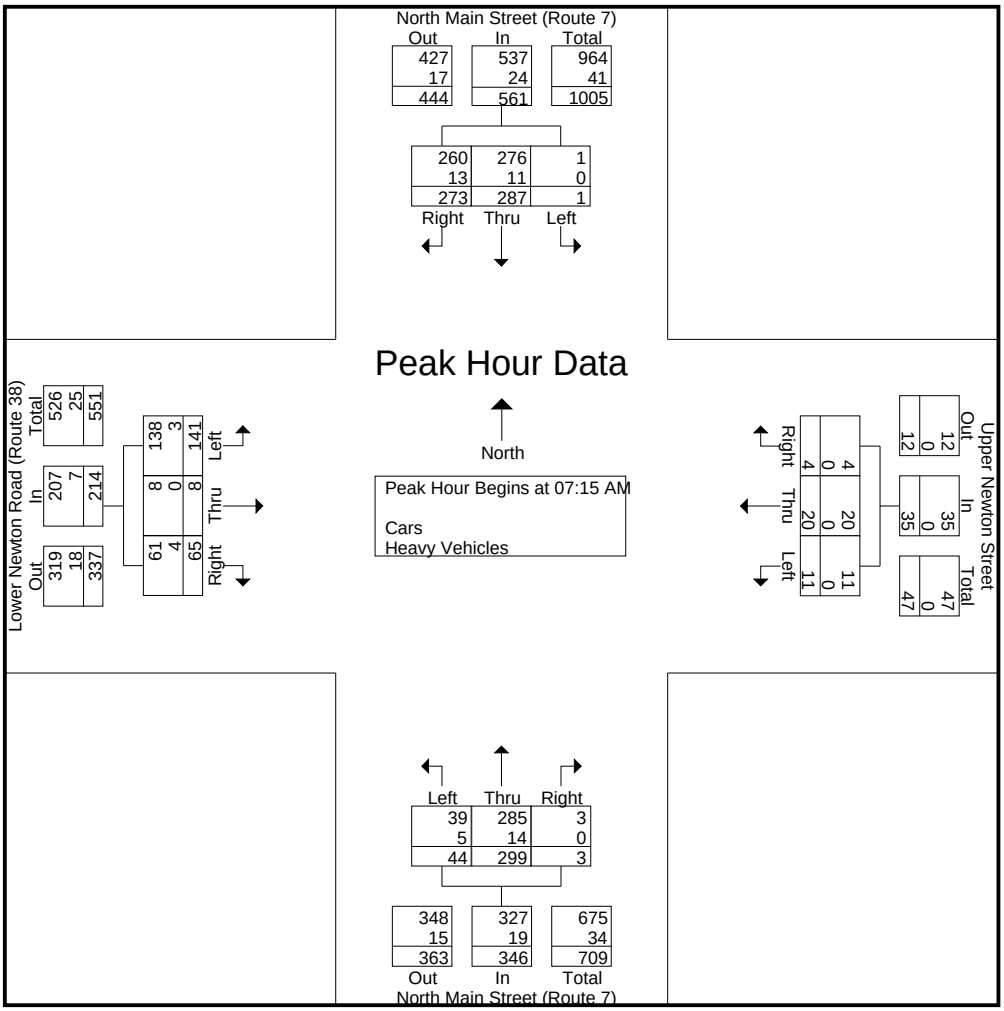
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	71	68	0	139	**2**	6	**4**	**12**	0	75	11	86	14	**3**	29	46	283
07:30 AM	**76**	80	0	156	1	3	2	6	**3**	70	7	80	**20**	1	32	53	295
07:45 AM	74	**87**	**1**	**162**	0	4	3	7	0	70	10	80	17	2	**40**	**59**	**308**
08:00 AM	52	52	0	104	1	**7**	2	10	0	**84**	**16**	**100**	14	2	40	56	270
Total Volume	273	287	1	561	4	20	11	35	3	299	44	346	65	8	141	214	1156
% App. Total	48.7	51.2	0.2		11.4	57.1	31.4		0.9	86.4	12.7		30.4	3.7	65.9		
PHF	.898	.825	.250	.866	.500	.714	.688	.729	.250	.890	.688	.865	.813	.667	.881	.907	.938
Cars	260	276	1	537	4	20	11	35	3	285	39	327	61	8	138	207	1106
% Cars	95.2	96.2	100	95.7	100	100	100	100	100	95.3	88.6	94.5	93.8	100	97.9	96.7	95.7
Heavy Vehicles	13	11	0	24	0	0	0	0	0	14	5	19	4	0	3	7	50
% Heavy Vehicles	4.8	3.8	0	4.3	0	0	0	0	0	4.7	11.4	5.5	6.2	0	2.1	3.3	4.3



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Groups Printed- Cars - Heavy Vehicles

	North Main Street (Route 7) From North			Upper Newton Street From East			North Main Street (Route 7) From South			Lower Newton Road (Route 38) From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
04:00 PM	62	79	1	1	3	4	1	140	28	10	1	103	433
04:15 PM	67	113	1	2	4	4	1	158	19	15	3	92	479
04:30 PM	69	98	0	3	6	1	0	138	18	19	4	90	446
04:45 PM	72	93	1	2	2	4	3	135	15	19	5	102	453
Total	270	383	3	8	15	13	5	571	80	63	13	387	1811
05:00 PM	72	103	2	2	2	2	0	162	23	13	5	98	484
05:15 PM	52	99	0	2	5	6	2	146	17	17	4	83	433
05:30 PM	50	99	0	0	3	3	1	120	13	15	3	74	381
05:45 PM	59	84	1	1	5	3	1	117	7	10	3	36	327
Total	233	385	3	5	15	14	4	545	60	55	15	291	1625
Grand Total	503	768	6	13	30	27	9	1116	140	118	28	678	3436
Apprch %	39.4	60.1	0.5	18.6	42.9	38.6	0.7	88.2	11.1	14.3	3.4	82.3	
Total %	14.6	22.4	0.2	0.4	0.9	0.8	0.3	32.5	4.1	3.4	0.8	19.7	
Cars	487	756	6	12	29	27	9	1096	137	114	28	667	3368
% Cars	96.8	98.4	100	92.3	96.7	100	100	98.2	97.9	96.6	100	98.4	98
Heavy Vehicles	16	12	0	1	1	0	0	20	3	4	0	11	68
% Heavy Vehicles	3.2	1.6	0	7.7	3.3	0	0	1.8	2.1	3.4	0	1.6	2

	North Main Street (Route 7) From North				Upper Newton Street From East				North Main Street (Route 7) From South				Lower Newton Road (Route 38) From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:15 PM																	
04:15 PM	67	**113**	1	**181**	2	4	**4**	**10**	1	158	19	178	15	3	92	110	479
04:30 PM	69	98	0	167	**3**	**6**	1	10	0	138	18	156	**19**	4	90	113	446
04:45 PM	**72**	93	1	166	2	2	4	8	**3**	135	15	153	19	**5**	**102**	**126**	453
05:00 PM	72	103	**2**	177	2	2	2	6	0	**162**	**23**	**185**	13	5	98	116	**484**
Total Volume	280	407	4	691	9	14	11	34	4	593	75	672	66	17	382	465	1862
% App. Total	40.5	58.9	0.6		26.5	41.2	32.4		0.6	88.2	11.2		14.2	3.7	82.2		
PHF	.972	.900	.500	.954	.750	.583	.688	.850	.333	.915	.815	.908	.868	.850	.936	.923	.962
Cars	271	401	4	676	8	14	11	33	4	581	75	660	64	17	374	455	1824
% Cars	96.8	98.5	100	97.8	88.9	100	100	97.1	100	98.0	100	98.2	97.0	100	97.9	97.8	98.0
Heavy Vehicles	9	6	0	15	1	0	0	1	0	12	0	12	2	0	8	10	38
% Heavy Vehicles	3.2	1.5	0	2.2	11.1	0	0	2.9	0	2.0	0	1.8	3.0	0	2.1	2.2	2.0

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N/S: North Main Street (Route 7)
E/W: Upper Newton St/Lower Newton Rd
City, State: St. Albans, VT
Client: VHB/ D. Finnigan

File Name : 102302 AA
Site Code : TBA
Start Date : 9/1/2010
Page No : 1

Groups Printed- Cars

	North Main Street (Route 7) From North			Upper Newton Street From East			North Main Street (Route 7) From South			Lower Newton Road (Route 38) From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
04:00 PM	60	76	1	1	3	4	1	140	25	9	1	103	424
04:15 PM	66	113	1	2	4	4	1	151	19	15	3	91	470
04:30 PM	66	95	0	3	6	1	0	136	18	19	4	85	433
04:45 PM	70	92	1	1	2	4	3	134	15	17	5	101	445
Total	262	376	3	7	15	13	5	561	77	60	13	380	1772
05:00 PM	69	101	2	2	2	2	0	160	23	13	5	97	476
05:15 PM	50	99	0	2	5	6	2	145	17	16	4	82	428
05:30 PM	48	98	0	0	3	3	1	117	13	15	3	74	375
05:45 PM	58	82	1	1	4	3	1	113	7	10	3	34	317
Total	225	380	3	5	14	14	4	535	60	54	15	287	1596
Grand Total	487	756	6	12	29	27	9	1096	137	114	28	667	3368
Apprch %	39	60.5	0.5	17.6	42.6	39.7	0.7	88.2	11	14.1	3.5	82.4	
Total %	14.5	22.4	0.2	0.4	0.9	0.8	0.3	32.5	4.1	3.4	0.8	19.8	

	North Main Street (Route 7) From North				Upper Newton Street From East				North Main Street (Route 7) From South				Lower Newton Road (Route 38) From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:15 PM																	
04:15 PM	66	**113**	1	**180**	2	4	**4**	**10**	1	151	19	171	15	3	91	109	470
04:30 PM	66	95	0	161	**3**	**6**	1	10	0	136	18	154	**19**	4	85	108	433
04:45 PM	**70**	92	1	163	1	2	4	7	**3**	134	15	152	17	**5**	**101**	**123**	445
05:00 PM	69	101	**2**	172	2	2	2	6	0	**160**	**23**	**183**	13	5	97	115	**476**
Total Volume	271	401	4	676	8	14	11	33	4	581	75	660	64	17	374	455	1824
% App. Total	40.1	59.3	0.6		24.2	42.4	33.3		0.6	88	11.4		14.1	3.7	82.2		
PHF	.968	.887	.500	.939	.667	.583	.688	.825	.333	.908	.815	.902	.842	.850	.926	.925	.958

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E/W: Upper Newton St/Lower Newton Rd
City, State: St. Albans, VT
Client: VHB/ D. Finnigan

File Name : 102302 AA
Site Code : TBA
Start Date : 9/1/2010
Page No : 1

Groups Printed- Heavy Vehicles

	North Main Street (Route 7) From North			Upper Newton Street From East			North Main Street (Route 7) From South			Lower Newton Road (Route 38) From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
04:00 PM	2	3	0	0	0	0	0	0	3	1	0	0	9
04:15 PM	1	0	0	0	0	0	0	7	0	0	0	1	9
04:30 PM	3	3	0	0	0	0	0	2	0	0	0	5	13
04:45 PM	2	1	0	1	0	0	0	1	0	2	0	1	8
Total	8	7	0	1	0	0	0	10	3	3	0	7	39
05:00 PM	3	2	0	0	0	0	0	2	0	0	0	1	8
05:15 PM	2	0	0	0	0	0	0	1	0	1	0	1	5
05:30 PM	2	1	0	0	0	0	0	3	0	0	0	0	6
05:45 PM	1	2	0	0	1	0	0	4	0	0	0	2	10
Total	8	5	0	0	1	0	0	10	0	1	0	4	29
Grand Total	16	12	0	1	1	0	0	20	3	4	0	11	68
Apprch %	57.1	42.9	0	50	50	0	0	87	13	26.7	0	73.3	
Total %	23.5	17.6	0	1.5	1.5	0	0	29.4	4.4	5.9	0	16.2	

	North Main Street (Route 7) From North				Upper Newton Street From East				North Main Street (Route 7) From South				Lower Newton Road (Route 38) From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	2	**3**	0	5	0	0	0	0	0	0	**3**	3	1	0	0	1	9
04:15 PM	1	0	0	1	0	0	0	0	0	**7**	0	**7**	0	0	1	1	9
04:30 PM	**3**	3	0	**6**	0	0	0	0	0	2	0	2	0	0	**5**	**5**	**13**
04:45 PM	2	1	0	3	**1**	0	0	**1**	0	1	0	1	**2**	0	1	3	8
Total Volume	8	7	0	15	1	0	0	1	0	10	3	13	3	0	7	10	39
% App. Total	53.3	46.7	0		100	0	0		0	76.9	23.1		30	0	70		
PHF	.667	.583	.000	.625	.250	.000	.000	.250	.000	.357	.250	.464	.375	.000	.350	.500	.750

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City, State: St. Albans, VT
Client: VHB/ D. Finnigan

File Name : 102302 AA
Site Code : TBA
Start Date : 9/1/2010
Page No : 1

Groups Printed- Peds and Bicycles

	North Main Street (Route 7) From North				Upper Newton Street From East				North Main Street (Route 7) From South				Lower Newton Road (Route 38) From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	1	1	0	0	0	0	0	0	0	0	0	6	0	0	0	0	8
04:45 PM	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2
Total	1	2	0	0	0	0	0	1	0	0	0	6	0	0	0	3	13
05:00 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
Grand Total	1	2	0	0	0	0	0	1	0	1	0	6	0	0	0	3	14
Apprch %	33.3	66.7	0	0	0	0	0	100	0	14.3	0	85.7	0	0	0	100	
Total %	7.1	14.3	0	0	0	0	0	7.1	0	7.1	0	42.9	0	0	0	21.4	

	North Main Street (Route 7) From North					Upper Newton Street From East					North Main Street (Route 7) From South					Lower Newton Road (Route 38) From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**3**	**3**	3
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	**1**	**1**	0	0	**2**	0	0	0	0	0	0	0	0	**6**	**6**	0	0	0	0	0	**8**
04:45 PM	0	1	0	0	1	0	0	0	**1**	**1**	0	0	0	0	0	0	0	0	0	0	2
Total Volume	1	2	0	0	3	0	0	0	1	1	0	0	0	6	6	0	0	0	3	3	13
% App. Total	33.3	66.7	0	0		0	0	0	100		0	0	0	100		0	0	0	100		
PHF	.250	.500	.000	.000	.375	.000	.000	.000	.250	.250	.000	.000	.000	.250	.250	.000	.000	.000	.250	.250	.406

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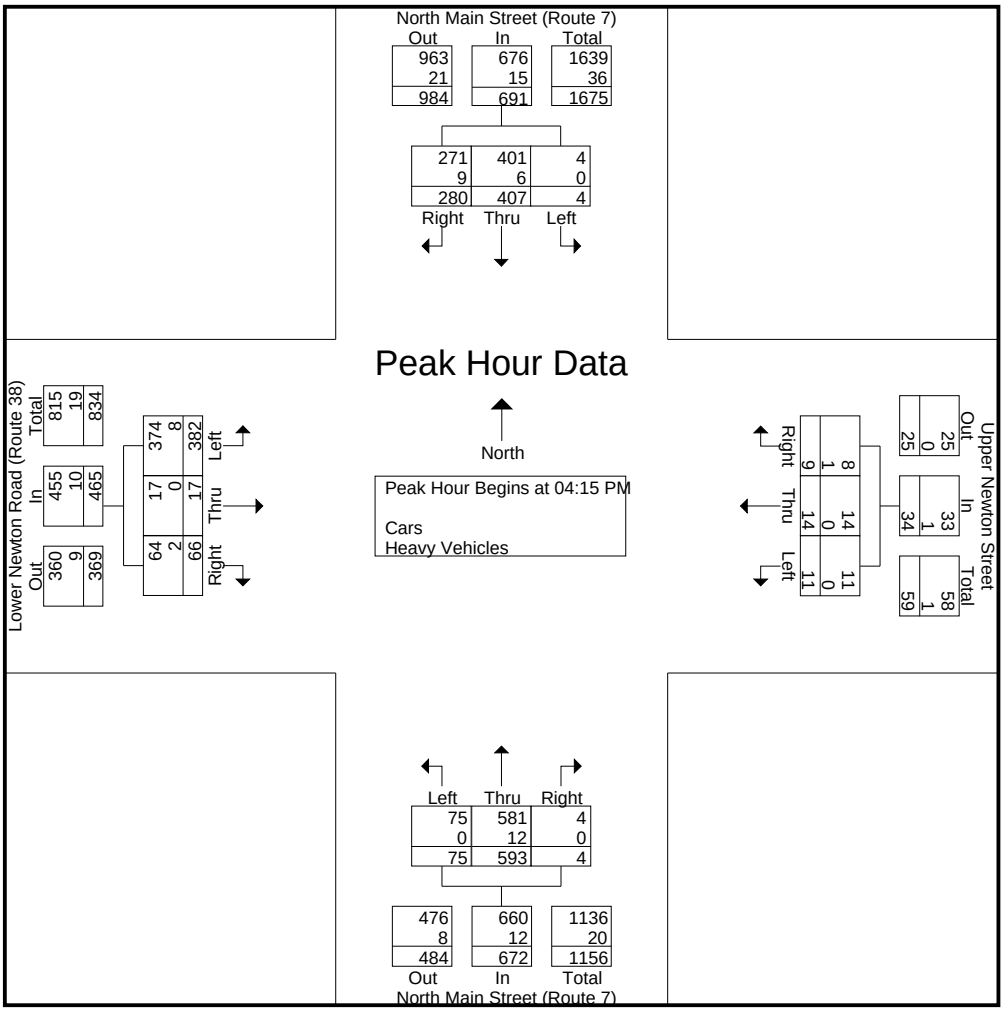
E/W: Upper Newton St/Lower Newton Rd
City, State: St. Albans, VT
Client: VHB/ D. Finnigan

File Name : 102302 AA
Site Code : TBA
Start Date : 9/1/2010
Page No : 1

	North Main Street (Route 7) From North				Upper Newton Street From East				North Main Street (Route 7) From South				Lower Newton Road (Route 38) From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:15 PM																	
04:15 PM	67	**113**	1	**181**	2	4	**4**	**10**	1	158	19	178	15	3	92	110	479
04:30 PM	69	98	0	167	**3**	**6**	1	10	0	138	18	156	**19**	4	90	113	446
04:45 PM	**72**	93	1	166	2	2	4	8	**3**	135	15	153	19	**5**	**102**	**126**	453
05:00 PM	72	103	**2**	177	2	2	2	6	0	**162**	**23**	**185**	13	5	98	116	**484**
Total Volume	280	407	4	691	9	14	11	34	4	593	75	672	66	17	382	465	1862
% App. Total	40.5	58.9	0.6		26.5	41.2	32.4		0.6	88.2	11.2		14.2	3.7	82.2		
PHF	.972	.900	.500	.954	.750	.583	.688	.850	.333	.915	.815	.908	.868	.850	.936	.923	.962
Cars	271	401	4	676	8	14	11	33	4	581	75	660	64	17	374	455	1824
% Cars	96.8	98.5	100	97.8	88.9	100	100	97.1	100	98.0	100	98.2	97.0	100	97.9	97.8	98.0
Heavy Vehicles	9	6	0	15	1	0	0	1	0	12	0	12	2	0	8	10	38
% Heavy Vehicles	3.2	1.5	0	2.2	11.1	0	0	2.9	0	2.0	0	1.8	3.0	0	2.1	2.2	2.0



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N/S: Solo Service Bay/ Federal Street
E/W: Lower Newton Road (Route 38)
City, State: St. Albans, VT
Client: VHB/ D. Finnigan

File Name : 102302 B
Site Code : TBA
Start Date : 9/2/2010
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Solo Service Bay Driveway From North			Lower Newton Road (Route 38) From East			Federal Street From South			Lower Newton Road (Route 38) From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
07:00 AM	0	0	0	0	23	44	14	0	14	18	19	0	132
07:15 AM	0	0	0	0	30	51	15	0	13	21	30	0	160
07:30 AM	0	0	0	0	27	58	16	0	12	25	40	0	178
07:45 AM	0	0	0	0	27	60	21	0	15	26	33	0	182
Total	0	0	0	0	107	213	66	0	54	90	122	0	652
08:00 AM	0	0	0	0	35	38	24	0	6	20	35	0	158
08:15 AM	0	0	0	0	23	44	28	0	12	13	23	0	143
08:30 AM	0	0	0	0	24	47	26	0	9	8	24	0	138
08:45 AM	0	0	0	0	25	53	28	0	5	12	15	0	138
Total	0	0	0	0	107	182	106	0	32	53	97	0	577
Grand Total	0	0	0	0	214	395	172	0	86	143	219	0	1229
Apprch %	0	0	0	0	35.1	64.9	66.7	0	33.3	39.5	60.5	0	
Total %	0	0	0	0	17.4	32.1	14	0	7	11.6	17.8	0	
Cars	0	0	0	0	194	377	166	0	83	136	199	0	1155
% Cars	0	0	0	0	90.7	95.4	96.5	0	96.5	95.1	90.9	0	94
Heavy Vehicles	0	0	0	0	20	18	6	0	3	7	20	0	74
% Heavy Vehicles	0	0	0	0	9.3	4.6	3.5	0	3.5	4.9	9.1	0	6

	Solo Service Bay Driveway From North				Lower Newton Road (Route 38) From East				Federal Street From South				Lower Newton Road (Route 38) From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	0	0	0	0	0	30	51	81	15	0	13	28	21	30	0	51	160
07:30 AM	0	0	0	0	0	27	58	85	16	0	12	28	25	**40**	0	**65**	178
07:45 AM	0	0	0	0	0	27	**60**	**87**	21	0	**15**	**36**	**26**	33	0	59	**182**
08:00 AM	0	0	0	0	0	**35**	38	73	**24**	0	6	30	20	35	0	55	158
Total Volume	0	0	0	0	0	119	207	326	76	0	46	122	92	138	0	230	678
% App. Total	0	0	0		0	36.5	63.5		62.3	0	37.7		40	60	0		
PHF	.000	.000	.000	.000	.000	.850	.863	.937	.792	.000	.767	.847	.885	.863	.000	.885	.931
Cars	0	0	0	0	0	109	199	308	73	0	45	118	87	128	0	215	641
% Cars	0	0	0	0	0	91.6	96.1	94.5	96.1	0	97.8	96.7	94.6	92.8	0	93.5	94.5
Heavy Vehicles	0	0	0	0	0	10	8	18	3	0	1	4	5	10	0	15	37
% Heavy Vehicles	0	0	0	0	0	8.4	3.9	5.5	3.9	0	2.2	3.3	5.4	7.2	0	6.5	5.5

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Client: VHB/ D. Finnigan

File Name : 102302 B
Site Code : TBA
Start Date : 9/2/2010
Page No : 1

Groups Printed- Cars

	Solo Service Bay Driveway From North			Lower Newton Road (Route 38) From East			Federal Street From South			Lower Newton Road (Route 38) From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
07:00 AM	0	0	0	0	20	43	13	0	14	18	17	0	125
07:15 AM	0	0	0	0	28	46	14	0	13	21	28	0	150
07:30 AM	0	0	0	0	26	57	16	0	12	23	37	0	171
07:45 AM	0	0	0	0	25	58	20	0	14	24	31	0	172
Total	0	0	0	0	99	204	63	0	53	86	113	0	618
08:00 AM	0	0	0	0	30	38	23	0	6	19	32	0	148
08:15 AM	0	0	0	0	20	39	28	0	11	12	20	0	130
08:30 AM	0	0	0	0	21	44	24	0	9	8	22	0	128
08:45 AM	0	0	0	0	24	52	28	0	4	11	12	0	131
Total	0	0	0	0	95	173	103	0	30	50	86	0	537
Grand Total	0	0	0	0	194	377	166	0	83	136	199	0	1155
Apprch %	0	0	0	0	34	66	66.7	0	33.3	40.6	59.4	0	
Total %	0	0	0	0	16.8	32.6	14.4	0	7.2	11.8	17.2	0	

	Solo Service Bay Driveway From North				Lower Newton Road (Route 38) From East				Federal Street From South				Lower Newton Road (Route 38) From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	0	0	0	0	0	28	46	74	14	0	13	27	21	28	0	49	150
07:30 AM	0	0	0	0	0	26	57	**83**	16	0	12	28	23	**37**	0	**60**	171
07:45 AM	0	0	0	0	0	25	**58**	83	20	0	**14**	**34**	**24**	31	0	55	**172**
08:00 AM	0	0	0	0	0	**30**	38	68	**23**	0	6	29	19	32	0	51	148
Total Volume	0	0	0	0	0	109	199	308	73	0	45	118	87	128	0	215	641
% App. Total	0	0	0		0	35.4	64.6		61.9	0	38.1		40.5	59.5	0		
PHF	.000	.000	.000	.000	.000	.908	.858	.928	.793	.000	.804	.868	.906	.865	.000	.896	.932

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N/S: Solo Service Bay/ Federal Street
E/W: Lower Newton Road (Route 38)
City, State: St. Albans, VT
Client: VHB/ D. Finnigan

File Name : 102302 B
Site Code : TBA
Start Date : 9/2/2010
Page No : 1

Groups Printed- Heavy Vehicles

	Solo Service Bay Driveway From North			Lower Newton Road (Route 38) From East			Federal Street From South			Lower Newton Road (Route 38) From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
07:00 AM	0	0	0	0	3	1	1	0	0	0	2	0	7
07:15 AM	0	0	0	0	2	5	1	0	0	0	2	0	10
07:30 AM	0	0	0	0	1	1	0	0	0	2	3	0	7
07:45 AM	0	0	0	0	2	2	1	0	1	2	2	0	10
Total	0	0	0	0	8	9	3	0	1	4	9	0	34
08:00 AM	0	0	0	0	5	0	1	0	0	1	3	0	10
08:15 AM	0	0	0	0	3	5	0	0	1	1	3	0	13
08:30 AM	0	0	0	0	3	3	2	0	0	0	2	0	10
08:45 AM	0	0	0	0	1	1	0	0	1	1	3	0	7
Total	0	0	0	0	12	9	3	0	2	3	11	0	40
Grand Total	0	0	0	0	20	18	6	0	3	7	20	0	74
Apprch %	0	0	0	0	52.6	47.4	66.7	0	33.3	25.9	74.1	0	
Total %	0	0	0	0	27	24.3	8.1	0	4.1	9.5	27	0	

	Solo Service Bay Driveway From North				Lower Newton Road (Route 38) From East				Federal Street From South				Lower Newton Road (Route 38) From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:45 AM																	
07:45 AM	0	0	0	0	0	2	2	4	1	0	**1**	**2**	**2**	2	0	**4**	10
08:00 AM	0	0	0	0	0	**5**	0	5	1	0	0	1	1	**3**	0	4	10
08:15 AM	0	0	0	0	0	3	**5**	**8**	0	0	1	1	1	3	0	4	**13**
08:30 AM	0	0	0	0	0	3	3	6	**2**	0	0	2	0	2	0	2	10
Total Volume	0	0	0	0	0	13	10	23	4	0	2	6	4	10	0	14	43
% App. Total	0	0	0		0	56.5	43.5		66.7	0	33.3		28.6	71.4	0		
PHF	.000	.000	.000	.000	.000	.650	.500	.719	.500	.000	.500	.750	.500	.833	.000	.875	.827

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City, State: St. Albans, VT
Client: VHB/ D. Finnigan

File Name : 102302 B
Site Code : TBA
Start Date : 9/2/2010
Page No : 1

Groups Printed- Peds and Bicycles

	Solo Service Bay Driveway From North				Lower Newton Road (Route 38) From East				Federal Street From South				Lower Newton Road (Route 38) From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
07:15 AM	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	3
07:45 AM	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
Total	0	0	0	0	0	0	1	0	1	0	0	3	1	0	0	0	6
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	3
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	3
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	6
Grand Total	0	0	0	0	0	0	1	0	1	0	0	9	1	0	0	0	12
Apprch %	0	0	0	0	0	0	100	0	10	0	0	90	100	0	0	0	
Total %	0	0	0	0	0	0	8.3	0	8.3	0	0	75	8.3	0	0	0	

	Solo Service Bay Driveway From North					Lower Newton Road (Route 38) From East					Federal Street From South					Lower Newton Road (Route 38) From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	**3**	**3**	0	0	0	0	0	**3**
07:45 AM	0	0	0	0	0	0	0	0	0	0	**1**	0	0	0	1	0	0	0	0	0	1
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	0	0	0	0	3
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	0	0	0	0	3
Total Volume	0	0	0	0	0	0	0	0	0	0	1	0	0	9	10	0	0	0	0	0	10
% App. Total	0	0	0	0		0	0	0	0		10	0	0	90		0	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.250	.000	.000	.750	.833	.000	.000	.000	.000	.000	.833

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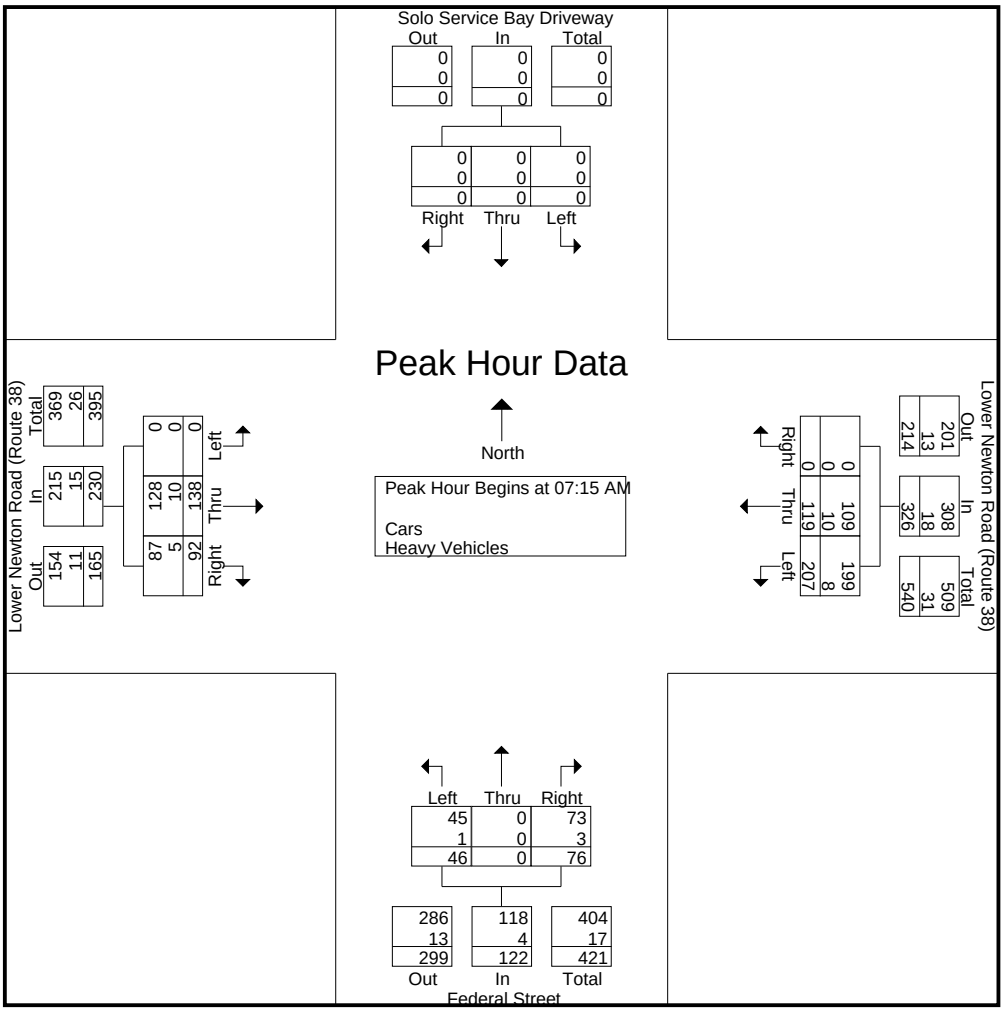
City, State: St. Albans, VT
Client: VHB/ D. Finnigan

File Name : 102302 B
Site Code : TBA
Start Date : 9/2/2010
Page No : 1

	Solo Service Bay Driveway From North				Lower Newton Road (Route 38) From East				Federal Street From South				Lower Newton Road (Route 38) From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	0	0	0	0	0	30	51	81	15	0	13	28	21	30	0	51	160
07:30 AM	0	0	0	0	0	27	58	85	16	0	12	28	25	**40**	0	**65**	178
07:45 AM	0	0	0	0	0	27	**60**	**87**	21	0	**15**	**36**	**26**	33	0	59	**182**
08:00 AM	0	0	0	0	0	**35**	38	73	**24**	0	6	30	20	35	0	55	158
Total Volume	0	0	0	0	0	119	207	326	76	0	46	122	92	138	0	230	678
% App. Total	0	0	0		0	36.5	63.5		62.3	0	37.7		40	60	0		
PHF	.000	.000	.000	.000	.000	.850	.863	.937	.792	.000	.767	.847	.885	.863	.000	.885	.931
Cars	0	0	0	0	0	109	199	308	73	0	45	118	87	128	0	215	641
% Cars	0	0	0	0	0	91.6	96.1	94.5	96.1	0	97.8	96.7	94.6	92.8	0	93.5	94.5
Heavy Vehicles	0	0	0	0	0	10	8	18	3	0	1	4	5	10	0	15	37
% Heavy Vehicles	0	0	0	0	0	8.4	3.9	5.5	3.9	0	2.2	3.3	5.4	7.2	0	6.5	5.5



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N/S: Solo Service Bay/ Federal Street
E/W: Lower Newton Road (Route 38)
City, State: St. Albans, VT
Client: VHB/ D. Finnigan

File Name : 102302 BB
Site Code : TBA
Start Date : 9/1/2010
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Solo Service Bay Driveway From North			Lower Newton Road (Route 38) From East			Federal Street From South			Lower Newton Road (Route 38) From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
04:00 PM	0	0	0	0	39	48	89	0	25	10	38	0	249
04:15 PM	0	0	0	0	39	51	60	0	19	12	37	0	218
04:30 PM	0	0	0	0	39	51	78	0	21	12	34	0	235
04:45 PM	0	0	0	0	28	57	80	0	19	7	40	0	231
Total	0	0	0	0	145	207	307	0	84	41	149	0	933
05:00 PM	0	0	0	0	32	63	85	0	14	15	29	1	239
05:15 PM	1	0	0	0	37	33	69	1	20	9	32	0	202
05:30 PM	0	0	0	0	26	38	57	0	20	7	31	0	179
05:45 PM	0	0	0	0	18	53	30	0	10	10	18	0	139
Total	1	0	0	0	113	187	241	1	64	41	110	1	759
Grand Total	1	0	0	0	258	394	548	1	148	82	259	1	1692
Apprch %	100	0	0	0	39.6	60.4	78.6	0.1	21.2	24	75.7	0.3	
Total %	0.1	0	0	0	15.2	23.3	32.4	0.1	8.7	4.8	15.3	0.1	
Cars	1	0	0	0	254	377	539	1	145	80	253	1	1651
% Cars	100	0	0	0	98.4	95.7	98.4	100	98	97.6	97.7	100	97.6
Heavy Vehicles	0	0	0	0	4	17	9	0	3	2	6	0	41
% Heavy Vehicles	0	0	0	0	1.6	4.3	1.6	0	2	2.4	2.3	0	2.4

	Solo Service Bay Driveway From North				Lower Newton Road (Route 38) From East				Federal Street From South				Lower Newton Road (Route 38) From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	0	0	0	0	0	**39**	48	87	**89**	0	**25**	**114**	10	38	0	48	**249**
04:15 PM	0	0	0	0	0	39	51	**90**	60	0	19	79	**12**	37	0	**49**	218
04:30 PM	0	0	0	0	0	39	51	90	78	0	21	99	12	34	0	46	235
04:45 PM	0	0	0	0	0	28	**57**	85	80	0	19	99	7	**40**	0	47	231
Total Volume	0	0	0	0	0	145	207	352	307	0	84	391	41	149	0	190	933
% App. Total	0	0	0		0	41.2	58.8		78.5	0	21.5		21.6	78.4	0		
PHF	.000	.000	.000	.000	.000	.929	.908	.978	.862	.000	.840	.857	.854	.931	.000	.969	.937
Cars	0	0	0	0	0	142	199	341	302	0	83	385	39	144	0	183	909
% Cars	0	0	0	0	0	97.9	96.1	96.9	98.4	0	98.8	98.5	95.1	96.6	0	96.3	97.4
Heavy Vehicles	0	0	0	0	0	3	8	11	5	0	1	6	2	5	0	7	24
% Heavy Vehicles	0	0	0	0	0	2.1	3.9	3.1	1.6	0	1.2	1.5	4.9	3.4	0	3.7	2.6

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Client: VHB/ D. Finnigan

File Name : 102302 BB
Site Code : TBA
Start Date : 9/1/2010
Page No : 1

Groups Printed- Cars

	Solo Service Bay Driveway From North			Lower Newton Road (Route 38) From East			Federal Street From South			Lower Newton Road (Route 38) From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
04:00 PM	0	0	0	0	37	46	89	0	25	9	37	0	243
04:15 PM	0	0	0	0	39	50	60	0	18	12	36	0	215
04:30 PM	0	0	0	0	38	49	74	0	21	11	33	0	226
04:45 PM	0	0	0	0	28	54	79	0	19	7	38	0	225
Total	0	0	0	0	142	199	302	0	83	39	144	0	909
05:00 PM	0	0	0	0	32	59	84	0	14	15	29	1	234
05:15 PM	1	0	0	0	37	31	68	1	18	9	31	0	196
05:30 PM	0	0	0	0	25	37	57	0	20	7	31	0	177
05:45 PM	0	0	0	0	18	51	28	0	10	10	18	0	135
Total	1	0	0	0	112	178	237	1	62	41	109	1	742
Grand Total	1	0	0	0	254	377	539	1	145	80	253	1	1651
Apprch %	100	0	0	0	40.3	59.7	78.7	0.1	21.2	24	75.7	0.3	
Total %	0.1	0	0	0	15.4	22.8	32.6	0.1	8.8	4.8	15.3	0.1	

	Solo Service Bay Driveway From North				Lower Newton Road (Route 38) From East				Federal Street From South				Lower Newton Road (Route 38) From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	0	0	0	0	0	37	46	83	**89**	0	**25**	**114**	9	37	0	46	**243**
04:15 PM	0	0	0	0	0	**39**	50	**89**	60	0	18	78	**12**	36	0	**48**	215
04:30 PM	0	0	0	0	0	38	49	87	74	0	21	95	11	33	0	44	226
04:45 PM	0	0	0	0	0	28	**54**	82	79	0	19	98	7	**38**	0	45	225
Total Volume	0	0	0	0	0	142	199	341	302	0	83	385	39	144	0	183	909
% App. Total	0	0	0		0	41.6	58.4		78.4	0	21.6		21.3	78.7	0		
PHF	.000	.000	.000	.000	.000	.910	.921	.958	.848	.000	.830	.844	.813	.947	.000	.953	.935

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File Name : 102302 BB
Site Code : TBA
Start Date : 9/1/2010
Page No : 1

Groups Printed- Heavy Vehicles

	Solo Service Bay Driveway From North			Lower Newton Road (Route 38) From East			Federal Street From South			Lower Newton Road (Route 38) From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
04:00 PM	0	0	0	0	2	2	0	0	0	1	1	0	6
04:15 PM	0	0	0	0	0	1	0	0	1	0	1	0	3
04:30 PM	0	0	0	0	1	2	4	0	0	1	1	0	9
04:45 PM	0	0	0	0	0	3	1	0	0	0	2	0	6
Total	0	0	0	0	3	8	5	0	1	2	5	0	24
05:00 PM	0	0	0	0	0	4	1	0	0	0	0	0	5
05:15 PM	0	0	0	0	0	2	1	0	2	0	1	0	6
05:30 PM	0	0	0	0	1	1	0	0	0	0	0	0	2
05:45 PM	0	0	0	0	0	2	2	0	0	0	0	0	4
Total	0	0	0	0	1	9	4	0	2	0	1	0	17
Grand Total	0	0	0	0	4	17	9	0	3	2	6	0	41
Apprch %	0	0	0	0	19	81	75	0	25	25	75	0	
Total %	0	0	0	0	9.8	41.5	22	0	7.3	4.9	14.6	0	

	Solo Service Bay Driveway From North				Lower Newton Road (Route 38) From East				Federal Street From South				Lower Newton Road (Route 38) From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	0	0	0	0	0	**1**	2	3	**4**	0	0	**4**	**1**	1	0	**2**	**9**
04:45 PM	0	0	0	0	0	0	3	3	1	0	0	1	0	**2**	0	2	6
05:00 PM	0	0	0	0	0	0	**4**	**4**	1	0	0	1	0	0	0	0	5
05:15 PM	0	0	0	0	0	0	2	2	1	0	**2**	3	0	1	0	1	6
Total Volume	0	0	0	0	0	1	11	12	7	0	2	9	1	4	0	5	26
% App. Total	0	0	0		0	8.3	91.7		77.8	0	22.2		20	80	0		
PHF	.000	.000	.000	.000	.000	.250	.688	.750	.438	.000	.250	.563	.250	.500	.000	.625	.722

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Page No : 1

Groups Printed- Peds and Bicycles

	Solo Service Bay Driveway From North				Lower Newton Road (Route 38) From East				Federal Street From South				Lower Newton Road (Route 38) From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
04:00 PM	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
04:30 PM	0	0	0	0	0	0	1	0	0	0	0	4	0	0	0	0	5
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	2	1	0	0	0	0	4	0	1	0	0	8
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	2	1	0	0	0	0	4	0	1	0	0	8
Apprch %	0	0	0	0	0	66.7	33.3	0	0	0	0	100	0	100	0	0	
Total %	0	0	0	0	0	25	12.5	0	0	0	0	50	0	12.5	0	0	

	Solo Service Bay Driveway From North					Lower Newton Road (Route 38) From East					Federal Street From South					Lower Newton Road (Route 38) From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	0	0	0	0	0	0	**2**	0	0	**2**	0	0	0	0	0	0	0	0	0	0	2
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0	0	**1**	1
04:30 PM	0	0	0	0	0	0	0	**1**	0	1	0	0	0	**4**	**4**	0	0	0	0	0	**5**
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	2	1	0	3	0	0	0	4	4	0	1	0	0	1	8
% App. Total	0	0	0	0		0	66.7	33.3	0		0	0	0	100		0	100	0	0		
PHF	.000	.000	.000	.000	.000	.000	.250	.250	.000	.375	.000	.000	.000	.250	.250	.000	.250	.000	.000	.250	.400

PRECISION DATA INDUSTRIES, LLC
P.O. Box 301 Berlin, MA 01503
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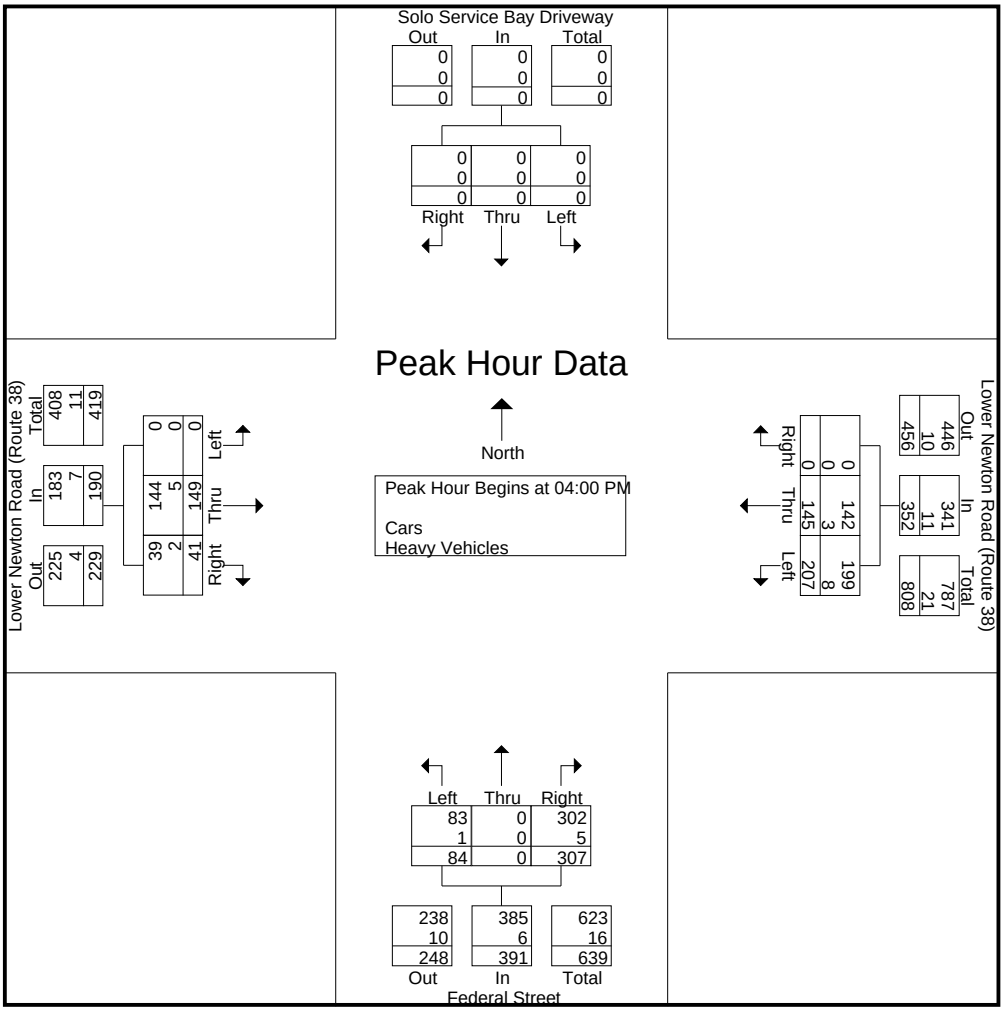
N/S: Solo Service Bay/ Federal Street
E/W: Lower Newton Road (Route 38)
City, State: St. Albans, VT
Client: VHB/ D. Finnigan

File Name : 102302 BB
Site Code : TBA
Start Date : 9/1/2010
Page No : 1

	Solo Service Bay Driveway From North				Lower Newton Road (Route 38) From East				Federal Street From South				Lower Newton Road (Route 38) From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	0	0	0	0	0	**39**	48	87	**89**	0	**25**	**114**	10	38	0	48	**249**
04:15 PM	0	0	0	0	0	39	51	**90**	60	0	19	79	**12**	37	0	**49**	218
04:30 PM	0	0	0	0	0	39	51	90	78	0	21	99	12	34	0	46	235
04:45 PM	0	0	0	0	0	28	**57**	85	80	0	19	99	7	**40**	0	47	231
Total Volume	0	0	0	0	0	145	207	352	307	0	84	391	41	149	0	190	933
% App. Total	0	0	0		0	41.2	58.8		78.5	0	21.5		21.6	78.4	0		
PHF	.000	.000	.000	.000	.000	.929	.908	.978	.862	.000	.840	.857	.854	.931	.000	.969	.937
Cars	0	0	0	0	0	142	199	341	302	0	83	385	39	144	0	183	909
% Cars	0	0	0	0	0	97.9	96.1	96.9	98.4	0	98.8	98.5	95.1	96.6	0	96.3	97.4
Heavy Vehicles	0	0	0	0	0	3	8	11	5	0	1	6	2	5	0	7	24
% Heavy Vehicles	0	0	0	0	0	2.1	3.9	3.1	1.6	0	1.2	1.5	4.9	3.4	0	3.7	2.6



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N/S: Federal Street/ Catherine Street
E/W: Lake Street
City, State: St. Albans, VT
Client: VHB/ D. Finnigan

File Name : 102302 C
Site Code : TBA
Start Date : 9/2/2010
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Federal Street From North			Lake Street From East			Catherine Street From South			Lake Street From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
07:00 AM	45	15	5	8	27	0	1	8	0	5	54	21	189
07:15 AM	43	15	8	9	38	1	2	16	1	11	46	31	221
07:30 AM	58	20	4	20	49	2	3	13	2	3	41	32	247
07:45 AM	64	15	9	12	34	3	2	8	1	5	42	29	224
Total	210	65	26	49	148	6	8	45	4	24	183	113	881
08:00 AM	41	13	5	13	47	0	0	6	1	2	30	32	190
08:15 AM	36	6	10	13	30	1	0	6	2	4	37	25	170
08:30 AM	35	7	10	4	25	1	6	6	1	4	42	28	169
08:45 AM	60	9	11	18	31	2	4	9	0	3	46	34	227
Total	172	35	36	48	133	4	10	27	4	13	155	119	756
Grand Total	382	100	62	97	281	10	18	72	8	37	338	232	1637
Apprch %	70.2	18.4	11.4	25	72.4	2.6	18.4	73.5	8.2	6.1	55.7	38.2	
Total %	23.3	6.1	3.8	5.9	17.2	0.6	1.1	4.4	0.5	2.3	20.6	14.2	
Cars	365	92	58	86	267	10	17	69	8	36	324	218	1550
% Cars	95.5	92	93.5	88.7	95	100	94.4	95.8	100	97.3	95.9	94	94.7
Heavy Vehicles	17	8	4	11	14	0	1	3	0	1	14	14	87
% Heavy Vehicles	4.5	8	6.5	11.3	5	0	5.6	4.2	0	2.7	4.1	6	5.3

	Federal Street From North				Lake Street From East				Catherine Street From South				Lake Street From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	43	15	8	66	9	38	1	48	2	**16**	1	**19**	**11**	**46**	31	**88**	221
07:30 AM	58	**20**	4	82	**20**	**49**	2	**71**	**3**	13	**2**	18	3	41	**32**	76	**247**
07:45 AM	**64**	15	**9**	**88**	12	34	**3**	49	2	8	1	11	5	42	29	76	224
08:00 AM	41	13	5	59	13	47	0	60	0	6	1	7	2	30	32	64	190
Total Volume	206	63	26	295	54	168	6	228	7	43	5	55	21	159	124	304	882
% App. Total	69.8	21.4	8.8		23.7	73.7	2.6		12.7	78.2	9.1		6.9	52.3	40.8		
PHF	.805	.788	.722	.838	.675	.857	.500	.803	.583	.672	.625	.724	.477	.864	.969	.864	.893
Cars	199	57	24	280	47	161	6	214	6	41	5	52	21	150	118	289	835
% Cars	96.6	90.5	92.3	94.9	87.0	95.8	100	93.9	85.7	95.3	100	94.5	100	94.3	95.2	95.1	94.7
Heavy Vehicles	7	6	2	15	7	7	0	14	1	2	0	3	0	9	6	15	47
% Heavy Vehicles	3.4	9.5	7.7	5.1	13.0	4.2	0	6.1	14.3	4.7	0	5.5	0	5.7	4.8	4.9	5.3

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N/S: Federal Street/ Catherine Street
E/W: Lake Street
City, State: St. Albans, VT
Client: VHB/ D. Finnigan

File Name : 102302 C
Site Code : TBA
Start Date : 9/2/2010
Page No : 1

Groups Printed- Cars

	Federal Street From North			Lake Street From East			Catherine Street From South			Lake Street From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
07:00 AM	42	13	4	6	25	0	1	8	0	4	54	20	177
07:15 AM	41	14	8	9	34	1	2	16	1	11	45	30	212
07:30 AM	56	19	4	18	48	2	2	12	2	3	36	30	232
07:45 AM	62	13	7	10	34	3	2	7	1	5	42	27	213
Total	201	59	23	43	141	6	7	43	4	23	177	107	834
08:00 AM	40	11	5	10	45	0	0	6	1	2	27	31	178
08:15 AM	36	6	10	13	26	1	0	6	2	4	34	23	161
08:30 AM	31	7	10	4	25	1	6	5	1	4	42	25	161
08:45 AM	57	9	10	16	30	2	4	9	0	3	44	32	216
Total	164	33	35	43	126	4	10	26	4	13	147	111	716
Grand Total	365	92	58	86	267	10	17	69	8	36	324	218	1550
Apprch %	70.9	17.9	11.3	23.7	73.6	2.8	18.1	73.4	8.5	6.2	56.1	37.7	
Total %	23.5	5.9	3.7	5.5	17.2	0.6	1.1	4.5	0.5	2.3	20.9	14.1	

	Federal Street From North				Lake Street From East				Catherine Street From South				Lake Street From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total

Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 07:15 AM

07:15 AM	41	14	**8**	63	9	34	1	44	**2**	**16**	1	**19**	**11**	**45**	30	**86**	212
07:30 AM	56	**19**	4	79	**18**	**48**	2	**68**	2	12	**2**	16	3	36	30	69	**232**
07:45 AM	**62**	13	7	**82**	10	34	**3**	47	2	7	1	10	5	42	27	74	213
08:00 AM	40	11	5	56	10	45	0	55	0	6	1	7	2	27	**31**	60	178
Total Volume	199	57	24	280	47	161	6	214	6	41	5	52	21	150	118	289	835
% App. Total	71.1	20.4	8.6		22	75.2	2.8		11.5	78.8	9.6		7.3	51.9	40.8		
PHF	.802	.750	.750	.854	.653	.839	.500	.787	.750	.641	.625	.684	.477	.833	.952	.840	.900

PRECISION
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N/S: Federal Street/ Catherine Street
E/W: Lake Street
City, State: St. Albans, VT
Client: VHB/ D. Finnigan

File Name : 102302 C
Site Code : TBA
Start Date : 9/2/2010
Page No : 1

Groups Printed- Heavy Vehicles

	Federal Street From North			Lake Street From East			Catherine Street From South			Lake Street From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
07:00 AM	3	2	1	2	2	0	0	0	0	1	0	1	12
07:15 AM	2	1	0	0	4	0	0	0	0	0	1	1	9
07:30 AM	2	1	0	2	1	0	1	1	0	0	5	2	15
07:45 AM	2	2	2	2	0	0	0	1	0	0	0	2	11
Total	9	6	3	6	7	0	1	2	0	1	6	6	47
08:00 AM	1	2	0	3	2	0	0	0	0	0	3	1	12
08:15 AM	0	0	0	0	4	0	0	0	0	0	3	2	9
08:30 AM	4	0	0	0	0	0	0	1	0	0	0	3	8
08:45 AM	3	0	1	2	1	0	0	0	0	0	2	2	11
Total	8	2	1	5	7	0	0	1	0	0	8	8	40
Grand Total	17	8	4	11	14	0	1	3	0	1	14	14	87
Apprch %	58.6	27.6	13.8	44	56	0	25	75	0	3.4	48.3	48.3	
Total %	19.5	9.2	4.6	12.6	16.1	0	1.1	3.4	0	1.1	16.1	16.1	

	Federal Street From North				Lake Street From East				Catherine Street From South				Lake Street From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	**3**	**2**	1	**6**	**2**	2	0	**4**	0	0	0	0	**1**	0	1	2	12
07:15 AM	2	1	0	3	0	**4**	0	4	0	0	0	0	0	1	1	2	9
07:30 AM	2	1	0	3	2	1	0	3	**1**	**1**	0	**2**	0	**5**	**2**	**7**	**15**
07:45 AM	2	2	**2**	6	2	0	0	2	0	1	0	1	0	0	2	2	11
Total Volume	9	6	3	18	6	7	0	13	1	2	0	3	1	6	6	13	47
% App. Total	50	33.3	16.7		46.2	53.8	0		33.3	66.7	0		7.7	46.2	46.2		
PHF	.750	.750	.375	.750	.750	.438	.000	.813	.250	.500	.000	.375	.250	.300	.750	.464	.783

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N/S: Federal Street/ Catherine Street
E/W: Lake Street
City, State: St. Albans, VT
Client: VHB/ D. Finnigan

File Name : 102302 C
Site Code : TBA
Start Date : 9/2/2010
Page No : 1

Groups Printed- Peds and Bicycles

	Federal Street From North				Lake Street From East				Catherine Street From South				Lake Street From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
07:00 AM	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	1	7
07:15 AM	1	0	0	3	0	0	0	0	0	0	0	4	2	0	0	3	13
07:30 AM	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	5
07:45 AM	0	0	0	3	0	3	0	1	0	0	0	1	0	0	2	0	10
Total	1	0	0	17	0	3	0	1	0	0	0	5	2	0	2	4	35
08:00 AM	0	0	0	3	0	0	0	1	0	0	0	1	0	0	0	0	5
08:15 AM	0	0	0	1	0	0	0	1	0	0	0	4	0	2	0	0	8
08:30 AM	0	0	0	4	1	1	0	4	0	0	0	5	0	3	0	1	19
08:45 AM	0	0	0	1	0	1	0	1	0	0	0	2	0	0	0	0	5
Total	0	0	0	9	1	2	0	7	0	0	0	12	0	5	0	1	37
Grand Total	1	0	0	26	1	5	0	8	0	0	0	17	2	5	2	5	72
Apprch %	3.7	0	0	96.3	7.1	35.7	0	57.1	0	0	0	100	14.3	35.7	14.3	35.7	
Total %	1.4	0	0	36.1	1.4	6.9	0	11.1	0	0	0	23.6	2.8	6.9	2.8	6.9	

	Federal Street From North					Lake Street From East					Catherine Street From South					Lake Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	0	0	0	3	3	0	**3**	0	1	4	0	0	0	1	1	0	0	**2**	0	2	10
08:00 AM	0	0	0	3	3	0	0	0	1	1	0	0	0	1	1	0	0	0	0	0	5
08:15 AM	0	0	0	1	1	0	0	0	1	1	0	0	0	4	4	0	2	0	0	2	8
08:30 AM	0	0	0	**4**	**4**	**1**	1	0	**4**	**6**	0	0	0	**5**	**5**	0	**3**	0	**1**	**4**	**19**
Total Volume	0	0	0	11	11	1	4	0	7	12	0	0	0	11	11	0	5	2	1	8	42
% App. Total	0	0	0	100		8.3	33.3	0	58.3		0	0	0	100		0	62.5	25	12.5		
PHF	.000	.000	.000	.688	.688	.250	.333	.000	.438	.500	.000	.000	.000	.550	.550	.000	.417	.250	.250	.500	.553

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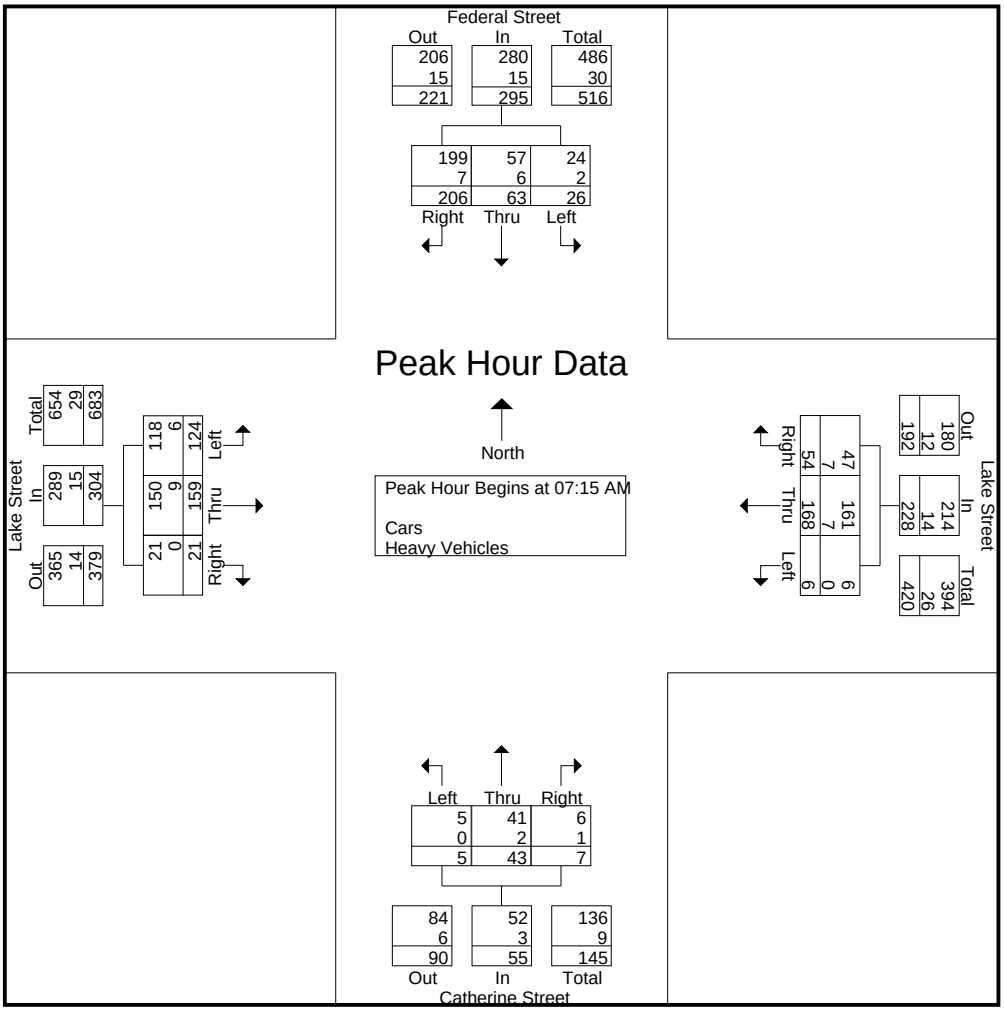
Site Code : TBA
Start Date : 9/2/2010
Page No : 1

	Federal Street From North				Lake Street From East				Catherine Street From South				Lake Street From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	43	15	8	66	9	38	1	48	2	**16**	1	**19**	**11**	**46**	31	**88**	221
07:30 AM	58	**20**	4	82	**20**	**49**	2	**71**	**3**	13	**2**	18	3	41	**32**	76	**247**
07:45 AM	**64**	15	**9**	**88**	12	34	**3**	49	2	8	1	11	5	42	29	76	224
08:00 AM	41	13	5	59	13	47	0	60	0	6	1	7	2	30	32	64	190
Total Volume	206	63	26	295	54	168	6	228	7	43	5	55	21	159	124	304	882
% App. Total	69.8	21.4	8.8		23.7	73.7	2.6		12.7	78.2	9.1		6.9	52.3	40.8		
PHF	.805	.788	.722	.838	.675	.857	.500	.803	.583	.672	.625	.724	.477	.864	.969	.864	.893
Cars	199	57	24	280	47	161	6	214	6	41	5	52	21	150	118	289	835
% Cars	96.6	90.5	92.3	94.9	87.0	95.8	100	93.9	85.7	95.3	100	94.5	100	94.3	95.2	95.1	94.7
Heavy Vehicles	7	6	2	15	7	7	0	14	1	2	0	3	0	9	6	15	47
% Heavy Vehicles	3.4	9.5	7.7	5.1	13.0	4.2	0	6.1	14.3	4.7	0	5.5	0	5.7	4.8	4.9	5.3



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City, State: St. Albans, VT
Client: VHB/ D. Finnigan

File Name : 102302 CC
Site Code : TBA
Start Date : 9/1/2010
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Federal Street From North			Lake Street From East			Catherine Street From South			Lake Street From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
04:00 PM	60	7	8	15	59	2	7	13	1	3	72	64	311
04:15 PM	53	10	5	14	48	2	4	15	3	4	59	60	277
04:30 PM	60	6	8	23	49	4	9	6	3	9	73	64	314
04:45 PM	69	11	13	10	56	2	4	11	2	6	73	68	325
Total	242	34	34	62	212	10	24	45	9	22	277	256	1227
05:00 PM	71	7	9	12	54	0	10	22	2	5	52	73	317
05:15 PM	52	5	10	18	56	3	6	3	2	5	68	68	296
05:30 PM	57	4	11	17	47	1	4	6	2	4	59	42	254
05:45 PM	45	4	6	14	51	2	7	9	3	2	36	45	224
Total	225	20	36	61	208	6	27	40	9	16	215	228	1091
Grand Total	467	54	70	123	420	16	51	85	18	38	492	484	2318
Apprch %	79	9.1	11.8	22	75.1	2.9	33.1	55.2	11.7	3.7	48.5	47.7	
Total %	20.1	2.3	3	5.3	18.1	0.7	2.2	3.7	0.8	1.6	21.2	20.9	
Cars	459	52	69	117	414	16	51	85	18	38	485	475	2279
% Cars	98.3	96.3	98.6	95.1	98.6	100	100	100	100	100	98.6	98.1	98.3
Heavy Vehicles	8	2	1	6	6	0	0	0	0	0	7	9	39
% Heavy Vehicles	1.7	3.7	1.4	4.9	1.4	0	0	0	0	0	1.4	1.9	1.7

	Federal Street From North				Lake Street From East				Catherine Street From South				Lake Street From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	60	6	8	74	**23**	49	**4**	76	9	6	**3**	18	**9**	**73**	64	146	314
04:45 PM	69	**11**	**13**	**93**	10	**56**	2	68	4	11	2	17	6	73	68	**147**	**325**
05:00 PM	**71**	7	9	87	12	54	0	66	**10**	**22**	2	**34**	5	52	**73**	130	317
05:15 PM	52	5	10	67	18	56	3	**77**	6	3	2	11	5	68	68	141	296
Total Volume	252	29	40	321	63	215	9	287	29	42	9	80	25	266	273	564	1252
% App. Total	78.5	9	12.5		22	74.9	3.1		36.2	52.5	11.2		4.4	47.2	48.4		
PHF	.887	.659	.769	.863	.685	.960	.563	.932	.725	.477	.750	.588	.694	.911	.935	.959	.963
Cars	246	29	40	315	57	213	9	279	29	42	9	80	25	263	268	556	1230
% Cars	97.6	100	100	98.1	90.5	99.1	100	97.2	100	100	100	100	100	98.9	98.2	98.6	98.2
Heavy Vehicles	6	0	0	6	6	2	0	8	0	0	0	0	0	3	5	8	22
% Heavy Vehicles	2.4	0	0	1.9	9.5	0.9	0	2.8	0	0	0	0	0	1.1	1.8	1.4	1.8

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N/S: Federal Street/ Catherine Street
E/W: Lake Street
City, State: St. Albans, VT
Client: VHB/ D. Finnigan

File Name : 102302 CC
Site Code : TBA
Start Date : 9/1/2010
Page No : 1

Groups Printed- Cars

	Federal Street From North			Lake Street From East			Catherine Street From South			Lake Street From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
04:00 PM	59	5	8	15	59	2	7	13	1	3	72	62	306
04:15 PM	53	10	5	14	47	2	4	15	3	4	55	58	270
04:30 PM	58	6	8	19	49	4	9	6	3	9	72	63	306
04:45 PM	68	11	13	10	55	2	4	11	2	6	73	67	322
Total	238	32	34	58	210	10	24	45	9	22	272	250	1204
05:00 PM	69	7	9	11	53	0	10	22	2	5	51	71	310
05:15 PM	51	5	10	17	56	3	6	3	2	5	67	67	292
05:30 PM	57	4	10	17	45	1	4	6	2	4	59	42	251
05:45 PM	44	4	6	14	50	2	7	9	3	2	36	45	222
Total	221	20	35	59	204	6	27	40	9	16	213	225	1075
Grand Total	459	52	69	117	414	16	51	85	18	38	485	475	2279
Apprch %	79.1	9	11.9	21.4	75.7	2.9	33.1	55.2	11.7	3.8	48.6	47.6	
Total %	20.1	2.3	3	5.1	18.2	0.7	2.2	3.7	0.8	1.7	21.3	20.8	

	Federal Street From North				Lake Street From East				Catherine Street From South				Lake Street From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	58	6	8	72	**19**	49	**4**	72	9	6	**3**	18	**9**	72	63	144	306
04:45 PM	68	**11**	**13**	**92**	10	55	2	67	4	11	2	17	6	**73**	67	**146**	**322**
05:00 PM	**69**	7	9	85	11	53	0	64	**10**	**22**	2	**34**	5	51	**71**	127	310
05:15 PM	51	5	10	66	17	**56**	3	**76**	6	3	2	11	5	67	67	139	292
Total Volume	246	29	40	315	57	213	9	279	29	42	9	80	25	263	268	556	1230
% App. Total	78.1	9.2	12.7		20.4	76.3	3.2		36.2	52.5	11.2		4.5	47.3	48.2		
PHF	.891	.659	.769	.856	.750	.951	.563	.918	.725	.477	.750	.588	.694	.901	.944	.952	.955

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Site Code : TBA
Start Date : 9/1/2010
Page No : 1

Groups Printed- Heavy Vehicles

	Federal Street From North			Lake Street From East			Catherine Street From South			Lake Street From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
04:00 PM	1	2	0	0	0	0	0	0	0	0	0	2	5
04:15 PM	0	0	0	0	1	0	0	0	0	0	4	2	7
04:30 PM	2	0	0	4	0	0	0	0	0	0	1	1	8
04:45 PM	1	0	0	0	1	0	0	0	0	0	0	1	3
Total	4	2	0	4	2	0	0	0	0	0	5	6	23
05:00 PM	2	0	0	1	1	0	0	0	0	0	1	2	7
05:15 PM	1	0	0	1	0	0	0	0	0	0	1	1	4
05:30 PM	0	0	1	0	2	0	0	0	0	0	0	0	3
05:45 PM	1	0	0	0	1	0	0	0	0	0	0	0	2
Total	4	0	1	2	4	0	0	0	0	0	2	3	16
Grand Total	8	2	1	6	6	0	0	0	0	0	7	9	39
Apprch %	72.7	18.2	9.1	50	50	0	0	0	0	0	43.8	56.2	
Total %	20.5	5.1	2.6	15.4	15.4	0	0	0	0	0	17.9	23.1	

	Federal Street From North				Lake Street From East				Catherine Street From South				Lake Street From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:15 PM																	
04:15 PM	0	0	0	0	0	**1**	0	1	0	0	0	0	0	**4**	**2**	**6**	7
04:30 PM	**2**	0	0	**2**	**4**	0	0	**4**	0	0	0	0	0	1	1	2	**8**
04:45 PM	1	0	0	1	0	1	0	1	0	0	0	0	0	0	1	1	3
05:00 PM	2	0	0	2	1	1	0	2	0	0	0	0	0	1	2	3	7
Total Volume	5	0	0	5	5	3	0	8	0	0	0	0	0	6	6	12	25
% App. Total	100	0	0		62.5	37.5	0		0	0	0		0	50	50		
PHF	.625	.000	.000	.625	.313	.750	.000	.500	.000	.000	.000	.000	.000	.375	.750	.500	.781

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Start Date : 9/1/2010
Page No : 1

Groups Printed- Peds and Bicycles

	Federal Street From North				Lake Street From East				Catherine Street From South				Lake Street From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
04:00 PM	0	0	0	2	0	0	0	2	0	0	1	8	0	0	0	0	13
04:15 PM	0	0	0	15	0	0	0	0	0	0	0	1	0	2	1	0	19
04:30 PM	0	0	0	3	0	2	0	4	0	0	0	12	0	0	2	0	23
04:45 PM	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	4
Total	1	0	0	21	0	2	0	6	0	0	1	22	0	2	3	1	59
05:00 PM	0	0	0	7	0	1	0	0	1	1	3	2	0	1	0	0	16
05:15 PM	0	0	0	4	0	0	0	2	0	0	0	2	0	0	0	0	8
05:30 PM	0	0	0	9	0	0	0	0	0	0	0	2	0	0	0	0	11
05:45 PM	0	0	0	10	0	0	0	0	0	0	0	1	0	0	1	0	12
Total	0	0	0	30	0	1	0	2	1	1	3	7	0	1	1	0	47
Grand Total	1	0	0	51	0	3	0	8	1	1	4	29	0	3	4	1	106
Apprch %	1.9	0	0	98.1	0	27.3	0	72.7	2.9	2.9	11.4	82.9	0	37.5	50	12.5	
Total %	0.9	0	0	48.1	0	2.8	0	7.5	0.9	0.9	3.8	27.4	0	2.8	3.8	0.9	

	Federal Street From North					Lake Street From East					Catherine Street From South					Lake Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	0	0	0	**15**	**15**	0	0	0	0	0	0	0	0	1	1	0	**2**	1	0	**3**	19
04:30 PM	0	0	0	3	3	0	**2**	0	**4**	**6**	0	0	0	**12**	**12**	0	0	**2**	0	2	**23**
04:45 PM	**1**	0	0	1	2	0	0	0	0	0	0	0	0	1	1	0	0	0	**1**	1	4
05:00 PM	0	0	0	7	7	0	1	0	0	1	**1**	**1**	**3**	2	7	0	1	0	0	1	16
Total Volume	1	0	0	26	27	0	3	0	4	7	1	1	3	16	21	0	3	3	1	7	62
% App. Total	3.7	0	0	96.3		0	42.9	0	57.1		4.8	4.8	14.3	76.2		0	42.9	42.9	14.3		
PHF	.250	.000	.000	.433	.450	.000	.375	.000	.250	.292	.250	.250	.250	.333	.438	.000	.375	.375	.250	.583	.674

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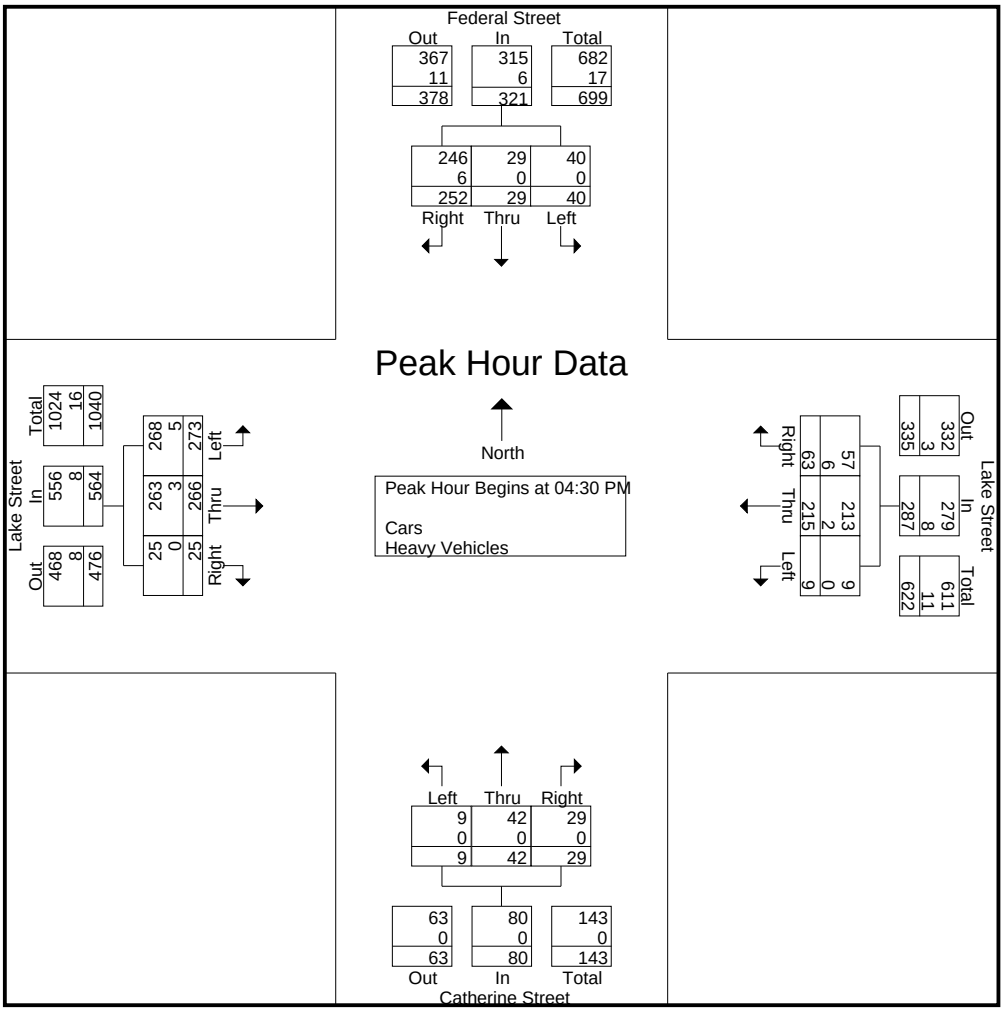
Page No : 1

	Federal Street From North				Lake Street From East				Catherine Street From South				Lake Street From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	60	6	8	74	**23**	49	**4**	76	9	6	**3**	18	**9**	**73**	64	146	314
04:45 PM	69	**11**	**13**	**93**	10	**56**	2	68	4	11	2	17	6	73	68	**147**	**325**
05:00 PM	**71**	7	9	87	12	54	0	66	**10**	**22**	2	**34**	5	52	**73**	130	317
05:15 PM	52	5	10	67	18	56	3	**77**	6	3	2	11	5	68	68	141	296
Total Volume	252	29	40	321	63	215	9	287	29	42	9	80	25	266	273	564	1252
% App. Total	78.5	9	12.5		22	74.9	3.1		36.2	52.5	11.2		4.4	47.2	48.4		
PHF	.887	.659	.769	.863	.685	.960	.563	.932	.725	.477	.750	.588	.694	.911	.935	.959	.963
Cars	246	29	40	315	57	213	9	279	29	42	9	80	25	263	268	556	1230
% Cars	97.6	100	100	98.1	90.5	99.1	100	97.2	100	100	100	100	100	98.9	98.2	98.6	98.2
Heavy Vehicles	6	0	0	6	6	2	0	8	0	0	0	0	0	3	5	8	22
% Heavy Vehicles	2.4	0	0	1.9	9.5	0.9	0	2.8	0	0	0	0	0	1.1	1.8	1.4	1.8



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City, State: St. Albans, VT
Client: VHB/ D. Finnigan

File Name : 102302 D
Site Code : TBA
Start Date : 9/2/2010
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Catherine Street From North			Stebbins Street From East			Allen Street From South			Market Street From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
07:00 AM	0	7	11	3	8	6	2	5	12	13	15	0	82
07:15 AM	1	8	18	7	17	13	4	14	12	13	18	0	125
07:30 AM	0	12	12	8	14	4	3	10	8	14	11	1	97
07:45 AM	0	9	10	4	5	7	0	7	3	12	4	0	61
Total	1	36	51	22	44	30	9	36	35	52	48	1	365
08:00 AM	0	6	12	12	7	1	1	3	7	7	7	0	63
08:15 AM	0	3	7	3	4	6	1	3	5	5	0	0	37
08:30 AM	0	3	8	3	5	2	0	8	3	3	6	0	41
08:45 AM	0	7	7	4	3	3	2	5	7	6	9	0	53
Total	0	19	34	22	19	12	4	19	22	21	22	0	194
Grand Total	1	55	85	44	63	42	13	55	57	73	70	1	559
Apprch %	0.7	39	60.3	29.5	42.3	28.2	10.4	44	45.6	50.7	48.6	0.7	
Total %	0.2	9.8	15.2	7.9	11.3	7.5	2.3	9.8	10.2	13.1	12.5	0.2	
Cars	1	53	77	43	56	42	13	52	56	73	64	0	530
% Cars	100	96.4	90.6	97.7	88.9	100	100	94.5	98.2	100	91.4	0	94.8
Heavy Vehicles	0	2	8	1	7	0	0	3	1	0	6	1	29
% Heavy Vehicles	0	3.6	9.4	2.3	11.1	0	0	5.5	1.8	0	8.6	100	5.2

	Catherine Street From North				Stebbins Street From East				Allen Street From South				Market Street From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total

Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 07:00 AM

07:00 AM	0	7	11	18	3	8	6	17	2	5	**12**	19	13	15	0	28	82
07:15 AM	**1**	8	**18**	**27**	7	**17**	**13**	**37**	**4**	**14**	12	**30**	13	**18**	0	**31**	**125**
07:30 AM	0	**12**	12	24	**8**	14	4	26	3	10	8	21	**14**	11	**1**	26	97
07:45 AM	0	9	10	19	4	5	7	16	0	7	3	10	12	4	0	16	61
Total Volume	1	36	51	88	22	44	30	96	9	36	35	80	52	48	1	101	365
% App. Total	1.1	40.9	58		22.9	45.8	31.2		11.2	45	43.8		51.5	47.5	1		
PHF	.250	.750	.708	.815	.688	.647	.577	.649	.563	.643	.729	.667	.929	.667	.250	.815	.730
Cars	1	34	46	81	21	41	30	92	9	34	35	78	52	46	0	98	349
% Cars	100	94.4	90.2	92.0	95.5	93.2	100	95.8	100	94.4	100	97.5	100	95.8	0	97.0	95.6
Heavy Vehicles	0	2	5	7	1	3	0	4	0	2	0	2	0	2	1	3	16
% Heavy Vehicles	0	5.6	9.8	8.0	4.5	6.8	0	4.2	0	5.6	0	2.5	0	4.2	100	3.0	4.4

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File Name : 102302 D
Site Code : TBA
Start Date : 9/2/2010
Page No : 1

Groups Printed- Cars

	Catherine Street From North			Stebbins Street From East			Allen Street From South			Market Street From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
07:00 AM	0	6	10	3	7	6	2	5	12	13	15	0	79
07:15 AM	1	8	16	7	16	13	4	14	12	13	18	0	122
07:30 AM	0	12	11	8	13	4	3	8	8	14	10	0	91
07:45 AM	0	8	9	3	5	7	0	7	3	12	3	0	57
Total	1	34	46	21	41	30	9	34	35	52	46	0	349
08:00 AM	0	6	10	12	6	1	1	3	7	7	5	0	58
08:15 AM	0	3	6	3	3	6	1	3	4	5	0	0	34
08:30 AM	0	3	8	3	5	2	0	7	3	3	6	0	40
08:45 AM	0	7	7	4	1	3	2	5	7	6	7	0	49
Total	0	19	31	22	15	12	4	18	21	21	18	0	181
Grand Total	1	53	77	43	56	42	13	52	56	73	64	0	530
Apprch %	0.8	40.5	58.8	30.5	39.7	29.8	10.7	43	46.3	53.3	46.7	0	
Total %	0.2	10	14.5	8.1	10.6	7.9	2.5	9.8	10.6	13.8	12.1	0	

	Catherine Street From North				Stebbins Street From East				Allen Street From South				Market Street From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	0	6	10	16	3	7	6	16	2	5	**12**	19	13	15	0	28	79
07:15 AM	**1**	8	**16**	**25**	7	**16**	**13**	**36**	**4**	**14**	12	**30**	13	**18**	0	**31**	**122**
07:30 AM	0	**12**	11	23	**8**	13	4	25	3	8	8	19	**14**	10	0	24	91
07:45 AM	0	8	9	17	3	5	7	15	0	7	3	10	12	3	0	15	57
Total Volume	1	34	46	81	21	41	30	92	9	34	35	78	52	46	0	98	349
% App. Total	1.2	42	56.8		22.8	44.6	32.6		11.5	43.6	44.9		53.1	46.9	0		
PHF	.250	.708	.719	.810	.656	.641	.577	.639	.563	.607	.729	.650	.929	.639	.000	.790	.715

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Client: VHB/ D. Finnigan

File Name : 102302 D
Site Code : TBA
Start Date : 9/2/2010
Page No : 1

Groups Printed- Heavy Vehicles

	Catherine Street From North			Stebbins Street From East			Allen Street From South			Market Street From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
07:00 AM	0	1	1	0	1	0	0	0	0	0	0	0	3
07:15 AM	0	0	2	0	1	0	0	0	0	0	0	0	3
07:30 AM	0	0	1	0	1	0	0	2	0	0	1	1	6
07:45 AM	0	1	1	1	0	0	0	0	0	0	1	0	4
Total	0	2	5	1	3	0	0	2	0	0	2	1	16
08:00 AM	0	0	2	0	1	0	0	0	0	0	2	0	5
08:15 AM	0	0	1	0	1	0	0	0	1	0	0	0	3
08:30 AM	0	0	0	0	0	0	0	1	0	0	0	0	1
08:45 AM	0	0	0	0	2	0	0	0	0	0	2	0	4
Total	0	0	3	0	4	0	0	1	1	0	4	0	13
Grand Total	0	2	8	1	7	0	0	3	1	0	6	1	29
Apprch %	0	20	80	12.5	87.5	0	0	75	25	0	85.7	14.3	
Total %	0	6.9	27.6	3.4	24.1	0	0	10.3	3.4	0	20.7	3.4	

	Catherine Street From North				Stebbins Street From East				Allen Street From South				Market Street From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	0	0	**2**	**2**	0	**1**	0	**1**	0	0	0	0	0	0	0	0	3
07:30 AM	0	0	1	1	0	1	0	1	0	**2**	0	**2**	0	1	**1**	**2**	**6**
07:45 AM	0	**1**	1	2	**1**	0	0	1	0	0	0	0	0	1	0	1	4
08:00 AM	0	0	2	2	0	1	0	1	0	0	0	0	0	**2**	0	2	5
Total Volume	0	1	6	7	1	3	0	4	0	2	0	2	0	4	1	5	18
% App. Total	0	14.3	85.7		25	75	0		0	100	0		0	80	20		
PHF	.000	.250	.750	.875	.250	.750	.000	1.000	.000	.250	.000	.250	.000	.500	.250	.625	.750

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City, State: St. Albans, VT
Client: VHB/ D. Finnigan

File Name : 102302 D
Site Code : TBA
Start Date : 9/2/2010
Page No : 1

Groups Printed- Peds and Bicycles

	Catherine Street From North				Stebbins Street From East				Allen Street From South				Market Street From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
07:00 AM	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	1	4
07:15 AM	0	0	2	16	0	0	0	1	0	0	0	5	0	0	0	0	24
07:30 AM	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	2	20	0	0	0	1	0	0	0	5	0	0	0	1	29
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
Grand Total	0	0	2	20	0	0	0	2	0	0	0	5	0	0	0	1	30
Apprch %	0	0	9.1	90.9	0	0	0	100	0	0	0	100	0	0	0	100	
Total %	0	0	6.7	66.7	0	0	0	6.7	0	0	0	16.7	0	0	0	3.3	

	Catherine Street From North					Stebbins Street From East					Allen Street From South					Market Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	**1**	4
07:15 AM	0	0	**2**	**16**	**18**	0	0	0	**1**	**1**	0	0	0	**5**	**5**	0	0	0	0	0	**24**
07:30 AM	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	2	20	22	0	0	0	1	1	0	0	0	5	5	0	0	0	1	1	29
% App. Total	0	0	9.1	90.9		0	0	0	100		0	0	0	100		0	0	0	100		
PHF	.000	.000	.250	.313	.306	.000	.000	.000	.250	.250	.000	.000	.000	.250	.250	.000	.000	.000	.250	.250	.302

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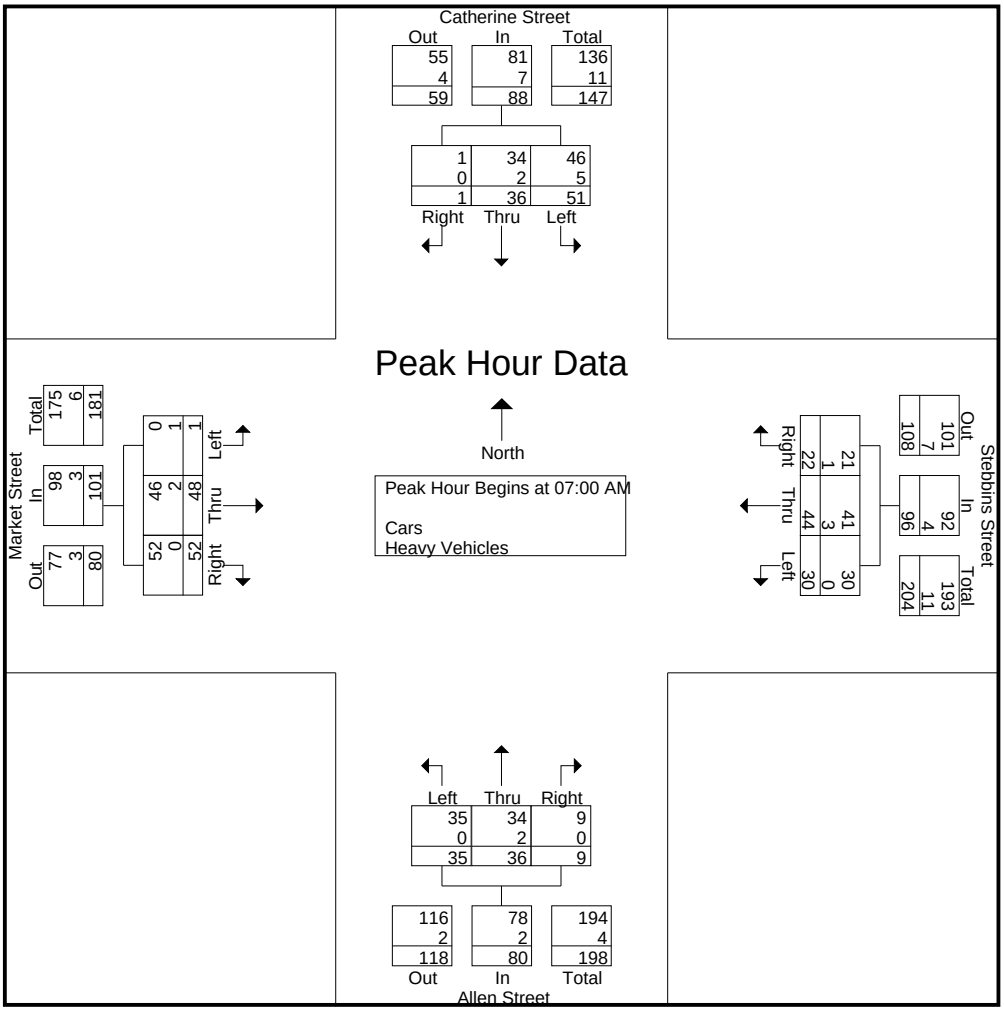
Start Date : 9/2/2010
Page No : 1

	Catherine Street From North				Stebbins Street From East				Allen Street From South				Market Street From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	0	7	11	18	3	8	6	17	2	5	**12**	19	13	15	0	28	82
07:15 AM	**1**	8	**18**	**27**	7	**17**	**13**	**37**	**4**	**14**	12	**30**	13	**18**	0	**31**	**125**
07:30 AM	0	**12**	12	24	**8**	14	4	26	3	10	8	21	**14**	11	**1**	26	97
07:45 AM	0	9	10	19	4	5	7	16	0	7	3	10	12	4	0	16	61
Total Volume	1	36	51	88	22	44	30	96	9	36	35	80	52	48	1	101	365
% App. Total	1.1	40.9	58		22.9	45.8	31.2		11.2	45	43.8		51.5	47.5	1		
PHF	.250	.750	.708	.815	.688	.647	.577	.649	.563	.643	.729	.667	.929	.667	.250	.815	.730
Cars	1	34	46	81	21	41	30	92	9	34	35	78	52	46	0	98	349
% Cars	100	94.4	90.2	92.0	95.5	93.2	100	95.8	100	94.4	100	97.5	100	95.8	0	97.0	95.6
Heavy Vehicles	0	2	5	7	1	3	0	4	0	2	0	2	0	2	1	3	16
% Heavy Vehicles	0	5.6	9.8	8.0	4.5	6.8	0	4.2	0	5.6	0	2.5	0	4.2	100	3.0	4.4



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City, State: St. Albans, VT
Client: VHB/ D. Finnigan

File Name : 102302 DD
Site Code : TBA
Start Date : 9/1/2010
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Catherine Street From North			Stebbins Street From East			Allen Street From South			Market Street From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
04:00 PM	4	4	8	6	15	0	1	11	21	14	7	0	91
04:15 PM	1	7	9	11	11	1	0	9	4	10	7	1	71
04:30 PM	1	7	10	8	14	2	1	12	12	17	5	1	90
04:45 PM	1	8	13	13	16	3	1	7	10	13	7	0	92
Total	7	26	40	38	56	6	3	39	47	54	26	2	344
05:00 PM	0	2	10	14	14	1	0	17	12	20	8	0	98
05:15 PM	0	8	6	10	12	0	3	2	7	15	6	0	69
05:30 PM	0	7	6	8	7	0	2	6	10	12	4	0	62
05:45 PM	0	4	5	5	13	1	1	10	5	11	2	0	57
Total	0	21	27	37	46	2	6	35	34	58	20	0	286
Grand Total	7	47	67	75	102	8	9	74	81	112	46	2	630
Apprch %	5.8	38.8	55.4	40.5	55.1	4.3	5.5	45.1	49.4	70	28.8	1.2	
Total %	1.1	7.5	10.6	11.9	16.2	1.3	1.4	11.7	12.9	17.8	7.3	0.3	
Cars	7	46	65	75	100	8	8	74	80	108	45	2	618
% Cars	100	97.9	97	100	98	100	88.9	100	98.8	96.4	97.8	100	98.1
Heavy Vehicles	0	1	2	0	2	0	1	0	1	4	1	0	12
% Heavy Vehicles	0	2.1	3	0	2	0	11.1	0	1.2	3.6	2.2	0	1.9

	Catherine Street From North				Stebbins Street From East				Allen Street From South				Market Street From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total

Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 04:15 PM

04:15 PM	**1**	7	9	17	11	11	1	23	0	9	4	13	10	7	**1**	18	71
04:30 PM	1	7	10	18	8	14	2	24	**1**	12	**12**	25	17	5	1	23	90
04:45 PM	1	**8**	**13**	**22**	13	**16**	**3**	**32**	1	7	10	18	13	7	0	20	92
05:00 PM	0	2	10	12	**14**	14	1	29	0	**17**	12	**29**	**20**	**8**	0	**28**	**98**
Total Volume	3	24	42	69	46	55	7	108	2	45	38	85	60	27	2	89	351
% App. Total	4.3	34.8	60.9		42.6	50.9	6.5		2.4	52.9	44.7		67.4	30.3	2.2		
PHF	.750	.750	.808	.784	.821	.859	.583	.844	.500	.662	.792	.733	.750	.844	.500	.795	.895
Cars	3	24	42	69	46	54	7	107	2	45	37	84	57	27	2	86	346
% Cars	100	100	100	100	100	98.2	100	99.1	100	100	97.4	98.8	95.0	100	100	96.6	98.6
Heavy Vehicles	0	0	0	0	0	1	0	1	0	0	1	1	3	0	0	3	5
% Heavy Vehicles	0	0	0	0	0	1.8	0	0.9	0	0	2.6	1.2	5.0	0	0	3.4	1.4

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City, State: St. Albans, VT
Client: VHB/ D. Finnigan

File Name : 102302 DD
Site Code : TBA
Start Date : 9/1/2010
Page No : 1

Groups Printed- Cars

	Catherine Street From North			Stebbins Street From East			Allen Street From South			Market Street From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
04:00 PM	4	3	7	6	15	0	1	11	21	14	7	0	89
04:15 PM	1	7	9	11	11	1	0	9	3	10	7	1	70
04:30 PM	1	7	10	8	14	2	1	12	12	15	5	1	88
04:45 PM	1	8	13	13	16	3	1	7	10	12	7	0	91
Total	7	25	39	38	56	6	3	39	46	51	26	2	338
05:00 PM	0	2	10	14	13	1	0	17	12	20	8	0	97
05:15 PM	0	8	6	10	12	0	3	2	7	14	6	0	68
05:30 PM	0	7	5	8	7	0	1	6	10	12	3	0	59
05:45 PM	0	4	5	5	12	1	1	10	5	11	2	0	56
Total	0	21	26	37	44	2	5	35	34	57	19	0	280
Grand Total	7	46	65	75	100	8	8	74	80	108	45	2	618
Apprch %	5.9	39	55.1	41	54.6	4.4	4.9	45.7	49.4	69.7	29	1.3	
Total %	1.1	7.4	10.5	12.1	16.2	1.3	1.3	12	12.9	17.5	7.3	0.3	

	Catherine Street From North				Stebbins Street From East				Allen Street From South				Market Street From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total

Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 04:15 PM

04:15 PM	**1**	7	9	17	11	11	1	23	0	9	3	12	10	7	**1**	18	70
04:30 PM	1	7	10	18	8	14	2	24	**1**	12	**12**	25	15	5	1	21	88
04:45 PM	1	**8**	**13**	**22**	13	**16**	**3**	**32**	1	7	10	18	12	7	0	19	91
05:00 PM	0	2	10	12	**14**	13	1	28	0	**17**	12	**29**	**20**	**8**	0	**28**	**97**
Total Volume	3	24	42	69	46	54	7	107	2	45	37	84	57	27	2	86	346
% App. Total	4.3	34.8	60.9		43	50.5	6.5		2.4	53.6	44		66.3	31.4	2.3		
PHF	.750	.750	.808	.784	.821	.844	.583	.836	.500	.662	.771	.724	.713	.844	.500	.768	.892

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Page No : 1

Groups Printed- Heavy Vehicles

	Catherine Street From North			Stebbins Street From East			Allen Street From South			Market Street From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
04:00 PM	0	1	1	0	0	0	0	0	0	0	0	0	2
04:15 PM	0	0	0	0	0	0	0	0	1	0	0	0	1
04:30 PM	0	0	0	0	0	0	0	0	0	2	0	0	2
04:45 PM	0	0	0	0	0	0	0	0	0	1	0	0	1
Total	0	1	1	0	0	0	0	0	1	3	0	0	6
05:00 PM	0	0	0	0	1	0	0	0	0	0	0	0	1
05:15 PM	0	0	0	0	0	0	0	0	0	1	0	0	1
05:30 PM	0	0	1	0	0	0	1	0	0	0	1	0	3
05:45 PM	0	0	0	0	1	0	0	0	0	0	0	0	1
Total	0	0	1	0	2	0	1	0	0	1	1	0	6
Grand Total	0	1	2	0	2	0	1	0	1	4	1	0	12
Apprch %	0	33.3	66.7	0	100	0	50	0	50	80	20	0	
Total %	0	8.3	16.7	0	16.7	0	8.3	0	8.3	33.3	8.3	0	

	Catherine Street From North				Stebbins Street From East				Allen Street From South				Market Street From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	0	**1**	**1**	**2**	0	0	0	0	0	0	0	0	0	0	0	0	**2**
04:15 PM	0	0	0	0	0	0	0	0	0	0	**1**	**1**	0	0	0	0	1
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	**2**	0	0	**2**	2
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
Total Volume	0	1	1	2	0	0	0	0	0	0	1	1	3	0	0	3	6
% App. Total	0	50	50		0	0	0		0	0	100		100	0	0		
PHF	.000	.250	.250	.250	.000	.000	.000	.000	.000	.000	.250	.250	.375	.000	.000	.375	.750

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Groups Printed- Peds and Bicycles

	Catherine Street From North				Stebbins Street From East				Allen Street From South				Market Street From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
04:00 PM	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	2
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
04:45 PM	0	0	0	0	0	0	0	2	0	1	0	1	0	0	0	1	5
Total	0	0	0	1	1	0	1	2	0	1	0	1	0	0	0	1	8
05:00 PM	0	0	0	0	0	0	0	1	0	2	0	0	0	0	0	0	3
05:15 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	3
05:30 PM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	1	0	3	0	2	0	0	0	0	0	1	7
Grand Total	0	0	0	1	1	1	1	5	0	3	0	1	0	0	0	2	15
Apprch %	0	0	0	100	12.5	12.5	12.5	62.5	0	75	0	25	0	0	0	100	
Total %	0	0	0	6.7	6.7	6.7	6.7	33.3	0	20	0	6.7	0	0	0	13.3	

	Catherine Street From North					Stebbins Street From East					Allen Street From South					Market Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	0	0	0	0	0	0	0	**1**	0	1	0	0	0	0	0	0	0	0	0	0	1
04:45 PM	0	0	0	0	0	0	0	0	**2**	**2**	0	1	0	**1**	**2**	0	0	0	**1**	**1**	**5**
05:00 PM	0	0	0	0	0	0	0	0	1	1	0	**2**	0	0	2	0	0	0	0	0	3
05:15 PM	0	0	0	0	0	0	**1**	0	1	2	0	0	0	0	0	0	0	0	1	1	3
Total Volume	0	0	0	0	0	0	1	1	4	6	0	3	0	1	4	0	0	0	2	2	12
% App. Total	0	0	0	0		0	16.7	16.7	66.7		0	75	0	25		0	0	0	100		
PHF	.000	.000	.000	.000	.000	.000	.250	.250	.500	.750	.000	.375	.000	.250	.500	.000	.000	.000	.500	.500	.600

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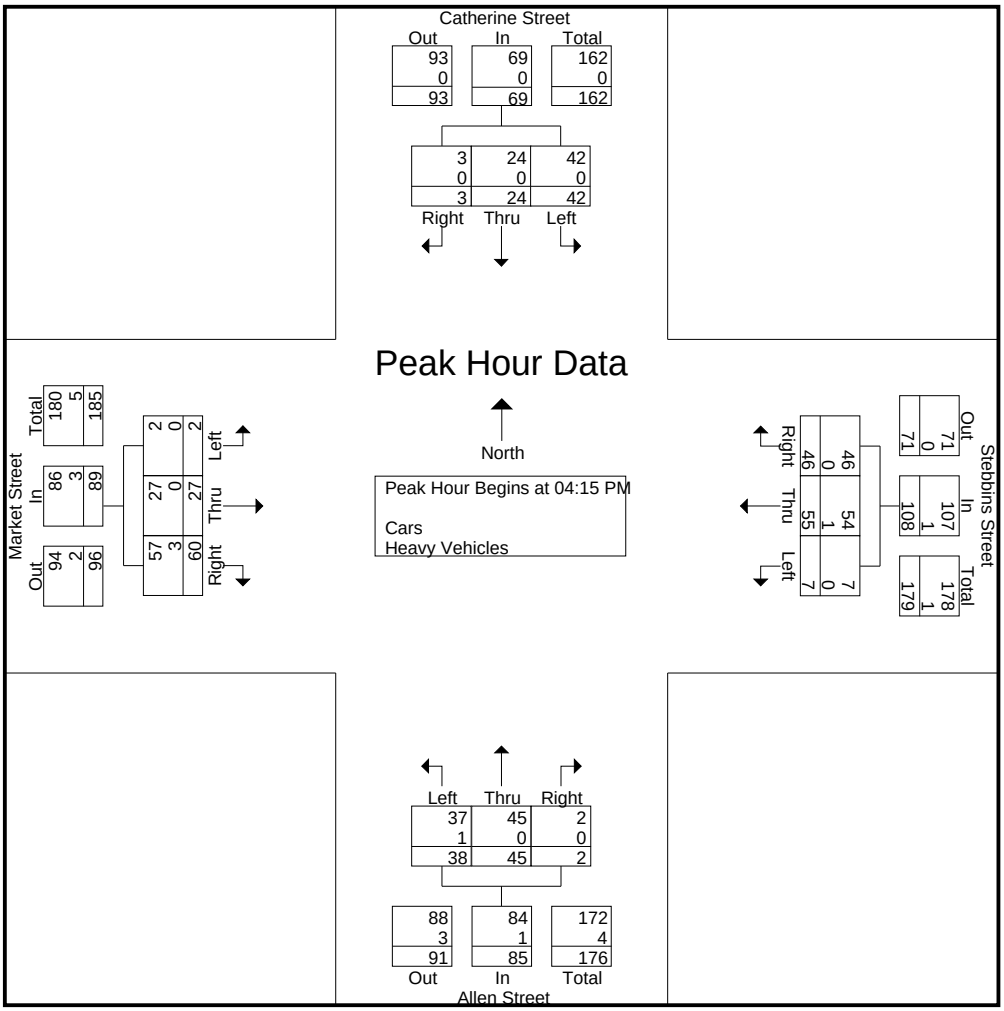
	Catherine Street From North				Stebbins Street From East				Allen Street From South				Market Street From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:15 PM																	
04:15 PM	**1**	7	9	17	11	11	1	23	0	9	4	13	10	7	**1**	18	71
04:30 PM	1	7	10	18	8	14	2	24	**1**	12	**12**	25	17	5	1	23	90
04:45 PM	1	**8**	**13**	**22**	13	**16**	**3**	**32**	1	7	10	18	13	7	0	20	92
05:00 PM	0	2	10	12	**14**	14	1	29	0	**17**	12	**29**	**20**	**8**	0	**28**	**98**
Total Volume	3	24	42	69	46	55	7	108	2	45	38	85	60	27	2	89	351
% App. Total	4.3	34.8	60.9		42.6	50.9	6.5		2.4	52.9	44.7		67.4	30.3	2.2		
PHF	.750	.750	.808	.784	.821	.859	.583	.844	.500	.662	.792	.733	.750	.844	.500	.795	.895
Cars	3	24	42	69	46	54	7	107	2	45	37	84	57	27	2	86	346
% Cars	100	100	100	100	100	98.2	100	99.1	100	100	97.4	98.8	95.0	100	100	96.6	98.6
Heavy Vehicles	0	0	0	0	0	1	0	1	0	0	1	1	3	0	0	3	5
% Heavy Vehicles	0	0	0	0	0	1.8	0	0.9	0	0	2.6	1.2	5.0	0	0	3.4	1.4



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N/S: Allen Street/ Lemnah Drive
E/W: Lower Welden Street
City, State: St. Albans, VT
Client: VHB/ D. Finnigan

File Name : 102302 E
Site Code : TBA
Start Date : 9/2/2010
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Allen Street From North			Lower Welden Street From East			Lemnah Drive From South			Lower Welden Street From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
07:00 AM	8	13	5	5	32	1	5	11	9	5	42	0	136
07:15 AM	3	19	14	8	26	3	13	14	14	10	49	2	175
07:30 AM	8	14	14	3	34	4	2	10	2	8	47	2	148
07:45 AM	9	12	12	1	44	6	5	9	21	8	18	0	145
Total	28	58	45	17	136	14	25	44	46	31	156	4	604
08:00 AM	7	3	4	4	39	6	4	5	10	5	33	0	120
08:15 AM	5	5	2	1	24	2	1	8	4	9	26	2	89
08:30 AM	2	5	4	1	20	4	1	8	1	8	21	0	75
08:45 AM	4	5	4	5	15	3	2	7	10	7	12	1	75
Total	18	18	14	11	98	15	8	28	25	29	92	3	359
Grand Total	46	76	59	28	234	29	33	72	71	60	248	7	963
Apprch %	25.4	42	32.6	9.6	80.4	10	18.8	40.9	40.3	19	78.7	2.2	
Total %	4.8	7.9	6.1	2.9	24.3	3	3.4	7.5	7.4	6.2	25.8	0.7	
Cars	44	76	59	28	229	29	29	69	67	56	231	5	922
% Cars	95.7	100	100	100	97.9	100	87.9	95.8	94.4	93.3	93.1	71.4	95.7
Heavy Vehicles	2	0	0	0	5	0	4	3	4	4	17	2	41
% Heavy Vehicles	4.3	0	0	0	2.1	0	12.1	4.2	5.6	6.7	6.9	28.6	4.3

	Allen Street From North				Lower Welden Street From East				Lemnah Drive From South				Lower Welden Street From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	8	13	5	26	5	32	1	38	5	11	9	25	5	42	0	47	136
07:15 AM	3	**19**	**14**	**36**	**8**	26	3	37	**13**	**14**	14	**41**	**10**	**49**	**2**	**61**	**175**
07:30 AM	8	14	14	36	3	34	4	41	2	10	2	14	8	47	2	57	148
07:45 AM	**9**	12	12	33	1	**44**	**6**	**51**	5	9	**21**	35	8	18	0	26	145
Total Volume	28	58	45	131	17	136	14	167	25	44	46	115	31	156	4	191	604
% App. Total	21.4	44.3	34.4		10.2	81.4	8.4		21.7	38.3	40		16.2	81.7	2.1		
PHF	.778	.763	.804	.910	.531	.773	.583	.819	.481	.786	.548	.701	.775	.796	.500	.783	.863
Cars	27	58	45	130	17	132	14	163	24	43	42	109	28	141	3	172	574
% Cars	96.4	100	100	99.2	100	97.1	100	97.6	96.0	97.7	91.3	94.8	90.3	90.4	75.0	90.1	95.0
Heavy Vehicles	1	0	0	1	0	4	0	4	1	1	4	6	3	15	1	19	30
% Heavy Vehicles	3.6	0	0	0.8	0	2.9	0	2.4	4.0	2.3	8.7	5.2	9.7	9.6	25.0	9.9	5.0

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City, State: St. Albans, VT
Client: VHB/ D. Finnigan

File Name : 102302 E
Site Code : TBA
Start Date : 9/2/2010
Page No : 1

Groups Printed- Cars

	Allen Street From North			Lower Welden Street From East			Lemnah Drive From South			Lower Welden Street From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
07:00 AM	8	13	5	5	30	1	5	11	9	4	42	0	133
07:15 AM	3	19	14	8	25	3	13	14	11	10	44	1	165
07:30 AM	7	14	14	3	34	4	1	9	2	7	41	2	138
07:45 AM	9	12	12	1	43	6	5	9	20	7	14	0	138
Total	27	58	45	17	132	14	24	43	42	28	141	3	574
08:00 AM	7	3	4	4	38	6	2	5	10	5	32	0	116
08:15 AM	5	5	2	1	24	2	1	7	4	9	26	1	87
08:30 AM	1	5	4	1	20	4	1	7	1	8	21	0	73
08:45 AM	4	5	4	5	15	3	1	7	10	6	11	1	72
Total	17	18	14	11	97	15	5	26	25	28	90	2	348
Grand Total	44	76	59	28	229	29	29	69	67	56	231	5	922
Apprch %	24.6	42.5	33	9.8	80.1	10.1	17.6	41.8	40.6	19.2	79.1	1.7	
Total %	4.8	8.2	6.4	3	24.8	3.1	3.1	7.5	7.3	6.1	25.1	0.5	

	Allen Street From North				Lower Welden Street From East				Lemnah Drive From South				Lower Welden Street From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total

Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 07:00 AM

07:00 AM	8	13	5	26	5	30	1	36	5	11	9	25	4	42	0	46	133
07:15 AM	3	**19**	**14**	**36**	**8**	25	3	36	**13**	**14**	11	**38**	**10**	**44**	1	**55**	**165**
07:30 AM	7	14	14	35	3	34	4	41	1	9	2	12	7	41	**2**	50	138
07:45 AM	**9**	12	12	33	1	**43**	**6**	**50**	5	9	**20**	34	7	14	0	21	138
Total Volume	27	58	45	130	17	132	14	163	24	43	42	109	28	141	3	172	574
% App. Total	20.8	44.6	34.6		10.4	81	8.6		22	39.4	38.5		16.3	82	1.7		
PHF	.750	.763	.804	.903	.531	.767	.583	.815	.462	.768	.525	.717	.700	.801	.375	.782	.870

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File Name : 102302 E
Site Code : TBA
Start Date : 9/2/2010
Page No : 1

Groups Printed- Heavy Vehicles

	Allen Street From North			Lower Welden Street From East			Lemnah Drive From South			Lower Welden Street From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
07:00 AM	0	0	0	0	2	0	0	0	0	1	0	0	3
07:15 AM	0	0	0	0	1	0	0	0	3	0	5	1	10
07:30 AM	1	0	0	0	0	0	1	1	0	1	6	0	10
07:45 AM	0	0	0	0	1	0	0	0	1	1	4	0	7
Total	1	0	0	0	4	0	1	1	4	3	15	1	30
08:00 AM	0	0	0	0	1	0	2	0	0	0	1	0	4
08:15 AM	0	0	0	0	0	0	0	1	0	0	0	1	2
08:30 AM	1	0	0	0	0	0	0	1	0	0	0	0	2
08:45 AM	0	0	0	0	0	0	1	0	0	1	1	0	3
Total	1	0	0	0	1	0	3	2	0	1	2	1	11
Grand Total	2	0	0	0	5	0	4	3	4	4	17	2	41
Apprch %	100	0	0	0	100	0	36.4	27.3	36.4	17.4	73.9	8.7	
Total %	4.9	0	0	0	12.2	0	9.8	7.3	9.8	9.8	41.5	4.9	

	Allen Street From North				Lower Welden Street From East				Lemnah Drive From South				Lower Welden Street From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total

Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 07:15 AM

07:15 AM	0	0	0	0	0	**1**	0	**1**	0	0	**3**	**3**	0	5	**1**	6	**10**
07:30 AM	**1**	0	0	**1**	0	0	0	0	1	**1**	0	2	**1**	**6**	0	**7**	10
07:45 AM	0	0	0	0	0	1	0	1	0	0	1	1	1	4	0	5	7
08:00 AM	0	0	0	0	0	1	0	1	**2**	0	0	2	0	1	0	1	4
Total Volume	1	0	0	1	0	3	0	3	3	1	4	8	2	16	1	19	31
% App. Total	100	0	0		0	100	0		37.5	12.5	50		10.5	84.2	5.3		
PHF	.250	.000	.000	.250	.000	.750	.000	.750	.375	.250	.333	.667	.500	.667	.250	.679	.775

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Client: VHB/ D. Finnigan

File Name : 102302 E
Site Code : TBA
Start Date : 9/2/2010
Page No : 1

Groups Printed- Peds and Bicycles

	Allen Street From North				Lower Welden Street From East				Lemnah Drive From South				Lower Welden Street From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
07:00 AM	1	0	0	9	1	0	0	2	0	0	0	0	0	0	0	0	13
07:15 AM	0	0	0	1	0	1	0	0	0	0	0	0	0	1	0	0	3
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	3
Total	2	0	0	11	1	1	0	2	0	0	1	0	0	1	0	0	19
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	3
08:45 AM	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	2
Total	0	0	0	2	0	1	0	2	0	0	0	0	0	0	0	0	5
Grand Total	2	0	0	13	1	2	0	4	0	0	1	0	0	1	0	0	24
Apprch %	13.3	0	0	86.7	14.3	28.6	0	57.1	0	0	100	0	0	100	0	0	
Total %	8.3	0	0	54.2	4.2	8.3	0	16.7	0	0	4.2	0	0	4.2	0	0	

	Allen Street From North					Lower Welden Street From East					Lemnah Drive From South					Lower Welden Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	**1**	0	0	**9**	**10**	**1**	0	0	**2**	**3**	0	0	0	0	0	0	0	0	0	0	**13**
07:15 AM	0	0	0	1	1	0	**1**	0	0	1	0	0	0	0	0	0	**1**	0	0	**1**	3
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	1	0	0	1	2	0	0	0	0	0	0	0	**1**	0	**1**	0	0	0	0	0	3
Total Volume	2	0	0	11	13	1	1	0	2	4	0	0	1	0	1	0	1	0	0	1	19
% App. Total	15.4	0	0	84.6		25	25	0	50		0	0	100	0		0	100	0	0		
PHF	.500	.000	.000	.306	.325	.250	.250	.000	.250	.333	.000	.000	.250	.000	.250	.000	.250	.000	.000	.250	.365

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Start Date : 9/2/2010
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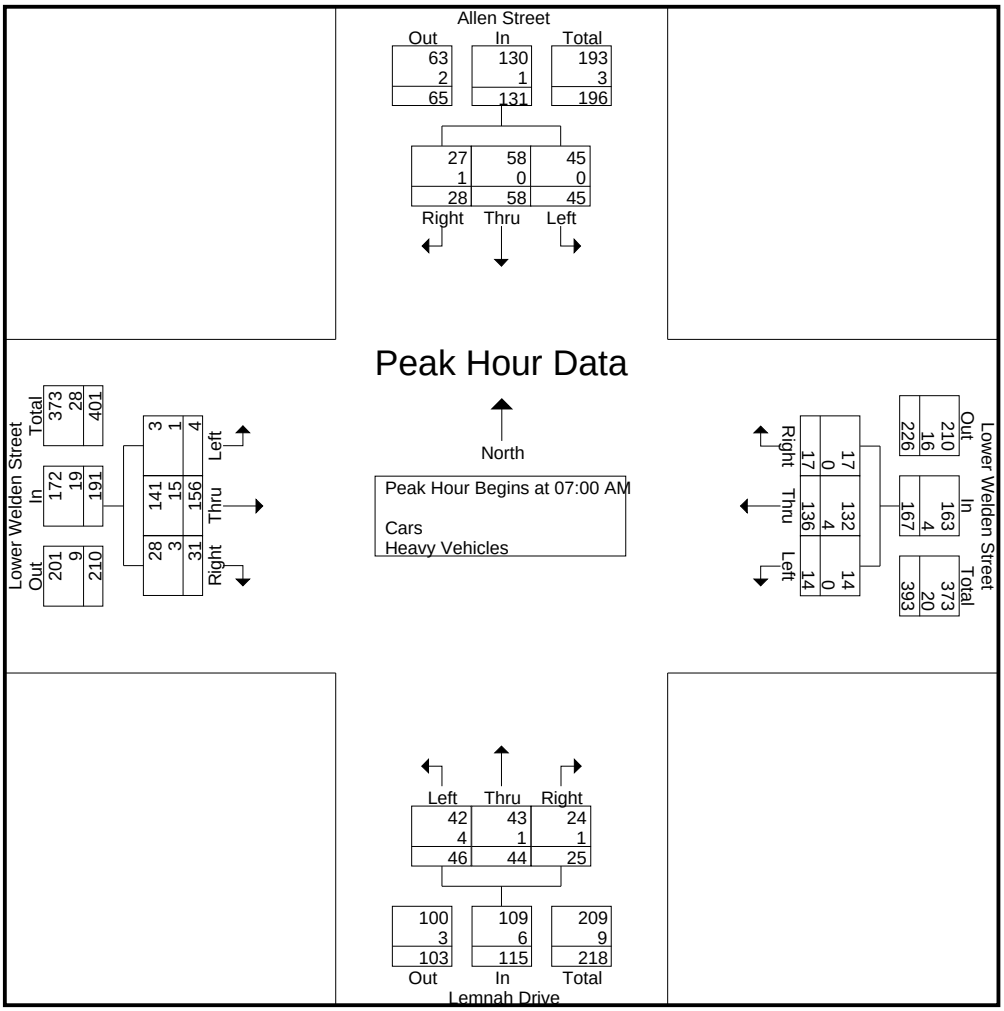
	Allen Street From North				Lower Welden Street From East				Lemnah Drive From South				Lower Welden Street From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	8	13	5	26	5	32	1	38	5	11	9	25	5	42	0	47	136
07:15 AM	3	**19**	**14**	**36**	**8**	26	3	37	**13**	**14**	14	**41**	**10**	**49**	**2**	**61**	**175**
07:30 AM	8	14	14	36	3	34	4	41	2	10	2	14	8	47	2	57	148
07:45 AM	**9**	12	12	33	1	**44**	**6**	**51**	5	9	**21**	35	8	18	0	26	145
Total Volume	28	58	45	131	17	136	14	167	25	44	46	115	31	156	4	191	604
% App. Total	21.4	44.3	34.4		10.2	81.4	8.4		21.7	38.3	40		16.2	81.7	2.1		
PHF	.778	.763	.804	.910	.531	.773	.583	.819	.481	.786	.548	.701	.775	.796	.500	.783	.863
Cars	27	58	45	130	17	132	14	163	24	43	42	109	28	141	3	172	574
% Cars	96.4	100	100	99.2	100	97.1	100	97.6	96.0	97.7	91.3	94.8	90.3	90.4	75.0	90.1	95.0
Heavy Vehicles	1	0	0	1	0	4	0	4	1	1	4	6	3	15	1	19	30
% Heavy Vehicles	3.6	0	0	0.8	0	2.9	0	2.4	4.0	2.3	8.7	5.2	9.7	9.6	25.0	9.9	5.0



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City, State: St. Albans, VT
Client: VHB/ D. Finnigan

File Name : 102302 EE
Site Code : TBA
Start Date : 9/1/2010
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Allen Street From North			Lower Welden Street From East			Lemnnah Drive From South			Lower Welden Street From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
04:00 PM	4	5	8	1	30	1	7	21	12	8	35	2	134
04:15 PM	4	10	5	2	36	2	2	10	9	10	28	0	118
04:30 PM	2	13	6	4	42	6	7	15	18	10	70	1	194
04:45 PM	2	12	6	7	49	2	4	10	9	8	46	2	157
Total	12	40	25	14	157	11	20	56	48	36	179	5	603
05:00 PM	3	7	15	8	38	3	7	18	14	14	53	2	182
05:15 PM	0	11	4	3	27	1	2	3	10	9	32	2	104
05:30 PM	2	6	9	3	35	2	6	8	7	11	35	3	127
05:45 PM	1	8	5	2	34	2	2	13	6	3	17	3	96
Total	6	32	33	16	134	8	17	42	37	37	137	10	509
Grand Total	18	72	58	30	291	19	37	98	85	73	316	15	1112
Apprch %	12.2	48.6	39.2	8.8	85.6	5.6	16.8	44.5	38.6	18.1	78.2	3.7	
Total %	1.6	6.5	5.2	2.7	26.2	1.7	3.3	8.8	7.6	6.6	28.4	1.3	
Cars	17	70	57	30	278	17	37	97	82	69	311	15	1080
% Cars	94.4	97.2	98.3	100	95.5	89.5	100	99	96.5	94.5	98.4	100	97.1
Heavy Vehicles	1	2	1	0	13	2	0	1	3	4	5	0	32
% Heavy Vehicles	5.6	2.8	1.7	0	4.5	10.5	0	1	3.5	5.5	1.6	0	2.9

	Allen Street From North				Lower Welden Street From East				Lemnnah Drive From South				Lower Welden Street From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:15 PM																	
04:15 PM	**4**	10	5	19	2	36	2	40	2	10	9	21	10	28	0	38	118
04:30 PM	2	**13**	6	21	4	42	**6**	52	**7**	15	**18**	**40**	10	**70**	1	**81**	**194**
04:45 PM	2	12	6	20	7	**49**	2	**58**	4	10	9	23	8	46	**2**	56	157
05:00 PM	3	7	**15**	**25**	**8**	38	3	49	7	**18**	14	39	**14**	53	2	69	182
Total Volume	11	42	32	85	21	165	13	199	20	53	50	123	42	197	5	244	651
% App. Total	12.9	49.4	37.6		10.6	82.9	6.5		16.3	43.1	40.7		17.2	80.7	2		
PHF	.688	.808	.533	.850	.656	.842	.542	.858	.714	.736	.694	.769	.750	.704	.625	.753	.839
Cars	11	40	32	83	21	155	11	187	20	52	48	120	39	195	5	239	629
% Cars	100	95.2	100	97.6	100	93.9	84.6	94.0	100	98.1	96.0	97.6	92.9	99.0	100	98.0	96.6
Heavy Vehicles	0	2	0	2	0	10	2	12	0	1	2	3	3	2	0	5	22
% Heavy Vehicles	0	4.8	0	2.4	0	6.1	15.4	6.0	0	1.9	4.0	2.4	7.1	1.0	0	2.0	3.4

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Client: VHB/ D. Finnigan

File Name : 102302 EE
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Start Date : 9/1/2010
Page No : 1

Groups Printed- Cars

	Allen Street From North			Lower Welden Street From East			Lemnnah Drive From South			Lower Welden Street From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
04:00 PM	3	5	8	1	29	1	7	21	11	8	32	2	128
04:15 PM	4	10	5	2	33	1	2	9	8	9	27	0	110
04:30 PM	2	12	6	4	40	6	7	15	18	10	70	1	191
04:45 PM	2	11	6	7	46	1	4	10	8	6	46	2	149
Total	11	38	25	14	148	9	20	55	45	33	175	5	578
05:00 PM	3	7	15	8	36	3	7	18	14	14	52	2	179
05:15 PM	0	11	4	3	26	1	2	3	10	8	32	2	102
05:30 PM	2	6	8	3	35	2	6	8	7	11	35	3	126
05:45 PM	1	8	5	2	33	2	2	13	6	3	17	3	95
Total	6	32	32	16	130	8	17	42	37	36	136	10	502
Grand Total	17	70	57	30	278	17	37	97	82	69	311	15	1080
Apprch %	11.8	48.6	39.6	9.2	85.5	5.2	17.1	44.9	38	17.5	78.7	3.8	
Total %	1.6	6.5	5.3	2.8	25.7	1.6	3.4	9	7.6	6.4	28.8	1.4	

	Allen Street From North				Lower Welden Street From East				Lemnnah Drive From South				Lower Welden Street From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:15 PM																	
04:15 PM	**4**	10	5	19	2	33	1	36	2	9	8	19	9	27	0	36	110
04:30 PM	2	**12**	6	20	4	40	**6**	50	**7**	15	**18**	**40**	10	**70**	1	**81**	**191**
04:45 PM	2	11	6	19	7	**46**	1	**54**	4	10	8	22	6	46	**2**	54	149
05:00 PM	3	7	**15**	**25**	**8**	36	3	47	7	**18**	14	39	**14**	52	2	68	179
Total Volume	11	40	32	83	21	155	11	187	20	52	48	120	39	195	5	239	629
% App. Total	13.3	48.2	38.6		11.2	82.9	5.9		16.7	43.3	40		16.3	81.6	2.1		
PHF	.688	.833	.533	.830	.656	.842	.458	.866	.714	.722	.667	.750	.696	.696	.625	.738	.823

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N/S: Allen Street/ Lemnah Drive
E/W: Lower Welden Street
City, State: St. Albans, VT
Client: VHB/ D. Finnigan

File Name : 102302 EE
Site Code : TBA
Start Date : 9/1/2010
Page No : 1

Groups Printed- Heavy Vehicles

	Allen Street From North			Lower Welden Street From East			Lemnnah Drive From South			Lower Welden Street From West			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
04:00 PM	1	0	0	0	1	0	0	0	1	0	3	0	6
04:15 PM	0	0	0	0	3	1	0	1	1	1	1	0	8
04:30 PM	0	1	0	0	2	0	0	0	0	0	0	0	3
04:45 PM	0	1	0	0	3	1	0	0	1	2	0	0	8
Total	1	2	0	0	9	2	0	1	3	3	4	0	25
05:00 PM	0	0	0	0	2	0	0	0	0	0	1	0	3
05:15 PM	0	0	0	0	1	0	0	0	0	1	0	0	2
05:30 PM	0	0	1	0	0	0	0	0	0	0	0	0	1
05:45 PM	0	0	0	0	1	0	0	0	0	0	0	0	1
Total	0	0	1	0	4	0	0	0	0	1	1	0	7
Grand Total	1	2	1	0	13	2	0	1	3	4	5	0	32
Apprch %	25	50	25	0	86.7	13.3	0	25	75	44.4	55.6	0	
Total %	3.1	6.2	3.1	0	40.6	6.2	0	3.1	9.4	12.5	15.6	0	

	Allen Street From North				Lower Welden Street From East				Lemnnah Drive From South				Lower Welden Street From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	**1**	0	0	**1**	0	1	0	1	0	0	**1**	1	0	**3**	0	**3**	6
04:15 PM	0	0	0	0	0	**3**	**1**	**4**	0	**1**	1	**2**	1	1	0	2	**8**
04:30 PM	0	**1**	0	1	0	2	0	2	0	0	0	0	0	0	0	0	3
04:45 PM	0	1	0	1	0	3	1	4	0	0	1	1	**2**	0	0	2	8
Total Volume	1	2	0	3	0	9	2	11	0	1	3	4	3	4	0	7	25
% App. Total	33.3	66.7	0		0	81.8	18.2		0	25	75		42.9	57.1	0		
PHF	.250	.500	.000	.750	.000	.750	.500	.688	.000	.250	.750	.500	.375	.333	.000	.583	.781

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E/W: Lower Welden Street
City, State: St. Albans, VT
Client: VHB/ D. Finnigan

File Name : 102302 EE
Site Code : TBA
Start Date : 9/1/2010
Page No : 1

Groups Printed- Peds and Bicycles

	Allen Street From North				Lower Welden Street From East				Lemnnah Drive From South				Lower Welden Street From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
04:15 PM	0	0	0	2	0	1	0	1	0	0	0	0	0	0	0	0	4
04:30 PM	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	2
04:45 PM	0	1	0	2	0	1	0	1	0	0	0	0	0	0	0	0	5
Total	0	1	0	4	0	3	0	2	0	0	0	0	0	2	0	0	12
05:00 PM	0	0	0	2	1	1	0	1	1	1	0	0	0	0	0	0	7
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	1	0	2	0	0	0	0	1	0	0	0	0	0	4
Total	0	0	0	3	1	3	0	1	1	1	1	0	0	0	0	0	11
Grand Total	0	1	0	7	1	6	0	3	1	1	1	0	0	2	0	0	23
Apprch %	0	12.5	0	87.5	10	60	0	30	33.3	33.3	33.3	0	0	100	0	0	
Total %	0	4.3	0	30.4	4.3	26.1	0	13	4.3	4.3	4.3	0	0	8.7	0	0	

	Allen Street From North					Lower Welden Street From East					Lemnnah Drive From South					Lower Welden Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	0	0	0	**2**	2	0	**1**	0	**1**	2	0	0	0	0	0	0	0	0	0	0	4
04:30 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	**1**	0	0	**1**	2
04:45 PM	0	**1**	0	2	**3**	0	1	0	1	2	0	0	0	0	0	0	0	0	0	0	5
05:00 PM	0	0	0	2	2	**1**	1	0	1	**3**	**1**	**1**	0	0	**2**	0	0	0	0	0	**7**
Total Volume	0	1	0	6	7	1	4	0	3	8	1	1	0	0	2	0	1	0	0	1	18
% App. Total	0	14.3	0	85.7		12.5	50	0	37.5		50	50	0	0		0	100	0	0		
PHF	.000	.250	.000	.750	.583	.250	1.000														

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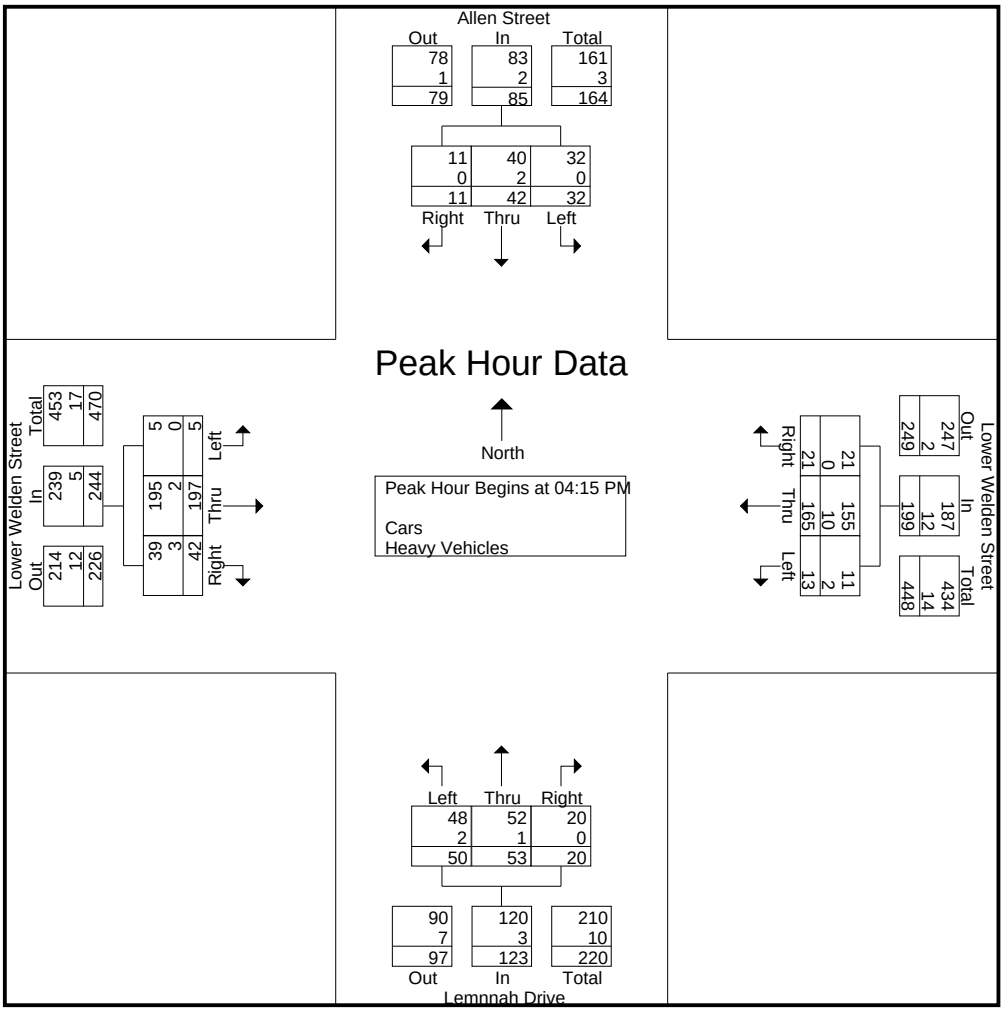
Client: VHB/ D. Finnigan

File Name : 102302 EE
Site Code : TBA
Start Date : 9/1/2010
Page No : 1

	Allen Street From North				Lower Welden Street From East				Lemnnah Drive From South				Lower Welden Street From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:15 PM																	
04:15 PM	**4**	10	5	19	2	36	2	40	2	10	9	21	10	28	0	38	118
04:30 PM	2	**13**	6	21	4	42	**6**	52	**7**	15	**18**	**40**	10	**70**	1	**81**	**194**
04:45 PM	2	12	6	20	7	**49**	2	**58**	4	10	9	23	8	46	**2**	56	157
05:00 PM	3	7	**15**	**25**	**8**	38	3	49	7	**18**	14	39	**14**	53	2	69	182
Total Volume	11	42	32	85	21	165	13	199	20	53	50	123	42	197	5	244	651
% App. Total	12.9	49.4	37.6		10.6	82.9	6.5		16.3	43.1	40.7		17.2	80.7	2		
PHF	.688	.808	.533	.850	.656	.842	.542	.858	.714	.736	.694	.769	.750	.704	.625	.753	.839
Cars	11	40	32	83	21	155	11	187	20	52	48	120	39	195	5	239	629
% Cars	100	95.2	100	97.6	100	93.9	84.6	94.0	100	98.1	96.0	97.6	92.9	99.0	100	98.0	96.6
Heavy Vehicles	0	2	0	2	0	10	2	12	0	1	2	3	3	2	0	5	22
% Heavy Vehicles	0	4.8	0	2.4	0	6.1	15.4	6.0	0	1.9	4.0	2.4	7.1	1.0	0	2.0	3.4



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E/W: Nason Street
City, State: St. Albans, VT
Client: VHB/ D. Finnigan

File Name : 102302 F
Site Code : TBA
Start Date : 9/2/2010
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Lemnah Drive From North		Nason Street From East		Nason Street From West		
Start Time	Right	Left	Right	Thru	Thru	Left	Int. Total
07:00 AM	12	3	6	9	32	18	80
07:15 AM	16	15	16	8	15	21	91
07:30 AM	11	11	9	16	17	5	69
07:45 AM	18	10	23	18	22	15	106
Total	57	39	54	51	86	59	346
08:00 AM	5	3	8	10	11	8	45
08:15 AM	7	5	10	9	14	10	55
08:30 AM	3	5	8	7	12	5	40
08:45 AM	3	3	10	8	11	7	42
Total	18	16	36	34	48	30	182
Grand Total	75	55	90	85	134	89	528
Apprch %	57.7	42.3	51.4	48.6	60.1	39.9	
Total %	14.2	10.4	17	16.1	25.4	16.9	
Cars	73	51	88	82	133	86	513
% Cars	97.3	92.7	97.8	96.5	99.3	96.6	97.2
Heavy Vehicles	2	4	2	3	1	3	15
% Heavy Vehicles	2.7	7.3	2.2	3.5	0.7	3.4	2.8

	Lemnah Drive From North			Nason Street From East			Nason Street From West			
Start Time	Right	Left	App. Total	Right	Thru	App. Total	Thru	Left	App. Total	Int. Total

Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 07:00 AM

07:00 AM	12	3	15	6	9	15	**32**	18	**50**	80
07:15 AM	16	**15**	**31**	16	8	24	15	**21**	36	91
07:30 AM	11	11	22	9	16	25	17	5	22	69
07:45 AM	**18**	10	28	**23**	**18**	**41**	22	15	37	**106**
Total Volume	57	39	96	54	51	105	86	59	145	346
% App. Total	59.4	40.6		51.4	48.6		59.3	40.7		
PHF	.792	.650	.774	.587	.708	.640	.672	.702	.725	.816
Cars	55	35	90	54	49	103	86	57	143	336
% Cars	96.5	89.7	93.8	100	96.1	98.1	100	96.6	98.6	97.1
Heavy Vehicles	2	4	6	0	2	2	0	2	2	10
% Heavy Vehicles	3.5	10.3	6.3	0	3.9	1.9	0	3.4	1.4	2.9

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City, State: St. Albans, VT
Client: VHB/ D. Finnigan

File Name : 102302 F
Site Code : TBA
Start Date : 9/2/2010
Page No : 1

Groups Printed- Cars

	Lemnah Drive From North		Nason Street From East		Nason Street From West		
Start Time	Right	Left	Right	Thru	Thru	Left	Int. Total
07:00 AM	11	3	6	7	32	18	77
07:15 AM	15	13	16	8	15	20	87
07:30 AM	11	11	9	16	17	5	69
07:45 AM	18	8	23	18	22	14	103
Total	55	35	54	49	86	57	336
08:00 AM	5	3	8	10	11	8	45
08:15 AM	7	5	10	8	13	9	52
08:30 AM	3	5	7	7	12	5	39
08:45 AM	3	3	9	8	11	7	41
Total	18	16	34	33	47	29	177
Grand Total	73	51	88	82	133	86	513
Apprch %	58.9	41.1	51.8	48.2	60.7	39.3	
Total %	14.2	9.9	17.2	16	25.9	16.8	

	Lemnah Drive From North			Nason Street From East			Nason Street From West			
Start Time	Right	Left	App. Total	Right	Thru	App. Total	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:00 AM										
07:00 AM	11	3	14	6	7	13	**32**	18	**50**	77
07:15 AM	15	**13**	**28**	16	8	24	15	**20**	35	87
07:30 AM	11	11	22	9	16	25	17	5	22	69
07:45 AM	**18**	8	26	**23**	**18**	**41**	22	14	36	**103**
Total Volume	55	35	90	54	49	103	86	57	143	336
% App. Total	61.1	38.9		52.4	47.6		60.1	39.9		
PHF	.764	.673	.804	.587	.681	.628	.672	.713	.715	.816

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Page No : 1

Groups Printed- Heavy Vehicles

	Lemnah Drive From North		Nason Street From East		Nason Street From West		
Start Time	Right	Left	Right	Thru	Thru	Left	Int. Total
07:00 AM	1	0	0	2	0	0	3
07:15 AM	1	2	0	0	0	1	4
07:30 AM	0	0	0	0	0	0	0
07:45 AM	0	2	0	0	0	1	3
Total	2	4	0	2	0	2	10
08:00 AM	0	0	0	0	0	0	0
08:15 AM	0	0	0	1	1	1	3
08:30 AM	0	0	1	0	0	0	1
08:45 AM	0	0	1	0	0	0	1
Total	0	0	2	1	1	1	5
Grand Total	2	4	2	3	1	3	15
Apprch %	33.3	66.7	40	60	25	75	
Total %	13.3	26.7	13.3	20	6.7	20	

	Lemnah Drive From North			Nason Street From East			Nason Street From West			
Start Time	Right	Left	App. Total	Right	Thru	App. Total	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:00 AM										
07:00 AM	**1**	0	1	0	**2**	**2**	0	0	0	3
07:15 AM	1	**2**	**3**	0	0	0	0	**1**	**1**	**4**
07:30 AM	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	2	2	0	0	0	0	1	1	3
Total Volume	2	4	6	0	2	2	0	2	2	10
% App. Total	33.3	66.7		0	100		0	100		
PHF	.500	.500	.500	.000	.250	.250	.000	.500	.500	.625

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Page No : 1

Groups Printed- Peds and Bicycles

	Lemnah Drive From North			Nason Street From East			Nason Street From West			
Start Time	Right	Left	Peds	Right	Thru	Peds	Thru	Left	Peds	Int. Total
07:00 AM	1	0	1	0	0	0	0	0	0	2
07:15 AM	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	1	0	0	0	0	0	0	1
07:45 AM	0	0	0	0	0	0	0	0	0	0
Total	1	0	2	0	0	0	0	0	0	3
08:00 AM	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
Grand Total	1	0	2	0	0	0	0	0	0	3
Apprch %	33.3	0	66.7	0	0	0	0	0	0	
Total %	33.3	0	66.7	0	0	0	0	0	0	

	Lemnah Drive From North				Nason Street From East				Nason Street From West				
Start Time	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:00 AM													
07:00 AM	**1**	0	**1**	**2**	0	0	0	0	0	0	0	0	**2**
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	1	1	0	0	0	0	0	0	0	0	1
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	1	0	2	3	0	0	0	0	0	0	0	0	3
% App. Total	33.3	0	66.7		0	0	0		0	0	0		
PHF	.250	.000	.500	.375	.000	.000	.000	.000	.000	.000	.000	.000	.375

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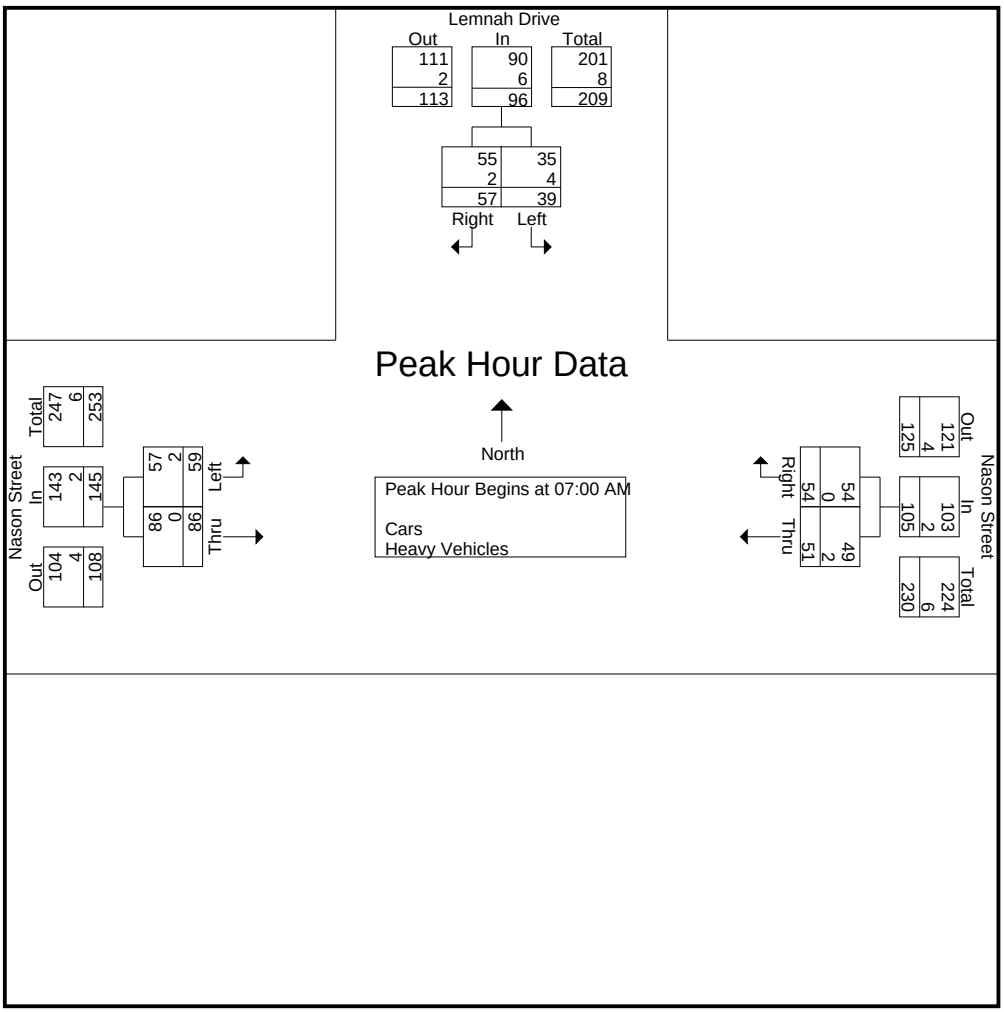
	Lemnah Drive From North			Nason Street From East			Nason Street From West			
Start Time	Right	Left	App. Total	Right	Thru	App. Total	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:00 AM										
07:00 AM	12	3	15	6	9	15	**32**	18	**50**	80
07:15 AM	16	**15**	**31**	16	8	24	15	**21**	36	91
07:30 AM	11	11	22	9	16	25	17	5	22	69
07:45 AM	**18**	10	28	**23**	**18**	**41**	22	15	37	**106**
Total Volume	57	39	96	54	51	105	86	59	145	346
% App. Total	59.4	40.6		51.4	48.6		59.3	40.7		
PHF	.792	.650	.774	.587	.708	.640	.672	.702	.725	.816
Cars	55	35	90	54	49	103	86	57	143	336
% Cars	96.5	89.7	93.8	100	96.1	98.1	100	96.6	98.6	97.1
Heavy Vehicles	2	4	6	0	2	2	0	2	2	10
% Heavy Vehicles	3.5	10.3	6.3	0	3.9	1.9	0	3.4	1.4	2.9



PRECISION
D A T A
INDUSTRIES, LLC
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Email: datarequests@pdillc.com

N: Lemnah Drive
E/W: Nason Street
City, State: St. Albans, VT
Client: VHB/ D. Finnigan

File Name : 102302 FF
Site Code : TBA
Start Date : 9/1/2010
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	Lemnah Drive From North		Nason Street From East		Nason Street From West		
Start Time	Right	Left	Right	Thru	Thru	Left	Int. Total
04:00 PM	7	6	11	20	13	29	86
04:15 PM	10	10	4	21	10	12	67
04:30 PM	18	13	12	25	15	22	105
04:45 PM	13	10	8	24	16	11	82
Total	48	39	35	90	54	74	340
05:00 PM	15	15	10	37	12	22	111
05:15 PM	14	9	9	17	13	6	68
05:30 PM	8	7	9	24	12	10	70
05:45 PM	7	12	5	20	20	17	81
Total	44	43	33	98	57	55	330
Grand Total	92	82	68	188	111	129	670
Apprch %	52.9	47.1	26.6	73.4	46.2	53.8	
Total %	13.7	12.2	10.1	28.1	16.6	19.3	
Cars	87	82	63	182	108	127	649
% Cars	94.6	100	92.6	96.8	97.3	98.4	96.9
Heavy Vehicles	5	0	5	6	3	2	21
% Heavy Vehicles	5.4	0	7.4	3.2	2.7	1.6	3.1

	Lemnah Drive From North			Nason Street From East			Nason Street From West			
Start Time	Right	Left	App. Total	Right	Thru	App. Total	Thru	Left	App. Total	Int. Total

Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 04:30 PM

04:30 PM	**18**	13	**31**	**12**	25	37	15	**22**	**37**	105
04:45 PM	13	10	23	8	24	32	**16**	11	27	82
05:00 PM	15	**15**	30	10	**37**	**47**	12	22	34	**111**
05:15 PM	14	9	23	9	17	26	13	6	19	68
Total Volume	60	47	107	39	103	142	56	61	117	366
% App. Total	56.1	43.9		27.5	72.5		47.9	52.1		
PHF	.833	.783	.863	.813	.696	.755	.875	.693	.791	.824
Cars	56	47	103	38	98	136	53	60	113	352
% Cars	93.3	100	96.3	97.4	95.1	95.8	94.6	98.4	96.6	96.2
Heavy Vehicles	4	0	4	1	5	6	3	1	4	14
% Heavy Vehicles	6.7	0	3.7	2.6	4.9	4.2	5.4	1.6	3.4	3.8

PRECISION
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City, State: St. Albans, VT
Client: VHB/ D. Finnigan

File Name : 102302 FF
Site Code : TBA
Start Date : 9/1/2010
Page No : 1

Groups Printed- Cars

	Lemnah Drive From North		Nason Street From East		Nason Street From West		
Start Time	Right	Left	Right	Thru	Thru	Left	Int. Total
04:00 PM	6	6	10	20	13	29	84
04:15 PM	10	10	3	21	10	11	65
04:30 PM	18	13	12	22	14	22	101
04:45 PM	10	10	8	24	15	10	77
Total	44	39	33	87	52	72	327
05:00 PM	14	15	9	35	12	22	107
05:15 PM	14	9	9	17	12	6	67
05:30 PM	8	7	8	23	12	10	68
05:45 PM	7	12	4	20	20	17	80
Total	43	43	30	95	56	55	322
Grand Total	87	82	63	182	108	127	649
Apprch %	51.5	48.5	25.7	74.3	46	54	
Total %	13.4	12.6	9.7	28	16.6	19.6	

	Lemnah Drive From North			Nason Street From East			Nason Street From West			
Start Time	Right	Left	App. Total	Right	Thru	App. Total	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:30 PM										
04:30 PM	**18**	13	**31**	**12**	22	34	14	**22**	**36**	101
04:45 PM	10	10	20	8	24	32	**15**	10	25	77
05:00 PM	14	**15**	29	9	**35**	**44**	12	22	34	**107**
05:15 PM	14	9	23	9	17	26	12	6	18	67
Total Volume	56	47	103	38	98	136	53	60	113	352
% App. Total	54.4	45.6		27.9	72.1		46.9	53.1		
PHF	.778	.783	.831	.792	.700	.773	.883	.682	.785	.822

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Client: VHB/ D. Finnigan

File Name : 102302 FF
Site Code : TBA
Start Date : 9/1/2010
Page No : 1

Groups Printed- Heavy Vehicles

	Lemnah Drive From North		Nason Street From East		Nason Street From West		
Start Time	Right	Left	Right	Thru	Thru	Left	Int. Total
04:00 PM	1	0	1	0	0	0	2
04:15 PM	0	0	1	0	0	1	2
04:30 PM	0	0	0	3	1	0	4
04:45 PM	3	0	0	0	1	1	5
Total	4	0	2	3	2	2	13
05:00 PM	1	0	1	2	0	0	4
05:15 PM	0	0	0	0	1	0	1
05:30 PM	0	0	1	1	0	0	2
05:45 PM	0	0	1	0	0	0	1
Total	1	0	3	3	1	0	8
Grand Total	5	0	5	6	3	2	21
Apprch %	100	0	45.5	54.5	60	40	
Total %	23.8	0	23.8	28.6	14.3	9.5	

	Lemnah Drive From North			Nason Street From East			Nason Street From West			
Start Time	Right	Left	App. Total	Right	Thru	App. Total	Thru	Left	App. Total	Int. Total

Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 04:15 PM

04:15 PM	0	0	0	**1**	0	1	0	**1**	1	2
04:30 PM	0	0	0	0	**3**	**3**	**1**	0	1	4
04:45 PM	**3**	0	**3**	0	0	0	1	1	**2**	**5**
05:00 PM	1	0	1	1	2	3	0	0	0	4
Total Volume	4	0	4	2	5	7	2	2	4	15
% App. Total	100	0		28.6	71.4		50	50		
PHF	.333	.000	.333	.500	.417	.583	.500	.500	.500	.750

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File Name : 102302 FF
Site Code : TBA
Start Date : 9/1/2010
Page No : 1

Groups Printed- Peds and Bicycles

	Lemnah Drive From North			Nason Street From East			Nason Street From West			
Start Time	Right	Left	Peds	Right	Thru	Peds	Thru	Left	Peds	Int. Total
04:00 PM	0	0	0	0	1	0	0	0	0	1
04:15 PM	0	0	0	0	0	0	1	0	0	1
04:30 PM	0	0	0	0	1	0	0	0	0	1
04:45 PM	0	1	0	0	0	0	1	0	0	2
Total	0	1	0	0	2	0	2	0	0	5
05:00 PM	0	0	0	0	0	0	0	3	0	3
05:15 PM	0	0	0	0	0	0	1	0	0	1
05:30 PM	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	1	0	0	0	0	0	0	1
Total	0	0	1	0	0	0	1	3	0	5
Grand Total	0	1	1	0	2	0	3	3	0	10
Apprch %	0	50	50	0	100	0	50	50	0	
Total %	0	10	10	0	20	0	30	30	0	

	Lemnah Drive From North				Nason Street From East				Nason Street From West				
Start Time	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:15 PM													
04:15 PM	0	0	0	0	0	0	0	0	**1**	0	0	1	1
04:30 PM	0	0	0	0	0	**1**	0	**1**	0	0	0	0	1
04:45 PM	0	**1**	0	**1**	0	0	0	0	1	0	0	1	2
05:00 PM	0	0	0	0	0	0	0	0	0	**3**	0	**3**	**3**
Total Volume	0	1	0	1	0	1	0	1	2	3	0	5	7
% App. Total	0	100	0		0	100	0		40	60	0		
PHF	.000	.250	.000	.250	.000	.250	.000	.250	.500	.250	.000	.417	.583

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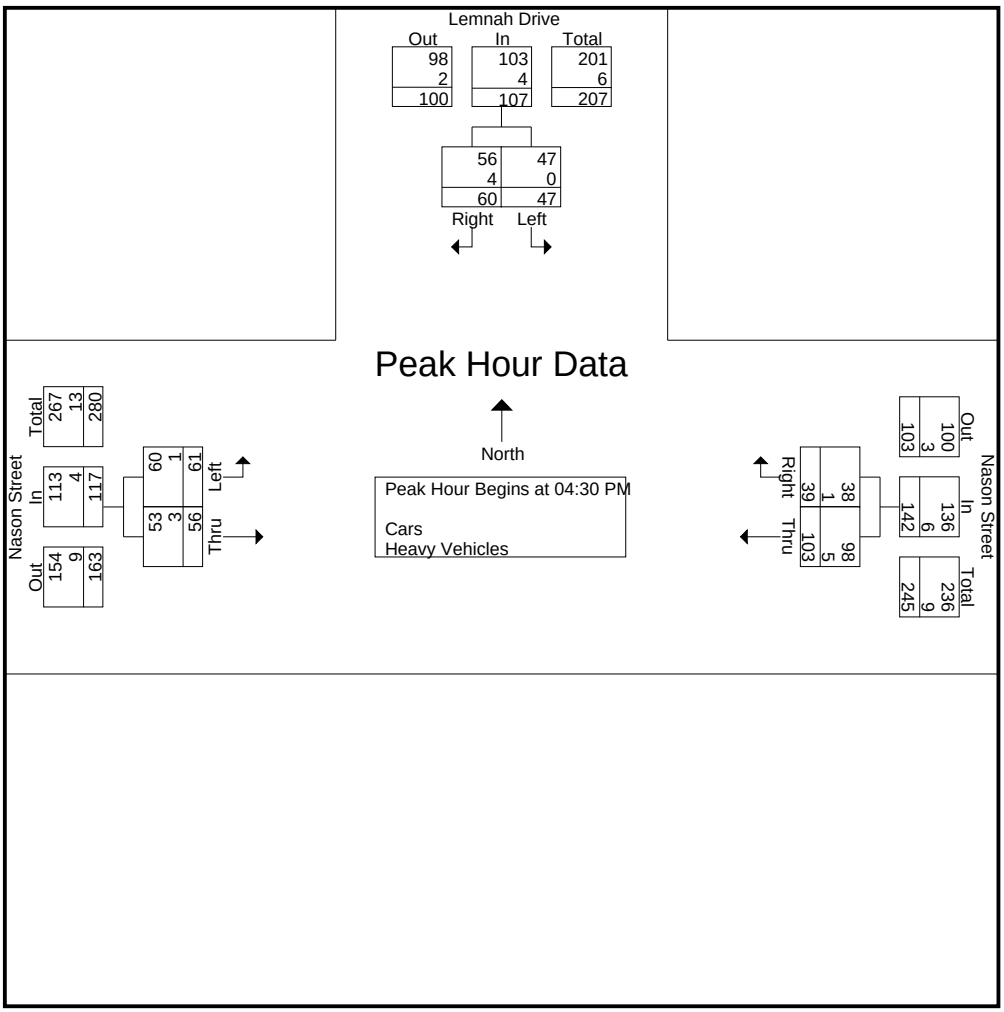
File Name : 102302 FF
Site Code : TBA
Start Date : 9/1/2010
Page No : 1

	Lemnah Drive From North			Nason Street From East			Nason Street From West			
Start Time	Right	Left	App. Total	Right	Thru	App. Total	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:30 PM										
04:30 PM	**18**	13	**31**	**12**	25	37	15	**22**	**37**	105
04:45 PM	13	10	23	8	24	32	**16**	11	27	82
05:00 PM	15	**15**	30	10	**37**	**47**	12	22	34	**111**
05:15 PM	14	9	23	9	17	26	13	6	19	68
Total Volume	60	47	107	39	103	142	56	61	117	366
% App. Total	56.1	43.9		27.5	72.5		47.9	52.1		
PHF	.833	.783	.863	.813	.696	.755	.875	.693	.791	.824
Cars	56	47	103	38	98	136	53	60	113	352
% Cars	93.3	100	96.3	97.4	95.1	95.8	94.6	98.4	96.6	96.2
Heavy Vehicles	4	0	4	1	5	6	3	1	4	14
% Heavy Vehicles	6.7	0	3.7	2.6	4.9	4.2	5.4	1.6	3.4	3.8



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N/S: South Main Street (Route 7)
E: Interstate Access Road
City, State: St. Albans, VT
Client: VHB/ D. Finnigan

File Name : 102302 G
Site Code : TBA
Start Date : 9/2/2010
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	South Main Street (Route 7) From North		Interstate Access Road From East		South Main Street (Route 7) From South		
Start Time	Thru	Left	Right	Left	Right	Thru	Int. Total
07:00 AM	69	83	60	6	21	125	364
07:15 AM	84	85	44	8	21	129	371
07:30 AM	88	85	66	13	19	89	360
07:45 AM	64	72	84	15	21	106	362
Total	305	325	254	42	82	449	1457
08:00 AM	48	65	58	5	7	73	256
08:15 AM	43	41	51	6	8	56	205
08:30 AM	54	52	39	12	14	54	225
08:45 AM	31	44	38	13	13	61	200
Total	176	202	186	36	42	244	886
Grand Total	481	527	440	78	124	693	2343
Apprch %	47.7	52.3	84.9	15.1	15.2	84.8	
Total %	20.5	22.5	18.8	3.3	5.3	29.6	
Cars	456	490	417	53	109	668	2193
% Cars	94.8	93	94.8	67.9	87.9	96.4	93.6
Heavy Vehicles	25	37	23	25	15	25	150
% Heavy Vehicles	5.2	7	5.2	32.1	12.1	3.6	6.4

	South Main Street (Route 7) From North			Interstate Access Road From East			South Main Street (Route 7) From South			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:00 AM										
07:00 AM	69	83	152	60	6	66	**21**	125	146	364
07:15 AM	84	**85**	169	44	8	52	21	**129**	**150**	**371**
07:30 AM	**88**	85	**173**	66	13	79	19	89	108	360
07:45 AM	64	72	136	**84**	**15**	**99**	21	106	127	362
Total Volume	305	325	630	254	42	296	82	449	531	1457
% App. Total	48.4	51.6		85.8	14.2		15.4	84.6		
PHF	.866	.956	.910	.756	.700	.747	.976	.870	.885	.982
Cars	291	302	593	240	33	273	76	433	509	1375
% Cars	95.4	92.9	94.1	94.5	78.6	92.2	92.7	96.4	95.9	94.4
Heavy Vehicles	14	23	37	14	9	23	6	16	22	82
% Heavy Vehicles	4.6	7.1	5.9	5.5	21.4	7.8	7.3	3.6	4.1	5.6

PRECISION
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N/S: South Main Street (Route 7)
E: Interstate Access Road
City, State: St. Albans, VT
Client: VHB/ D. Finnigan

File Name : 102302 G
Site Code : TBA
Start Date : 9/2/2010
Page No : 1

Groups Printed- Cars

	South Main Street (Route 7) From North		Interstate Access Road From East		South Main Street (Route 7) From South		
Start Time	Thru	Left	Right	Left	Right	Thru	Int. Total
07:00 AM	67	79	55	5	20	120	346
07:15 AM	78	81	41	5	21	125	351
07:30 AM	85	75	64	8	16	85	333
07:45 AM	61	67	80	15	19	103	345
Total	291	302	240	33	76	433	1375
08:00 AM	46	59	55	5	4	71	240
08:15 AM	41	39	50	3	8	52	193
08:30 AM	48	48	37	5	11	51	200
08:45 AM	30	42	35	7	10	61	185
Total	165	188	177	20	33	235	818
Grand Total	456	490	417	53	109	668	2193
Apprch %	48.2	51.8	88.7	11.3	14	86	
Total %	20.8	22.3	19	2.4	5	30.5	

	South Main Street (Route 7) From North			Interstate Access Road From East			South Main Street (Route 7) From South			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:00 AM										
07:00 AM	67	79	146	55	5	60	20	120	140	346
07:15 AM	78	**81**	159	41	5	46	**21**	**125**	**146**	**351**
07:30 AM	**85**	75	**160**	64	8	72	16	85	101	333
07:45 AM	61	67	128	**80**	**15**	**95**	19	103	122	345
Total Volume	291	302	593	240	33	273	76	433	509	1375
% App. Total	49.1	50.9		87.9	12.1		14.9	85.1		
PHF	.856	.932	.927	.750	.550	.718	.905	.866	.872	.979

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Site Code : TBA
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Page No : 1

Groups Printed- Heavy Vehicles

	South Main Street (Route 7) From North		Interstate Access Road From East		South Main Street (Route 7) From South		
Start Time	Thru	Left	Right	Left	Right	Thru	Int. Total
07:00 AM	2	4	5	1	1	5	18
07:15 AM	6	4	3	3	0	4	20
07:30 AM	3	10	2	5	3	4	27
07:45 AM	3	5	4	0	2	3	17
Total	14	23	14	9	6	16	82
08:00 AM	2	6	3	0	3	2	16
08:15 AM	2	2	1	3	0	4	12
08:30 AM	6	4	2	7	3	3	25
08:45 AM	1	2	3	6	3	0	15
Total	11	14	9	16	9	9	68
Grand Total	25	37	23	25	15	25	150
Apprch %	40.3	59.7	47.9	52.1	37.5	62.5	
Total %	16.7	24.7	15.3	16.7	10	16.7	

	South Main Street (Route 7) From North			Interstate Access Road From East			South Main Street (Route 7) From South			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:00 AM										
07:00 AM	2	4	6	**5**	1	6	1	**5**	6	18
07:15 AM	**6**	4	10	3	3	6	0	4	4	20
07:30 AM	3	**10**	**13**	2	**5**	**7**	**3**	4	**7**	**27**
07:45 AM	3	5	8	4	0	4	2	3	5	17
Total Volume	14	23	37	14	9	23	6	16	22	82
% App. Total	37.8	62.2		60.9	39.1		27.3	72.7		
PHF	.583	.575	.712	.700	.450	.821	.500	.800	.786	.759

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Start Date : 9/2/2010
Page No : 1

Groups Printed- Peds and Bicycles

	South Main Street (Route 7) From North			Interstate Access Road From East			South Main Street (Route 7) From South			
Start Time	Thru	Left	Peds	Right	Left	Peds	Right	Thru	Peds	Int. Total
07:00 AM	0	0	0	0	0	1	0	1	0	2
07:15 AM	0	0	0	0	0	0	0	2	0	2
07:30 AM	0	0	0	0	0	6	0	0	0	6
07:45 AM	1	0	0	0	0	2	0	3	0	6
Total	1	0	0	0	0	9	0	6	0	16
08:00 AM	1	0	0	0	0	3	0	2	0	6
08:15 AM	1	0	0	0	0	1	0	0	0	2
08:30 AM	0	0	0	0	0	0	0	1	0	1
08:45 AM	0	0	0	0	0	0	0	0	0	0
Total	2	0	0	0	0	4	0	3	0	9
Grand Total	3	0	0	0	0	13	0	9	0	25
Apprch %	100	0	0	0	0	100	0	100	0	
Total %	12	0	0	0	0	52	0	36	0	

	South Main Street (Route 7) From North				Interstate Access Road From East				South Main Street (Route 7) From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:15 AM													
07:15 AM	0	0	0	0	0	0	0	0	0	2	0	2	2
07:30 AM	0	0	0	0	0	0	**6**	**6**	0	0	0	0	**6**
07:45 AM	**1**	0	0	**1**	0	0	2	2	0	**3**	0	**3**	6
08:00 AM	1	0	0	1	0	0	3	3	0	2	0	2	6
Total Volume	2	0	0	2	0	0	11	11	0	7	0	7	20
% App. Total	100	0	0		0	0	100		0	100	0		
PHF	.500	.000	.000	.500	.000	.000	.458	.458	.000	.583	.000	.583	.833

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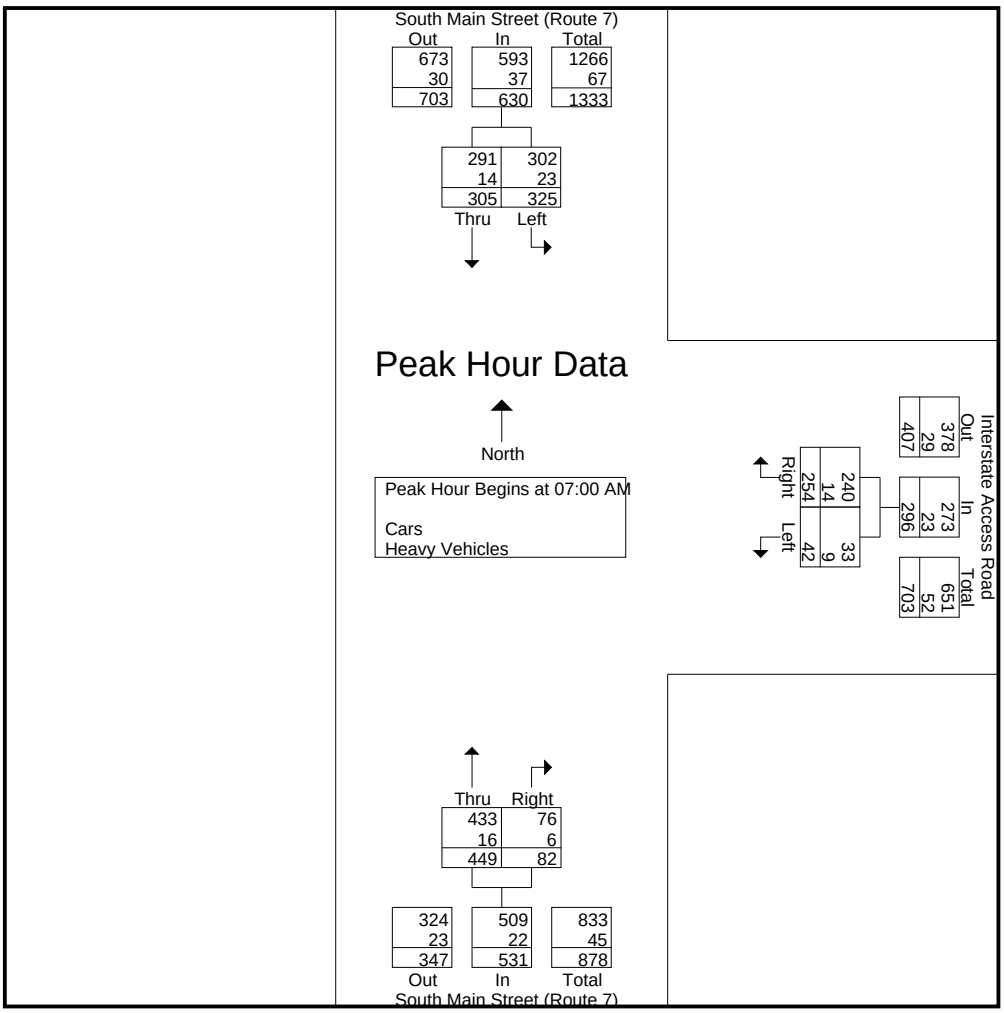
	South Main Street (Route 7) From North			Interstate Access Road From East			South Main Street (Route 7) From South			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:00 AM										
07:00 AM	69	83	152	60	6	66	**21**	125	146	364
07:15 AM	84	**85**	169	44	8	52	21	**129**	**150**	**371**
07:30 AM	**88**	85	**173**	66	13	79	19	89	108	360
07:45 AM	64	72	136	**84**	**15**	**99**	21	106	127	362
Total Volume	305	325	630	254	42	296	82	449	531	1457
% App. Total	48.4	51.6		85.8	14.2		15.4	84.6		
PHF	.866	.956	.910	.756	.700	.747	.976	.870	.885	.982
Cars	291	302	593	240	33	273	76	433	509	1375
% Cars	95.4	92.9	94.1	94.5	78.6	92.2	92.7	96.4	95.9	94.4
Heavy Vehicles	14	23	37	14	9	23	6	16	22	82
% Heavy Vehicles	4.6	7.1	5.9	5.5	21.4	7.8	7.3	3.6	4.1	5.6



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City, State: St. Albans, VT
Client: VHB/ D. Finnigan

File Name : 102302 GG
Site Code : TBA
Start Date : 9/1/2010
Page No : 1

Groups Printed- Cars - Heavy Vehicles

	South Main Street (Route 7) From North		Interstate Access Road From East		South Main Street (Route 7) From South		
Start Time	Thru	Left	Right	Left	Right	Thru	Int. Total
04:00 PM	76	48	53	16	46	106	345
04:15 PM	80	56	85	8	16	88	333
04:30 PM	95	58	86	14	27	107	387
04:45 PM	112	79	79	13	21	78	382
Total	363	241	303	51	110	379	1447
05:00 PM	93	78	106	8	39	130	454
05:15 PM	81	59	76	12	19	88	335
05:30 PM	66	55	73	9	19	69	291
05:45 PM	66	53	89	13	19	89	329
Total	306	245	344	42	96	376	1409
Grand Total	669	486	647	93	206	755	2856
Apprch %	57.9	42.1	87.4	12.6	21.4	78.6	
Total %	23.4	17	22.7	3.3	7.2	26.4	
Cars	654	478	624	67	184	730	2737
% Cars	97.8	98.4	96.4	72	89.3	96.7	95.8
Heavy Vehicles	15	8	23	26	22	25	119
% Heavy Vehicles	2.2	1.6	3.6	28	10.7	3.3	4.2

	South Main Street (Route 7) From North			Interstate Access Road From East			South Main Street (Route 7) From South			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:30 PM										
04:30 PM	95	58	153	86	**14**	100	27	107	134	387
04:45 PM	**112**	**79**	**191**	79	13	92	21	78	99	382
05:00 PM	93	78	171	**106**	8	**114**	**39**	**130**	**169**	**454**
05:15 PM	81	59	140	76	12	88	19	88	107	335
Total Volume	381	274	655	347	47	394	106	403	509	1558
% App. Total	58.2	41.8		88.1	11.9		20.8	79.2		
PHF	.850	.867	.857	.818	.839	.864	.679	.775	.753	.858
Cars	373	270	643	336	34	370	93	394	487	1500
% Cars	97.9	98.5	98.2	96.8	72.3	93.9	87.7	97.8	95.7	96.3
Heavy Vehicles	8	4	12	11	13	24	13	9	22	58
% Heavy Vehicles	2.1	1.5	1.8	3.2	27.7	6.1	12.3	2.2	4.3	3.7

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Groups Printed- Cars

	South Main Street (Route 7) From North		Interstate Access Road From East		South Main Street (Route 7) From South		
Start Time	Thru	Left	Right	Left	Right	Thru	Int. Total
04:00 PM	72	47	49	13	41	102	324
04:15 PM	79	55	81	6	15	82	318
04:30 PM	94	58	83	10	26	105	376
04:45 PM	109	77	77	10	15	77	365
Total	354	237	290	39	97	366	1383
05:00 PM	90	76	103	6	35	125	435
05:15 PM	80	59	73	8	17	87	324
05:30 PM	65	54	72	6	17	67	281
05:45 PM	65	52	86	8	18	85	314
Total	300	241	334	28	87	364	1354
Grand Total	654	478	624	67	184	730	2737
Apprch %	57.8	42.2	90.3	9.7	20.1	79.9	
Total %	23.9	17.5	22.8	2.4	6.7	26.7	

	South Main Street (Route 7) From North			Interstate Access Road From East			South Main Street (Route 7) From South			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:30 PM										
04:30 PM	94	58	152	83	**10**	93	26	105	131	376
04:45 PM	**109**	**77**	**186**	77	10	87	15	77	92	365
05:00 PM	90	76	166	**103**	6	**109**	**35**	**125**	**160**	**435**
05:15 PM	80	59	139	73	8	81	17	87	104	324
Total Volume	373	270	643	336	34	370	93	394	487	1500
% App. Total	58	42		90.8	9.2		19.1	80.9		
PHF	.856	.877	.864	.816	.850	.849	.664	.788	.761	.862

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Client: VHB/ D. Finnigan

File Name : 102302 GG
Site Code : TBA
Start Date : 9/1/2010
Page No : 1

Groups Printed- Heavy Vehicles

	South Main Street (Route 7) From North		Interstate Access Road From East		South Main Street (Route 7) From South		
Start Time	Thru	Left	Right	Left	Right	Thru	Int. Total
04:00 PM	4	1	4	3	5	4	21
04:15 PM	1	1	4	2	1	6	15
04:30 PM	1	0	3	4	1	2	11
04:45 PM	3	2	2	3	6	1	17
Total	9	4	13	12	13	13	64
05:00 PM	3	2	3	2	4	5	19
05:15 PM	1	0	3	4	2	1	11
05:30 PM	1	1	1	3	2	2	10
05:45 PM	1	1	3	5	1	4	15
Total	6	4	10	14	9	12	55
Grand Total	15	8	23	26	22	25	119
Apprch %	65.2	34.8	46.9	53.1	46.8	53.2	
Total %	12.6	6.7	19.3	21.8	18.5	21	

	South Main Street (Route 7) From North			Interstate Access Road From East			South Main Street (Route 7) From South			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:00 PM										
04:00 PM	**4**	1	**5**	**4**	3	**7**	5	4	**9**	**21**
04:15 PM	1	1	2	4	2	6	1	**6**	7	15
04:30 PM	1	0	1	3	**4**	7	1	2	3	11
04:45 PM	3	**2**	5	2	3	5	**6**	1	7	17
Total Volume	9	4	13	13	12	25	13	13	26	64
% App. Total	69.2	30.8		52	48		50	50		
PHF	.563	.500	.650	.813	.750	.893	.542	.542	.722	.762

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Page No : 1

Groups Printed- Peds and Bicycles

	South Main Street (Route 7) From North			Interstate Access Road From East			South Main Street (Route 7) From South			
Start Time	Thru	Left	Peds	Right	Left	Peds	Right	Thru	Peds	Int. Total
04:00 PM	0	2	0	0	0	0	0	0	0	2
04:15 PM	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	2	0	2
04:45 PM	2	0	0	0	0	0	0	0	0	2
Total	2	2	0	0	0	0	0	2	0	6
05:00 PM	0	0	0	0	0	2	0	0	0	2
05:15 PM	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	1	0	1	0	0	0	2
Total	0	0	0	1	0	3	0	0	0	4
Grand Total	2	2	0	1	0	3	0	2	0	10
Apprch %	50	50	0	25	0	75	0	100	0	
Total %	20	20	0	10	0	30	0	20	0	

	South Main Street (Route 7) From North				Interstate Access Road From East				South Main Street (Route 7) From South				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:00 PM													
04:00 PM	0	**2**	0	**2**	0	0	0	0	0	0	0	0	**2**
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	**2**	0	**2**	2
04:45 PM	**2**	0	0	2	0	0	0	0	0	0	0	0	2
Total Volume	2	2	0	4	0	0	0	0	0	2	0	2	6
% App. Total	50	50	0		0	0	0		0	100	0		
PHF	.250	.250	.000	.500	.000	.000	.000	.000	.000	.250	.000	.250	.750

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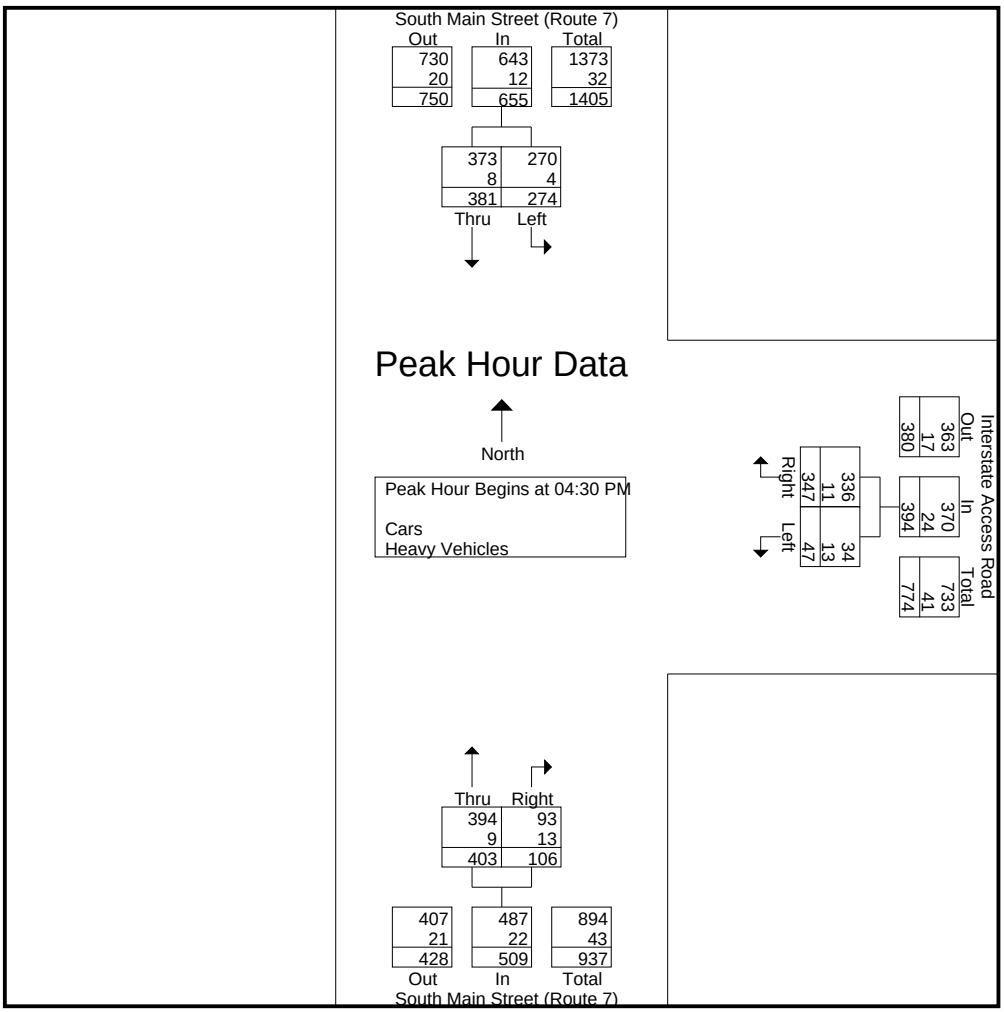
	South Main Street (Route 7) From North			Interstate Access Road From East			South Main Street (Route 7) From South			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:30 PM										
04:30 PM	95	58	153	86	**14**	100	27	107	134	387
04:45 PM	**112**	**79**	**191**	79	13	92	21	78	99	382
05:00 PM	93	78	171	**106**	8	**114**	**39**	**130**	**169**	**454**
05:15 PM	81	59	140	76	12	88	19	88	107	335
Total Volume	381	274	655	347	47	394	106	403	509	1558
% App. Total	58.2	41.8		88.1	11.9		20.8	79.2		
PHF	.850	.867	.857	.818	.839	.864	.679	.775	.753	.858
Cars	373	270	643	336	34	370	93	394	487	1500
% Cars	97.9	98.5	98.2	96.8	72.3	93.9	87.7	97.8	95.7	96.3
Heavy Vehicles	8	4	12	11	13	24	13	9	22	58
% Heavy Vehicles	2.1	1.5	1.8	3.2	27.7	6.1	12.3	2.2	4.3	3.7



Design Hour Adjustment Calculations

Vermont Agency of Transportation
Permanent Count Station P6F029
Georgia: US 7 1.7 miles North of I-89

2009 Average	Weekday 7:00 AM	Weekday 4:00 PM	*DHV calcs AM*	*AM Adjustment Factors Average*	*AM Adjustment Factors Peak*
January	353	340	*0.96*	*1.03*	*1.15*
February	358	334	*0.93*	*1.01*	*1.14*
March	394	353	*0.90*	*0.92*	*1.03*
April	380	366	*0.96*	*0.96*	*1.07*
May	389	431	*1.11*	*0.93*	*1.05*
June	357	410	*1.15*	*1.02*	*1.14*
July	299	387	*1.29*	*1.21*	*1.36*
August	312	396	*1.27*	*1.16*	*1.30*
September	407	420	*1.03*	*0.89*	*1.00*
October	401	397	*0.99*	*0.91*	*1.01*
November	363	346	*0.95*	*1.00*	*1.12*
December	345	327	*0.95*	*1.05*	*1.18*
Average Month	*363*	*376*	*1.03*		
Peak Month	*407*	*431*	*1.06*		
9/1/2010 1st Wednesday		425			
9/2/2010 1st Thursday	433				
			AM DHV / *443*		
2009 DHV (30th Highest Hour) =		**457**			

PM DHV Factor (Sep) = DHV / PM CTC VolumePM = 1.09

AM DHV Factor (Sept)= AM DHV / AM CTC VolumeAM = 1.09

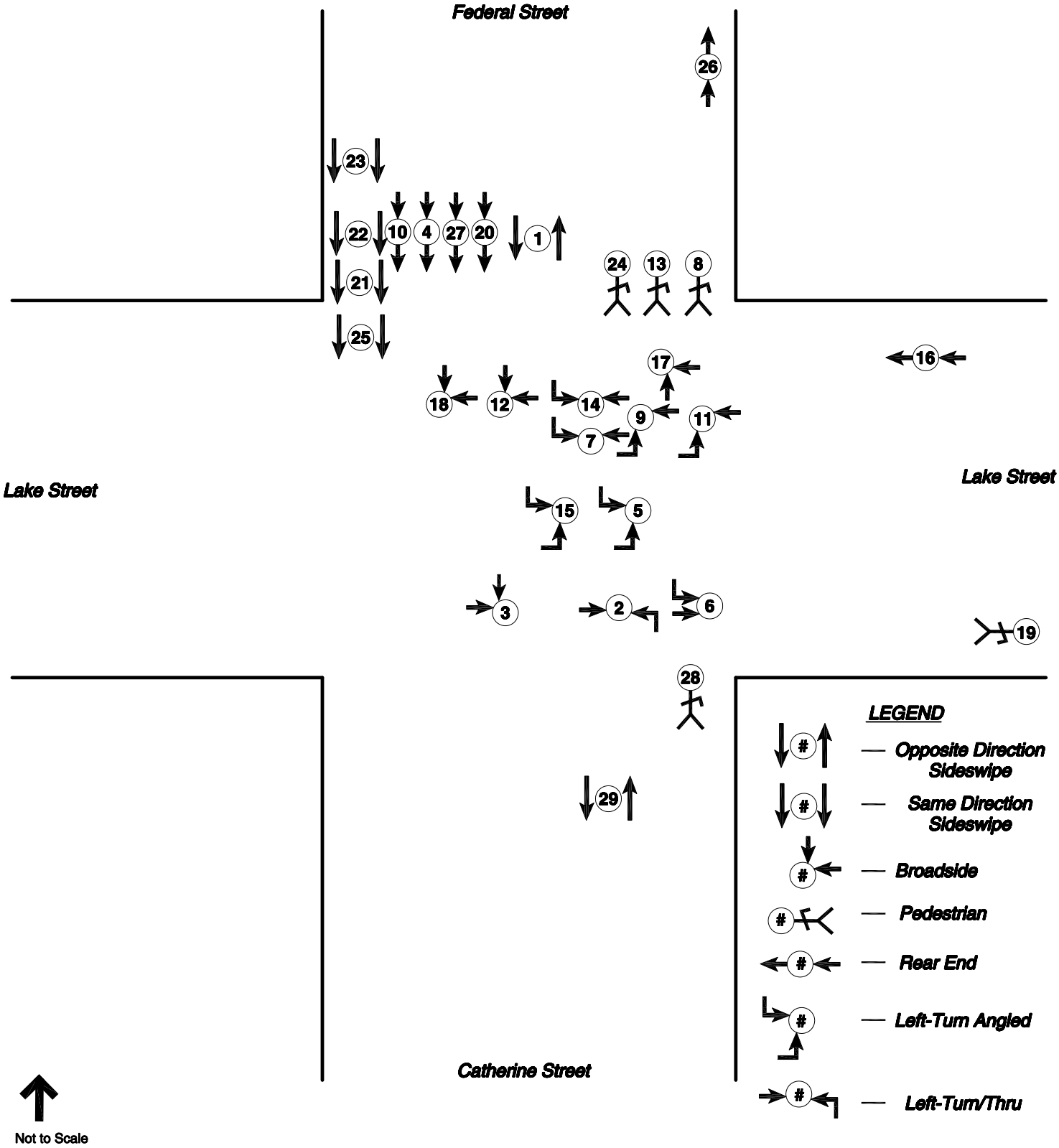
Crash Summaries

US Route 7 Crash Summary
Vermont Agency of Transportation - Crash Listings Summary (2005 - 2009)

Intersections	Mile Marker	Year 2005	2006	2007	2008	2009	Total	Avg.	Volume Peak Hour	Volume Daily	Section Length	Annual Vehicles Total	Annual Vehicles Million	Actual Rate (C/MV)	Critical Rate (C/MV)	Actual/Critical Ratio	HCL
US Route 7 / Lower Newton St / Upper Newton St		8	7	5	0	3	23	4.6	1,215	9,798		3,576,411	3.58	1.286	1.135	1.133	**Yes**
US Route 7	1.79 - 1.81	6	5	4	0	2											
VT Route 38 (Lower Newton St)	0.0 - 0.01	2	2	1	0	1											
Upper Newton St	0.0 - 0.01	0	0	0	0	0											
Federal St / Lower Newton St		1	1	1	1	2	6	1.2	739	5,960		2,175,282	2.18	0.552	1.291	0.427	**No**
VT Route 38	0.12 - 0.14	1	0	1	0	1											
Federal St	0.6 - 0.61	0	1	0	1	1											
VT Route 36 (Lake St) / Federal St / Catherine St		6	7	3	10	3	29	5.8	1,042	8,403		3,067,177	3.07	1.891	1.182	1.600	**Yes**
VT Route 36	0.75 - 0.77	4	2	3	7	3											
Federal St	0.0 - 0.01	2	5	0	1	0											
Catherine St	0.1	0	0	0	2	0											
Catherine St / Stebbins St		1	0	0	1	0	2	0.4	322	2,597		947,823	0.95	0.422	1.567	0.269	**No**
Catherine St	0.0	1	0	0	0	0											
Stebbins St		0	0	0	1	0											
Lower Welden St / Allen St / Lemnah Dr		1	0	0	0	2	3	0.6	580	4,677		1,707,258	1.71	0.351	1.371	0.256	**No**
Lower Welden St	0.31 - 0.33	0	0	0	0	2											
Allen St	0.0 - 0.1	1	0	0	0	0											
Nason St / Lemnah Dr		0	0	0	0	0	0	0.0	331	2,669		974,315	0.97	0.000	1.558	0.000	**No**
Nason St	0.23	0	0	0	0	0											
US Route 7 / Nason St		0	1	2	2	1	6	1.2	1,617	13,040		4,759,718	4.76	0.252	1.054	0.239	**No**
US Route 7	0.6 - 0.62	0	0	2	2	1											
Nason St	0.36 - 0.37	0	1	0	0	0											
US Route 7 / St Albans State Highway		7	3	1	5	1	17	3.4	1,418	11,435		4,173,952	4.17	0.815	1.091	0.747	**No**
US Route 7	0.54 - 0.56	6	3	1	4	1											
St Albans State Highway	0.0 - 0.01	1	0	0	1	0											
Intersection Total:							**86**										
Sections																	
Lower Newton St (VT Route 38)	0.02 - 0.11	1	1	1	1	0	4	0.8	-	7,700	0.09	2,810,500	2.81	3.163	10.345	0.306	**No**
Federal St	0.02 - 0.59	2	5	6	9	6	28	5.6	-	5,300	0.57	1,934,500	1.93	5.079	7.104	0.715	**No**
Nason St	0.22 - 0.35	0	1	0	1	1	3	0.6	-	2,000	0.13	730,000	0.73	6.322	12.837	0.493	**No**
US Route 7 - between Nason St & SASH	0.57 - 0.59	0	1	0	0	0	1	0.2	-	11,600	0.13	4,234,000	4.23	0.363	8.468	0.043	**No**
Section Total:							**36**										
Grand Total:		16	16	10	12	8	**122**										

Peak Hour Volumes are from the 2005 peak hour traffic volumes from the Federal Street Corridor Study 2005 Update.
Daily volume is estimated based on a K-Factor of 12.4 from the VTrans count station on VT Route 7 in Georgia (P6F029). K-Factor = 12.4%
Crash Rates expressed in accidents per million vehicles .
Section volumes are from:
2009 AADT Federal Aid Urban Streets for Nason St, Allen St and Federal St
2008 AADT State Highways for Lower Newton St and US Route 7

$R_{A(INT)}$ = 0.406
K = 2.58
$R_{A(SEC)}$ = 3.1774



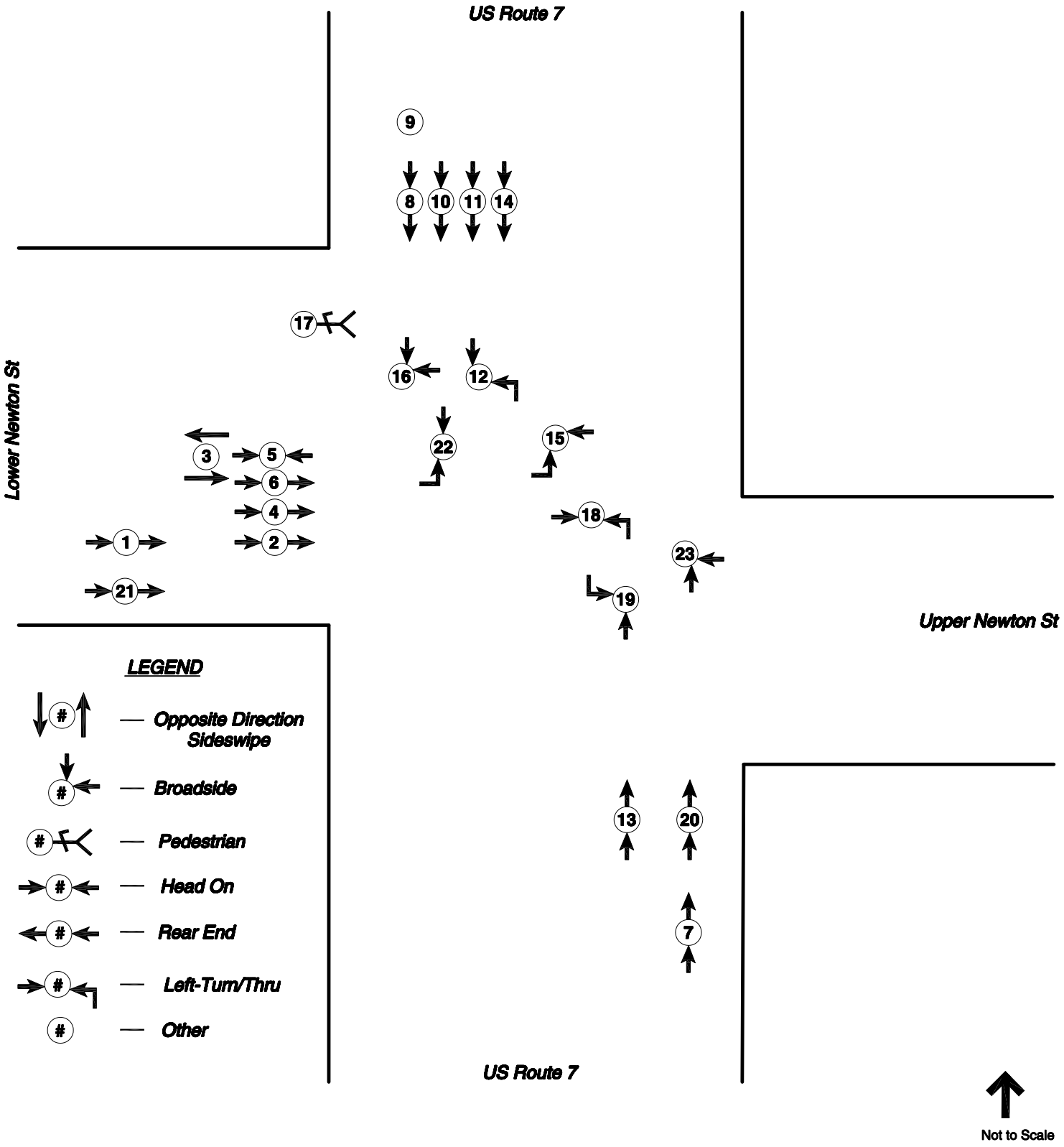
Vanasse Hangen Brustlin, Inc.

Collision Diagram
Lake St (VT 36) at Federal St
2005-2009

Appendix

High Crash Location (HCL) Summary (2005 - 2009) - Intersection of VT Route 36 at Federal St & Catherine St, St Albans, VT

#	Mile Marker	Crash Number	Intersection Approach	Direction	Date	Time	Weather	Road Surface	Cars and Light Trucks	Trucks (Heavy Trucks)	Injuries	Fatalities	Crash Type: Head On	Sideswipe Opposite Direction	Sideswipe Same Direction	Rear End	Left Turn Angled	Broadside	Right Turn Angled	Pedestrian	Cause of Crash: Excessive Speed	Inattention	Driving Under the Influence	Failure to Stop	Improper Turn	Following Too Close	Failure to Yield ROW	Operator Poor Judgment	Poor Visibility	Roadway Conditions	Miscellaneous/Notes
VT-36																															
1	0.76	0612/2084-05	Federal St	S	1/28/2005	4:50 PM	Clear	dry	2	0	0	0		1								1									EB vehicle turning left hit SB stopped vehicle
2	0.76	0612/5875-05	VT 36 EB / Catherine St	E/N	4/14/2005	7:09 AM	Cloudy	dry	2	0	0	0						1				1					1				NB vehicle left turned into EB thru vehicle
3	0.76	0612/10433-05	VT 36 EB / Federal St	E/S	7/13/2005	3:00 PM	Cloudy	dry	2	0	0	0						1				1									EB vehicle hit broadside by SB vehicle
4	0.76	0612/12930-05	Federal St	S	9/21/2005	2:42 PM	Clear	dry	2	0	0	0				1												1			rear ended when stopped in traffic
5	0.76	0612/9012-06	VT 36 EB / Federal St	E/S	6/21/2006	12:10 PM	Clear	dry	2	0	0	0					1										1				EB vehicle making left turn hit by SB vehicle turning left
6	0.76	0612/11570-06	VT 36 EB / Federal St	E/S	9/2/2006	1:15 PM	Cloudy	dry	2	0	1	0					1										1	1			EB vehicle hit by SB vehicle turning left
7	0.76	0612/1079-07	VT 36 WB / Federal St	W/S	1/24/2007	2:36 PM	Clear	dry	2	0	2	0					1										1				WB vehicle hit by SB left turning vehicle
8	0.76	0613/6336-07	Federal St	N	5/10/2007	2:38 PM	Clear	dry	1	0	0	0								1		1									EB vehicle turning left hit pedestian in crosswalk
9	0.76	VT0060100/08SA00294	VT 36 EB / VT 36 WB	E/W	1/25/2008	9:42 AM	Clear	dry	2	0	1	0					1								1						EB vehicle turn left infront of WB vehicle
10	0.76	VT0060100/08SA00496	Federal St	S	2/10/2008	1:16 PM	Cloudy	dry	2	0	0	0				1								1							rear ended when stopped in traffic
11	0.76	VT0060100/08SA00768	VT 36 EB / VT 36 WB	E/W	3/3/2008	10:42 AM	Cloudy	wet	2	0	0	0					1					1						1			EB vehicle turning left hit WB vehicle waiting to turn left
12	0.76	VT0060100/08SA04068	VT 36 WB / Federal St	W/S	8/29/2008	12:26 PM	Cloudy	dry	2	0	1	0						1									1				WB thru /SB thru broadside crash
13	0.76	VT0060100/08SA05383	Federal St	N	11/8/2008	8:20 PM	Rain	wet	1	0	1	0								1		1							1		EB vehicle turning left hit pedestrian in cross walk
14	0.76	VT0060100/08SA05750	VT 36 WB / Federal St	W/S	12/2/2008	12:07 PM	Cloudy	dry	2	0	0	0						1							1						WB vehicle hit by SB vehicle turning left
15	0.76	VT0060100/08SA06174	VT 36 EB / Federal St	E/S	12/30/2008	2:22 PM	Cloudy	wet	2	0	1	0					1								1						EB vehicle turning left hit by SB vehicle turning left
16	0.76	VT0060100/09SA02572	VT 36 WB	W	6/14/2009	10:30 AM	Clear	dry	3	0	1	0				1						1									2 WB vehicles stop for pedestrian 3rd WB vehicle vision obscured by balloons rear ends the others
17	0.76	VT0060100/09SA04488	VT 36 WB / Catherine St	W/N	10/13/2009	7:22 AM	Clear	dry	2	0	0	0						1				1									WB vehicle hit by NB vehicle
18	0.76	VT0060100/09SA05458	VT 36 WB / Federal St	W/S	12/23/2009	2:39 PM	Cloudy	snow	2	0	0	0						1				1					1				WB vehicle hit by SB vehicle
19	0.77	0612/10089-07	VT 36 EB	E	7/27/2007	3:48 PM	Rain	wet	1	0	1	0			1					1		1									attempting to enter EB parked vehicle pedestrian possible hit by EB vehicle
Federal St																															
20	0	0612/4041-05	Federal St	S	3/1/2005	3:29 PM	Snow	snow	2	0	0	0				1						1									rear ended when stopped in traffic
21	0	0612/17302-05	Federal St	S	12/19/2005	2:22 PM	Clear	wet	2	0	0	0			1										1						SB vehicle turning right hit SB vehicle turing right from parking spaces
22	0	0612/7002-06	Federal St	S	5/19/2006	2:54 PM	Rain	wet	1	1	0	0			1				1												SB vehicle turning right hit by 2nd vehicle bypassing first to turn right
23	0	0612/8223-06	Federal St	S	6/26/2006	12:30 PM	Rain	wet	2	0	0	0			1							1									SB vehicle turning right hit by SB vehicle turning right, both turning from parking spaces
24	0	0612/9509-06	Federal St	N	7/24/2006	7:50 AM	Clear	dry	1	0	1	0								1		1							1		EB vehicle turning left hit WB pedestrian
25	0	0612/11851-06	Federal St	S	9/16/2006	3:55 PM	Clear	dry	2	0	0	0			1										1						SB vehicle turning right hit by SB vehicle turning right using parking spaces
26	0	VT0060100/08SA05667	Federal St	N	11/26/2008	2:49 PM	Clear	dry	2	0	0	0				1										1					NB vehicle rear ended when stopped in traffic
27	0.01	0612/16017-06	Federal St	S	12/7/2006	3:55 PM	Snow	snow	2	0	0	0				1					1									1	SB vehicle rear ended when stopped in traffic
Catherine St																															
28	0.1	VT0060100/08SA04597	Catherine St	N	9/24/2008	10:25 AM	Clear	dry	1	0	1	0								1		1									NB vehicle hit pedestrian crossing Catherine St
29	0.1	VT0060100/08SA05897	Catherine St	E	12/10/2008	12:23 PM	Snow	snow	1	1	0	0		1							1									1	EB vehicle turning right slid into NB vehicle
#			**Total**								11	0	0	2	5	6	6	6	1	5	2	14	0	1	5	1	6	3	2	2	
													0%	6%	16%	19%	19%	19%	3%	16%	6%	39%	0%	3%	14%	3%	17%	8%	6%	6%	



Vanasse Hangen Brustlin, Inc.

Collision Diagram
US 7 at Newton St (VT 38)
2005-2009

Appendix

High Crash Location (HCL) Summary (2005 - 2009) - Intersection of US Route 7 at VT Route 38 (Lower Newton St & Upper Newton St), St Albans, VT

#	Mile Marker	Crash Number	Intersection Approach	Direction	Date	Time	Weather	Road Surface	Cars and Light Trucks	Trucks (Heavy Trucks)	Injuries	Fatalities	Crash Type: Head On	Crash Type: Sideswipe Opposite Direction	Crash Type: Sideswipe Same Direction	Crash Type: Rear End	Crash Type: Left-Turn Angled	Crash Type: Broadside	Crash Type: Right-Turn Angled	Crash Type: Pedestrian	Cause of Crash: Excessive Speed	Cause of Crash: Inattention	Cause of Crash: Driving Under the Influence	Cause of Crash: Failure to Stop	Cause of Crash: Improper Lane Change	Cause of Crash: Failure to Yield ROW	Cause of Crash: Operator Poor Judgment	Cause of Crash: Defective Vehicle	Cause of Crash: Roadway Conditions	Cause of Crash: Driver Illness/State of Mind	Cause of Crash: Driver Inexperienced/Learning	Miscellaneous/Notes
VT-38																																
1	0	0612/8725-05	Lower Newton St	E	6/1/2005	3:25 PM	Clear	dry	2	0	0	0				1						1										2nd vehicle in queue at signal rolled backwards into 3rd vehicle
2	0	0612/4980-06	Lower Newton St	E	3/13/2006	3:07 PM	Clear	dry	2	0	0	0				1						1						1				vehicle ran out of gas and rolled backwards into the next vehicle
3	0	0612/16018-06	Lower Newton St	E/S	12/7/2006	2:50 PM	Snow	snow	3	0	0	0		1							1								1			SB vehicle turning right onto Lower Newton sideswiped 2 cars stopped EB
4	0	0612/5987-07	Lower Newton St	E	4/11/2007	6:54 PM	Cloudy	dry	2	0	0	0				1						1										vehicle EB on Lower Newton moved befored the first vehicle and rear ended it
5	0	VT0060100/09SA05342	Lower Newton St	E/S	12/13/2009	4:27 PM	Snow	snow	2	0	0	0	1															1	1			SB vehicle turning right onto Lower Newton slid into EB vehicle head waiting at signal
6	0.01	0612/14127-05	Lower Newton St	E	10/20/2005	8:53 AM	Clear	dry	2	0	0	0				1															1	vehicle EB rolled back into the next vehicle – learning to drive standard
US 7																																
7	1.79	0612/17993-05	US 7 NB	N	12/19/2005	6:15 PM	Snow	snow	2	0	0	0				1						1										rear ended when stopped in traffic
8	1.8	0612/5262-05	US 7 SB	S	2/19/2005	6:18 PM	Snow	unknow	2	0	1	0				1						1		1								rear ended when stopped in traffic
9	1.8	0612/5137-05	US 7 SB	S	3/9/2005	7:24 AM	Clear	wet	2	0	0	0							1						1							car turning right hit by car trying to switch lanes
10	1.8	0612/5876-05	US 7 SB	S	3/26/2005	12:34 PM	Clear	dry	2	0	0	0				1						1										rear ended when stopped in traffic
11	1.8	0612/7311-05	US 7 SB	S	5/21/2005	11:12 AM	Cloudy	dry	2	0	1	0				1						1										rear ended when stopped in traffic
12	1.8	0612/17914-05	US 7 NB / US 7 SB	N/S	12/10/2005	5:09 PM	Cloudy	dry	2	0	1	0					1						1			1						NB vehicle turning left hit by SB vehicle runing the red light
13	1.8	0612/914-06	US 7 NB	N	1/16/2006	12:06 PM	Snow	snow	4	0	0	0				1													1			4 vehicle rear end collision – slippery road and small distance between cars
14	1.8	0612/6206-06	US 7 SB	S	5/2/2006	8:17 PM	Rain	wet	2	0	0	0				1									1							vehicle backed up to switch from SBT to SBR lane and rear ended next vehicle
15	1.8	0612/6084-06	Lower Newton St / Upper Newton St	E/W	5/4/2006	11:50 AM	Clear	dry	2	0	0	0					1									1						WB vehicle traveling thru hit by EB vehicle making left turn
16	1.8	0612/933-06	US 7 SB / Upper Newton St	S/W	7/17/2006	9:16 PM	Unknown	unknown	2	0	1	0						1														vehicles travelling SB and WB – no further details
17	1.8	0612/14805-06	Lower Newton St	W	10/16/2006	4:18 PM	Clear	dry	1	0	1	0								1		1										pedestrian crossing Lower Newton NB hit by NBL turning vehicle
18	1.8	0612/8423-07	US 7 NB / Lower Newton St	N/E	6/28/2007	10:32 AM	Cloudy	dry	2	0	0	0					1									1						NB left turning vehicle and EB thru vehicle hit, both have green light
19	1.8	0612/8394-07	US 7 NB / US 7 SB	N	6/29/2007	11:39 AM	Clear	dry	2	0	0	0					1					1										SB left turning vehicle hit NB vehicle
20	1.8	0612/10575-07	US 7 NB	N	8/16/2007	10:02 PM	Rain	wet	2	0	0	0				1						1										rear ended when stopped in traffic
21	1.8	0612/16384-07	Lower Newton St	E	8/28/2007	7:41 PM	Unknown	unknow	2	0	0	0				1						1										rear ended a parked car
22	1.8	VT0060100/09SA05002	US 7 SB / Lower Newton St	S/E	11/17/2009	1:18 PM	Clear	unknow	2	0	1	0					1										1			1		SB thru vehicle hit by EB left turn. SB thru had green
23	1.81	VT0060100/09SA05220	US 7 NB / Upper Newton St	E	12/3/2009	12:55 PM	Clear	dry	2	0	0	0						1				1										NB thru broadsided by WB thru, both claim green light
#			**Total**								6	0	1	1	0	12	5	2	1	1	1	12	1	1	2	3	1	2	3	1	1	
													4%	4%	0%	52%	22%	9%	4%	4%	4%	43%	4%	4%	7%	11%	4%	7%	11%	4%	4%	

Existing Conditions Intersection Capacity Analysis

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		4%			-4%			0%			0%	
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0			4.0	4.0
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00			1.00	1.00
Frpb, ped/bikes	1.00	0.98			1.00		1.00	1.00			1.00	0.98
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00			1.00	1.00
Frt	1.00	0.87			0.98		1.00	1.00			1.00	0.85
Flt Protected	0.95	1.00			0.99		0.95	1.00			1.00	1.00
Satd. Flow (prot)	1717	1540			1871		1702	1788			1825	1521
Flt Permitted	0.73	1.00			0.92		0.52	1.00			0.99	1.00
Satd. Flow (perm)	1312	1540			1749		926	1788			1818	1521
Volume (vph)	155	10	70	10	20	5	50	325	5	5	315	300
Peak-hour factor, PHF	0.91	0.91	0.91	0.73	0.73	0.73	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	170	11	77	14	27	7	57	374	6	6	362	345
RTOR Reduction (vph)	0	59	0	0	5	0	0	1	0	0	0	118
Lane Group Flow (vph)	170	29	0	0	43	0	57	379	0	0	368	227
Confl. Peds. (#/hr)			1	1			1		1	1		1
Heavy Vehicles (%)	3%	3%	3%	0%	0%	0%	6%	6%	6%	4%	4%	4%
Turn Type	Perm			Perm			Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	15.0	15.0			15.0		45.0	45.0			45.0	45.0
Effective Green, g (s)	16.0	16.0			16.0		46.0	46.0			46.0	46.0
Actuated g/C Ratio	0.23	0.23			0.23		0.66	0.66			0.66	0.66
Clearance Time (s)	5.0	5.0			5.0		5.0	5.0			5.0	5.0
Lane Grp Cap (vph)	300	352			400		609	1175			1195	1000
v/s Ratio Prot		0.02						c0.21				
v/s Ratio Perm	c0.13				0.02		0.06				0.20	0.15
v/c Ratio	0.57	0.08			0.11		0.09	0.32			0.31	0.23
Uniform Delay, d1	23.9	21.2			21.3		4.4	5.2			5.2	4.8
Progression Factor	1.00	1.00			1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	7.6	0.5			0.5		0.3	0.7			0.7	0.5
Delay (s)	31.5	21.7			21.9		4.7	6.0			5.8	5.4
Level of Service	C	C			C		A	A			A	A
Approach Delay (s)		28.1			21.9			5.8			5.6	
Approach LOS		C			C			A			A	

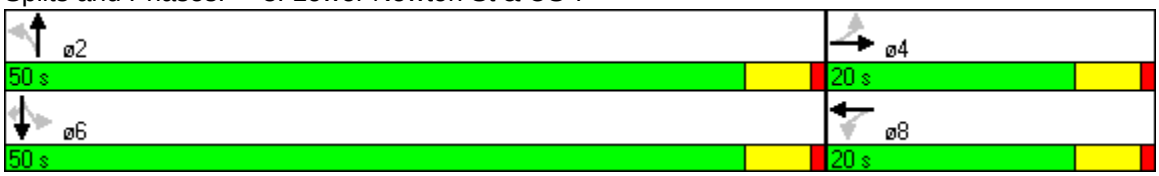
Intersection Summary			
HCM Average Control Delay	10.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	59.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Volume (vph)	155	10	10	20	50	325	5	315	300
Lane Group Flow (vph)	170	88	0	48	57	380	0	368	345
Turn Type	Perm		Perm		Perm		Perm		Perm
Protected Phases		4		8		2		6	
Permitted Phases	4		8		2		6		6
Detector Phases	4	4	8	8	2	2	6	6	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
Total Split (s)	20.0	20.0	20.0	20.0	50.0	50.0	50.0	50.0	50.0
Total Split (%)	28.6%	28.6%	28.6%	28.6%	71.4%	71.4%	71.4%	71.4%	71.4%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max	Max
v/c Ratio	0.57	0.21		0.12	0.09	0.32		0.31	0.31
Control Delay	32.4	8.9		20.0	4.9	6.1		6.0	1.4
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0	0.0
Total Delay	32.4	8.9		20.0	4.9	6.1		6.0	1.4
Queue Length 50th (ft)	65	4		14	8	60		58	0
Queue Length 95th (ft)	125	36		31	19	94		90	20
Internal Link Dist (ft)		575		1031		1282		1047	
Turn Bay Length (ft)	130				115				150
Base Capacity (vph)	300	412		405	609	1176		1195	1118
Starvation Cap Reductn	0	0		0	0	0		0	0
Spillback Cap Reductn	0	0		0	0	0		0	0
Storage Cap Reductn	0	0		0	0	0		0	0
Reduced v/c Ratio	0.57	0.21		0.12	0.09	0.32		0.31	0.31

Intersection Summary

Cycle Length: 70
Actuated Cycle Length: 70
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 40
Control Type: Pretimed

Splits and Phases: 8: Lower Newton St & US 7



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	45	275	490	90	355	330
Peak Hour Factor	0.75	0.75	0.89	0.89	0.91	0.91
Hourly flow rate (vph)	60	367	551	101	390	363
Pedestrians	9					
Lane Width (ft)	12.0					
Walking Speed (ft/s)	4.0					
Percent Blockage	1					
Right turn flare (veh)		13				
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1753	610			661	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1753	610			661	
tC, single (s)	6.5	6.3			4.2	
tC, 2 stage (s)						
tF (s)	3.6	3.4			2.3	
p0 queue free %	0	24			57	
cM capacity (veh/h)	51	480			902	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	427	652	390	363
Volume Left	60	0	390	0
Volume Right	367	101	0	0
cSH	363	1700	902	1700
Volume to Capacity	1.18	0.38	0.43	0.21
Queue Length 95th (ft)	431	0	55	0
Control Delay (s)	72.1	0.0	12.0	0.0
Lane LOS	F		B	
Approach Delay (s)	72.1	0.0	6.2	
Approach LOS	F			

Intersection Summary			
Average Delay	19.4		
Intersection Capacity Utilization	64.4%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	45	100	90	675	585	30
Peak Hour Factor	0.82	0.82	0.82	0.82	0.91	0.91
Hourly flow rate (vph)	55	122	110	823	643	33
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1702	659	676			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1702	659	676			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	38	74	88			
cM capacity (veh/h)	89	463	906			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	177	110	823	676
Volume Left	55	110	0	0
Volume Right	122	0	0	33
cSH	201	906	1700	1700
Volume to Capacity	0.88	0.12	0.48	0.40
Queue Length 95th (ft)	170	10	0	0
Control Delay (s)	84.8	9.5	0.0	0.0
Lane LOS	F	A		
Approach Delay (s)	84.8	1.1		0.0
Approach LOS	F			

Intersection Summary			
Average Delay	9.0		
Intersection Capacity Utilization	56.2%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	70	95	55	65	50	65
Peak Hour Factor	0.73	0.73	0.64	0.64	0.77	0.77
Hourly flow rate (vph)	96	130	86	102	65	84
Pedestrians					2	
Lane Width (ft)					10.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	190				461	139
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	190				461	139
tC, single (s)	4.1				6.5	6.3
tC, 2 stage (s)						
tF (s)	2.2				3.6	3.4
p0 queue free %	93				87	91
cM capacity (veh/h)	1389				513	898

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total	226	188	65	84
Volume Left	96	0	65	0
Volume Right	0	102	0	84
cSH	1389	1700	513	898
Volume to Capacity	0.07	0.11	0.13	0.09
Queue Length 95th (ft)	6	0	11	8
Control Delay (s)	3.6	0.0	13.0	9.4
Lane LOS	A		B	A
Approach Delay (s)	3.6	0.0	11.0	
Approach LOS			B	

Intersection Summary			
Average Delay	4.4		
Intersection Capacity Utilization	25.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	5	170	35	15	150	25	50	60	25	50	65	30
Peak Hour Factor	0.78	0.78	0.78	0.82	0.82	0.82	0.70	0.70	0.70	0.91	0.91	0.91
Hourly flow rate (vph)	6	218	45	18	183	30	71	86	36	55	71	33
Pedestrians					2						11	
Lane Width (ft)					11.0						12.0	
Walking Speed (ft/s)					4.0						4.0	
Percent Blockage					0						1	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)					862							
pX, platoon unblocked												
vC, conflicting volume	224			263			557	514	242	580	521	209
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	224			263			557	514	242	580	521	209
tC, single (s)	4.2			4.1			7.2	6.6	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			80	81	95	84	84	96
cM capacity (veh/h)	1286			1301			360	447	788	337	448	826

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	269	232	193	159
Volume Left	6	18	71	55
Volume Right	45	30	36	33
cSH	1286	1301	443	440
Volume to Capacity	0.00	0.01	0.44	0.36
Queue Length 95th (ft)	0	1	54	41
Control Delay (s)	0.2	0.7	19.2	17.8
Lane LOS	A	A	C	C
Approach Delay (s)	0.2	0.7	19.2	17.8
Approach LOS			C	C

Intersection Summary			
Average Delay	7.9		
Intersection Capacity Utilization	34.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	40	60	85	25	55	45
Peak Hour Factor	0.65	0.65	0.65	0.65	0.82	0.82
Hourly flow rate (vph)	62	92	131	38	67	55
Pedestrians		1	1		20	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		2	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	189				386	171
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	189				386	171
tC, single (s)	4.1				6.5	6.3
tC, 2 stage (s)						
tF (s)	2.2				3.6	3.4
p0 queue free %	95				88	93
cM capacity (veh/h)	1344				567	842

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	154	169	122
Volume Left	62	0	67
Volume Right	0	38	55
cSH	1344	1700	665
Volume to Capacity	0.05	0.10	0.18
Queue Length 95th (ft)	4	0	17
Control Delay (s)	3.3	0.0	11.6
Lane LOS	A		B
Approach Delay (s)	3.3	0.0	11.6
Approach LOS			B

Intersection Summary			
Average Delay	4.3		
Intersection Capacity Utilization	24.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	135	175	25	5	185	60	5	50	10	30	70	225
Peak Hour Factor	0.86	0.86	0.86	0.80	0.80	0.80	0.72	0.72	0.72	0.84	0.84	0.84
Hourly flow rate (vph)	157	203	29	6	231	75	7	69	14	36	83	268
Pedestrians		3			2			6			14	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			0			0			1	
Right turn flare (veh)												5
Median type								None			None	
Median storage veh)												
Upstream signal (ft)					605							
pX, platoon unblocked												
vC, conflicting volume	320			239			998	871	226	878	848	286
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	320			239			998	871	226	878	848	286
tC, single (s)	4.1			4.2			7.2	6.6	6.3	7.2	6.6	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.6	4.1	3.4	3.5	4.0	3.3
p0 queue free %	87			100			92	71	98	80	67	64
cM capacity (veh/h)	1209			1299			92	243	798	179	251	736

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	390	312	90	387
Volume Left	157	6	7	36
Volume Right	29	75	14	268
cSH	1209	1299	238	746
Volume to Capacity	0.13	0.00	0.38	0.52
Queue Length 95th (ft)	11	0	42	76
Control Delay (s)	4.2	0.2	29.1	20.0
Lane LOS	A	A	D	C
Approach Delay (s)	4.2	0.2	29.1	20.0
Approach LOS			D	C

Intersection Summary			
Average Delay	10.2		
Intersection Capacity Utilization	54.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	150	100	225	145	50	85
Peak Hour Factor	0.89	0.89	0.94	0.94	0.85	0.85
Hourly flow rate (vph)	169	112	239	154	59	100
Pedestrians					6	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)				655		
pX, platoon unblocked						
vC, conflicting volume			287		864	231
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			287		864	231
tC, single (s)			4.2		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.3		3.5	3.3
p0 queue free %			81		77	88
cM capacity (veh/h)			1246		260	802

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	281	394	159
Volume Left	0	239	59
Volume Right	112	0	100
cSH	1700	1246	453
Volume to Capacity	0.17	0.19	0.35
Queue Length 95th (ft)	0	18	39
Control Delay (s)	0.0	5.9	17.2
Lane LOS		A	C
Approach Delay (s)	0.0	5.9	17.2
Approach LOS			C

Intersection Summary			
Average Delay	6.1		
Intersection Capacity Utilization	52.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		4%			-4%			0%			0%	
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0			4.0	4.0
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00			1.00	1.00
Frpb, ped/bikes	1.00	0.97			1.00		1.00	1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00			1.00	1.00
Frt	1.00	0.88			0.96		1.00	1.00			1.00	0.85
Flt Protected	0.95	1.00			0.99		0.95	1.00			1.00	1.00
Satd. Flow (prot)	1734	1572			1778		1770	1861			1862	1583
Flt Permitted	0.73	1.00			0.92		0.44	1.00			0.99	1.00
Satd. Flow (perm)	1332	1572			1665		826	1861			1853	1583
Volume (vph)	415	20	70	10	15	10	80	645	5	5	445	305
Peak-hour factor, PHF	0.92	0.92	0.92	0.85	0.85	0.85	0.91	0.91	0.91	0.95	0.95	0.95
Adj. Flow (vph)	451	22	76	12	18	12	88	709	5	5	468	321
RTOR Reduction (vph)	0	59	0	0	9	0	0	0	0	0	0	110
Lane Group Flow (vph)	451	39	0	0	33	0	88	714	0	0	473	211
Confl. Peds. (#/hr)			6	6					1	1		
Heavy Vehicles (%)	2%	2%	2%	3%	3%	3%	2%	2%	2%	2%	2%	2%
Turn Type	Perm			Perm			Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	15.0	15.0			15.0		45.0	45.0			45.0	45.0
Effective Green, g (s)	16.0	16.0			16.0		46.0	46.0			46.0	46.0
Actuated g/C Ratio	0.23	0.23			0.23		0.66	0.66			0.66	0.66
Clearance Time (s)	5.0	5.0			5.0		5.0	5.0			5.0	5.0
Lane Grp Cap (vph)	304	359			381		543	1223			1218	1040
v/s Ratio Prot		0.03						c0.38				
v/s Ratio Perm	c0.34				0.02		0.11				0.26	0.13
v/c Ratio	1.48	0.11			0.09		0.16	0.58			0.39	0.20
Uniform Delay, d1	27.0	21.4			21.2		4.6	6.7			5.5	4.7
Progression Factor	1.00	1.00			1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	234.5	0.6			0.4		0.6	2.0			0.9	0.4
Delay (s)	261.5	22.0			21.7		5.2	8.7			6.5	5.2
Level of Service	F	C			C		A	A			A	A
Approach Delay (s)		218.7			21.7			8.3			5.9	
Approach LOS		F			C			A			A	

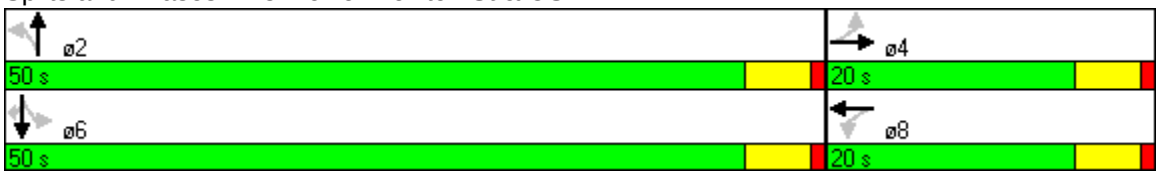
Intersection Summary			
HCM Average Control Delay	60.5	HCM Level of Service	E
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	97.6%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Volume (vph)	415	20	10	15	80	645	5	445	305
Lane Group Flow (vph)	451	98	0	42	88	714	0	473	321
Turn Type	Perm		Perm		Perm		Perm		Perm
Protected Phases		4		8		2		6	
Permitted Phases	4		8		2		6		6
Detector Phases	4	4	8	8	2	2	6	6	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
Total Split (s)	20.0	20.0	20.0	20.0	50.0	50.0	50.0	50.0	50.0
Total Split (%)	28.6%	28.6%	28.6%	28.6%	71.4%	71.4%	71.4%	71.4%	71.4%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max	Max
v/c Ratio	1.48	0.23		0.11	0.16	0.58		0.39	0.28
Control Delay	258.2	10.1		17.7	5.5	9.1		6.7	1.3
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0	0.0
Total Delay	258.2	10.1		17.7	5.5	9.1		6.7	1.3
Queue Length 50th (ft)	~274	7		10	12	145		80	0
Queue Length 95th (ft)	#440	43		31	29	230		127	22
Internal Link Dist (ft)		575		1031		1282		1047	
Turn Bay Length (ft)	130				115				150
Base Capacity (vph)	305	418		389	543	1223		1218	1150
Starvation Cap Reductn	0	0		0	0	0		0	0
Spillback Cap Reductn	0	0		0	0	0		0	0
Storage Cap Reductn	0	0		0	0	0		0	0
Reduced v/c Ratio	1.48	0.23		0.11	0.16	0.58		0.39	0.28

Intersection Summary

Cycle Length: 70
Actuated Cycle Length: 70
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 60
Control Type: Pretimed
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 8: Lower Newton St & US 7



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	50	380	440	115	300	415
Peak Hour Factor	0.86	0.86	0.75	0.75	0.86	0.86
Hourly flow rate (vph)	58	442	587	153	349	483
Pedestrians	2					
Lane Width (ft)	12.0					
Walking Speed (ft/s)	4.0					
Percent Blockage	0					
Right turn flare (veh)		13				
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1846	665			742	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1846	665			742	
tC, single (s)	6.5	6.3			4.1	
tC, 2 stage (s)						
tF (s)	3.6	3.4			2.2	
p0 queue free %	0	2			60	
cM capacity (veh/h)	48	452			864	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	500	740	349	483
Volume Left	58	0	349	0
Volume Right	442	153	0	0
cSH	411	1700	864	1700
Volume to Capacity	1.22	0.44	0.40	0.28
Queue Length 95th (ft)	509	0	49	0
Control Delay (s)	98.8	0.0	12.0	0.0
Lane LOS	F		B	
Approach Delay (s)	98.8	0.0	5.0	
Approach LOS	F			

Intersection Summary			
Average Delay	25.9		
Intersection Capacity Utilization	60.4%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	35	75	125	695	640	40
Peak Hour Factor	0.80	0.80	0.81	0.81	0.86	0.86
Hourly flow rate (vph)	44	94	154	858	744	47
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1934	767	791			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1934	767	791			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	26	77	81			
cM capacity (veh/h)	59	402	821			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	138	154	858	791
Volume Left	44	154	0	0
Volume Right	94	0	0	47
cSH	141	821	1700	1700
Volume to Capacity	0.98	0.19	0.50	0.47
Queue Length 95th (ft)	175	17	0	0
Control Delay (s)	131.8	10.4	0.0	0.0
Lane LOS	F	B		
Approach Delay (s)	131.8	1.6		0.0
Approach LOS	F			

Intersection Summary			
Average Delay	10.2		
Intersection Capacity Utilization	59.6%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	80	60	110	55	50	65
Peak Hour Factor	0.79	0.79	0.76	0.76	0.86	0.86
Hourly flow rate (vph)	101	76	145	72	58	76
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	217				459	181
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	217				459	181
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	92				89	91
cM capacity (veh/h)	1347				514	857

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total	177	217	58	76
Volume Left	101	0	58	0
Volume Right	0	72	0	76
cSH	1347	1700	514	857
Volume to Capacity	0.08	0.13	0.11	0.09
Queue Length 95th (ft)	6	0	9	7
Control Delay (s)	4.8	0.0	12.9	9.6
Lane LOS	A		B	A
Approach Delay (s)	4.8	0.0	11.0	
Approach LOS			B	

Intersection Summary			
Average Delay	4.4		
Intersection Capacity Utilization	30.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	5	215	45	15	180	25	55	60	20	35	55	10
Peak Hour Factor	0.75	0.75	0.75	0.86	0.86	0.86	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	287	60	17	209	29	60	65	22	38	60	11
Pedestrians					3						6	
Lane Width (ft)					11.0						12.0	
Walking Speed (ft/s)					4.0						4.0	
Percent Blockage					0						0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)					862							
pX, platoon unblocked												
vC, conflicting volume	244			347			629	609	320	652	625	230
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	244			347			629	609	320	652	625	230
tC, single (s)	4.1			4.2			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			99			82	84	97	88	85	99
cM capacity (veh/h)	1315			1190			337	400	719	315	392	805

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	353	256	147	109
Volume Left	7	17	60	38
Volume Right	60	29	22	11
cSH	1315	1190	396	379
Volume to Capacity	0.01	0.01	0.37	0.29
Queue Length 95th (ft)	0	1	42	29
Control Delay (s)	0.2	0.7	19.4	18.3
Lane LOS	A	A	C	C
Approach Delay (s)	0.2	0.7	19.4	18.3
Approach LOS			C	C

Intersection Summary			
Average Delay	5.9		
Intersection Capacity Utilization	36.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	50	30	70	50	45	30
Peak Hour Factor	0.76	0.76	0.84	0.84	0.78	0.78
Hourly flow rate (vph)	66	39	83	60	58	38
Pedestrians		1	3			
Lane Width (ft)		12.0	12.0			
Walking Speed (ft/s)		4.0	4.0			
Percent Blockage		0	0			
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	143				287	114
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	143				287	114
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	95				91	96
cM capacity (veh/h)	1452				674	943

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	105	143	96
Volume Left	66	0	58
Volume Right	0	60	38
cSH	1452	1700	761
Volume to Capacity	0.05	0.08	0.13
Queue Length 95th (ft)	4	0	11
Control Delay (s)	4.9	0.0	10.4
Lane LOS	A		B
Approach Delay (s)	4.9	0.0	10.4
Approach LOS			B

Intersection Summary			
Average Delay	4.4		
Intersection Capacity Utilization	22.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	300	290	30	10	235	70	10	55	35	45	35	275
Peak Hour Factor	0.96	0.96	0.96	0.93	0.93	0.93	0.59	0.59	0.59	0.86	0.86	0.86
Hourly flow rate (vph)	312	302	31	11	253	75	17	93	59	52	41	320
Pedestrians		1			4			15			15	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			0			1			1	
Right turn flare (veh)												5
Median type								None			None	
Median storage veh)												
Upstream signal (ft)					605							
pX, platoon unblocked												
vC, conflicting volume	343			348			1451	1322	337	1379	1300	306
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	343			348			1451	1322	337	1379	1300	306
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 %	74			99			51	17	92	0	65	56
cM capacity (veh/h)	1206			1190			35	113	699	28	115	724

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	646	339	169	413
Volume Left	312	11	17	52
Volume Right	31	75	59	320
cSH	1206	1190	121	224
Volume to Capacity	0.26	0.01	1.40	1.84
Queue Length 95th (ft)	26	1	288	724
Control Delay (s)	5.9	0.3	287.1	433.1
Lane LOS	A	A	F	F
Approach Delay (s)	5.9	0.3	287.1	433.1
Approach LOS			F	F

Intersection Summary			
Average Delay	147.7		
Intersection Capacity Utilization	73.8%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	170	45	235	165	90	335
Peak Hour Factor	0.97	0.97	0.98	0.98	0.86	0.86
Hourly flow rate (vph)	175	46	240	168	105	390
Pedestrians					4	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)				655		
pX, platoon unblocked						
vC, conflicting volume			226		850	202
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			226		850	202
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			82		61	53
cM capacity (veh/h)			1332		270	836

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	222	408	494
Volume Left	0	240	105
Volume Right	46	0	390
cSH	1700	1332	579
Volume to Capacity	0.13	0.18	0.85
Queue Length 95th (ft)	0	16	233
Control Delay (s)	0.0	5.6	37.2
Lane LOS		A	E
Approach Delay (s)	0.0	5.6	37.2
Approach LOS			E

Intersection Summary			
Average Delay	18.4		
Intersection Capacity Utilization	69.3%	ICU Level of Service	C
Analysis Period (min)	15		

Growth Rate Calculations

C: Rural Primary and Secondary

					Short Term Growth				**2004**	**to**	**2009**	**0.92**
					20 Year Growth				**2009**	**to**	**2029**	**1.09**
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
2004	1.00											
2005	0.98	1.00										
2006	0.97	0.98	1.00									
2007	0.95	0.97	0.98	1.00								
2008	0.93	0.95	0.97	0.98	1.00							
2009	0.92	0.94	0.95	0.97	0.98	1.00						
2010						1.00	1.00					
2011						1.01	1.00	1.00				
2012						1.01	1.01	1.00	1.00			
2013						1.02	1.01	1.01	1.00	1.00		
2014						1.02	1.02	1.01	1.01	1.00	1.00	
2015						1.03	1.02	1.02	1.01	1.01	1.00	1.00
2016						1.03	1.03	1.02	1.02	1.01	1.01	1.00
2017						1.04	1.03	1.03	1.02	1.02	1.01	1.01
2018						1.04	1.04	1.03	1.03	1.02	1.02	1.01
2019						1.05	1.04	1.04	1.03	1.03	1.02	1.02
2020						1.05	1.04	1.04	1.04	1.03	1.03	1.02
2021						1.05	1.05	1.04	1.04	1.04	1.03	1.03
2022						1.06	1.05	1.05	1.04	1.04	1.04	1.03
2023						1.06	1.06	1.05	1.05	1.04	1.04	1.04
2024						1.07	1.06	1.06	1.05	1.05	1.04	1.04
2025						1.07	1.07	1.06	1.06	1.05	1.05	1.04
2026						1.08	1.07	1.07	1.06	1.06	1.05	1.05
2027						1.08	1.08	1.07	1.07	1.06	1.06	1.05
2028						1.09	1.08	1.08	1.07	1.07	1.06	1.06
2029						1.09	1.09	1.08	1.08	1.07	1.07	1.06
2030						1.09	1.09	1.08	1.08	1.08	1.07	1.07
2031						1.10	1.09	1.09	1.08	1.08	1.07	1.07
2032						1.10	1.10	1.09	1.09	1.08	1.08	1.07
2033						1.11	1.10	1.10	1.09	1.09	1.08	1.08
2034						1.11	1.11	1.10	1.10	1.09	1.09	1.08
2035						1.12	1.11	1.11	1.10	1.10	1.09	1.09
2036						1.12	1.12	1.11	1.11	1.10	1.10	1.09
2037						1.13	1.12	1.12	1.11	1.11	1.10	1.10
2038						1.13	1.13	1.12	1.12	1.11	1.11	1.10
2039						1.14	1.13	1.12	1.12	1.11	1.11	1.11
2040						1.14	1.13	1.13	1.12	1.12	1.11	1.11
2041						1.14	1.14	1.13	1.13	1.12	1.12	1.11
2042						1.15	1.14	1.14	1.13	1.13	1.12	1.12
2043						1.15	1.15	1.14	1.14	1.13	1.13	1.12
2044						1.16	1.15	1.15	1.14	1.14	1.13	1.13
2045						1.16	1.16	1.15	1.15	1.14	1.14	1.13
2046						1.17	1.16	1.16	1.15	1.15	1.14	1.14
2047						1.17	1.17	1.16	1.16	1.15	1.15	1.14
2048						1.18	1.17	1.17	1.16	1.15	1.15	1.14
2049						1.18	1.17	1.17	1.16	1.16	1.15	1.15
2050						1.18	1.18	1.17	1.17	1.16	1.16	1.15
2051						1.19	1.18	1.18	1.17	1.17	1.16	1.16
2052						1.19	1.19	1.18	1.18	1.17	1.17	1.16
2053						1.20	1.19	1.19	1.18	1.18	1.17	1.17
2054						1.20	1.20	1.19	1.19	1.18	1.18	1.17

GROWTH FACTORS: **Use 1.0% Annual Background Growth**

GROWTH FACTORS
VTRANS COUNT STATIONS P6F029
US 7 1.7 MILES NORTH OF I-89 IN GEORGIA, VT

YEAR	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
VOLUME	3500	3500	4100	4100	3900	4000	4200	3900	3800	3700	3700	3600	3600	3700

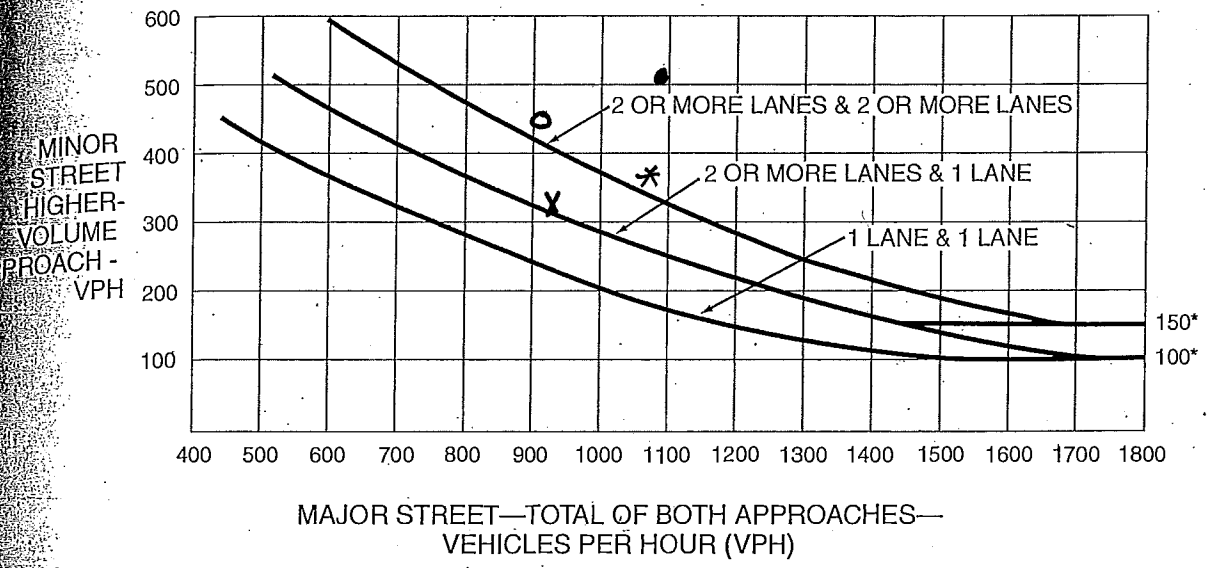
Average Annual Growth Rate (1999-2009) = -1.0%
Average Annual Growth Rate (1996-2009) = 0.4%

Traffic Signal Warrants

US 7 @ Interstate Access Rd

Meets Warrant

Figure 4C-3. Warrant 3, Peak Hour



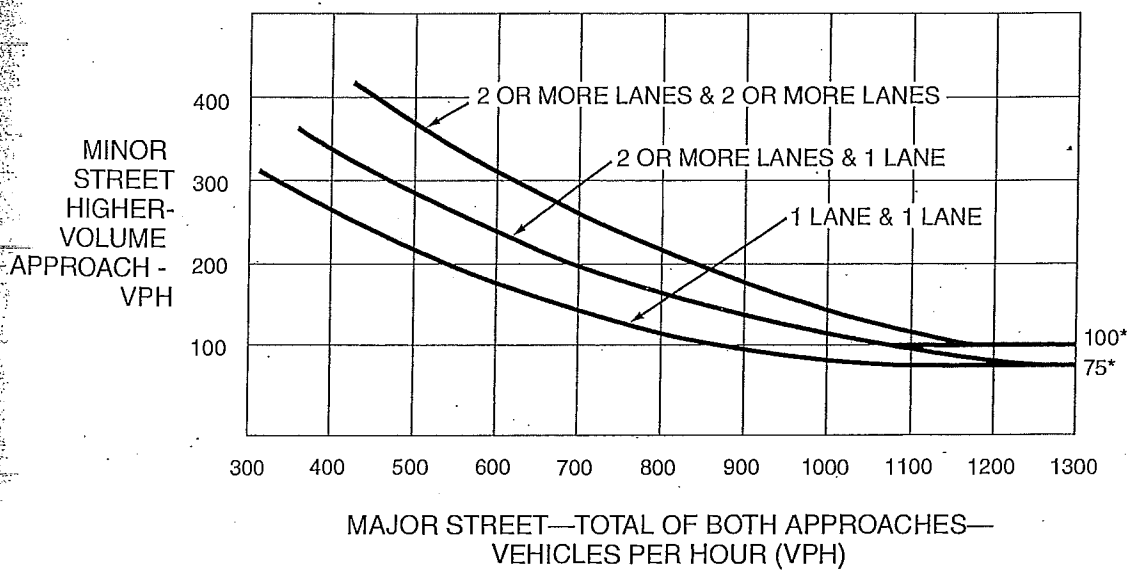
*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

2010 Action
AM 925, 320 x
PM 980, 425 o

2030 Action
AM 1085, 375 *
PM 1095, 505 •

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)

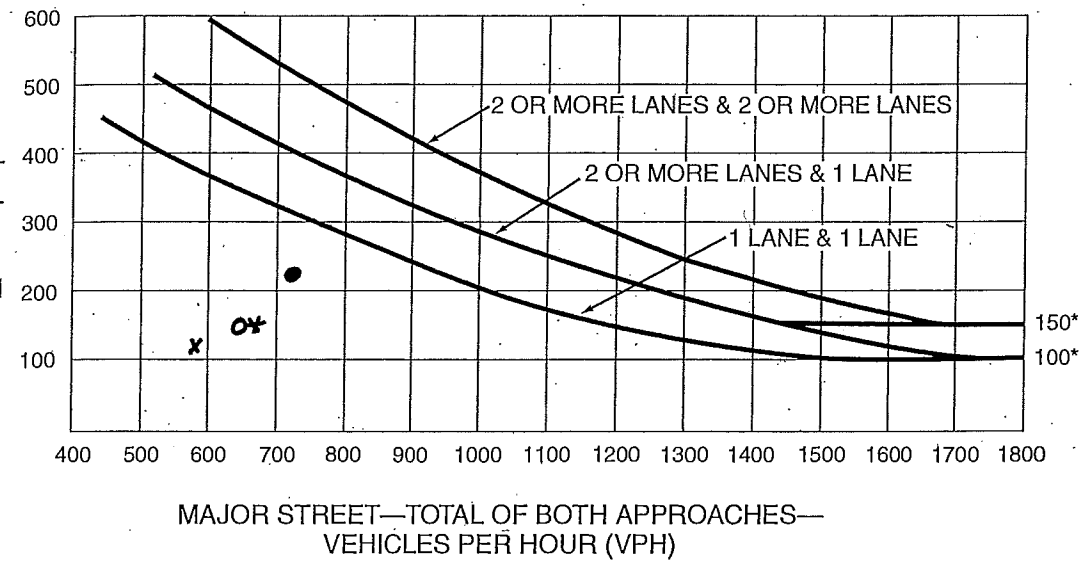


*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

Federal St @ Lower Weldon St

Does NOT meet

Figure 4C-3. Warrant 3, Peak Hour



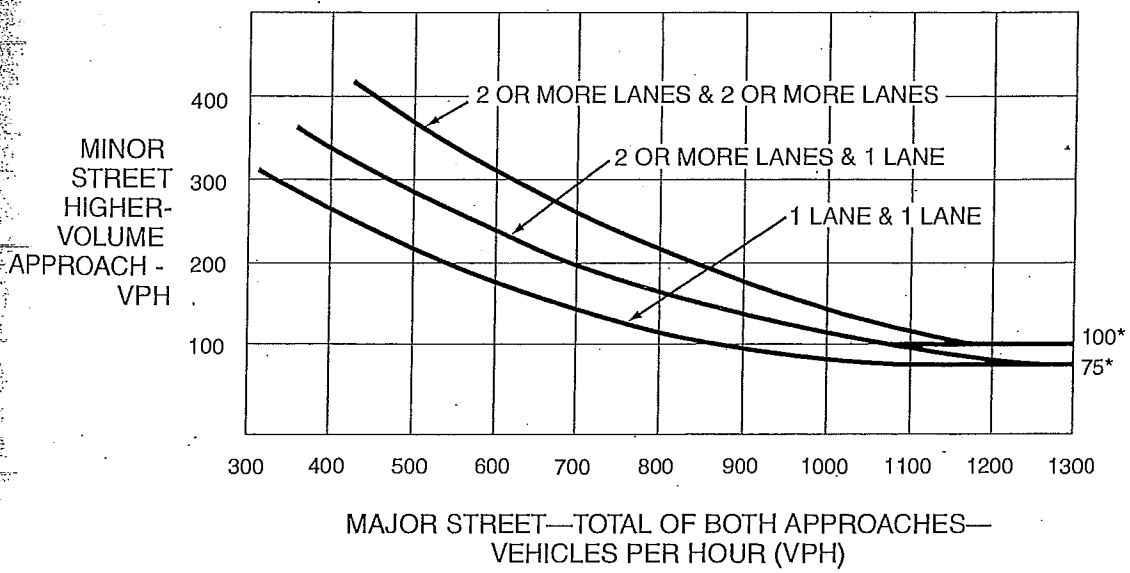
2010 Action
AM 590,125 x
PM 660,150 o

*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

2030 Action
AM 645,160 *
PM 720,230 ●

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)

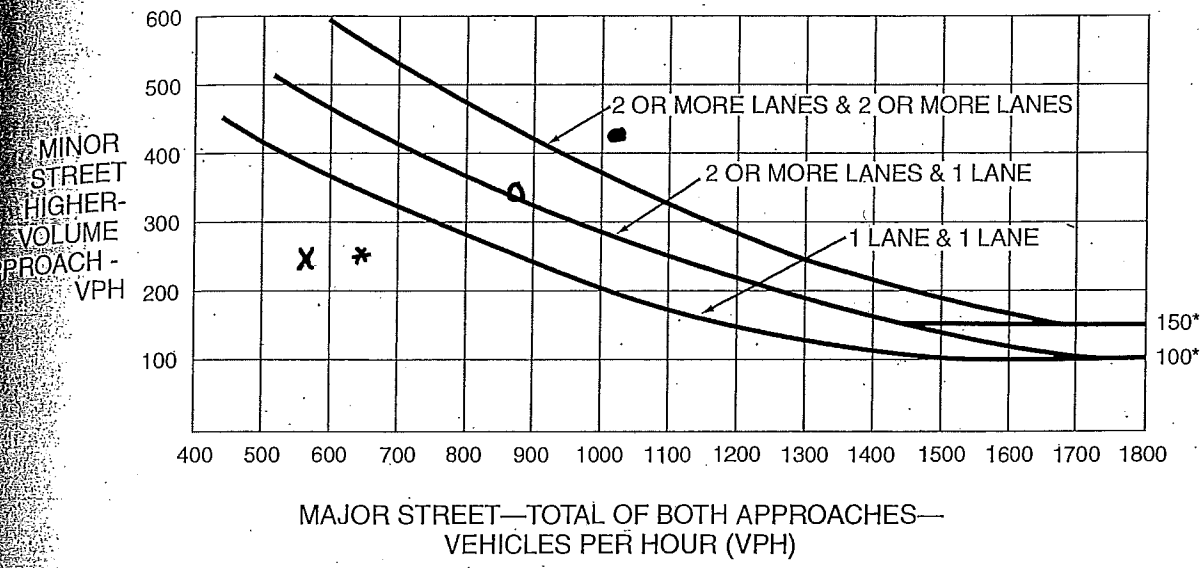


*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

Federal St @ Lake St

Meets Warrant

Figure 4C-3. Warrant 3, Peak Hour



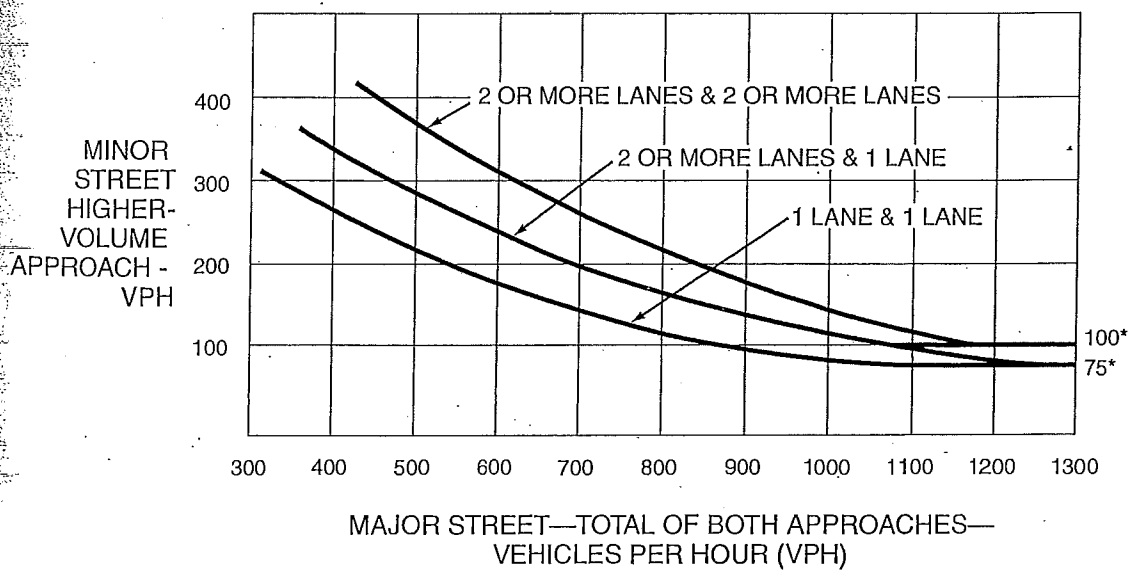
2010 Action
AM 570, 255 X
PM 875, 340 O

*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

2030 Action
AM 650, 250 *
PM 1015, 405 ●

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)

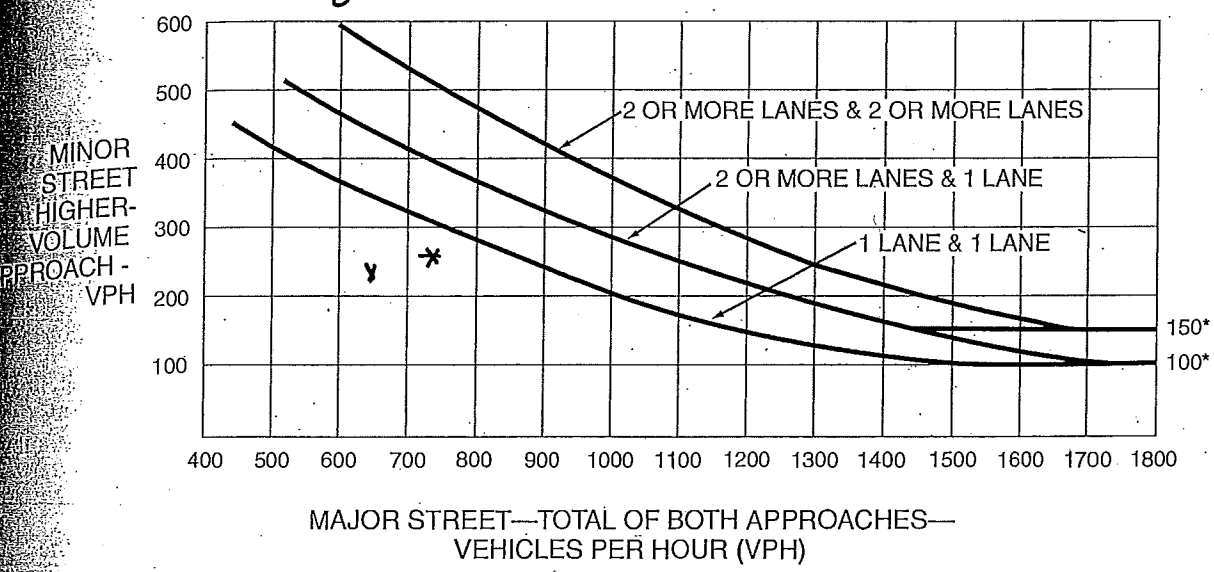


*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

Federal St @ Lower Newton St

Meets Warrant

Figure 4C-3. Warrant 3, Peak Hour



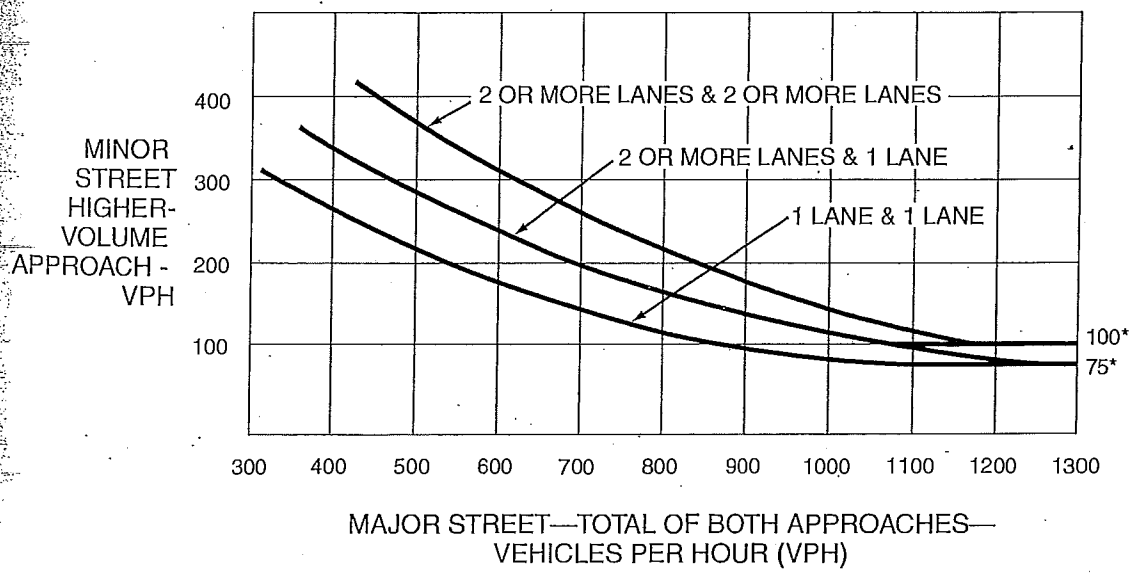
2010 Action
AM 650, 230 ¥
PM 600, 615 O

*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

2030 Action
AM 740, 260 *
PM 680, 740 ●

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

2010 No Action and Proposed Action Intersection Capacity Analyses

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.97		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1787	1599	1778		1736	1827
Flt Permitted	0.95	1.00	1.00		0.38	1.00
Satd. Flow (perm)	1787	1599	1778		692	1827
Volume (vph)	45	50	365	90	30	340
Peak-hour factor, PHF	0.92	0.92	0.91	0.91	0.95	0.95
Adj. Flow (vph)	49	54	401	99	32	358
RTOR Reduction (vph)	0	49	5	0	0	0
Lane Group Flow (vph)	49	5	495	0	32	358
Heavy Vehicles (%)	1%	1%	4%	4%	4%	4%
Turn Type		Prot			pm+pt	
Protected Phases	8	8	2		1	6
Permitted Phases					6	
Actuated Green, G (s)	9.1	9.1	56.3		63.9	63.9
Effective Green, g (s)	9.1	9.1	56.3		63.9	63.9
Actuated g/C Ratio	0.10	0.10	0.63		0.71	0.71
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	5.0	5.0	5.0		5.0	5.0
Lane Grp Cap (vph)	182	163	1120		537	1306
v/s Ratio Prot	c0.03	0.00	c0.28		0.00	c0.20
v/s Ratio Perm					0.04	
v/c Ratio	0.27	0.03	0.44		0.06	0.27
Uniform Delay, d1	37.1	36.2	8.5		4.6	4.5
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	1.7	0.2	1.3		0.1	0.5
Delay (s)	38.7	36.4	9.8		4.7	5.0
Level of Service	D	D	A		A	A
Approach Delay (s)	37.5		9.8			5.0
Approach LOS	D		A			A

Intersection Summary			
HCM Average Control Delay	10.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	89.4	Sum of lost time (s)	20.4
Intersection Capacity Utilization	35.8%	ICU Level of Service	A
Analysis Period (min)	15		

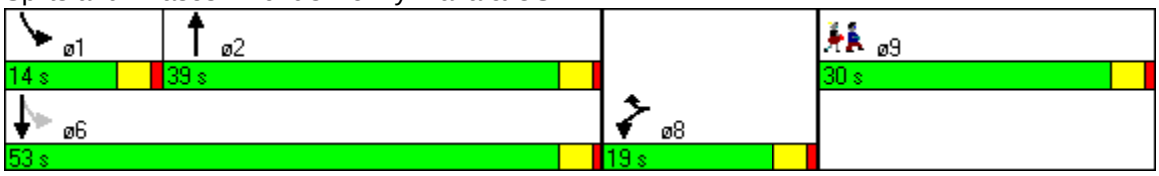
c Critical Lane Group

Lane Group	WBL	WBR	NBT	SBL	SBT	ø9
Lane Configurations						
Volume (vph)	45	50	365	30	340	
Lane Group Flow (vph)	49	54	500	32	358	
Turn Type		Prot		pm+pt		
Protected Phases	8	8	2	1	6	9
Permitted Phases				6		
Detector Phases	8	8	2	1	6	
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	4.0
Minimum Split (s)	10.0	10.0	10.0	9.0	10.0	30.0
Total Split (s)	19.0	19.0	39.0	14.0	53.0	30.0
Total Split (%)	18.6%	18.6%	38.2%	13.7%	52.0%	29%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag			Lag	Lead		
Lead-Lag Optimize?						
Recall Mode	None	None	Max	None	Max	None
v/c Ratio	0.23	0.22	0.41	0.09	0.26	
Control Delay	33.8	12.8	13.2	8.6	7.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	33.8	12.8	13.2	8.6	7.2	
Queue Length 50th (ft)	18	0	52	3	34	
Queue Length 95th (ft)	63	35	#436	26	210	
Internal Link Dist (ft)	63		1579		1282	
Turn Bay Length (ft)				150		
Base Capacity (vph)	314	326	1212	360	1357	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.16	0.17	0.41	0.09	0.26	

Intersection Summary

Cycle Length: 102
Actuated Cycle Length: 83.7
Natural Cycle: 75
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 9: JC Penny Plaza & US 7



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1719	1538	1736	1827	3471	1553
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1719	1538	1736	1827	3471	1553
Volume (vph)	95	120	135	395	305	115
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	103	130	147	429	332	125
RTOR Reduction (vph)	0	108	0	0	0	99
Lane Group Flow (vph)	103	22	147	429	332	26
Heavy Vehicles (%)	5%	5%	4%	4%	4%	4%
Turn Type		Over	Prot			Perm
Protected Phases	4	5	5	2 5	6	
Permitted Phases						6
Actuated Green, G (s)	14.0	15.0	15.0	38.0	19.0	19.0
Effective Green, g (s)	14.0	15.0	15.0	38.0	19.0	19.0
Actuated g/C Ratio	0.16	0.17	0.17	0.42	0.21	0.21
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0
Lane Grp Cap (vph)	267	256	289	771	733	328
v/s Ratio Prot	c0.06	0.01	0.08	c0.23	0.10	
v/s Ratio Perm						0.02
v/c Ratio	0.39	0.08	0.51	0.56	0.45	0.08
Uniform Delay, d1	34.1	31.7	34.1	19.6	31.0	28.5
Progression Factor	1.00	1.00	0.63	0.35	1.00	1.00
Incremental Delay, d2	4.2	0.6	5.2	2.4	2.0	0.5
Delay (s)	38.3	32.3	26.5	9.2	33.0	29.0
Level of Service	D	C	C	A	C	C
Approach Delay (s)	35.0			13.6	31.9	
Approach LOS	C			B	C	

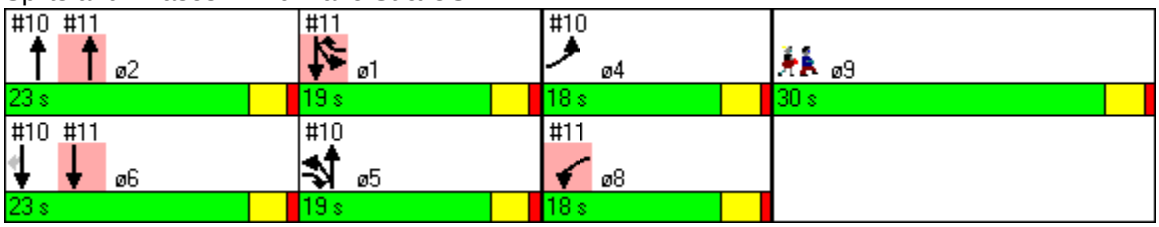
Intersection Summary			
HCM Average Control Delay	24.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	38.0
Intersection Capacity Utilization	32.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	ø1	ø2	ø8	ø9
Lane Configurations										
Volume (vph)	95	120	135	395	305	115				
Lane Group Flow (vph)	103	130	147	429	332	125				
Turn Type		Over	Prot			Perm				
Protected Phases	4	5	5	2 5	6		1	2	8	9
Permitted Phases						6				
Detector Phases	4	5	5	2 5	6	6				
Minimum Initial (s)	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.0	10.0	10.0		10.0	10.0	10.0	10.0	10.0	30.0
Total Split (s)	18.0	19.0	19.0	42.0	23.0	23.0	19.0	23.0	18.0	30.0
Total Split (%)	20.0%	21.1%	21.1%	46.7%	25.6%	25.6%	21%	26%	20%	33%
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag		Lag	Lag		Lead	Lead	Lag	Lead		
Lead-Lag Optimize?										
Recall Mode	Max	Max	Max		Max	Max	Max	Max	Max	Max
v/c Ratio	0.39	0.36	0.51	0.56	0.45	0.29				
Control Delay	39.0	9.3	27.0	9.3	33.3	7.8				
Queue Delay	0.0	0.2	23.4	1.2	0.4	0.0				
Total Delay	39.0	9.5	50.3	10.5	33.7	7.8				
Queue Length 50th (ft)	53	0	86	61	87	0				
Queue Length 95th (ft)	103	48	m125	56	129	44				
Internal Link Dist (ft)	525			79	1579					
Turn Bay Length (ft)		275				100				
Base Capacity (vph)	267	365	289	771	733	426				
Starvation Cap Reductn	0	0	131	161	0	0				
Spillback Cap Reductn	0	23	0	0	113	0				
Storage Cap Reductn	0	0	0	0	0	0				
Reduced v/c Ratio	0.39	0.38	0.93	0.70	0.54	0.29				

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 65
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: Lake St & US 7



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	1.00	0.95		1.00	1.00
Frt	1.00	0.85	0.97		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	1583	3362		1736	1827
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1770	1583	3362		1736	1827
Volume (vph)	80	190	340	90	120	305
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	87	207	370	98	130	332
RTOR Reduction (vph)	0	173	27	0	0	0
Lane Group Flow (vph)	87	35	441	0	130	332
Heavy Vehicles (%)	2%	2%	4%	4%	4%	4%
Turn Type		Over			Prot	
Protected Phases	8	1	2		1	1 6
Permitted Phases						
Actuated Green, G (s)	14.0	15.0	19.0		15.0	38.0
Effective Green, g (s)	14.0	15.0	19.0		15.0	38.0
Actuated g/C Ratio	0.16	0.17	0.21		0.17	0.42
Clearance Time (s)	4.0	4.0	4.0		4.0	
Lane Grp Cap (vph)	275	264	710		289	771
v/s Ratio Prot	c0.05	0.02	c0.13		0.07	c0.18
v/s Ratio Perm						
v/c Ratio	0.32	0.13	0.62		0.45	0.43
Uniform Delay, d1	33.7	31.9	32.2		33.8	18.4
Progression Factor	1.00	1.00	1.00		0.59	0.27
Incremental Delay, d2	3.0	1.0	4.1		4.6	1.6
Delay (s)	36.7	33.0	36.3		24.6	6.5
Level of Service	D	C	D		C	A
Approach Delay (s)	34.1		36.3			11.6
Approach LOS	C		D			B

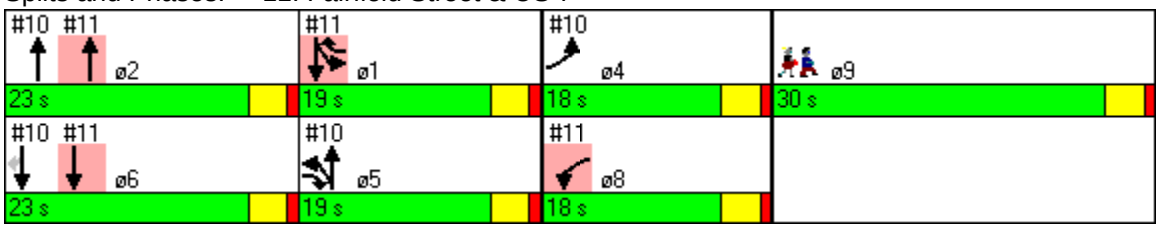
Intersection Summary			
HCM Average Control Delay	26.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	38.0
Intersection Capacity Utilization	33.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	WBL	WBR	NBT	SBL	SBT	ø4	ø5	ø6	ø9
Lane Configurations									
Volume (vph)	80	190	340	120	305				
Lane Group Flow (vph)	87	207	468	130	332				
Turn Type		Over		Prot					
Protected Phases	8	1	2	1	1 6	4	5	6	9
Permitted Phases									
Detector Phases	8	1	2	1	1 6				
Minimum Initial (s)	5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0
Minimum Split (s)	10.0	10.0	10.0	10.0		10.0	10.0	10.0	30.0
Total Split (s)	18.0	19.0	23.0	19.0	42.0	18.0	19.0	23.0	30.0
Total Split (%)	20.0%	21.1%	25.6%	21.1%	46.7%	20%	21%	26%	33%
Yellow Time (s)	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0
Lead/Lag		Lag	Lead	Lag			Lag	Lead	
Lead-Lag Optimize?									
Recall Mode	Max	Max	Max	Max		Max	Max	Max	Max
v/c Ratio	0.32	0.47	0.64	0.45	0.43				
Control Delay	37.4	9.0	34.4	25.0	6.6				
Queue Delay	0.0	0.3	3.5	17.2	0.8				
Total Delay	37.4	9.3	37.9	42.2	7.4				
Queue Length 50th (ft)	45	0	118	78	31				
Queue Length 95th (ft)	89	59	171	122	43				
Internal Link Dist (ft)	263		1354		79				
Turn Bay Length (ft)		250							
Base Capacity (vph)	275	436	737	289	771				
Starvation Cap Reductn	0	0	0	140	207				
Spillback Cap Reductn	0	32	180	0	0				
Storage Cap Reductn	0	0	0	0	0				
Reduced v/c Ratio	0.32	0.51	0.84	0.87	0.59				

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 65
Control Type: Pretimed

Splits and Phases: 11: Fairfield Street & US 7



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.93			0.95		1.00	0.99		1.00	0.98	
Flt Protected		0.99			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1717			1754		1736	1812		1736	1798	
Flt Permitted		0.92			0.95		0.32	1.00		0.38	1.00	
Satd. Flow (perm)		1603			1670		579	1812		688	1798	
Volume (vph)	50	70	125	10	50	40	95	445	25	25	380	45
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	76	136	11	54	43	103	484	27	27	413	49
RTOR Reduction (vph)	0	39	0	0	24	0	0	1	0	0	3	0
Lane Group Flow (vph)	0	227	0	0	84	0	103	510	0	27	459	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	4%	4%	4%	4%	4%	4%
Turn Type	Perm			Perm			pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		14.0			14.0		43.6	37.6		36.2	33.9	
Effective Green, g (s)		15.0			15.0		45.6	38.6		38.2	34.9	
Actuated g/C Ratio		0.20			0.20		0.60	0.51		0.50	0.46	
Clearance Time (s)		5.0			5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		315			328		452	917		390	822	
v/s Ratio Prot							c0.02	c0.28		0.00	0.26	
v/s Ratio Perm		c0.14			0.05		0.12			0.03		
v/c Ratio		0.72			0.26		0.23	0.56		0.07	0.56	
Uniform Delay, d1		28.7			25.9		8.0	13.0		10.0	15.1	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		7.9			0.4		0.3	2.4		0.1	2.7	
Delay (s)		36.6			26.3		8.3	15.4		10.1	17.8	
Level of Service		D			C		A	B		B	B	
Approach Delay (s)		36.6			26.3			14.2			17.4	
Approach LOS		D			C			B			B	

Intersection Summary			
HCM Average Control Delay	20.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	76.3	Sum of lost time (s)	19.4
Intersection Capacity Utilization	59.9%	ICU Level of Service	B
Analysis Period (min)	15		

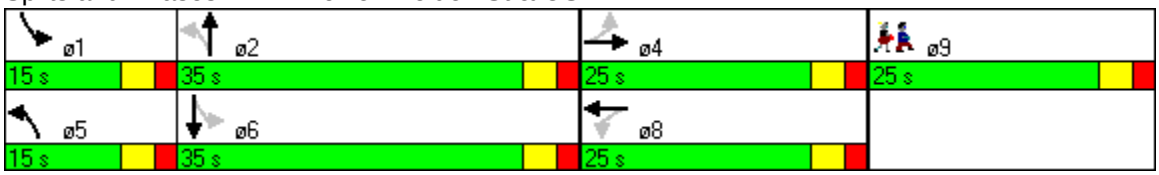
c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	ø9
Lane Configurations									
Volume (vph)	50	70	10	50	95	445	25	380	
Lane Group Flow (vph)	0	266	0	108	103	511	27	462	
Turn Type	Perm		Perm		pm+pt		pm+pt		
Protected Phases		4		8	5	2	1	6	9
Permitted Phases	4		8		2		6		
Detector Phases	4	4	8	8	5	2	1	6	
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0
Minimum Split (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	22.0
Total Split (s)	25.0	25.0	25.0	25.0	15.0	35.0	15.0	35.0	25.0
Total Split (%)	25.0%	25.0%	25.0%	25.0%	15.0%	35.0%	15.0%	35.0%	25%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lead/Lag					Lead	Lag	Lead	Lag	
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	Max	None	Max	None
v/c Ratio		0.69		0.28	0.29	0.50	0.10	0.54	
Control Delay		32.5		21.4	10.6	17.2	10.8	20.9	
Queue Delay		0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay		32.5		21.4	10.6	17.2	10.8	20.9	
Queue Length 50th (ft)		81		26	14	88	3	131	
Queue Length 95th (ft)		#217		87	65	#452	23	#411	
Internal Link Dist (ft)		782		814		1730		1354	
Turn Bay Length (ft)					150		150		
Base Capacity (vph)		493		505	400	1012	332	854	
Starvation Cap Reductn		0		0	0	0	0	0	
Spillback Cap Reductn		0		0	0	0	0	0	
Storage Cap Reductn		0		0	0	0	0	0	
Reduced v/c Ratio		0.54		0.21	0.26	0.50	0.08	0.54	

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 69.2
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 12: Lower Welden St & US 7



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.99		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1787	1599	1837		1770	1863
Flt Permitted	0.95	1.00	1.00		0.20	1.00
Satd. Flow (perm)	1787	1599	1837		374	1863
Volume (vph)	55	70	655	75	35	490
Peak-hour factor, PHF	0.92	0.92	0.91	0.91	0.95	0.95
Adj. Flow (vph)	60	76	720	82	37	516
RTOR Reduction (vph)	0	68	2	0	0	0
Lane Group Flow (vph)	60	8	800	0	37	516
Heavy Vehicles (%)	1%	1%	2%	2%	2%	2%
Turn Type		Prot			pm+pt	
Protected Phases	8	8	2		1	6
Permitted Phases					6	
Actuated Green, G (s)	9.5	9.5	56.2		63.9	63.9
Effective Green, g (s)	9.5	9.5	56.2		63.9	63.9
Actuated g/C Ratio	0.11	0.11	0.63		0.71	0.71
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	5.0	5.0	5.0		5.0	5.0
Lane Grp Cap (vph)	189	169	1151		324	1327
v/s Ratio Prot	c0.03	0.01	c0.44		0.00	c0.28
v/s Ratio Perm					0.08	
v/c Ratio	0.32	0.05	0.69		0.11	0.39
Uniform Delay, d1	37.1	36.0	11.1		8.1	5.1
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	2.0	0.2	3.5		0.3	0.9
Delay (s)	39.1	36.3	14.6		8.4	6.0
Level of Service	D	D	B		A	A
Approach Delay (s)	37.5		14.6			6.2
Approach LOS	D		B			A

Intersection Summary			
HCM Average Control Delay	13.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	89.7	Sum of lost time (s)	20.3
Intersection Capacity Utilization	50.0%	ICU Level of Service	A
Analysis Period (min)	15		

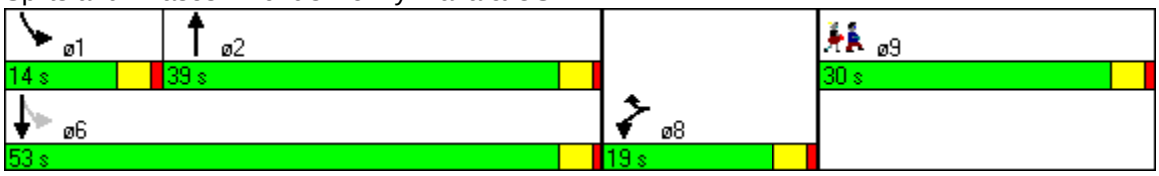
c Critical Lane Group

Lane Group	WBL	WBR	NBT	SBL	SBT	ø9
Lane Configurations						
Volume (vph)	55	70	655	35	490	
Lane Group Flow (vph)	60	76	802	37	516	
Turn Type		Prot		pm+pt		
Protected Phases	8	8	2	1	6	9
Permitted Phases				6		
Detector Phases	8	8	2	1	6	
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	4.0
Minimum Split (s)	10.0	10.0	10.0	9.0	10.0	30.0
Total Split (s)	19.0	19.0	39.0	14.0	53.0	30.0
Total Split (%)	18.6%	18.6%	38.2%	13.7%	52.0%	29%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag			Lag	Lead		
Lead-Lag Optimize?						
Recall Mode	None	None	Max	None	Max	None
v/c Ratio	0.27	0.28	0.65	0.13	0.37	
Control Delay	34.0	11.5	17.9	9.2	8.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	34.0	11.5	17.9	9.2	8.4	
Queue Length 50th (ft)	22	0	113	3	57	
Queue Length 95th (ft)	74	41	#882	29	329	
Internal Link Dist (ft)	63		1579		1282	
Turn Bay Length (ft)				150		
Base Capacity (vph)	314	344	1243	305	1377	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.19	0.22	0.65	0.12	0.37	

Intersection Summary

Cycle Length: 102
Actuated Cycle Length: 84.1
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 9: JC Penny Plaza & US 7



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1736	1827	3539	1583
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	1736	1827	3539	1583
Volume (vph)	160	210	175	600	420	155
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	174	228	190	652	457	168
RTOR Reduction (vph)	0	190	0	0	0	133
Lane Group Flow (vph)	174	38	190	652	457	35
Heavy Vehicles (%)	2%	2%	4%	4%	2%	2%
Turn Type		Over	Prot			Perm
Protected Phases	4	5	5	2 5	6	
Permitted Phases						6
Actuated Green, G (s)	14.0	15.0	15.0	38.0	19.0	19.0
Effective Green, g (s)	14.0	15.0	15.0	38.0	19.0	19.0
Actuated g/C Ratio	0.16	0.17	0.17	0.42	0.21	0.21
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0
Lane Grp Cap (vph)	275	264	289	771	747	334
v/s Ratio Prot	c0.10	0.02	0.11	c0.36	0.13	
v/s Ratio Perm						0.02
v/c Ratio	0.63	0.14	0.66	0.85	0.61	0.11
Uniform Delay, d1	35.6	32.0	35.1	23.4	32.2	28.6
Progression Factor	1.00	1.00	0.56	0.35	1.00	1.00
Incremental Delay, d2	10.6	1.1	6.5	6.7	3.7	0.6
Delay (s)	46.2	33.2	26.3	14.8	35.9	29.3
Level of Service	D	C	C	B	D	C
Approach Delay (s)	38.8			17.4	34.1	
Approach LOS	D			B	C	

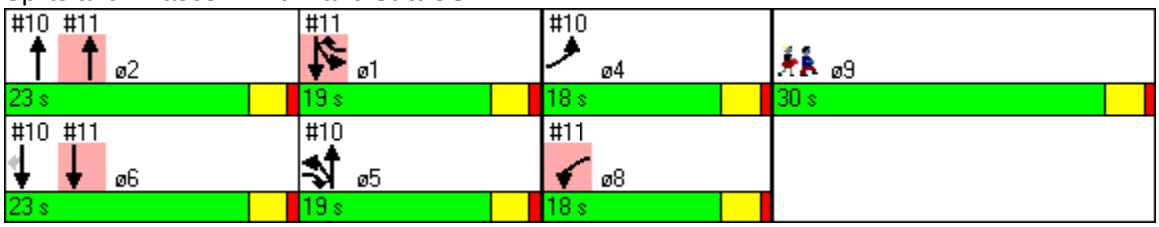
Intersection Summary			
HCM Average Control Delay	27.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	38.0
Intersection Capacity Utilization	47.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	ø1	ø2	ø8	ø9
Lane Configurations										
Volume (vph)	160	210	175	600	420	155				
Lane Group Flow (vph)	174	228	190	652	457	168				
Turn Type		Over	Prot			Perm				
Protected Phases	4	5	5	2 5	6		1	2	8	9
Permitted Phases						6				
Detector Phases	4	5	5	2 5	6	6				
Minimum Initial (s)	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.0	10.0	10.0		10.0	10.0	10.0	10.0	10.0	30.0
Total Split (s)	18.0	19.0	19.0	42.0	23.0	23.0	19.0	23.0	18.0	30.0
Total Split (%)	20.0%	21.1%	21.1%	46.7%	25.6%	25.6%	21%	26%	20%	33%
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag		Lag	Lag		Lead	Lead	Lag	Lead		
Lead-Lag Optimize?										
Recall Mode	Max	Max	Max		Max	Max	Max	Max	Max	Max
v/c Ratio	0.63	0.50	0.66	0.85	0.61	0.36				
Control Delay	47.0	9.0	27.1	16.2	36.2	7.4				
Queue Delay	0.0	0.3	114.4	30.8	3.5	0.0				
Total Delay	47.0	9.3	141.5	47.0	39.7	7.4				
Queue Length 50th (ft)	94	0	114	390	124	0				
Queue Length 95th (ft)	#165	62	m131	m410	175	51				
Internal Link Dist (ft)	525			79	1579					
Turn Bay Length (ft)		275				100				
Base Capacity (vph)	275	454	289	771	747	467				
Starvation Cap Reductn	0	0	134	150	0	0				
Spillback Cap Reductn	0	33	0	0	199	0				
Storage Cap Reductn	0	0	0	0	0	0				
Reduced v/c Ratio	0.63	0.54	1.23	1.05	0.83	0.36				

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 80
Control Type: Pretimed
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: Lake St & US 7



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	1.00	0.95		1.00	1.00
Frt	1.00	0.85	0.99		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	1583	3420		1770	1863
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1770	1583	3420		1770	1863
Volume (vph)	70	220	555	60	140	490
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	76	239	603	65	152	533
RTOR Reduction (vph)	0	199	9	0	0	0
Lane Group Flow (vph)	76	40	659	0	152	533
Heavy Vehicles (%)	2%	2%	4%	4%	2%	2%
Turn Type		Over			Prot	
Protected Phases	8	1	2		1	1 6
Permitted Phases						
Actuated Green, G (s)	14.0	15.0	19.0		15.0	38.0
Effective Green, g (s)	14.0	15.0	19.0		15.0	38.0
Actuated g/C Ratio	0.16	0.17	0.21		0.17	0.42
Clearance Time (s)	4.0	4.0	4.0		4.0	
Lane Grp Cap (vph)	275	264	722		295	787
v/s Ratio Prot	c0.04	0.03	c0.19		0.09	c0.29
v/s Ratio Perm						
v/c Ratio	0.28	0.15	0.91		0.52	0.68
Uniform Delay, d1	33.5	32.1	34.7		34.2	21.0
Progression Factor	1.00	1.00	1.00		0.60	0.35
Incremental Delay, d2	2.5	1.2	18.0		5.2	3.9
Delay (s)	36.0	33.3	52.7		25.7	11.3
Level of Service	D	C	D		C	B
Approach Delay (s)	33.9		52.7			14.5
Approach LOS	C		D			B

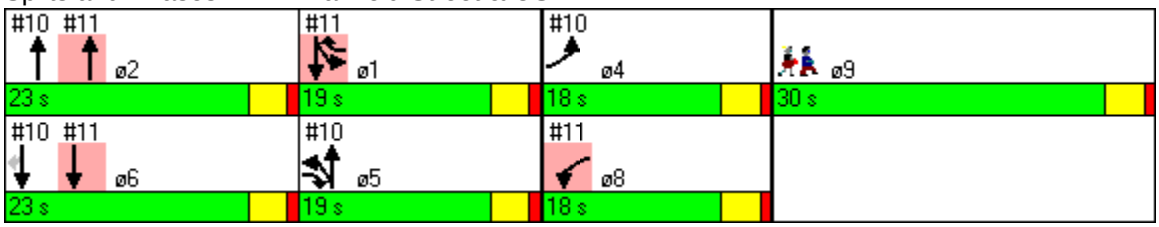
Intersection Summary			
HCM Average Control Delay	33.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	38.0
Intersection Capacity Utilization	39.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	WBL	WBR	NBT	SBL	SBT	ø4	ø5	ø6	ø9
Lane Configurations									
Volume (vph)	70	220	555	140	490				
Lane Group Flow (vph)	76	239	668	152	533				
Turn Type		Over		Prot					
Protected Phases	8	1	2	1	1 6	4	5	6	9
Permitted Phases									
Detector Phases	8	1	2	1	1 6				
Minimum Initial (s)	5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0
Minimum Split (s)	10.0	10.0	10.0	10.0		10.0	10.0	10.0	30.0
Total Split (s)	18.0	19.0	23.0	19.0	42.0	18.0	19.0	23.0	30.0
Total Split (%)	20.0%	21.1%	25.6%	21.1%	46.7%	20%	21%	26%	33%
Yellow Time (s)	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0
Lead/Lag		Lag	Lead	Lag			Lag	Lead	
Lead-Lag Optimize?									
Recall Mode	Max	Max	Max	Max		Max	Max	Max	Max
v/c Ratio	0.28	0.52	0.92	0.52	0.68				
Control Delay	36.6	9.1	53.3	26.1	11.5				
Queue Delay	0.0	0.3	102.9	31.7	3.0				
Total Delay	36.6	9.4	156.2	57.8	14.5				
Queue Length 50th (ft)	39	0	193	90	289				
Queue Length 95th (ft)	80	63	#299	m137	368				
Internal Link Dist (ft)	263		1354		79				
Turn Bay Length (ft)		250							
Base Capacity (vph)	275	463	730	295	787				
Starvation Cap Reductn	0	0	0	139	156				
Spillback Cap Reductn	0	35	188	0	0				
Storage Cap Reductn	0	0	0	0	0				
Reduced v/c Ratio	0.28	0.56	1.23	0.97	0.84				

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 80
Control Type: Pretimed
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 11: Fairfield Street & US 7



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.93			0.96		1.00	0.99		1.00	0.99	
Flt Protected		0.99			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1724			1768		1736	1815		1770	1835	
Flt Permitted		0.92			0.88		0.15	1.00		0.16	1.00	
Satd. Flow (perm)		1606			1567		275	1815		300	1835	
Volume (vph)	55	85	130	15	40	25	130	565	25	25	460	50
Peak-hour factor, PHF	0.75	0.75	0.75	0.85	0.85	0.85	0.80	0.80	0.80	0.85	0.85	0.85
Adj. Flow (vph)	73	113	173	18	47	29	162	706	31	29	541	59
RTOR Reduction (vph)	0	32	0	0	15	0	0	1	0	0	4	0
Lane Group Flow (vph)	0	327	0	0	79	0	162	736	0	29	596	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	4%	4%	4%	2%	2%	2%
Turn Type	Perm			Perm			pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		20.0			20.0		47.6	40.1		36.1	33.6	
Effective Green, g (s)		21.0			21.0		48.6	41.1		38.1	34.6	
Actuated g/C Ratio		0.25			0.25		0.57	0.48		0.45	0.41	
Clearance Time (s)		5.0			5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		395			386		328	875		194	744	
v/s Ratio Prot							c0.06	c0.41		0.01	0.32	
v/s Ratio Perm		c0.20			0.05		0.22			0.06		
v/c Ratio		0.83			0.20		0.49	0.84		0.15	0.80	
Uniform Delay, d1		30.4			25.5		13.4	19.3		15.8	22.3	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		13.4			0.3		1.2	9.6		0.4	8.9	
Delay (s)		43.8			25.8		14.6	28.9		16.1	31.2	
Level of Service		D			C		B	C		B	C	
Approach Delay (s)		43.8			25.8			26.3			30.5	
Approach LOS		D			C			C			C	

Intersection Summary			
HCM Average Control Delay	30.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	85.3	Sum of lost time (s)	19.7
Intersection Capacity Utilization	66.7%	ICU Level of Service	C
Analysis Period (min)	15		

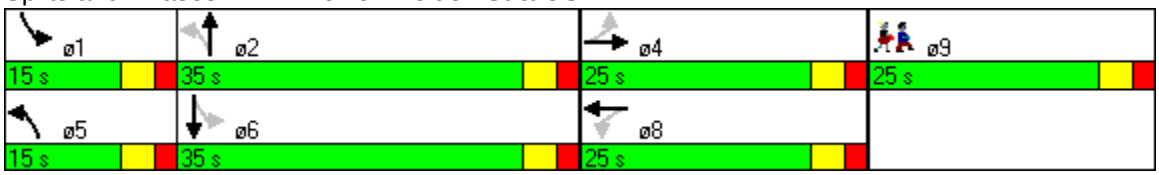
c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	ø9
Lane Configurations									
Volume (vph)	55	85	15	40	130	565	25	460	
Lane Group Flow (vph)	0	359	0	94	162	737	29	600	
Turn Type	Perm		Perm		pm+pt		pm+pt		
Protected Phases		4		8	5	2	1	6	9
Permitted Phases	4		8		2		6		
Detector Phases	4	4	8	8	5	2	1	6	
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0
Minimum Split (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	22.0
Total Split (s)	25.0	25.0	25.0	25.0	15.0	35.0	15.0	35.0	25.0
Total Split (%)	25.0%	25.0%	25.0%	25.0%	15.0%	35.0%	15.0%	35.0%	25%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lead/Lag					Lead	Lag	Lead	Lag	
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	Max	None	Max	None
v/c Ratio		0.78		0.23	0.49	0.77	0.12	0.81	
Control Delay		38.8		22.2	15.9	25.7	11.7	33.0	
Queue Delay		0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay		38.8		22.2	15.9	25.7	11.7	33.0	
Queue Length 50th (ft)		134		26	29	197	5	233	
Queue Length 95th (ft)		#267		77	86	#642	23	#547	
Internal Link Dist (ft)		782		814		1730		1354	
Turn Bay Length (ft)					150		150		
Base Capacity (vph)		463		409	345	956	306	741	
Starvation Cap Reductn		0		0	0	0	0	0	
Spillback Cap Reductn		0		0	0	0	0	0	
Storage Cap Reductn		0		0	0	0	0	0	
Reduced v/c Ratio		0.78		0.23	0.47	0.77	0.09	0.81	

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 78.1
Natural Cycle: 100
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 12: Lower Welden St & US 7



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	195	300	90	195	140	5	45	85	190	5	160	190
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	14	14	12
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frt	1.00	0.97		1.00	1.00		1.00	0.90			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			1.00	1.00
Satd. Flow (prot)	1736	1750		1703	1784		1671	1577			1984	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00			0.99	1.00
Satd. Flow (perm)	1736	1750		1703	1784		1671	1577			1958	1583
Peak-hour factor, PHF	0.89	0.89	0.89	0.91	0.91	0.91	0.75	0.75	0.75	0.92	0.92	0.92
Adj. Flow (vph)	219	337	101	214	154	5	60	113	253	5	174	207
RTOR Reduction (vph)	0	8	0	0	1	0	0	57	0	0	0	142
Lane Group Flow (vph)	219	430	0	214	158	0	60	309	0	0	179	65
Confl. Peds. (#/hr)			9	9								
Heavy Vehicles (%)	4%	4%	4%	6%	6%	6%	8%	8%	8%	2%	2%	2%
Turn Type	Prot			Prot			Prot			Perm		pm+ov
Protected Phases	5	2		1	6		3	3 4			4	5
Permitted Phases										4		4
Actuated Green, G (s)	19.4	36.6		19.2	36.4		18.8	39.8			16.0	35.4
Effective Green, g (s)	20.4	37.6		20.2	37.4		19.8	40.8			17.0	37.4
Actuated g/C Ratio	0.17	0.31		0.17	0.31		0.17	0.34			0.14	0.31
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0				5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0				3.0	3.0
Lane Grp Cap (vph)	295	548		287	556		276	536			277	546
v/s Ratio Prot	c0.13	c0.25		0.13	0.09		0.04	c0.20				0.02
v/s Ratio Perm											0.09	0.02
v/c Ratio	0.74	0.78		0.75	0.28		0.22	0.58			0.65	0.12
Uniform Delay, d1	47.3	37.5		47.5	31.2		43.4	32.5			48.7	29.5
Progression Factor	1.00	1.00		0.96	0.72		1.00	1.00			1.00	1.00
Incremental Delay, d2	9.7	10.7		9.9	1.3		0.4	1.5			5.1	0.1
Delay (s)	57.0	48.3		55.5	23.6		43.8	34.0			53.8	29.6
Level of Service	E	D		E	C		D	C			D	C
Approach Delay (s)		51.2			41.9			35.4			40.8	
Approach LOS		D			D			D			D	

Intersection Summary			
HCM Average Control Delay	43.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.4
Intersection Capacity Utilization	70.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

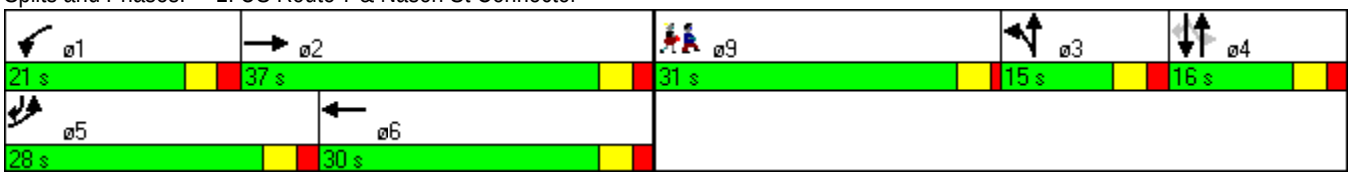
1: US Route 7 & Nason St Connector

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR	ø9
Lane Configurations										
Volume (vph)	195	300	195	140	45	85	5	160	190	
Lane Group Flow (vph)	219	438	214	159	60	366	0	179	207	
Turn Type	Prot		Prot		Prot		Perm		pm+ov	
Protected Phases	5	2	1	6	3	3 4		4	5	9
Permitted Phases							4		4	
Detector Phase	5	2	1	6	3	3 4	4	4	5	
Switch Phase										
Minimum Initial (s)	5.0	10.0	5.0	10.0	5.0		5.0	5.0	5.0	4.0
Minimum Split (s)	15.0	15.0	15.0	15.0	13.0		15.0	15.0	15.0	31.0
Total Split (s)	28.0	37.0	21.0	30.0	15.0	31.0	16.0	16.0	28.0	31.0
Total Split (%)	23.3%	30.8%	17.5%	25.0%	12.5%	25.8%	13.3%	13.3%	23.3%	26%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lead	Lag	Lead	Lag	Lag				Lead	Lead
Lead-Lag Optimize?										
Recall Mode	None	C-Min	None	C-Min	None		None	None	None	None
v/c Ratio	0.74	0.73	0.75	0.26	0.22	0.62		0.64	0.30	
Control Delay	62.3	44.3	62.1	24.7	46.7	30.8		60.4	4.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	62.3	44.3	62.1	24.7	46.7	30.8		60.4	4.8	
Queue Length 50th (ft)	161	301	116	106	39	167		130	0	
Queue Length 95th (ft)	239	#500	#315	111	74	253		#277	53	
Internal Link Dist (ft)		422		220		1239		966		
Turn Bay Length (ft)			150						200	
Base Capacity (vph)	347	601	289	604	276	593		278	723	
Starvation Cap Reductn	0	0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0		0	0	
Storage Cap Reductn	0	0	0	0	0	0		0	0	
Reduced v/c Ratio	0.63	0.73	0.74	0.26	0.22	0.62		0.64	0.29	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 55 (46%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow
Natural Cycle: 100
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: US Route 7 & Nason St Connector



Movement	EBL	EBR	EBR2	NBL	NBT	NBR	SBL	SBT	NWL2	NWT	NWR
Lane Configurations											
Volume (vph)	75	150	30	50	145	70	120	135	25	80	240
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	12	12	12	12	12	14	14	12	12	12
Total Lost time (s)	4.0	4.0			5.0			3.0	4.0	5.0	4.0
Lane Util. Factor	1.00	1.00			1.00			1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00			0.99			1.00	1.00	1.00	0.97
Flpb, ped/bikes	0.99	1.00			1.00			1.00	0.99	1.00	1.00
Frt	1.00	0.85			0.96			1.00	1.00	0.95	0.85
Flt Protected	0.95	1.00			0.99			0.98	0.95	1.00	1.00
Satd. Flow (prot)	1636	1524			1689			1886	1702	1719	1485
Flt Permitted	0.95	1.00			0.99			0.98	0.95	1.00	1.00
Satd. Flow (perm)	1636	1524			1689			1886	1702	1719	1485
Peak-hour factor, PHF	0.72	0.72	0.72	0.80	0.80	0.80	0.86	0.86	0.84	0.84	0.84
Adj. Flow (vph)	104	208	42	62	181	88	140	157	30	95	286
RTOR Reduction (vph)	0	7	0	0	12	0	0	0	0	0	257
Lane Group Flow (vph)	104	243	0	0	319	0	0	297	30	95	29
Confl. Peds. (#/hr)	3		2			14	14		2		3
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	5%	5%	5%	5%	5%
Turn Type		custom		Split			Split		Perm		Perm
Protected Phases	5	2		4	4		3	3		6	
Permitted Phases	2								6		6
Actuated Green, G (s)	25.7	25.7			24.2			36.7	10.0	10.0	10.0
Effective Green, g (s)	26.7	26.7			25.2			39.7	11.0	10.0	11.0
Actuated g/C Ratio	0.24	0.24			0.23			0.36	0.10	0.09	0.10
Clearance Time (s)	5.0	5.0			6.0			6.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0			3.0			3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	397	370			387			681	170	156	149
v/s Ratio Prot	0.03	c0.16			c0.19			c0.16		0.06	
v/s Ratio Perm	0.04								0.02		0.02
v/c Ratio	0.26	0.66			0.82			0.44	0.18	0.61	0.19
Uniform Delay, d1	33.7	37.5			40.3			26.7	45.4	48.1	45.4
Progression Factor	1.00	1.00			1.00			1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	4.2			13.2			2.0	0.5	6.6	0.6
Delay (s)	34.0	41.7			53.5			28.7	45.8	54.7	46.1
Level of Service	C	D			D			C	D	D	D
Approach Delay (s)	39.5				53.5			28.7		48.0	
Approach LOS	D				D			C		D	

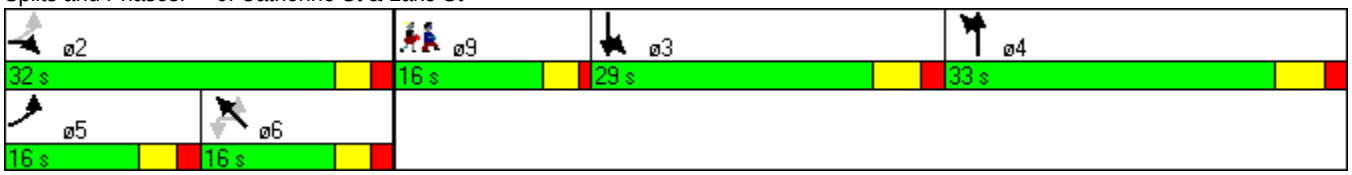
Intersection Summary			
HCM Average Control Delay	43.0	HCM Level of Service	D
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.4
Intersection Capacity Utilization	53.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	NBT	SBT	NWL2	NWT	NWR	ø9
Lane Configurations								
Volume (vph)	75	150	145	135	25	80	240	
Lane Group Flow (vph)	104	250	331	297	30	95	286	
Turn Type		custom			Perm		Perm	
Protected Phases	5	2	4	3		6		9
Permitted Phases	2				6		6	
Detector Phase	5	2	4	3	6	6	6	
Switch Phase								
Minimum Initial (s)	10.0	10.0	5.0	5.0	4.0	4.0	4.0	4.0
Minimum Split (s)	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0
Total Split (s)	16.0	32.0	33.0	29.0	16.0	16.0	16.0	16.0
Total Split (%)	14.5%	29.1%	30.0%	26.4%	14.5%	14.5%	14.5%	15%
Yellow Time (s)	3.0	3.0	4.0	4.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-3.0	-1.0	0.0	-1.0	
Total Lost Time (s)	4.0	4.0	5.0	3.0	4.0	5.0	4.0	
Lead/Lag	Lead			Lag	Lag	Lag	Lag	Lead
Lead-Lag Optimize?								
Recall Mode	None	None	None	C-Min	None	None	None	None
v/c Ratio	0.26	0.66	0.83	0.40	0.18	0.61	0.70	
Control Delay	35.2	45.5	55.9	29.4	47.3	64.6	15.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	35.2	45.5	55.9	29.4	47.3	64.6	15.7	
Queue Length 50th (ft)	58	150	209	151	19	65	0	
Queue Length 95th (ft)	83	180	266	271	46	112	60	
Internal Link Dist (ft)	486		514	140		468		
Turn Bay Length (ft)	300				50		370	
Base Capacity (vph)	398	397	445	736	187	173	418	
Starvation Cap Reductn	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.26	0.63	0.74	0.40	0.16	0.55	0.68	

Intersection Summary
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 3:SBTL, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated

Splits and Phases: 6: Catherine St & Lake St



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	65	165	270	130	75	175
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.95
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1752	1568	1697	1792	1776	1435
Flt Permitted	0.95	1.00	0.47	1.00	1.00	1.00
Satd. Flow (perm)	1752	1568	843	1792	1776	1435
Peak-hour factor, PHF	0.85	0.85	0.94	0.94	0.89	0.89
Adj. Flow (vph)	76	194	287	138	84	197
RTOR Reduction (vph)	0	93	0	0	0	177
Lane Group Flow (vph)	76	101	287	138	84	20
Confl. Peds. (#/hr)			6			6
Heavy Vehicles (%)	3%	3%	6%	6%	7%	7%
Turn Type		Prot	pm+pt			Perm
Protected Phases	2	2	3	8	4	
Permitted Phases			8			4
Actuated Green, G (s)	61.5	61.5	40.1	40.1	11.1	11.1
Effective Green, g (s)	62.5	62.5	41.1	41.1	12.1	12.1
Actuated g/C Ratio	0.52	0.52	0.34	0.34	0.10	0.10
Clearance Time (s)	6.0	6.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	913	817	467	614	179	145
v/s Ratio Prot	0.04	c0.06	c0.13	0.08	0.05	
v/s Ratio Perm			c0.08			0.01
v/c Ratio	0.08	0.12	0.61	0.22	0.47	0.14
Uniform Delay, d1	14.4	14.7	31.4	28.1	50.9	49.2
Progression Factor	1.00	1.00	1.00	0.99	1.00	1.00
Incremental Delay, d2	0.2	0.3	2.3	0.2	1.9	0.4
Delay (s)	14.6	15.0	33.8	27.9	52.9	49.6
Level of Service	B	B	C	C	D	D
Approach Delay (s)	14.9			31.9	50.6	
Approach LOS	B			C	D	

Intersection Summary			
HCM Average Control Delay	32.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.4
Intersection Capacity Utilization	37.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

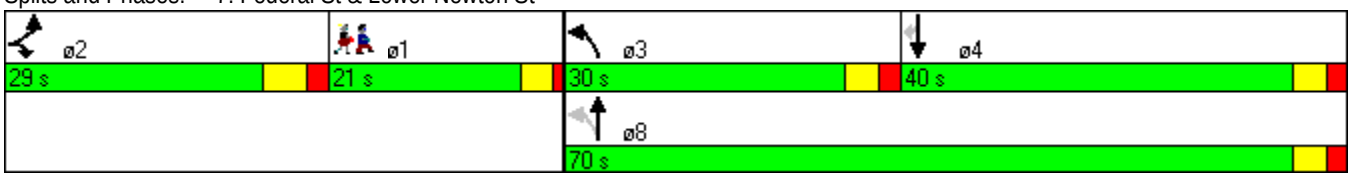
7: Federal St & Lower Newton St

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	ø1
Lane Configurations							
Volume (vph)	65	165	270	130	75	175	
Lane Group Flow (vph)	76	194	287	138	84	197	
Turn Type		Prot	pm+pt			Perm	
Protected Phases	2	2	3	8	4		1
Permitted Phases			8			4	
Detector Phase	2	2	3	8	4	4	
Switch Phase							
Minimum Initial (s)	10.0	10.0	5.0	5.0	5.0	5.0	4.0
Minimum Split (s)	16.0	16.0	16.0	16.0	16.0	16.0	21.0
Total Split (s)	29.0	29.0	30.0	70.0	40.0	40.0	21.0
Total Split (%)	24.2%	24.2%	25.0%	58.3%	33.3%	33.3%	18%
Yellow Time (s)	4.0	4.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lead	Lead	Lead		Lag	Lag	Lag
Lead-Lag Optimize?							
Recall Mode	C-Min	C-Min	None	None	None	None	None
v/c Ratio	0.08	0.20	0.61	0.23	0.47	0.61	
Control Delay	18.3	4.0	35.8	26.8	58.9	15.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	18.3	4.0	35.8	26.8	58.9	15.0	
Queue Length 50th (ft)	25	0	174	76	62	0	
Queue Length 95th (ft)	75	43	249	78	110	66	
Internal Link Dist (ft)	2598			579	189		
Turn Bay Length (ft)		225	175			100	
Base Capacity (vph)	960	947	486	986	533	577	
Starvation Cap Reductn	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	
Reduced v/c Ratio	0.08	0.20	0.59	0.14	0.16	0.34	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 15 (13%), Referenced to phase 2:EBL, Start of Yellow
Natural Cycle: 70
Control Type: Actuated-Coordinated

Splits and Phases: 7: Federal St & Lower Newton St



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	35	305	5	5	275	340	5	25	5	175	10	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			0%			-4%			4%	
Total Lost time (s)	4.0	4.0			4.0	4.0		4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00			1.00	1.00		1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00			1.00	0.98		1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00			1.00	1.00		1.00		1.00	1.00	
Frt	1.00	1.00			1.00	0.85		0.98		1.00	0.87	
Flt Protected	0.95	1.00			1.00	1.00		0.99		0.95	1.00	
Satd. Flow (prot)	1702	1787			1825	1521		1886		1717	1548	
Flt Permitted	0.52	1.00			0.99	1.00		0.99		0.95	1.00	
Satd. Flow (perm)	924	1787			1816	1521		1886		1717	1548	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.73	0.73	0.73	0.91	0.91	0.91
Adj. Flow (vph)	40	351	6	6	316	391	7	34	7	192	11	60
RTOR Reduction (vph)	0	0	0	0	0	155	0	6	0	0	50	0
Lane Group Flow (vph)	40	357	0	0	322	236	0	42	0	192	21	0
Confl. Peds. (#/hr)	1		1	1		1	1					1
Heavy Vehicles (%)	6%	6%	6%	4%	4%	4%	0%	0%	0%	3%	3%	3%
Turn Type	Perm			Perm		Perm	Split			Split		
Protected Phases		2			6		3	3		4	4	
Permitted Phases	2			6		6						
Actuated Green, G (s)	71.3	71.3			71.3	71.3		5.5		18.6	18.6	
Effective Green, g (s)	72.3	72.3			72.3	72.3		6.5		19.6	19.6	
Actuated g/C Ratio	0.60	0.60			0.60	0.60		0.05		0.16	0.16	
Clearance Time (s)	5.0	5.0			5.0	5.0		5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0			3.0	3.0		1.0		3.0	3.0	
Lane Grp Cap (vph)	557	1077			1094	916		102		280	253	
v/s Ratio Prot		c0.20						c0.02		c0.11	0.01	
v/s Ratio Perm	0.04				0.18	0.15						
v/c Ratio	0.07	0.33			0.29	0.26		0.41		0.69	0.08	
Uniform Delay, d1	9.9	11.8			11.5	11.2		54.9		47.3	42.6	
Progression Factor	1.66	1.58			1.00	1.00		1.00		0.79	0.37	
Incremental Delay, d2	0.2	0.8			0.7	0.7		1.0		6.7	0.1	
Delay (s)	16.7	19.5			12.2	11.9		55.9		43.9	15.9	
Level of Service	B	B			B	B		E		D	B	
Approach Delay (s)		19.2			12.0			55.9			36.4	
Approach LOS		B			B			E			D	

Intersection Summary			
HCM Average Control Delay	20.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	21.6
Intersection Capacity Utilization	52.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

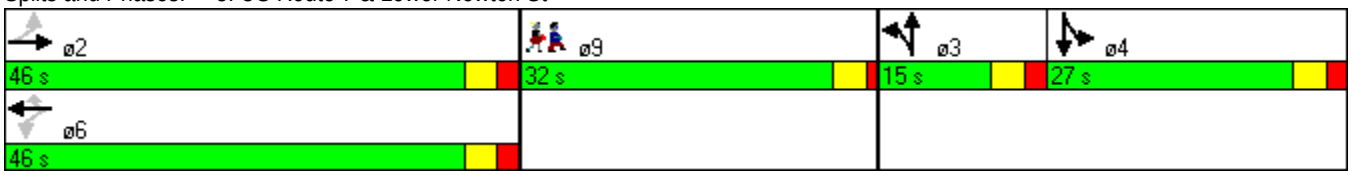
8: US Route 7 & Lower Newton St

Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	SBL	SBT	ø9
Lane Configurations									
Volume (vph)	35	305	5	275	340	25	175	10	
Lane Group Flow (vph)	40	357	0	322	391	48	192	71	
Turn Type	Perm		Perm		Perm		Split		
Protected Phases		2		6		3	4	4	9
Permitted Phases	2		6		6				
Detector Phase	2	2	6	6	6	3	4	4	
Switch Phase									
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	5.0	5.0	5.0	4.0
Minimum Split (s)	16.0	16.0	16.0	16.0	16.0	15.0	16.0	16.0	32.0
Total Split (s)	46.0	46.0	46.0	46.0	46.0	15.0	27.0	27.0	32.0
Total Split (%)	38.3%	38.3%	38.3%	38.3%	38.3%	12.5%	22.5%	22.5%	27%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag						Lead	Lag	Lag	
Lead-Lag Optimize?									
Recall Mode	C-Min	C-Min	C-Min	C-Min	C-Min	None	None	None	None
v/c Ratio	0.07	0.31		0.28	0.35	0.39	0.69	0.23	
Control Delay	27.2	24.7		15.5	3.3	57.0	49.4	6.6	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	27.2	24.7		15.5	3.3	57.0	49.4	6.6	
Queue Length 50th (ft)	7	75		89	0	32	95	0	
Queue Length 95th (ft)	62	373		283	58	56	219	36	
Internal Link Dist (ft)		1214		511		209		579	
Turn Bay Length (ft)	115				150		315		
Base Capacity (vph)	592	1146		1164	1115	178	338	352	
Starvation Cap Reductn	0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	
Reduced v/c Ratio	0.07	0.31		0.28	0.35	0.27	0.57	0.20	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 57 (48%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 80
Control Type: Actuated-Coordinated

Splits and Phases: 8: US Route 7 & Lower Newton St



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	285	85	35	305	45	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	1.00		1.00	1.00	1.00	1.00
Frt	0.97		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	1770		1736	1827	1787	1599
Flt Permitted	1.00		0.47	1.00	0.95	1.00
Satd. Flow (perm)	1770		853	1827	1787	1599
Peak-hour factor, PHF	0.91	0.91	0.95	0.95	0.92	0.92
Adj. Flow (vph)	313	93	37	321	49	54
RTOR Reduction (vph)	4	0	0	0	0	50
Lane Group Flow (vph)	402	0	37	321	49	4
Heavy Vehicles (%)	4%	4%	4%	4%	1%	1%
Turn Type			pm+pt			Prot
Protected Phases	2		1	6	8	8
Permitted Phases			6			
Actuated Green, G (s)	85.5		94.4	94.4	7.6	7.6
Effective Green, g (s)	86.5		95.4	95.4	8.6	8.6
Actuated g/C Ratio	0.72		0.80	0.80	0.07	0.07
Clearance Time (s)	5.0		5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1276		714	1452	128	115
v/s Ratio Prot	c0.23		0.00	c0.18	c0.03	0.00
v/s Ratio Perm			0.04			
v/c Ratio	0.31		0.05	0.22	0.38	0.03
Uniform Delay, d1	6.0		3.0	3.1	53.2	51.8
Progression Factor	0.19		0.12	0.11	1.00	1.00
Incremental Delay, d2	0.6		0.0	0.3	1.9	0.1
Delay (s)	1.7		0.4	0.7	55.1	52.0
Level of Service	A		A	A	E	D
Approach Delay (s)	1.7			0.7	53.4	
Approach LOS	A			A	D	

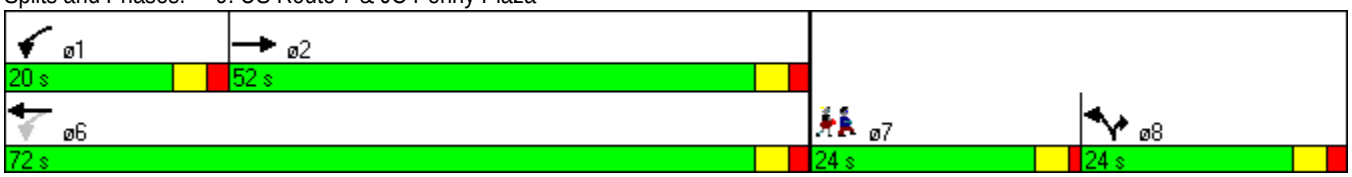
Intersection Summary			
HCM Average Control Delay	7.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	38.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBL	WBT	NBL	NBR	ø7
Lane Configurations						
Volume (vph)	285	35	305	45	50	
Lane Group Flow (vph)	406	37	321	49	54	
Turn Type		pm+pt			Prot	
Protected Phases	2	1	6	8	8	7
Permitted Phases		6				
Detector Phase	2	1	6	8	8	
Switch Phase						
Minimum Initial (s)	10.0	5.0	10.0	5.0	5.0	4.0
Minimum Split (s)	16.0	16.0	16.0	16.0	16.0	24.0
Total Split (s)	52.0	20.0	72.0	24.0	24.0	24.0
Total Split (%)	43.3%	16.7%	60.0%	20.0%	20.0%	20%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lag	Lead		Lag	Lag	Lead
Lead-Lag Optimize?						
Recall Mode	C-Min	None	C-Min	None	None	None
v/c Ratio	0.29	0.05	0.21	0.34	0.30	
Control Delay	1.9	0.7	0.8	57.6	17.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	1.9	0.7	0.8	57.6	17.7	
Queue Length 50th (ft)	100	0	3	36	0	
Queue Length 95th (ft)	0	3	15	75	39	
Internal Link Dist (ft)	1628		1214	63		
Turn Bay Length (ft)		150				
Base Capacity (vph)	1382	826	1529	298	312	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.29	0.04	0.21	0.16	0.17	

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 104 (87%), Referenced to phase 2:EBT and 6:WBTL, Start of Yellow
Natural Cycle: 80
Control Type: Actuated-Coordinated

Splits and Phases: 9: US Route 7 & JC Penny Plaza



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	130	320	265	135	100	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1736	1827	3471	1553	1719	1538
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1736	1827	3471	1553	1719	1538
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	141	348	288	147	109	98
RTOR Reduction (vph)	0	0	0	83	0	75
Lane Group Flow (vph)	141	348	288	64	109	23
Heavy Vehicles (%)	4%	4%	4%	4%	5%	5%
Turn Type	Prot			Perm		Over
Protected Phases	5	2 5	6		4	5
Permitted Phases				6		
Actuated Green, G (s)	27.3	61.8	51.2	51.2	12.9	27.3
Effective Green, g (s)	28.3	62.8	52.2	52.2	13.9	28.3
Actuated g/C Ratio	0.24	0.52	0.44	0.44	0.12	0.24
Clearance Time (s)	5.0		5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	409	956	1510	676	199	363
v/s Ratio Prot	0.08	c0.19	c0.08		c0.06	0.02
v/s Ratio Perm				0.04		
v/c Ratio	0.34	0.36	0.19	0.09	0.55	0.06
Uniform Delay, d1	38.1	16.8	20.9	20.0	50.1	35.6
Progression Factor	0.67	0.51	0.80	0.78	1.00	1.00
Incremental Delay, d2	0.5	0.2	0.3	0.3	3.1	0.1
Delay (s)	26.0	8.8	17.0	15.9	53.1	35.6
Level of Service	C	A	B	B	D	D
Approach Delay (s)		13.8	16.7		44.9	
Approach LOS		B	B		D	

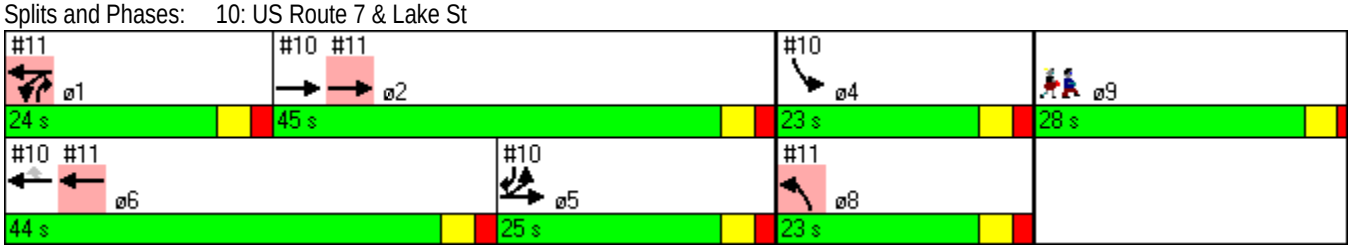
Intersection Summary			
HCM Average Control Delay	20.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	25.6
Intersection Capacity Utilization	31.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	ø1	ø2	ø8	ø9
Lane Configurations										
Volume (vph)	130	320	265	135	100	90				
Lane Group Flow (vph)	141	348	288	147	109	98				
Turn Type	Prot			Perm		Over				
Protected Phases	5	2 5	6		4	5	1	2	8	9
Permitted Phases				6						
Detector Phase	5	2 5	6	6	4	5				
Switch Phase										
Minimum Initial (s)	5.0		10.0	10.0	5.0	5.0	5.0	10.0	5.0	4.0
Minimum Split (s)	16.0		16.0	16.0	16.0	16.0	16.0	16.0	16.0	28.0
Total Split (s)	25.0	70.0	44.0	44.0	23.0	25.0	24.0	45.0	23.0	28.0
Total Split (%)	20.8%	58.3%	36.7%	36.7%	19.2%	20.8%	20%	38%	19%	23%
Yellow Time (s)	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0				
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0				
Lead/Lag	Lag		Lead	Lead		Lag	Lead	Lag		
Lead-Lag Optimize?							Yes	Yes		
Recall Mode	None		C-Min	C-Min	None	None	None	C-Min	None	None
v/c Ratio	0.34	0.35	0.18	0.19	0.55	0.22				
Control Delay	27.0	12.3	20.5	5.1	59.9	7.8				
Queue Delay	101.4	1.6	0.0	0.0	0.0	0.1				
Total Delay	128.4	13.9	20.5	5.1	59.9	7.9				
Queue Length 50th (ft)	76	51	68	9	81	0				
Queue Length 95th (ft)	94	219	78	9	135	42				
Internal Link Dist (ft)		60	1628		514					
Turn Bay Length (ft)				100		275				
Base Capacity (vph)	412	1014	1701	836	272	440				
Starvation Cap Reductn	292	484	0	0	0	0				
Spillback Cap Reductn	0	0	13	0	0	57				
Storage Cap Reductn	0	0	0	0	0	0				
Reduced v/c Ratio	1.18	0.66	0.17	0.18	0.40	0.26				

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow
Natural Cycle: 80
Control Type: Actuated-Coordinated

Splits and Phases: 10: US Route 7 & Lake St



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	260	100	110	245	85	190
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	0.95		1.00	1.00	1.00	1.00
Frt	0.96		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3326		1736	1827	1770	1583
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3326		1736	1827	1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	283	109	120	266	92	207
RTOR Reduction (vph)	24	0	0	0	0	176
Lane Group Flow (vph)	368	0	120	266	92	31
Heavy Vehicles (%)	4%	4%	4%	4%	2%	2%
Turn Type			Prot			Over
Protected Phases	2		1	1 6	8	1
Permitted Phases						
Actuated Green, G (s)	61.8		16.7	51.2	12.9	16.7
Effective Green, g (s)	62.8		17.7	52.2	13.9	17.7
Actuated g/C Ratio	0.52		0.15	0.44	0.12	0.15
Clearance Time (s)	5.0		5.0		5.0	5.0
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Lane Grp Cap (vph)	1741		256	795	205	233
v/s Ratio Prot	c0.11		c0.07	c0.15	c0.05	0.02
v/s Ratio Perm						
v/c Ratio	0.21		0.47	0.33	0.45	0.13
Uniform Delay, d1	15.3		46.8	22.4	49.5	44.5
Progression Factor	0.49		0.64	0.42	1.00	1.00
Incremental Delay, d2	0.3		1.3	0.2	1.6	0.3
Delay (s)	7.7		31.4	9.6	51.0	44.7
Level of Service	A		C	A	D	D
Approach Delay (s)	7.7			16.4	46.7	
Approach LOS	A			B	D	

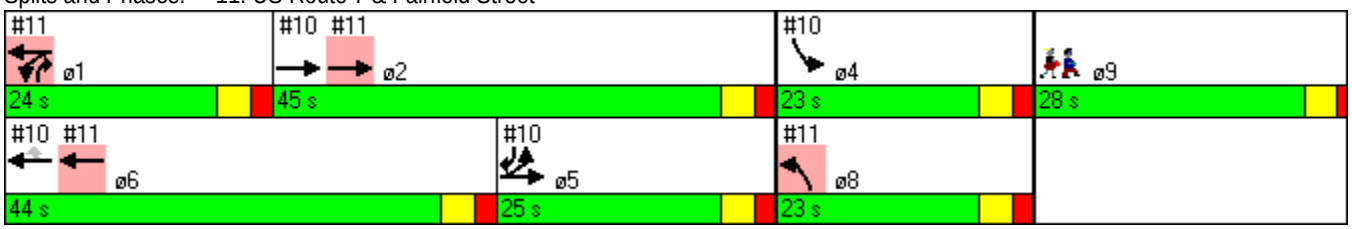
Intersection Summary			
HCM Average Control Delay	21.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	21.6
Intersection Capacity Utilization	31.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBL	WBT	NBL	NBR	ø4	ø5	ø6	ø9
Lane Configurations									
Volume (vph)	260	110	245	85	190				
Lane Group Flow (vph)	392	120	266	92	207				
Turn Type		Prot			Over				
Protected Phases	2	1	1 6	8	1	4	5	6	9
Permitted Phases									
Detector Phase	2	1	1 6	8	1				
Switch Phase									
Minimum Initial (s)	10.0	5.0		5.0	5.0	5.0	5.0	10.0	4.0
Minimum Split (s)	16.0	16.0		16.0	16.0	16.0	16.0	16.0	28.0
Total Split (s)	45.0	24.0	68.0	23.0	24.0	23.0	25.0	44.0	28.0
Total Split (%)	37.5%	20.0%	56.7%	19.2%	20.0%	19%	21%	37%	23%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0				
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0				
Lead/Lag	Lag	Lead			Lead		Lag	Lead	
Lead-Lag Optimize?	Yes	Yes			Yes				
Recall Mode	C-Min	None		None	None	None	None	C-Min	None
v/c Ratio	0.21	0.47	0.32	0.45	0.50				
Control Delay	8.6	35.2	12.6	55.6	10.0				
Queue Delay	0.1	4.9	0.8	0.0	0.8				
Total Delay	8.7	40.0	13.4	55.6	10.8				
Queue Length 50th (ft)	38	48	28	68	0				
Queue Length 95th (ft)	24	61	84	116	65				
Internal Link Dist (ft)	1342		60	263					
Turn Bay Length (ft)					250				
Base Capacity (vph)	1863	315	895	280	457				
Starvation Cap Reductn	0	136	362	0	0				
Spillback Cap Reductn	372	0	0	0	84				
Storage Cap Reductn	0	0	0	0	0				
Reduced v/c Ratio	0.26	0.67	0.50	0.33	0.55				

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow
Natural Cycle: 80
Control Type: Actuated-Coordinated

Splits and Phases: 11: US Route 7 & Fairfield Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	45	350	25	20	310	30	10	50	45	10	70	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.99		1.00	0.99			0.94			0.99	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.99	
Satd. Flow (prot)	1736	1809		1736	1802			1746			1838	
Flt Permitted	0.49	1.00		0.49	1.00			0.97			0.93	
Satd. Flow (perm)	899	1809		895	1802			1696			1717	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	49	380	27	22	337	33	11	54	49	11	76	5
RTOR Reduction (vph)	0	1	0	0	2	0	0	26	0	0	2	0
Lane Group Flow (vph)	49	406	0	22	368	0	0	88	0	0	90	0
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	2%	2%	2%	2%	2%	2%
Turn Type	pm+pt			pm+pt			Perm			Perm		
Protected Phases	5	2		1	6			4			4	
Permitted Phases	2			6			4			4		
Actuated Green, G (s)	87.4	82.1		84.2	80.5			11.6			11.6	
Effective Green, g (s)	89.4	83.1		86.2	81.5			12.6			12.6	
Actuated g/C Ratio	0.75	0.69		0.72	0.68			0.10			0.10	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	714	1253		676	1224			178			180	
v/s Ratio Prot	c0.00	c0.22		0.00	0.20							
v/s Ratio Perm	0.05			0.02				0.05			c0.05	
v/c Ratio	0.07	0.32		0.03	0.30			0.49			0.50	
Uniform Delay, d1	4.3	7.3		4.9	7.8			50.7			50.7	
Progression Factor	1.16	1.08		0.40	0.40			1.00			1.00	
Incremental Delay, d2	0.0	0.6		0.0	0.6			2.2			2.2	
Delay (s)	5.0	8.4		2.0	3.7			52.9			52.9	
Level of Service	A	A		A	A			D			D	
Approach Delay (s)		8.1			3.6			52.9			52.9	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM Average Control Delay	15.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.6
Intersection Capacity Utilization	41.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

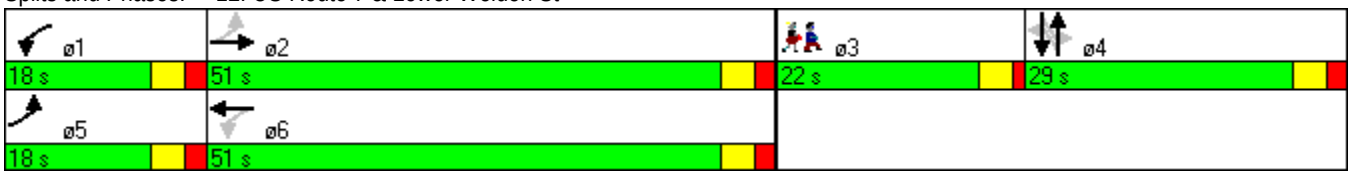
12: US Route 7 & Lower Welden St

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	ø3
Lane Configurations									
Volume (vph)	45	350	20	310	10	50	10	70	
Lane Group Flow (vph)	49	407	22	370	0	114	0	92	
Turn Type	pm+pt		pm+pt		Perm		Perm		
Protected Phases	5	2	1	6		4		4	3
Permitted Phases	2		6		4		4		
Detector Phase	5	2	1	6	4	4	4	4	
Switch Phase									
Minimum Initial (s)	5.0	10.0	5.0	10.0	5.0	5.0	5.0	5.0	4.0
Minimum Split (s)	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	22.0
Total Split (s)	18.0	51.0	18.0	51.0	29.0	29.0	29.0	29.0	22.0
Total Split (%)	15.0%	42.5%	15.0%	42.5%	24.2%	24.2%	24.2%	24.2%	18%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lag	Lag	Lag	Lead
Lead-Lag Optimize?									
Recall Mode	None	C-Min	None	C-Min	None	None	None	None	None
v/c Ratio	0.07	0.31	0.03	0.29		0.56		0.50	
Control Delay	6.2	9.8	2.3	4.2		47.6		58.3	
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0	
Total Delay	6.2	9.8	2.3	4.2		47.6		58.3	
Queue Length 50th (ft)	7	76	1	22		63		67	
Queue Length 95th (ft)	m24	366	4	137		119		116	
Internal Link Dist (ft)		1737		1342		813		649	
Turn Bay Length (ft)	150		150						
Base Capacity (vph)	809	1331	806	1289		377		360	
Starvation Cap Reductn	0	0	0	0		0		0	
Spillback Cap Reductn	0	0	0	0		0		0	
Storage Cap Reductn	0	0	0	0		0		0	
Reduced v/c Ratio	0.06	0.31	0.03	0.29		0.30		0.26	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 27 (23%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 75
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 12: US Route 7 & Lower Welden St



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	45	450	330	10	50	10
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.82	0.82	0.91	0.91	0.82	0.82
Hourly flow rate (vph)	55	549	363	11	61	12
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		TWLTL	None			
Median storage veh)		2				
Upstream signal (ft)		300				
pX, platoon unblocked					0.80	
vC, conflicting volume	374				1027	368
vC1, stage 1 conf vol					368	
vC2, stage 2 conf vol					659	
vCu, unblocked vol	374				908	368
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)	2.2				3.5	3.3
p0 queue free %	95				86	98
cM capacity (veh/h)	1174				438	677

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	55	549	374	73
Volume Left	55	0	0	61
Volume Right	0	0	11	12
cSH	1174	1700	1700	465
Volume to Capacity	0.05	0.32	0.22	0.16
Queue Length 95th (ft)	4	0	0	14
Control Delay (s)	8.2	0.0	0.0	14.2
Lane LOS	A			B
Approach Delay (s)	0.7		0.0	14.2
Approach LOS				B

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	34.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	45	200	40	5	270	75	30	5	20	95	15	55
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.77	0.77	0.77	0.64	0.64	0.64	0.73	0.73	0.73
Hourly flow rate (vph)	49	217	43	6	351	97	47	8	31	130	21	75
Pedestrians					2							
Lane Width (ft)					11.0							
Walking Speed (ft/s)					4.0							
Percent Blockage					0							
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		1046										
pX, platoon unblocked												
vC, conflicting volume	448			261			786	798	241	765	771	399
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	448			261			786	798	241	765	771	399
tC, single (s)	4.1			4.2			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96			99			81	97	96	55	93	88
cM capacity (veh/h)	1112			1281			251	303	797	291	316	653

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	49	261	6	448	86	130	96
Volume Left	49	0	6	0	47	130	0
Volume Right	0	43	0	97	31	0	75
cSH	1112	1700	1281	1700	341	291	531
Volume to Capacity	0.04	0.15	0.01	0.26	0.25	0.45	0.18
Queue Length 95th (ft)	3	0	0	0	25	55	16
Control Delay (s)	8.4	0.0	7.8	0.0	19.1	27.0	13.3
Lane LOS	A		A		C	D	B
Approach Delay (s)	1.3		0.1		19.1	21.2	
Approach LOS					C	C	

Intersection Summary			
Average Delay	6.4		
Intersection Capacity Utilization	42.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	225	35	0	0	0	0	0	25	5	40	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.82	0.92	0.82	0.92	0.65	0.65	0.82	0.82	0.92
Hourly flow rate (vph)	0	245	38	0	0	0	0	0	38	6	49	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)					566							
pX, platoon unblocked												
vC, conflicting volume	0			283			288	264	264	302	283	0
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	0			283			288	264	264	302	283	0
tC, single (s)	4.1			4.2			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	95	99	92	100
cM capacity (veh/h)	1623			1246			625	638	770	616	624	1085

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	283	38	55
Volume Left	0	0	6
Volume Right	38	38	0
cSH	1700	770	624
Volume to Capacity	0.17	0.05	0.09
Queue Length 95th (ft)	0	4	7
Control Delay (s)	0.0	9.9	11.3
Lane LOS		A	B
Approach Delay (s)	0.0	9.9	11.3
Approach LOS		A	B

Intersection Summary			
Average Delay	2.7		
Intersection Capacity Utilization	30.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	170	270	115	170	190	5	55	140	230	5	130	220
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	14	14	12
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frt	1.00	0.96		1.00	1.00		1.00	0.91			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			1.00	1.00
Satd. Flow (prot)	1736	1727		1770	1855		1703	1626			1984	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00			0.98	1.00
Satd. Flow (perm)	1736	1727		1770	1855		1703	1626			1949	1583
Peak-hour factor, PHF	0.75	0.75	0.75	0.86	0.86	0.86	0.86	0.86	0.86	0.92	0.92	0.92
Adj. Flow (vph)	227	360	153	198	221	6	64	163	267	5	141	239
RTOR Reduction (vph)	0	13	0	0	1	0	0	36	0	0	0	163
Lane Group Flow (vph)	227	500	0	198	226	0	64	394	0	0	146	76
Confl. Peds. (#/hr)			9	9								
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	6%	6%	6%	2%	2%	2%
Turn Type	Prot			Prot			Prot			Perm		pm+ov
Protected Phases	5	2		1	6		3	3 4			4	5
Permitted Phases										4		4
Actuated Green, G (s)	19.0	35.5		17.3	33.8		29.8	52.2			17.4	36.4
Effective Green, g (s)	20.0	36.5		18.3	34.8		30.8	53.2			18.4	38.4
Actuated g/C Ratio	0.17	0.30		0.15	0.29		0.26	0.44			0.15	0.32
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0				5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0				3.0	3.0
Lane Grp Cap (vph)	289	525		270	538		437	721			299	559
v/s Ratio Prot	c0.13	c0.29		0.11	0.12		0.04	c0.24				0.02
v/s Ratio Perm											0.07	0.03
v/c Ratio	0.79	0.95		0.73	0.42		0.15	0.55			0.49	0.14
Uniform Delay, d1	47.9	40.9		48.5	34.4		34.4	24.5			46.5	29.0
Progression Factor	1.00	1.00		0.93	1.15		1.00	1.00			1.00	1.00
Incremental Delay, d2	13.1	29.3		9.3	2.3		0.2	0.8			1.3	0.1
Delay (s)	61.0	70.2		54.6	41.9		34.6	25.4			47.7	29.1
Level of Service	E	E		D	D		C	C			D	C
Approach Delay (s)		67.4			47.8			26.6			36.2	
Approach LOS		E			D			C			D	

Intersection Summary			
HCM Average Control Delay	47.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	72.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

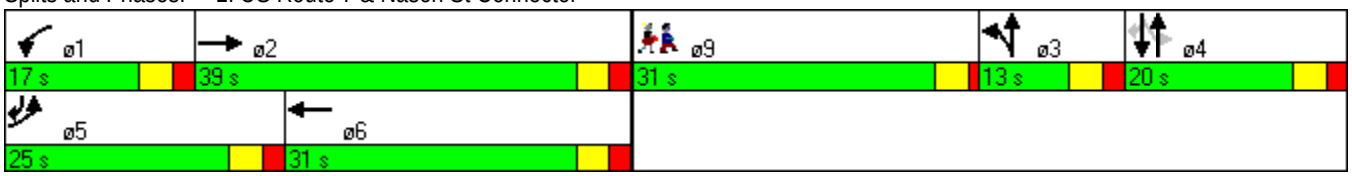
1: US Route 7 & Nason St Connector

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR	ø9
Lane Configurations										
Volume (vph)	170	270	170	190	55	140	5	130	220	
Lane Group Flow (vph)	227	513	198	227	64	430	0	146	239	
Turn Type	Prot		Prot		Prot		Perm		pm+ov	
Protected Phases	5	2	1	6	3	3 4		4	5	9
Permitted Phases							4		4	
Detector Phase	5	2	1	6	3	3 4	4	4	5	
Switch Phase										
Minimum Initial (s)	5.0	10.0	5.0	10.0	5.0		5.0	5.0	5.0	4.0
Minimum Split (s)	15.0	15.0	15.0	15.0	13.0		15.0	15.0	15.0	31.0
Total Split (s)	25.0	39.0	17.0	31.0	13.0	33.0	20.0	20.0	25.0	31.0
Total Split (%)	20.8%	32.5%	14.2%	25.8%	10.8%	27.5%	16.7%	16.7%	20.8%	26%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lead	Lag	Lead	Lag	Lag				Lead	Lead
Lead-Lag Optimize?										
Recall Mode	None	C-Min	None	C-Min	None		None	None	None	None
v/c Ratio	0.79	0.95	0.73	0.42	0.15	0.57		0.49	0.34	
Control Delay	67.2	69.4	62.6	45.1	33.9	23.2		52.1	4.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	67.2	69.4	62.6	45.1	33.9	23.2		52.1	4.4	
Queue Length 50th (ft)	166	385	98	162	38	206		105	0	
Queue Length 95th (ft)	208	#441	#304	235	67	256		171	52	
Internal Link Dist (ft)		422		220		1239		966		
Turn Bay Length (ft)			150						200	
Base Capacity (vph)	311	538	270	540	437	758		300	730	
Starvation Cap Reductn	0	0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0		0	0	
Storage Cap Reductn	0	0	0	0	0	0		0	0	
Reduced v/c Ratio	0.73	0.95	0.73	0.42	0.15	0.57		0.49	0.33	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow
Natural Cycle: 120
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: US Route 7 & Nason St Connector



Movement	EBL	EBR	EBR2	NBL	NBT	NBR	SBL	SBT	NWL2	NWT	NWR
Lane Configurations											
Volume (vph)	60	230	50	40	275	45	315	200	30	155	245
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	12	12	12	12	12	14	14	12	12	12
Total Lost time (s)	4.0	4.0			5.0			3.0	4.0	5.0	4.0
Lane Util. Factor	1.00	1.00			1.00			1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00			0.99			1.00	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00			1.00			1.00	0.99	1.00	1.00
Frt	1.00	0.85			0.98			1.00	1.00	0.95	0.85
Flt Protected	0.95	1.00			0.99			0.97	0.95	1.00	1.00
Satd. Flow (prot)	1708	1583			1792			1947	1746	1770	1547
Flt Permitted	0.95	1.00			0.99			0.97	0.95	1.00	1.00
Satd. Flow (perm)	1708	1583			1792			1947	1746	1770	1547
Peak-hour factor, PHF	0.92	0.92	0.92	0.93	0.93	0.93	0.96	0.96	0.92	0.92	0.92
Adj. Flow (vph)	65	250	54	43	296	48	328	208	33	168	266
RTOR Reduction (vph)	0	7	0	0	4	0	0	0	0	0	226
Lane Group Flow (vph)	65	297	0	0	383	0	0	536	33	168	40
Confl. Peds. (#/hr)	1		4			15	15		4		1
Heavy Vehicles (%)	2%	2%	2%	3%	3%	3%	1%	1%	2%	2%	2%
Turn Type		custom		Split			Split		Perm		Perm
Protected Phases	5	2		4	4		3	3		6	
Permitted Phases	2								6		6
Actuated Green, G (s)	30.5	30.5			25.0			40.7	17.2	17.2	17.2
Effective Green, g (s)	31.5	31.5			26.0			43.7	18.2	17.2	18.2
Actuated g/C Ratio	0.26	0.26			0.22			0.36	0.15	0.14	0.15
Clearance Time (s)	5.0	5.0			6.0			6.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0			3.0			3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	448	416			388			709	265	254	235
v/s Ratio Prot	0.01	c0.19			c0.21			c0.28		0.09	
v/s Ratio Perm	0.03								0.02		0.03
v/c Ratio	0.15	0.71			0.99			0.76	0.12	0.66	0.17
Uniform Delay, d1	33.9	40.2			46.8			33.5	44.0	48.6	44.3
Progression Factor	1.00	1.00			1.00			1.00	1.20	1.23	3.04
Incremental Delay, d2	0.1	5.8			41.2			7.4	0.2	6.0	0.3
Delay (s)	34.1	45.9			87.8			40.8	53.1	65.8	135.0
Level of Service	C	D			F			D	D	E	F
Approach Delay (s)	43.8				87.8			40.8		104.3	
Approach LOS	D				F			D		F	

Intersection Summary			
HCM Average Control Delay	68.7	HCM Level of Service	E
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.8
Intersection Capacity Utilization	82.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

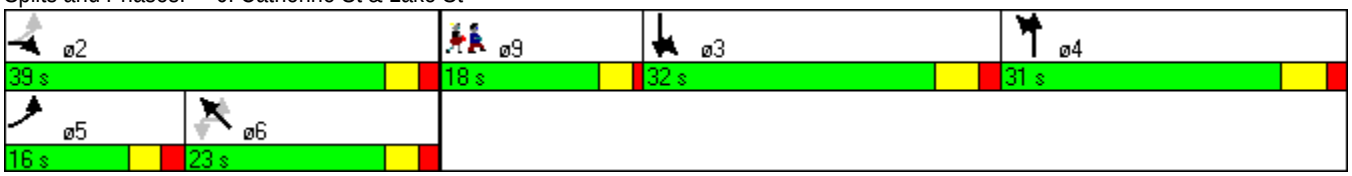
6: Catherine St & Lake St

Lane Group	EBL	EBR	NBT	SBT	NWL2	NWT	NWR	ø9
Lane Configurations								
Volume (vph)	60	230	275	200	30	155	245	
Lane Group Flow (vph)	65	304	387	536	33	168	266	
Turn Type		custom			Perm		Perm	
Protected Phases	5	2	4	3		6		9
Permitted Phases	2				6		6	
Detector Phase	5	2	4	3	6	6	6	
Switch Phase								
Minimum Initial (s)	10.0	10.0	5.0	5.0	4.0	4.0	4.0	4.0
Minimum Split (s)	16.0	16.0	16.0	16.0	16.0	16.0	16.0	18.0
Total Split (s)	16.0	39.0	31.0	32.0	23.0	23.0	23.0	18.0
Total Split (%)	13.3%	32.5%	25.8%	26.7%	19.2%	19.2%	19.2%	15%
Yellow Time (s)	3.0	3.0	4.0	4.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-3.0	-1.0	0.0	-1.0	
Total Lost Time (s)	4.0	4.0	5.0	3.0	4.0	5.0	4.0	
Lead/Lag	Lead			Lag	Lag	Lag	Lag	Lead
Lead-Lag Optimize?								
Recall Mode	None	None	None	C-Min	None	None	None	None
v/c Ratio	0.15	0.74	0.99	0.69	0.12	0.66	0.58	
Control Delay	33.6	51.0	88.2	37.9	54.0	72.7	21.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	33.6	51.0	88.2	37.9	54.0	72.7	21.9	
Queue Length 50th (ft)	38	206	308	332	19	103	12	
Queue Length 95th (ft)	73	301	#511	#703	m52	209	161	
Internal Link Dist (ft)	486		514	140		468		
Turn Bay Length (ft)	300				50		370	
Base Capacity (vph)	434	468	392	777	281	270	472	
Starvation Cap Reductn	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.15	0.65	0.99	0.69	0.12	0.62	0.56	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 26 (22%), Referenced to phase 3:SBTL, Start of Yellow
Natural Cycle: 105
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: Catherine St & Lake St



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	120	495	250	135	130	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.96
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1750	1845	1827	1498
Flt Permitted	0.95	1.00	0.37	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	690	1845	1827	1498
Peak-hour factor, PHF	0.86	0.86	0.98	0.98	0.97	0.97
Adj. Flow (vph)	140	576	255	138	134	88
RTOR Reduction (vph)	0	272	0	0	0	77
Lane Group Flow (vph)	140	304	255	138	134	11
Confl. Peds. (#/hr)			4			4
Heavy Vehicles (%)	2%	2%	3%	3%	4%	4%
Turn Type		Prot	pm+pt			Perm
Protected Phases	2	2	3	8	4	
Permitted Phases			8			4
Actuated Green, G (s)	62.4	62.4	39.2	39.2	14.1	14.1
Effective Green, g (s)	63.4	63.4	40.2	40.2	15.1	15.1
Actuated g/C Ratio	0.53	0.53	0.34	0.34	0.13	0.13
Clearance Time (s)	6.0	6.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	935	836	418	618	230	188
v/s Ratio Prot	0.08	c0.19	c0.11	0.07	0.07	
v/s Ratio Perm			c0.10			0.01
v/c Ratio	0.15	0.36	0.61	0.22	0.58	0.06
Uniform Delay, d1	14.5	16.5	31.4	28.7	49.5	46.2
Progression Factor	0.68	1.23	1.12	1.12	1.00	1.00
Incremental Delay, d2	0.3	1.0	2.4	0.2	3.7	0.1
Delay (s)	10.1	21.3	37.5	32.4	53.2	46.3
Level of Service	B	C	D	C	D	D
Approach Delay (s)	19.1			35.7	50.5	
Approach LOS	B			D	D	

Intersection Summary			
HCM Average Control Delay	29.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.4
Intersection Capacity Utilization	45.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

7: Federal St & Lower Newton St

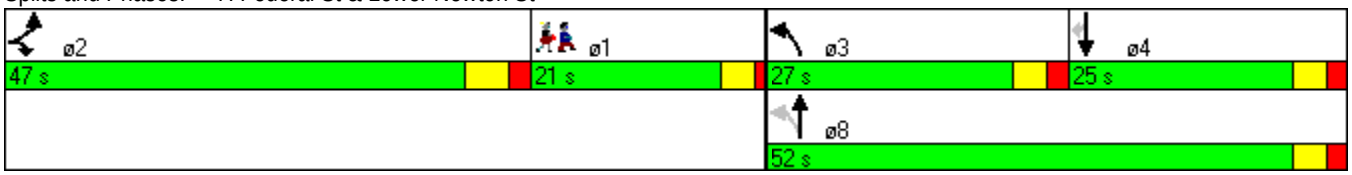
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	ø1
Lane Configurations							
Volume (vph)	120	495	250	135	130	85	
Lane Group Flow (vph)	140	576	255	138	134	88	
Turn Type		Prot	pm+pt			Perm	
Protected Phases	2	2	3	8	4		1
Permitted Phases			8			4	
Detector Phase	2	2	3	8	4	4	
Switch Phase							
Minimum Initial (s)	10.0	10.0	5.0	5.0	5.0	5.0	4.0
Minimum Split (s)	16.0	16.0	16.0	16.0	16.0	16.0	21.0
Total Split (s)	47.0	47.0	27.0	52.0	25.0	25.0	21.0
Total Split (%)	39.2%	39.2%	22.5%	43.3%	20.8%	20.8%	18%
Yellow Time (s)	4.0	4.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lead	Lead	Lead		Lag	Lag	Lag
Lead-Lag Optimize?							
Recall Mode	C-Min	C-Min	None	None	None	None	None
v/c Ratio	0.14	0.51	0.61	0.22	0.58	0.33	
Control Delay	11.9	4.0	39.3	31.2	59.2	12.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	11.9	4.0	39.3	31.2	59.2	12.6	
Queue Length 50th (ft)	33	44	166	84	99	0	
Queue Length 95th (ft)	m89	m86	248	145	158	46	
Internal Link Dist (ft)	2598			579	189		
Turn Bay Length (ft)		225	175			100	
Base Capacity (vph)	990	1139	441	745	320	336	
Starvation Cap Reductn	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	
Reduced v/c Ratio	0.14	0.51	0.58	0.19	0.42	0.26	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 25 (21%), Referenced to phase 2:EBL, Start of Yellow
Natural Cycle: 70
Control Type: Actuated-Coordinated

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 7: Federal St & Lower Newton St



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	55	495	5	5	435	315	10	15	10	565	20	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			0%			-4%			4%	
Total Lost time (s)	4.0	4.0			4.0	4.0		4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00			1.00	1.00		1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00			1.00	0.98		1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00			1.00	1.00		1.00		1.00	1.00	
Frt	1.00	1.00			1.00	0.85		0.96		1.00	0.90	
Flt Protected	0.95	1.00			1.00	1.00		0.99		0.95	1.00	
Satd. Flow (prot)	1770	1860			1862	1549		1784		1734	1616	
Flt Permitted	0.17	1.00			0.75	1.00		0.99		0.95	1.00	
Satd. Flow (perm)	309	1860			1404	1549		1784		1734	1616	
Peak-hour factor, PHF	0.91	0.91	0.91	0.95	0.95	0.95	0.85	0.85	0.85	0.92	0.92	0.92
Adj. Flow (vph)	60	544	5	5	458	332	12	18	12	614	22	43
RTOR Reduction (vph)	0	0	0	0	0	173	0	11	0	0	23	0
Lane Group Flow (vph)	60	549	0	0	463	159	0	31	0	614	42	0
Confl. Peds. (#/hr)			1	1		1	6					6
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	3%	3%	3%	2%	2%	2%
Turn Type	Perm			Perm		Perm	Split			Split		
Protected Phases		2			6		3	3		4	4	
Permitted Phases	2			6		6						
Actuated Green, G (s)	36.1	36.1			36.1	36.1		5.2		54.1	54.1	
Effective Green, g (s)	37.1	37.1			37.1	37.1		6.2		55.1	55.1	
Actuated g/C Ratio	0.31	0.31			0.31	0.31		0.05		0.46	0.46	
Clearance Time (s)	5.0	5.0			5.0	5.0		5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0			3.0	3.0		1.0		3.0	3.0	
Lane Grp Cap (vph)	96	575			434	479		92		796	742	
v/s Ratio Prot		0.30						c0.02		c0.35	0.03	
v/s Ratio Perm	0.19				c0.33	0.10						
v/c Ratio	0.62	0.95			1.07	0.33		0.33		0.77	0.06	
Uniform Delay, d1	35.5	40.6			41.5	31.9		54.9		27.2	18.0	
Progression Factor	0.91	0.97			1.00	1.00		1.00		1.04	1.40	
Incremental Delay, d2	24.6	26.1			62.1	1.8		0.8		4.1	0.0	
Delay (s)	56.9	65.7			103.6	33.7		55.7		32.4	25.2	
Level of Service	E	E			F	C		E		C	C	
Approach Delay (s)		64.8			74.4			55.7			31.7	
Approach LOS		E			E			E			C	

Intersection Summary			
HCM Average Control Delay	57.7	HCM Level of Service	E
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	21.6
Intersection Capacity Utilization	90.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

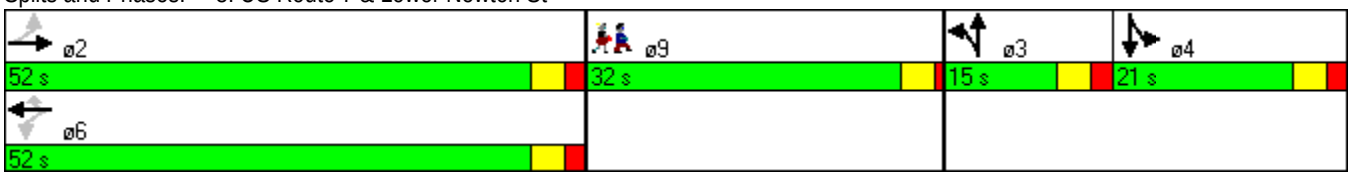
8: US Route 7 & Lower Newton St

Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	SBL	SBT	ø9
Lane Configurations									
Volume (vph)	55	495	5	435	315	15	565	20	
Lane Group Flow (vph)	60	549	0	463	332	42	614	65	
Turn Type	Perm		Perm		Perm		Split		
Protected Phases		2		6		3	4	4	9
Permitted Phases	2		6		6				
Detector Phase	2	2	6	6	6	3	4	4	
Switch Phase									
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	5.0	5.0	5.0	4.0
Minimum Split (s)	16.0	16.0	16.0	16.0	16.0	15.0	16.0	16.0	32.0
Total Split (s)	52.0	52.0	52.0	52.0	52.0	15.0	21.0	21.0	32.0
Total Split (%)	43.3%	43.3%	43.3%	43.3%	43.3%	12.5%	17.5%	17.5%	27%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag						Lead	Lag	Lag	
Lead-Lag Optimize?									
Recall Mode	C-Min	C-Min	C-Min	C-Min	C-Min	None	None	None	None
v/c Ratio	0.57	0.86		0.96	0.47	0.36	0.77	0.09	
Control Delay	47.4	47.8		69.6	9.4	49.9	38.0	20.7	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	47.4	47.8		69.6	9.4	49.9	38.0	20.7	
Queue Length 50th (ft)	47	433		342	42	23	278	8	
Queue Length 95th (ft)	66	349		#500	111	55	#1019	63	
Internal Link Dist (ft)		1214		511		209		579	
Turn Bay Length (ft)	115				150		315		
Base Capacity (vph)	124	744		562	771	174	796	758	
Starvation Cap Reductn	0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	
Reduced v/c Ratio	0.48	0.74		0.82	0.43	0.24	0.77	0.09	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 150
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 8: US Route 7 & Lower Newton St



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	535	70	40	430	70	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	1.00		1.00	1.00	1.00	1.00
Frt	0.98		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	1834		1770	1863	1787	1599
Flt Permitted	1.00		0.31	1.00	0.95	1.00
Satd. Flow (perm)	1834		587	1863	1787	1599
Peak-hour factor, PHF	0.91	0.91	0.95	0.95	0.92	0.92
Adj. Flow (vph)	588	77	42	453	76	60
RTOR Reduction (vph)	2	0	0	0	0	55
Lane Group Flow (vph)	663	0	42	453	76	5
Heavy Vehicles (%)	2%	2%	2%	2%	1%	1%
Turn Type			pm+pt			Prot
Protected Phases	2		1	6	8	8
Permitted Phases			6			
Actuated Green, G (s)	83.4		93.5	93.5	8.5	8.5
Effective Green, g (s)	84.4		94.5	94.5	9.5	9.5
Actuated g/C Ratio	0.70		0.79	0.79	0.08	0.08
Clearance Time (s)	5.0		5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1290		522	1467	141	127
v/s Ratio Prot	c0.36		0.00	c0.24	c0.04	0.00
v/s Ratio Perm			0.06			
v/c Ratio	0.51		0.08	0.31	0.54	0.04
Uniform Delay, d1	8.3		4.7	3.6	53.1	51.0
Progression Factor	0.73		0.87	1.28	1.00	1.00
Incremental Delay, d2	1.2		0.0	0.4	3.9	0.1
Delay (s)	7.2		4.1	4.9	57.1	51.1
Level of Service	A		A	A	E	D
Approach Delay (s)	7.2			4.9	54.5	
Approach LOS	A			A	D	

Intersection Summary			
HCM Average Control Delay	11.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	44.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBL	WBT	NBL	NBR	ø7
Lane Configurations						
Volume (vph)	535	40	430	70	55	
Lane Group Flow (vph)	665	42	453	76	60	
Turn Type		pm+pt			Prot	
Protected Phases	2	1	6	8	8	7
Permitted Phases		6				
Detector Phase	2	1	6	8	8	
Switch Phase						
Minimum Initial (s)	10.0	5.0	10.0	5.0	5.0	4.0
Minimum Split (s)	16.0	16.0	16.0	16.0	16.0	24.0
Total Split (s)	64.0	16.0	80.0	16.0	16.0	24.0
Total Split (%)	53.3%	13.3%	66.7%	13.3%	13.3%	20%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lag	Lead		Lag	Lag	Lead
Lead-Lag Optimize?						
Recall Mode	C-Min	None	C-Min	None	None	None
v/c Ratio	0.48	0.08	0.29	0.47	0.30	
Control Delay	8.2	4.2	6.1	61.2	16.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	8.2	4.2	6.1	61.2	16.4	
Queue Length 50th (ft)	158	0	3	57	0	
Queue Length 95th (ft)	105	m23	m422	107	42	
Internal Link Dist (ft)	1628		1214	63		
Turn Bay Length (ft)		150				
Base Capacity (vph)	1382	601	1545	183	218	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.48	0.07	0.29	0.42	0.28	

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 28 (23%), Referenced to phase 2:EBT and 6:WBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 9: US Route 7 & JC Penny Plaza

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	150	495	355	210	125	155
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1736	1827	3539	1583	1770	1583
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1736	1827	3539	1583	1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	163	538	386	228	136	168
RTOR Reduction (vph)	0	0	0	150	0	113
Lane Group Flow (vph)	163	538	386	78	136	55
Heavy Vehicles (%)	4%	4%	2%	2%	2%	2%
Turn Type	Prot			Perm		Over
Protected Phases	5	2 5	6		4	5
Permitted Phases				6		
Actuated Green, G (s)	38.0	52.9	39.9	39.9	13.5	38.0
Effective Green, g (s)	39.0	53.9	40.9	40.9	14.5	39.0
Actuated g/C Ratio	0.32	0.45	0.34	0.34	0.12	0.32
Clearance Time (s)	5.0		5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	564	821	1206	540	214	514
v/s Ratio Prot	0.09	c0.29	c0.11		c0.08	0.03
v/s Ratio Perm				0.05		
v/c Ratio	0.29	0.66	0.32	0.14	0.64	0.11
Uniform Delay, d1	30.2	25.8	29.3	27.4	50.2	28.3
Progression Factor	0.51	0.45	0.88	2.54	0.66	1.06
Incremental Delay, d2	0.3	1.8	0.7	0.5	4.9	0.1
Delay (s)	15.7	13.4	26.5	70.1	38.3	30.2
Level of Service	B	B	C	E	D	C
Approach Delay (s)		14.0	42.7		33.8	
Approach LOS		B	D		C	

Intersection Summary			
HCM Average Control Delay	28.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	25.6
Intersection Capacity Utilization	39.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

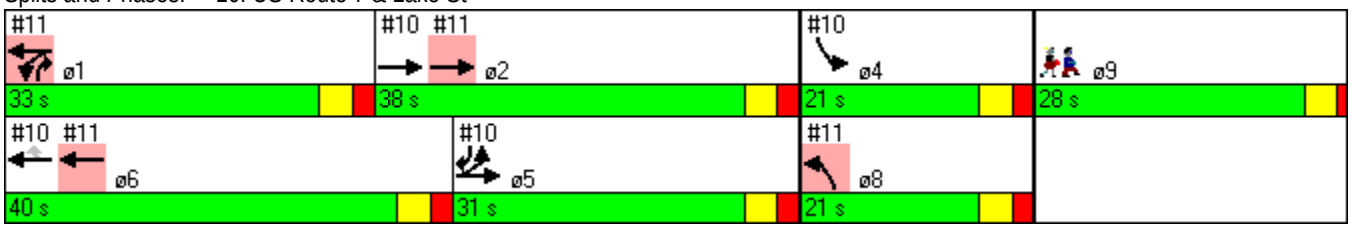
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	ø1	ø2	ø8	ø9
Lane Configurations										
Volume (vph)	150	495	355	210	125	155				
Lane Group Flow (vph)	163	538	386	228	136	168				
Turn Type	Prot			Perm		Over				
Protected Phases	5	2 5	6		4	5	1	2	8	9
Permitted Phases				6						
Detector Phase	5	2 5	6	6	4	5				
Switch Phase										
Minimum Initial (s)	5.0		10.0	10.0	5.0	5.0	5.0	10.0	5.0	4.0
Minimum Split (s)	16.0		16.0	16.0	16.0	16.0	16.0	16.0	16.0	28.0
Total Split (s)	31.0	69.0	40.0	40.0	21.0	31.0	33.0	38.0	21.0	28.0
Total Split (%)	25.8%	57.5%	33.3%	33.3%	17.5%	25.8%	28%	32%	18%	23%
Yellow Time (s)	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0				
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0				
Lead/Lag	Lag		Lead	Lead		Lag	Lead	Lag		
Lead-Lag Optimize?							Yes	Yes		
Recall Mode	None		C-Min	C-Min	None	None	None	C-Min	None	None
v/c Ratio	0.29	0.63	0.30	0.32	0.63	0.27				
Control Delay	18.5	20.2	26.2	11.6	44.1	7.0				
Queue Delay	8.5	0.8	0.0	0.0	0.0	0.3				
Total Delay	26.9	21.0	26.3	11.6	44.1	7.3				
Queue Length 50th (ft)	96	314	138	58	107	0				
Queue Length 95th (ft)	109	#660	211	161	m141	m59				
Internal Link Dist (ft)		60	1628		514					
Turn Bay Length (ft)				100		275				
Base Capacity (vph)	564	856	1276	717	251	628				
Starvation Cap Reductn	357	112	0	0	0	0				
Spillback Cap Reductn	0	0	49	0	0	145				
Storage Cap Reductn	0	0	0	0	0	0				
Reduced v/c Ratio	0.79	0.72	0.31	0.32	0.54	0.35				

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 115 (96%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: US Route 7 & Lake St



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	425	75	125	385	70	220
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	0.95		1.00	1.00	1.00	1.00
Frt	0.98		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3393		1770	1863	1770	1583
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3393		1770	1863	1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	462	82	136	418	76	239
RTOR Reduction (vph)	9	0	0	0	0	187
Lane Group Flow (vph)	535	0	136	418	76	52
Heavy Vehicles (%)	4%	4%	2%	2%	2%	2%
Turn Type			Prot			Over
Protected Phases	2		1	1 6	8	1
Permitted Phases						
Actuated Green, G (s)	52.9		25.0	39.9	13.5	25.0
Effective Green, g (s)	53.9		26.0	40.9	14.5	26.0
Actuated g/C Ratio	0.45		0.22	0.34	0.12	0.22
Clearance Time (s)	5.0		5.0		5.0	5.0
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Lane Grp Cap (vph)	1524		384	635	214	343
v/s Ratio Prot	c0.16		0.08	c0.22	c0.04	0.03
v/s Ratio Perm						
v/c Ratio	0.35		0.35	0.66	0.36	0.15
Uniform Delay, d1	21.6		39.9	33.6	48.5	38.1
Progression Factor	0.76		0.47	0.55	1.00	1.00
Incremental Delay, d2	0.6		0.5	2.4	1.0	0.2
Delay (s)	16.9		19.3	20.9	49.5	38.3
Level of Service	B		B	C	D	D
Approach Delay (s)	16.9			20.5	41.0	
Approach LOS	B			C	D	

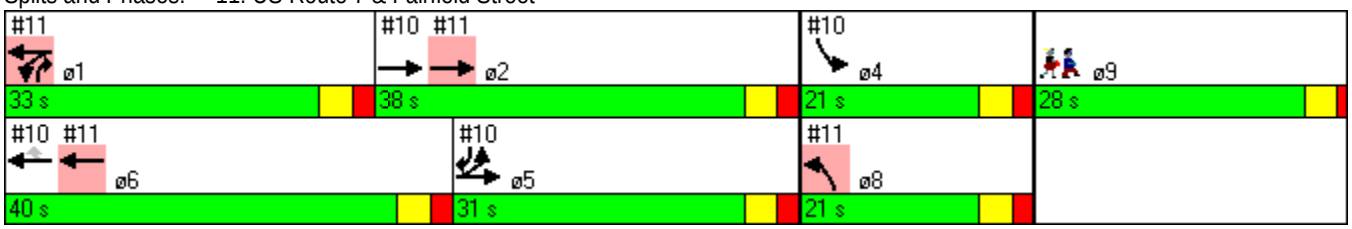
Intersection Summary			
HCM Average Control Delay	23.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	21.6
Intersection Capacity Utilization	35.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBL	WBT	NBL	NBR	ø4	ø5	ø6	ø9
Lane Configurations									
Volume (vph)	425	125	385	70	220				
Lane Group Flow (vph)	544	136	418	76	239				
Turn Type		Prot			Over				
Protected Phases	2	1	1 6	8	1	4	5	6	9
Permitted Phases									
Detector Phase	2	1	1 6	8	1				
Switch Phase									
Minimum Initial (s)	10.0	5.0		5.0	5.0	5.0	5.0	10.0	4.0
Minimum Split (s)	16.0	16.0		16.0	16.0	16.0	16.0	16.0	28.0
Total Split (s)	38.0	33.0	73.0	21.0	33.0	21.0	31.0	40.0	28.0
Total Split (%)	31.7%	27.5%	60.8%	17.5%	27.5%	18%	26%	33%	23%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0				
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0				
Lead/Lag	Lag	Lead			Lead		Lag	Lead	
Lead-Lag Optimize?	Yes	Yes			Yes				
Recall Mode	C-Min	None		None	None	None	None	C-Min	None
v/c Ratio	0.34	0.35	0.62	0.35	0.45				
Control Delay	18.8	20.8	22.9	52.3	7.5				
Queue Delay	0.1	6.9	0.7	0.0	1.4				
Total Delay	18.8	27.7	23.6	52.3	8.9				
Queue Length 50th (ft)	145	40	320	54	0				
Queue Length 95th (ft)	154	48	439	102	64				
Internal Link Dist (ft)	1342		60	263					
Turn Bay Length (ft)					250				
Base Capacity (vph)	1598	428	672	251	564				
Starvation Cap Reductn	0	242	68	0	0				
Spillback Cap Reductn	163	0	0	0	170				
Storage Cap Reductn	0	0	0	0	0				
Reduced v/c Ratio	0.38	0.73	0.69	0.30	0.61				

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 115 (96%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Splits and Phases: 11: US Route 7 & Fairfield Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	85	465	25	25	370	20	15	45	25	40	80	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.99		1.00	0.99			0.96			0.99	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.98	
Satd. Flow (prot)	1736	1813		1770	1848			1774			1816	
Flt Permitted	0.40	1.00		0.35	1.00			0.90			0.83	
Satd. Flow (perm)	724	1813		648	1848			1609			1530	
Peak-hour factor, PHF	0.80	0.80	0.80	0.85	0.85	0.85	0.85	0.85	0.85	0.75	0.75	0.75
Adj. Flow (vph)	106	581	31	29	435	24	18	53	29	53	107	13
RTOR Reduction (vph)	0	1	0	0	1	0	0	13	0	0	3	0
Lane Group Flow (vph)	106	611	0	29	458	0	0	87	0	0	170	0
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Turn Type	pm+pt			pm+pt			Perm			Perm		
Protected Phases	5	2		1	6			4			4	
Permitted Phases	2			6			4			4		
Actuated Green, G (s)	83.7	76.0		76.1	72.2			17.5			17.5	
Effective Green, g (s)	85.7	77.0		78.1	73.2			18.5			18.5	
Actuated g/C Ratio	0.71	0.64		0.65	0.61			0.15			0.15	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	590	1163		468	1127			248			236	
v/s Ratio Prot	c0.01	c0.34		0.00	0.25							
v/s Ratio Perm	0.12			0.04				0.05			c0.11	
v/c Ratio	0.18	0.53		0.06	0.41			0.35			0.72	
Uniform Delay, d1	6.4	11.6		8.3	12.1			45.4			48.3	
Progression Factor	0.87	0.94		2.25	2.09			1.00			1.00	
Incremental Delay, d2	0.1	1.3		0.0	0.9			0.9			10.4	
Delay (s)	5.7	12.3		18.8	26.2			46.3			58.7	
Level of Service	A	B		B	C			D			E	
Approach Delay (s)		11.3			25.8			46.3			58.7	
Approach LOS		B			C			D			E	

Intersection Summary			
HCM Average Control Delay	24.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.6
Intersection Capacity Utilization	52.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

12: US Route 7 & Lower Welden St

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	ø3
Lane Configurations									
Volume (vph)	85	465	25	370	15	45	40	80	
Lane Group Flow (vph)	106	612	29	459	0	100	0	173	
Turn Type	pm+pt		pm+pt		Perm		Perm		
Protected Phases	5	2	1	6		4		4	3
Permitted Phases	2		6		4		4		
Detector Phase	5	2	1	6	4	4	4	4	
Switch Phase									
Minimum Initial (s)	5.0	10.0	5.0	10.0	5.0	5.0	5.0	5.0	4.0
Minimum Split (s)	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	22.0
Total Split (s)	16.0	54.0	16.0	54.0	28.0	28.0	28.0	28.0	22.0
Total Split (%)	13.3%	45.0%	13.3%	45.0%	23.3%	23.3%	23.3%	23.3%	18%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lag	Lag	Lag	Lead
Lead-Lag Optimize?									
Recall Mode	None	C-Min	None	C-Min	None	None	None	None	None
v/c Ratio	0.18	0.49	0.06	0.39		0.38		0.72	
Control Delay	6.3	13.8	17.2	29.7		41.6		64.2	
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0	
Total Delay	6.3	13.8	17.2	29.7		41.6		64.2	
Queue Length 50th (ft)	6	51	10	168		59		127	
Queue Length 95th (ft)	m63	m505	m30	410		101		157	
Internal Link Dist (ft)		1737		1342		813		649	
Turn Bay Length (ft)	150		150						
Base Capacity (vph)	637	1241	588	1177		334		309	
Starvation Cap Reductn	0	0	0	0		0		0	
Spillback Cap Reductn	0	0	0	0		0		0	
Storage Cap Reductn	0	0	0	0		0		0	
Reduced v/c Ratio	0.17	0.49	0.05	0.39		0.30		0.56	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 69 (58%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 12: US Route 7 & Lower Welden St

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	35	470	360	5	25	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.81	0.81	0.86	0.86	0.80	0.80
Hourly flow rate (vph)	43	580	419	6	31	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		TWLTL	None			
Median storage veh)		2				
Upstream signal (ft)		300				
pX, platoon unblocked					0.75	
vC, conflicting volume	424				1088	422
vC1, stage 1 conf vol					422	
vC2, stage 2 conf vol					667	
vCu, unblocked vol	424				950	422
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)	2.2				3.5	3.3
p0 queue free %	96				93	99
cM capacity (veh/h)	1119				428	632

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	43	580	424	38
Volume Left	43	0	0	31
Volume Right	0	0	6	6
cSH	1119	1700	1700	452
Volume to Capacity	0.04	0.34	0.25	0.08
Queue Length 95th (ft)	3	0	0	7
Control Delay (s)	8.3	0.0	0.0	13.7
Lane LOS	A			B
Approach Delay (s)	0.6		0.0	13.7
Approach LOS				B

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	35.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	70	230	15	5	285	100	30	5	5	95	10	40
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.86	0.86	0.86	0.76	0.76	0.76	0.79	0.79	0.79
Hourly flow rate (vph)	76	250	16	6	331	116	39	7	7	120	13	51
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		1046										
pX, platoon unblocked												
vC, conflicting volume	448			266			810	870	258	813	820	390
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	448			266			810	870	258	813	820	390
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 %	93			100			84	98	99	56	96	92
cM capacity (veh/h)	1102			1286			249	267	776	272	286	657

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	76	266	6	448	53	120	63
Volume Left	76	0	6	0	39	120	0
Volume Right	0	16	0	116	7	0	51
cSH	1102	1700	1286	1700	275	272	522
Volume to Capacity	0.07	0.16	0.00	0.26	0.19	0.44	0.12
Queue Length 95th (ft)	6	0	0	0	17	53	10
Control Delay (s)	8.5	0.0	7.8	0.0	21.2	28.4	12.9
Lane LOS	A		A		C	D	B
Approach Delay (s)	1.9		0.1		21.2	23.0	
Approach LOS					C	C	

Intersection Summary			
Average Delay	5.8		
Intersection Capacity Utilization	43.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	285	25	0	0	0	0	0	50	5	30	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.82	0.92	0.82	0.84	0.84	0.84	0.92	0.92	0.92
Hourly flow rate (vph)	0	310	27	0	0	0	0	0	60	5	33	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)					566							
pX, platoon unblocked												
vC, conflicting volume	0			337			340	323	323	383	337	0
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	0			337			340	323	323	383	337	0
tC, single (s)	4.1			4.2			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	92	99	94	100
cM capacity (veh/h)	1623			1189			588	594	718	528	584	1085

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	337	60	38
Volume Left	0	0	5
Volume Right	27	60	0
cSH	1700	718	575
Volume to Capacity	0.20	0.08	0.07
Queue Length 95th (ft)	0	7	5
Control Delay (s)	0.0	10.5	11.7
Lane LOS		B	B
Approach Delay (s)	0.0	10.5	11.7
Approach LOS		B	B

Intersection Summary			
Average Delay	2.5		
Intersection Capacity Utilization	33.2%	ICU Level of Service	A
Analysis Period (min)	15		

2030 No Action and Proposed Action Intersection Capacity Analyses

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		4%			-4%			0%			0%	
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0			4.0	4.0
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00			1.00	1.00
Frpb, ped/bikes	1.00	0.98			1.00		1.00	1.00			1.00	0.98
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00			1.00	1.00
Frt	1.00	0.87			0.96		1.00	1.00			1.00	0.85
Flt Protected	0.95	1.00			0.99		0.95	1.00			1.00	1.00
Satd. Flow (prot)	1717	1547			1839		1702	1785			1825	1521
Flt Permitted	0.78	1.00			0.91		0.47	1.00			0.99	1.00
Satd. Flow (perm)	1405	1547			1700		840	1785			1807	1521
Volume (vph)	180	15	85	15	25	15	65	385	10	10	370	350
Peak-hour factor, PHF	0.91	0.91	0.91	0.73	0.73	0.73	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	198	16	93	21	34	21	75	443	11	11	425	402
RTOR Reduction (vph)	0	72	0	0	16	0	0	1	0	0	0	138
Lane Group Flow (vph)	198	37	0	0	60	0	75	453	0	0	436	264
Confl. Peds. (#/hr)			1	1			1		1	1		1
Heavy Vehicles (%)	3%	3%	3%	0%	0%	0%	6%	6%	6%	4%	4%	4%
Turn Type	Perm			Perm			Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	15.0	15.0			15.0		45.0	45.0			45.0	45.0
Effective Green, g (s)	16.0	16.0			16.0		46.0	46.0			46.0	46.0
Actuated g/C Ratio	0.23	0.23			0.23		0.66	0.66			0.66	0.66
Clearance Time (s)	5.0	5.0			5.0		5.0	5.0			5.0	5.0
Lane Grp Cap (vph)	321	354			389		552	1173			1187	1000
v/s Ratio Prot		0.02						c0.25				
v/s Ratio Perm	c0.14				0.04		0.09				0.24	0.17
v/c Ratio	0.62	0.11			0.15		0.14	0.39			0.37	0.26
Uniform Delay, d1	24.2	21.3			21.6		4.5	5.5			5.4	5.0
Progression Factor	1.00	1.00			1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	8.6	0.6			0.8		0.5	1.0			0.9	0.6
Delay (s)	32.8	21.9			22.4		5.0	6.5			6.3	5.6
Level of Service	C	C			C		A	A			A	A
Approach Delay (s)		29.0			22.4			6.3			6.0	
Approach LOS		C			C			A			A	

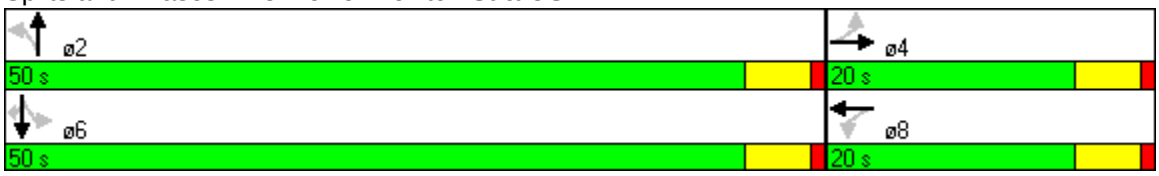
Intersection Summary			
HCM Average Control Delay	10.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	67.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Volume (vph)	180	15	15	25	65	385	10	370	350
Lane Group Flow (vph)	198	109	0	76	75	454	0	436	402
Turn Type	Perm		Perm		Perm		Perm		Perm
Protected Phases		4		8		2		6	
Permitted Phases	4		8		2		6		6
Detector Phases	4	4	8	8	2	2	6	6	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
Total Split (s)	20.0	20.0	20.0	20.0	50.0	50.0	50.0	50.0	50.0
Total Split (%)	28.6%	28.6%	28.6%	28.6%	71.4%	71.4%	71.4%	71.4%	71.4%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max	Max
v/c Ratio	0.62	0.26		0.19	0.14	0.39		0.37	0.35
Control Delay	33.9	8.9		18.3	5.3	6.6		6.5	1.5
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0	0.0
Total Delay	33.9	8.9		18.3	5.3	6.6		6.5	1.5
Queue Length 50th (ft)	77	5		19	10	76		72	0
Queue Length 95th (ft)	#147	42		39	24	116		111	21
Internal Link Dist (ft)		575		1031		1282		1047	
Turn Bay Length (ft)	130				115				150
Base Capacity (vph)	321	425		405	552	1174		1187	1137
Starvation Cap Reductn	0	0		0	0	0		0	0
Spillback Cap Reductn	0	0		0	0	0		0	0
Storage Cap Reductn	0	0		0	0	0		0	0
Reduced v/c Ratio	0.62	0.26		0.19	0.14	0.39		0.37	0.35

Intersection Summary

Cycle Length: 70
Actuated Cycle Length: 70
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 40
Control Type: Pretimed
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 8: Lower Newton St & US 7



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.98		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1787	1599	1784		1736	1827
Flt Permitted	0.95	1.00	1.00		0.34	1.00
Satd. Flow (perm)	1787	1599	1784		618	1827
Volume (vph)	45	50	425	90	30	400
Peak-hour factor, PHF	0.92	0.92	0.91	0.91	0.95	0.95
Adj. Flow (vph)	49	54	467	99	32	421
RTOR Reduction (vph)	0	49	4	0	0	0
Lane Group Flow (vph)	49	5	562	0	32	421
Heavy Vehicles (%)	1%	1%	4%	4%	4%	4%
Turn Type		Prot			pm+pt	
Protected Phases	8	8	2		1	6
Permitted Phases					6	
Actuated Green, G (s)	9.1	9.1	56.3		63.9	63.9
Effective Green, g (s)	9.1	9.1	56.3		63.9	63.9
Actuated g/C Ratio	0.10	0.10	0.63		0.71	0.71
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	5.0	5.0	5.0		5.0	5.0
Lane Grp Cap (vph)	182	163	1123		487	1306
v/s Ratio Prot	c0.03	0.00	c0.32		0.00	c0.23
v/s Ratio Perm					0.04	
v/c Ratio	0.27	0.03	0.50		0.07	0.32
Uniform Delay, d1	37.1	36.2	8.9		5.0	4.7
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	1.7	0.2	1.6		0.1	0.7
Delay (s)	38.7	36.4	10.5		5.2	5.4
Level of Service	D	D	B		A	A
Approach Delay (s)	37.5		10.5			5.4
Approach LOS	D		B			A

Intersection Summary			
HCM Average Control Delay	10.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	89.4	Sum of lost time (s)	20.4
Intersection Capacity Utilization	38.7%	ICU Level of Service	A
Analysis Period (min)	15		

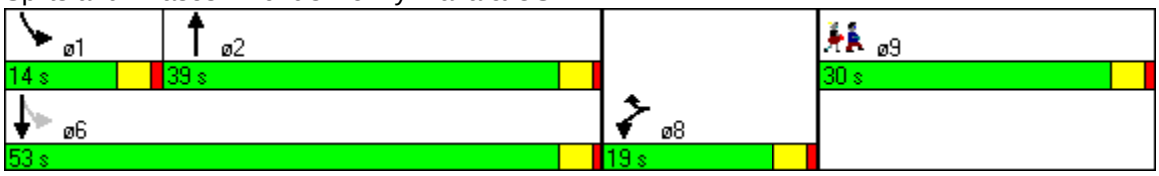
c Critical Lane Group

Lane Group	WBL	WBR	NBT	SBL	SBT	ø9
Lane Configurations						
Volume (vph)	45	50	425	30	400	
Lane Group Flow (vph)	49	54	566	32	421	
Turn Type		Prot		pm+pt		
Protected Phases	8	8	2	1	6	9
Permitted Phases				6		
Detector Phases	8	8	2	1	6	
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	4.0
Minimum Split (s)	10.0	10.0	10.0	9.0	10.0	30.0
Total Split (s)	19.0	19.0	39.0	14.0	53.0	30.0
Total Split (%)	18.6%	18.6%	38.2%	13.7%	52.0%	29%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag			Lag	Lead		
Lead-Lag Optimize?						
Recall Mode	None	None	Max	None	Max	None
v/c Ratio	0.23	0.22	0.47	0.12	0.31	
Control Delay	33.8	12.8	14.3	8.9	7.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	33.8	12.8	14.3	8.9	7.5	
Queue Length 50th (ft)	18	0	62	3	42	
Queue Length 95th (ft)	63	35	#535	26	253	
Internal Link Dist (ft)	63		1579		1282	
Turn Bay Length (ft)				150		
Base Capacity (vph)	314	326	1215	300	1357	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.16	0.17	0.47	0.11	0.31	

Intersection Summary

Cycle Length: 102
Actuated Cycle Length: 83.7
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 9: JC Penny Plaza & US 7



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1719	1538	1736	1827	3471	1553
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1719	1538	1736	1827	3471	1553
Volume (vph)	110	140	165	470	355	150
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	120	152	179	511	386	163
RTOR Reduction (vph)	0	127	0	0	0	129
Lane Group Flow (vph)	120	25	179	511	386	34
Heavy Vehicles (%)	5%	5%	4%	4%	4%	4%
Turn Type		Over	Prot			Perm
Protected Phases	4	5	5	2 5	6	
Permitted Phases						6
Actuated Green, G (s)	14.0	15.0	15.0	38.0	19.0	19.0
Effective Green, g (s)	14.0	15.0	15.0	38.0	19.0	19.0
Actuated g/C Ratio	0.16	0.17	0.17	0.42	0.21	0.21
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0
Lane Grp Cap (vph)	267	256	289	771	733	328
v/s Ratio Prot	c0.07	0.02	0.10	c0.28	0.11	
v/s Ratio Perm						0.02
v/c Ratio	0.45	0.10	0.62	0.66	0.53	0.10
Uniform Delay, d1	34.5	31.8	34.8	20.9	31.5	28.6
Progression Factor	1.00	1.00	0.62	0.37	1.00	1.00
Incremental Delay, d2	5.4	0.8	7.1	3.3	2.7	0.6
Delay (s)	39.9	32.5	28.8	10.9	34.2	29.3
Level of Service	D	C	C	B	C	C
Approach Delay (s)	35.8			15.5	32.7	
Approach LOS	D			B	C	

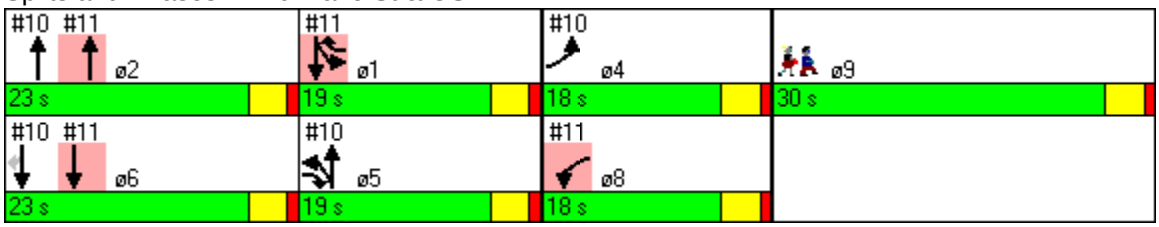
Intersection Summary			
HCM Average Control Delay	25.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	38.0
Intersection Capacity Utilization	37.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	ø1	ø2	ø8	ø9
Lane Configurations										
Volume (vph)	110	140	165	470	355	150				
Lane Group Flow (vph)	120	152	179	511	386	163				
Turn Type		Over	Prot			Perm				
Protected Phases	4	5	5	2 5	6		1	2	8	9
Permitted Phases						6				
Detector Phases	4	5	5	2 5	6	6				
Minimum Initial (s)	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.0	10.0	10.0		10.0	10.0	10.0	10.0	10.0	30.0
Total Split (s)	18.0	19.0	19.0	42.0	23.0	23.0	19.0	23.0	18.0	30.0
Total Split (%)	20.0%	21.1%	21.1%	46.7%	25.6%	25.6%	21%	26%	20%	33%
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag		Lag	Lag		Lead	Lead	Lag	Lead		
Lead-Lag Optimize?										
Recall Mode	Max	Max	Max		Max	Max	Max	Max	Max	Max
v/c Ratio	0.45	0.40	0.62	0.66	0.53	0.36				
Control Delay	40.6	9.2	29.2	11.1	34.5	7.5				
Queue Delay	0.0	0.2	70.2	2.6	2.2	0.0				
Total Delay	40.6	9.4	99.4	13.8	36.8	7.5				
Queue Length 50th (ft)	63	0	106	73	103	0				
Queue Length 95th (ft)	117	51	m139	67	148	50				
Internal Link Dist (ft)	525			79	1579					
Turn Bay Length (ft)		275				100				
Base Capacity (vph)	267	383	289	771	733	456				
Starvation Cap Reductn	0	0	128	153	0	0				
Spillback Cap Reductn	0	29	0	0	217	0				
Storage Cap Reductn	0	0	0	0	0	0				
Reduced v/c Ratio	0.45	0.43	1.11	0.83	0.75	0.36				

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 70
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: Lake St & US 7



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	1.00	0.95		1.00	1.00
Frt	1.00	0.85	0.97		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	1583	3364		1736	1827
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1770	1583	3364		1736	1827
Volume (vph)	95	230	405	105	140	355
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	103	250	440	114	152	386
RTOR Reduction (vph)	0	208	25	0	0	0
Lane Group Flow (vph)	103	42	529	0	152	386
Heavy Vehicles (%)	2%	2%	4%	4%	4%	4%
Turn Type		Over			Prot	
Protected Phases	8	1	2		1	1 6
Permitted Phases						
Actuated Green, G (s)	14.0	15.0	19.0		15.0	38.0
Effective Green, g (s)	14.0	15.0	19.0		15.0	38.0
Actuated g/C Ratio	0.16	0.17	0.21		0.17	0.42
Clearance Time (s)	4.0	4.0	4.0		4.0	
Lane Grp Cap (vph)	275	264	710		289	771
v/s Ratio Prot	c0.06	0.03	c0.16		0.09	c0.21
v/s Ratio Perm						
v/c Ratio	0.37	0.16	0.74		0.53	0.50
Uniform Delay, d1	34.1	32.1	33.2		34.3	19.0
Progression Factor	1.00	1.00	1.00		0.59	0.27
Incremental Delay, d2	3.9	1.3	7.0		6.0	2.1
Delay (s)	37.9	33.4	40.2		26.2	7.3
Level of Service	D	C	D		C	A
Approach Delay (s)	34.7		40.2			12.6
Approach LOS	C		D			B

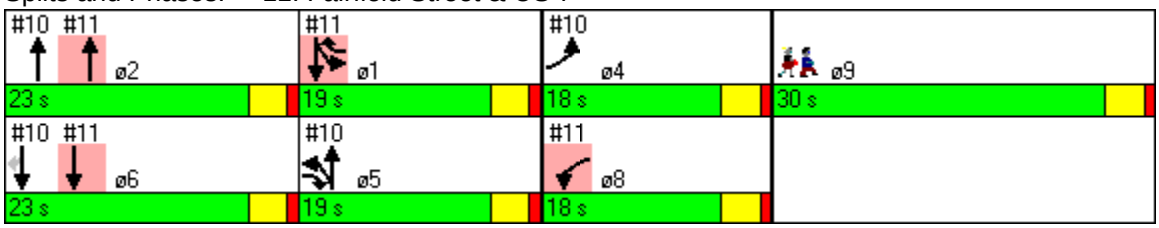
Intersection Summary			
HCM Average Control Delay	28.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	38.0
Intersection Capacity Utilization	37.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	WBL	WBR	NBT	SBL	SBT	ø4	ø5	ø6	ø9
Lane Configurations									
Volume (vph)	95	230	405	140	355				
Lane Group Flow (vph)	103	250	554	152	386				
Turn Type		Over		Prot					
Protected Phases	8	1	2	1	1 6	4	5	6	9
Permitted Phases									
Detector Phases	8	1	2	1	1 6				
Minimum Initial (s)	5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0
Minimum Split (s)	10.0	10.0	10.0	10.0		10.0	10.0	10.0	30.0
Total Split (s)	18.0	19.0	23.0	19.0	42.0	18.0	19.0	23.0	30.0
Total Split (%)	20.0%	21.1%	25.6%	21.1%	46.7%	20%	21%	26%	33%
Yellow Time (s)	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0
Lead/Lag		Lag	Lead	Lag			Lag	Lead	
Lead-Lag Optimize?									
Recall Mode	Max	Max	Max	Max		Max	Max	Max	Max
v/c Ratio	0.37	0.53	0.75	0.53	0.50				
Control Delay	38.6	9.1	38.8	26.6	7.4				
Queue Delay	0.0	0.4	30.2	36.2	1.2				
Total Delay	38.6	9.5	69.0	62.8	8.6				
Queue Length 50th (ft)	53	0	147	91	37				
Queue Length 95th (ft)	102	64	206	142	56				
Internal Link Dist (ft)	263		1354		79				
Turn Bay Length (ft)		250							
Base Capacity (vph)	275	472	735	289	771				
Starvation Cap Reductn	0	0	0	136	196				
Spillback Cap Reductn	0	37	202	0	0				
Storage Cap Reductn	0	0	0	0	0				
Reduced v/c Ratio	0.37	0.57	1.04	0.99	0.67				

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 70
Control Type: Pretimed

Splits and Phases: 11: Fairfield Street & US 7



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.93			0.95		1.00	0.99		1.00	0.98	
Flt Protected		0.99			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1720			1762		1736	1812		1736	1797	
Flt Permitted		0.90			0.94		0.22	1.00		0.27	1.00	
Satd. Flow (perm)		1566			1660		399	1812		488	1797	
Volume (vph)	65	85	145	15	65	45	115	525	30	30	445	55
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	71	92	158	16	71	49	125	571	33	33	484	60
RTOR Reduction (vph)	0	33	0	0	20	0	0	2	0	0	3	0
Lane Group Flow (vph)	0	288	0	0	116	0	125	602	0	33	541	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	4%	4%	4%	4%	4%	4%
Turn Type	Perm			Perm			pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		18.3			18.3		44.0	37.4		35.8	33.3	
Effective Green, g (s)		19.3			19.3		45.9	38.4		37.8	34.3	
Actuated g/C Ratio		0.24			0.24		0.57	0.48		0.47	0.42	
Clearance Time (s)		5.0			5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		374			397		352	861		282	763	
v/s Ratio Prot							c0.03	c0.33		0.01	0.30	
v/s Ratio Perm		c0.18			0.07		0.17			0.05		
v/c Ratio		0.77			0.29		0.36	0.70		0.12	0.71	
Uniform Delay, d1		28.7			25.2		11.1	16.7		12.8	19.1	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		9.2			0.4		0.6	4.7		0.2	5.5	
Delay (s)		37.8			25.6		11.7	21.4		13.0	24.6	
Level of Service		D			C		B	C		B	C	
Approach Delay (s)		37.8			25.6			19.7			24.0	
Approach LOS		D			C			B			C	

Intersection Summary			
HCM Average Control Delay	24.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	80.8	Sum of lost time (s)	19.6
Intersection Capacity Utilization	67.2%	ICU Level of Service	C
Analysis Period (min)	15		

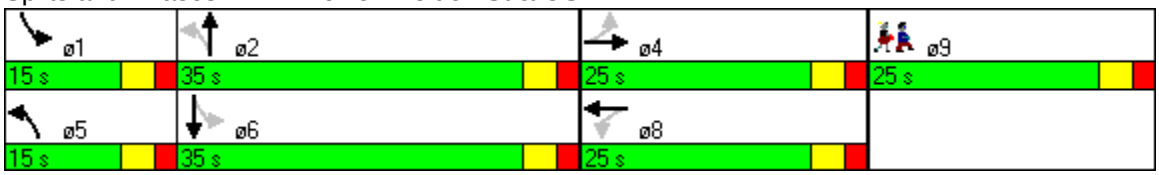
c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	ø9
Lane Configurations									
Volume (vph)	65	85	15	65	115	525	30	445	
Lane Group Flow (vph)	0	321	0	136	125	604	33	544	
Turn Type	Perm		Perm		pm+pt		pm+pt		
Protected Phases		4		8	5	2	1	6	9
Permitted Phases	4		8		2		6		
Detector Phases	4	4	8	8	5	2	1	6	
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0
Minimum Split (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	22.0
Total Split (s)	25.0	25.0	25.0	25.0	15.0	35.0	15.0	35.0	25.0
Total Split (%)	25.0%	25.0%	25.0%	25.0%	15.0%	35.0%	15.0%	35.0%	25%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lead/Lag					Lead	Lag	Lead	Lag	
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	Max	None	Max	None
v/c Ratio		0.75		0.31	0.40	0.64	0.13	0.69	
Control Delay		36.6		22.8	13.3	21.4	11.8	26.6	
Queue Delay		0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay		36.6		22.8	13.3	21.4	11.8	26.6	
Queue Length 50th (ft)		113		38	22	144	5	197	
Queue Length 95th (ft)		#330		113	76	#589	27	#532	
Internal Link Dist (ft)		782		814		1730		1354	
Turn Bay Length (ft)					150		150		
Base Capacity (vph)		459		475	343	946	313	790	
Starvation Cap Reductn		0		0	0	0	0	0	
Spillback Cap Reductn		0		0	0	0	0	0	
Storage Cap Reductn		0		0	0	0	0	0	
Reduced v/c Ratio		0.70		0.29	0.36	0.64	0.11	0.69	

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 73.6
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 12: Lower Welden St & US 7



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	55	320	570	105	415	385
Peak Hour Factor	0.75	0.75	0.89	0.89	0.91	0.91
Hourly flow rate (vph)	73	427	640	118	456	423
Pedestrians	9					
Lane Width (ft)	12.0					
Walking Speed (ft/s)	4.0					
Percent Blockage	1					
Right turn flare (veh)		13				
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2044	708			767	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2044	708			767	
tC, single (s)	6.5	6.3			4.2	
tC, 2 stage (s)						
tF (s)	3.6	3.4			2.3	
p0 queue free %	0	0			45	
cM capacity (veh/h)	26	421			822	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	500	758	456	423
Volume Left	73	0	456	0
Volume Right	427	118	0	0
cSH	157	1700	822	1700
Volume to Capacity	3.18	0.45	0.55	0.25
Queue Length 95th (ft)	Err	0	87	0
Control Delay (s)	Err	0.0	14.7	0.0
Lane LOS	F		B	
Approach Delay (s)	Err	0.0	7.6	
Approach LOS	F			

Intersection Summary			
Average Delay	2342.0		
Intersection Capacity Utilization	72.8%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	55	125	110	780	675	35
Peak Hour Factor	0.82	0.82	0.82	0.82	0.91	0.91
Hourly flow rate (vph)	67	152	134	951	742	38
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1981	761	780			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1981	761	780			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	62	84			
cM capacity (veh/h)	57	405	828			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	220	134	951	780
Volume Left	67	134	0	0
Volume Right	152	0	0	38
cSH	141	828	1700	1700
Volume to Capacity	1.56	0.16	0.56	0.46
Queue Length 95th (ft)	381	14	0	0
Control Delay (s)	339.7	10.2	0.0	0.0
Lane LOS	F	B		
Approach Delay (s)	339.7	1.3		0.0
Approach LOS	F			

Intersection Summary			
Average Delay	36.4		
Intersection Capacity Utilization	64.5%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	85	110	65	80	70	80
Peak Hour Factor	0.73	0.73	0.64	0.64	0.77	0.77
Hourly flow rate (vph)	116	151	102	125	91	104
Pedestrians					2	
Lane Width (ft)					10.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	229				550	166
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	229				550	166
tC, single (s)	4.1				6.5	6.3
tC, 2 stage (s)						
tF (s)	2.2				3.6	3.4
p0 queue free %	91				80	88
cM capacity (veh/h)	1344				446	867

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total	267	227	91	104
Volume Left	116	0	91	0
Volume Right	0	125	0	104
cSH	1344	1700	446	867
Volume to Capacity	0.09	0.13	0.20	0.12
Queue Length 95th (ft)	7	0	19	10
Control Delay (s)	3.9	0.0	15.1	9.7
Lane LOS	A		C	A
Approach Delay (s)	3.9	0.0	12.2	
Approach LOS			B	

Intersection Summary			
Average Delay	5.0		
Intersection Capacity Utilization	33.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	10	200	50	20	180	35	60	75	30	65	80	35
Peak Hour Factor	0.78	0.78	0.78	0.82	0.82	0.82	0.70	0.70	0.70	0.91	0.91	0.91
Hourly flow rate (vph)	13	256	64	24	220	43	86	107	43	71	88	38
Pedestrians					2						11	
Lane Width (ft)					11.0						12.0	
Walking Speed (ft/s)					4.0						4.0	
Percent Blockage					0						1	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)					862							
pX, platoon unblocked												
vC, conflicting volume	273			321			686	636	290	713	647	252
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	273			321			686	636	290	713	647	252
tC, single (s)	4.2			4.1			7.2	6.6	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			98			68	72	94	71	77	95
cM capacity (veh/h)	1234			1239			271	376	741	246	376	782

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	333	287	236	198
Volume Left	13	24	86	71
Volume Right	64	43	43	38
cSH	1234	1239	358	345
Volume to Capacity	0.01	0.02	0.66	0.57
Queue Length 95th (ft)	1	2	112	85
Control Delay (s)	0.4	0.8	32.5	28.6
Lane LOS	A	A	D	D
Approach Delay (s)	0.4	0.8	32.5	28.6
Approach LOS			D	D

Intersection Summary			
Average Delay	13.0		
Intersection Capacity Utilization	39.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	55	75	100	35	70	55
Peak Hour Factor	0.65	0.65	0.65	0.65	0.82	0.82
Hourly flow rate (vph)	85	115	154	54	85	67
Pedestrians		1	1		20	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		2	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	228				486	202
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	228				486	202
tC, single (s)	4.1				6.5	6.3
tC, 2 stage (s)						
tF (s)	2.2				3.6	3.4
p0 queue free %	93				82	92
cM capacity (veh/h)	1301				486	810

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	200	208	152
Volume Left	85	0	85
Volume Right	0	54	67
cSH	1301	1700	590
Volume to Capacity	0.07	0.12	0.26
Queue Length 95th (ft)	5	0	26
Control Delay (s)	3.7	0.0	13.2
Lane LOS	A		B
Approach Delay (s)	3.7	0.0	13.2
Approach LOS			B

Intersection Summary			
Average Delay	4.9		
Intersection Capacity Utilization	35.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	160	200	30	10	225	80	10	65	15	35	85	265
Peak Hour Factor	0.86	0.86	0.86	0.80	0.80	0.80	0.72	0.72	0.72	0.84	0.84	0.84
Hourly flow rate (vph)	186	233	35	12	281	100	14	90	21	42	101	315
Pedestrians		3			2			6			14	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			0			0			1	
Right turn flare (veh)												5
Median type								None			None	
Median storage veh)												
Upstream signal (ft)					605							
pX, platoon unblocked												
vC, conflicting volume	395			273			1196	1048	258	1060	1016	348
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	395			273			1196	1048	258	1060	1016	348
tC, single (s)	4.1			4.2			7.2	6.6	6.3	7.2	6.6	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.6	4.1	3.4	3.5	4.0	3.3
p0 queue free %	84			99			68	50	97	59	47	54
cM capacity (veh/h)	1134			1261			43	182	766	102	191	678

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	453	394	125	458
Volume Left	186	12	14	42
Volume Right	35	100	21	315
cSH	1134	1261	148	530
Volume to Capacity	0.16	0.01	0.84	0.86
Queue Length 95th (ft)	15	1	139	235
Control Delay (s)	4.6	0.3	96.7	39.3
Lane LOS	A	A	F	E
Approach Delay (s)	4.6	0.3	96.7	39.3
Approach LOS			F	E

Intersection Summary			
Average Delay	22.6		
Intersection Capacity Utilization	62.0%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	180	120	265	175	65	100
Peak Hour Factor	0.89	0.89	0.94	0.94	0.85	0.85
Hourly flow rate (vph)	202	135	282	186	76	118
Pedestrians					6	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)				655		
pX, platoon unblocked						
vC, conflicting volume			343		1026	276
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			343		1026	276
tC, single (s)			4.2		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.3		3.5	3.3
p0 queue free %			76		61	84
cM capacity (veh/h)			1188		197	757

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	337	468	194
Volume Left	0	282	76
Volume Right	135	0	118
cSH	1700	1188	357
Volume to Capacity	0.20	0.24	0.54
Queue Length 95th (ft)	0	23	78
Control Delay (s)	0.0	6.4	26.5
Lane LOS		A	D
Approach Delay (s)	0.0	6.4	26.5
Approach LOS			D

Intersection Summary			
Average Delay	8.1		
Intersection Capacity Utilization	60.7%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		4%			-4%			0%			0%	
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0			4.0	4.0
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00			1.00	1.00
Frpb, ped/bikes	1.00	0.97			1.00		1.00	1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00			1.00	1.00
Frt	1.00	0.88			0.96		1.00	1.00			1.00	0.85
Flt Protected	0.95	1.00			0.99		0.95	1.00			1.00	1.00
Satd. Flow (prot)	1734	1573			1773		1770	1859			1861	1583
Flt Permitted	0.82	1.00			0.91		0.39	1.00			0.98	1.00
Satd. Flow (perm)	1488	1573			1631		723	1859			1833	1583
Volume (vph)	485	25	85	15	20	15	95	750	10	10	520	355
Peak-hour factor, PHF	0.92	0.92	0.92	0.85	0.85	0.85	0.91	0.91	0.91	0.95	0.95	0.95
Adj. Flow (vph)	527	27	92	18	24	18	104	824	11	11	547	374
RTOR Reduction (vph)	0	71	0	0	14	0	0	1	0	0	0	128
Lane Group Flow (vph)	527	48	0	0	46	0	104	834	0	0	558	246
Confl. Peds. (#/hr)			6	6					1	1		
Heavy Vehicles (%)	2%	2%	2%	3%	3%	3%	2%	2%	2%	2%	2%	2%
Turn Type	Perm			Perm			Perm			Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Actuated Green, G (s)	15.0	15.0			15.0		45.0	45.0			45.0	45.0
Effective Green, g (s)	16.0	16.0			16.0		46.0	46.0			46.0	46.0
Actuated g/C Ratio	0.23	0.23			0.23		0.66	0.66			0.66	0.66
Clearance Time (s)	5.0	5.0			5.0		5.0	5.0			5.0	5.0
Lane Grp Cap (vph)	340	360			373		475	1222			1205	1040
v/s Ratio Prot		0.03						c0.45				
v/s Ratio Perm	c0.35				0.03		0.14				0.30	0.16
v/c Ratio	1.55	0.13			0.12		0.22	0.68			0.46	0.24
Uniform Delay, d1	27.0	21.5			21.4		4.8	7.5			5.9	4.9
Progression Factor	1.00	1.00			1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	261.6	0.8			0.7		1.1	3.1			1.3	0.5
Delay (s)	288.6	22.3			22.1		5.9	10.6			7.2	5.4
Level of Service	F	C			C		A	B			A	A
Approach Delay (s)		239.5			22.1			10.0			6.5	
Approach LOS		F			C			B			A	

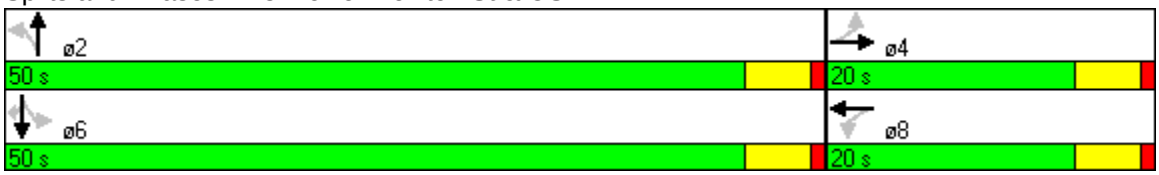
Intersection Summary			
HCM Average Control Delay	66.6	HCM Level of Service	E
HCM Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	111.5%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations									
Volume (vph)	485	25	15	20	95	750	10	520	355
Lane Group Flow (vph)	527	119	0	60	104	835	0	558	374
Turn Type	Perm		Perm		Perm		Perm		Perm
Protected Phases		4		8		2		6	
Permitted Phases	4		8		2		6		6
Detector Phases	4	4	8	8	2	2	6	6	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
Total Split (s)	20.0	20.0	20.0	20.0	50.0	50.0	50.0	50.0	50.0
Total Split (%)	28.6%	28.6%	28.6%	28.6%	71.4%	71.4%	71.4%	71.4%	71.4%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max	Max
v/c Ratio	1.55	0.28		0.16	0.22	0.68		0.46	0.32
Control Delay	286.7	9.9		17.7	6.2	11.1		7.5	1.4
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0	0.0
Total Delay	286.7	9.9		17.7	6.2	11.1		7.5	1.4
Queue Length 50th (ft)	~328	9		14	15	190		101	0
Queue Length 95th (ft)	#503	48		39	35	307		160	24
Internal Link Dist (ft)		575		1031		1282		1047	
Turn Bay Length (ft)	130				115				150
Base Capacity (vph)	340	431		387	475	1222		1205	1168
Starvation Cap Reductn	0	0		0	0	0		0	0
Spillback Cap Reductn	0	0		0	0	0		0	0
Storage Cap Reductn	0	0		0	0	0		0	0
Reduced v/c Ratio	1.55	0.28		0.16	0.22	0.68		0.46	0.32

Intersection Summary

Cycle Length: 70
Actuated Cycle Length: 70
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 80
Control Type: Pretimed
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 8: Lower Newton St & US 7



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.99		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1787	1599	1840		1770	1863
Flt Permitted	0.95	1.00	1.00		0.13	1.00
Satd. Flow (perm)	1787	1599	1840		250	1863
Volume (vph)	55	70	765	75	35	570
Peak-hour factor, PHF	0.92	0.92	0.91	0.91	0.95	0.95
Adj. Flow (vph)	60	76	841	82	37	600
RTOR Reduction (vph)	0	68	2	0	0	0
Lane Group Flow (vph)	60	8	921	0	37	600
Heavy Vehicles (%)	1%	1%	2%	2%	2%	2%
Turn Type		Prot			pm+pt	
Protected Phases	8	8	2		1	6
Permitted Phases					6	
Actuated Green, G (s)	9.5	9.5	56.2		63.9	63.9
Effective Green, g (s)	9.5	9.5	56.2		63.9	63.9
Actuated g/C Ratio	0.11	0.11	0.63		0.71	0.71
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	5.0	5.0	5.0		5.0	5.0
Lane Grp Cap (vph)	189	169	1153		241	1327
v/s Ratio Prot	c0.03	0.01	c0.50		0.01	c0.32
v/s Ratio Perm					0.10	
v/c Ratio	0.32	0.05	0.80		0.15	0.45
Uniform Delay, d1	37.1	36.0	12.5		11.2	5.5
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	2.0	0.2	5.8		0.6	1.1
Delay (s)	39.1	36.3	18.4		11.8	6.6
Level of Service	D	D	B		B	A
Approach Delay (s)	37.5		18.4			6.9
Approach LOS	D		B			A

Intersection Summary			
HCM Average Control Delay	15.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	89.7	Sum of lost time (s)	20.3
Intersection Capacity Utilization	55.8%	ICU Level of Service	B
Analysis Period (min)	15		

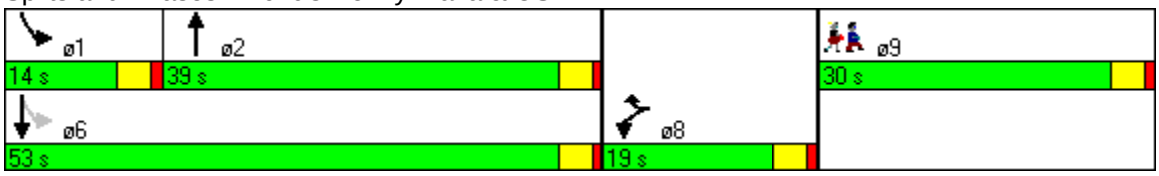
c Critical Lane Group

Lane Group	WBL	WBR	NBT	SBL	SBT	ø9
Lane Configurations						
Volume (vph)	55	70	765	35	570	
Lane Group Flow (vph)	60	76	923	37	600	
Turn Type		Prot		pm+pt		
Protected Phases	8	8	2	1	6	9
Permitted Phases				6		
Detector Phases	8	8	2	1	6	
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	4.0
Minimum Split (s)	10.0	10.0	10.0	9.0	10.0	30.0
Total Split (s)	19.0	19.0	39.0	14.0	53.0	30.0
Total Split (%)	18.6%	18.6%	38.2%	13.7%	52.0%	29%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag			Lag	Lead		
Lead-Lag Optimize?						
Recall Mode	None	None	Max	None	Max	None
v/c Ratio	0.27	0.28	0.74	0.13	0.44	
Control Delay	34.0	11.5	20.5	9.2	9.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	34.0	11.5	20.5	9.2	9.1	
Queue Length 50th (ft)	22	0	147	3	71	
Queue Length 95th (ft)	74	41	#1058	29	406	
Internal Link Dist (ft)	63		1579		1282	
Turn Bay Length (ft)				150		
Base Capacity (vph)	314	344	1245	305	1377	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.19	0.22	0.74	0.12	0.44	

Intersection Summary

Cycle Length: 102
Actuated Cycle Length: 84.1
Natural Cycle: 100
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 9: JC Penny Plaza & US 7



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1736	1827	3539	1583
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	1736	1827	3539	1583
Volume (vph)	190	240	205	700	495	170
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	207	261	223	761	538	185
RTOR Reduction (vph)	0	218	0	0	0	131
Lane Group Flow (vph)	207	44	223	761	538	54
Heavy Vehicles (%)	2%	2%	4%	4%	2%	2%
Turn Type		Over	Prot			Perm
Protected Phases	4	5	5	2 5	6	
Permitted Phases						6
Actuated Green, G (s)	14.0	15.0	15.0	38.0	19.0	19.0
Effective Green, g (s)	14.0	15.0	15.0	38.0	19.0	19.0
Actuated g/C Ratio	0.16	0.17	0.17	0.42	0.21	0.21
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0
Lane Grp Cap (vph)	275	264	289	771	747	334
v/s Ratio Prot	c0.12	0.03	0.13	c0.42	0.15	
v/s Ratio Perm						0.03
v/c Ratio	0.75	0.16	0.77	0.99	0.72	0.16
Uniform Delay, d1	36.3	32.1	35.9	25.8	33.0	29.0
Progression Factor	1.00	1.00	0.56	0.37	1.00	1.00
Incremental Delay, d2	17.3	1.3	7.0	16.5	5.9	1.0
Delay (s)	53.6	33.5	27.2	26.1	39.0	30.0
Level of Service	D	C	C	C	D	C
Approach Delay (s)	42.4			26.3	36.7	
Approach LOS	D			C	D	

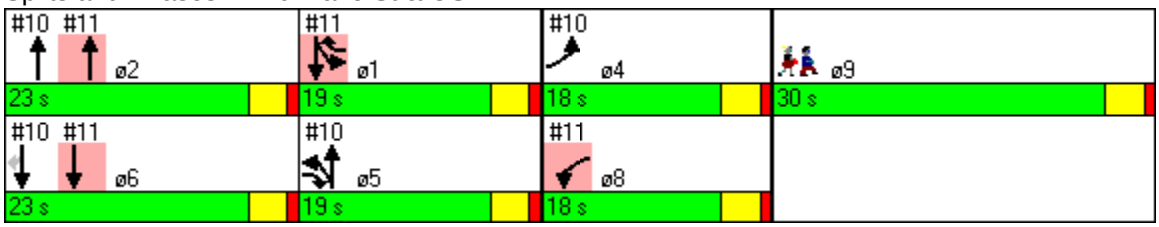
Intersection Summary			
HCM Average Control Delay	33.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	38.0
Intersection Capacity Utilization	54.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	ø1	ø2	ø8	ø9
Lane Configurations										
Volume (vph)	190	240	205	700	495	170				
Lane Group Flow (vph)	207	261	223	761	538	185				
Turn Type		Over	Prot			Perm				
Protected Phases	4	5	5	2 5	6		1	2	8	9
Permitted Phases						6				
Detector Phases	4	5	5	2 5	6	6				
Minimum Initial (s)	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.0	10.0	10.0		10.0	10.0	10.0	10.0	10.0	30.0
Total Split (s)	18.0	19.0	19.0	42.0	23.0	23.0	19.0	23.0	18.0	30.0
Total Split (%)	20.0%	21.1%	21.1%	46.7%	25.6%	25.6%	21%	26%	20%	33%
Yellow Time (s)	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lead/Lag		Lag	Lag		Lead	Lead	Lag	Lead		
Lead-Lag Optimize?										
Recall Mode	Max	Max	Max		Max	Max	Max	Max	Max	Max
v/c Ratio	0.75	0.54	0.77	0.99	0.72	0.40				
Control Delay	55.0	9.2	29.3	29.6	39.3	9.4				
Queue Delay	0.0	0.4	202.3	90.2	20.8	0.0				
Total Delay	55.0	9.6	231.6	119.8	60.2	9.4				
Queue Length 50th (ft)	114	0	135	464	150	9				
Queue Length 95th (ft)	#219	65	m137	m432	207	63				
Internal Link Dist (ft)	525			79	1579					
Turn Bay Length (ft)		275				100				
Base Capacity (vph)	275	481	289	771	747	465				
Starvation Cap Reductn	0	0	134	149	0	0				
Spillback Cap Reductn	0	37	0	0	212	0				
Storage Cap Reductn	0	0	0	0	0	0				
Reduced v/c Ratio	0.75	0.59	1.44	1.22	1.01	0.40				

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Pretimed
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: Lake St & US 7



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0	4.0
Lane Util. Factor	1.00	1.00	0.95		1.00	1.00
Frt	1.00	0.85	0.98		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	1583	3417		1770	1863
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1770	1583	3417		1770	1863
Volume (vph)	85	255	650	75	165	570
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	92	277	707	82	179	620
RTOR Reduction (vph)	0	231	9	0	0	0
Lane Group Flow (vph)	92	46	780	0	179	620
Heavy Vehicles (%)	2%	2%	4%	4%	2%	2%
Turn Type		Over			Prot	
Protected Phases	8	1	2		1	1 6
Permitted Phases						
Actuated Green, G (s)	14.0	15.0	19.0		15.0	38.0
Effective Green, g (s)	14.0	15.0	19.0		15.0	38.0
Actuated g/C Ratio	0.16	0.17	0.21		0.17	0.42
Clearance Time (s)	4.0	4.0	4.0		4.0	
Lane Grp Cap (vph)	275	264	721		295	787
v/s Ratio Prot	c0.05	0.03	c0.23		0.10	c0.33
v/s Ratio Perm						
v/c Ratio	0.33	0.17	1.08		0.61	0.79
Uniform Delay, d1	33.9	32.2	35.5		34.8	22.5
Progression Factor	1.00	1.00	1.00		0.59	0.38
Incremental Delay, d2	3.3	1.4	57.6		6.7	5.9
Delay (s)	37.1	33.6	93.1		27.2	14.4
Level of Service	D	C	F		C	B
Approach Delay (s)	34.5		93.1			17.3
Approach LOS	C		F			B

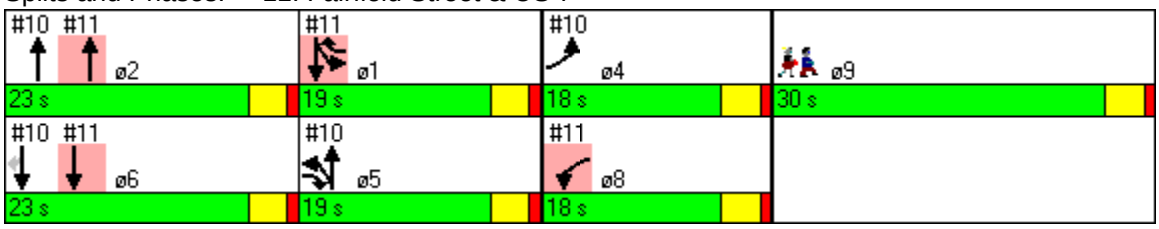
Intersection Summary			
HCM Average Control Delay	51.1	HCM Level of Service	D
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	38.0
Intersection Capacity Utilization	44.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	WBL	WBR	NBT	SBL	SBT	ø4	ø5	ø6	ø9
Lane Configurations									
Volume (vph)	85	255	650	165	570				
Lane Group Flow (vph)	92	277	789	179	620				
Turn Type		Over		Prot					
Protected Phases	8	1	2	1	1 6	4	5	6	9
Permitted Phases									
Detector Phases	8	1	2	1	1 6				
Minimum Initial (s)	5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0
Minimum Split (s)	10.0	10.0	10.0	10.0		10.0	10.0	10.0	30.0
Total Split (s)	18.0	19.0	23.0	19.0	42.0	18.0	19.0	23.0	30.0
Total Split (%)	20.0%	21.1%	25.6%	21.1%	46.7%	20%	21%	26%	33%
Yellow Time (s)	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0
Lead/Lag		Lag	Lead	Lag			Lag	Lead	
Lead-Lag Optimize?									
Recall Mode	Max	Max	Max	Max		Max	Max	Max	Max
v/c Ratio	0.33	0.56	1.08	0.61	0.79				
Control Delay	37.7	9.2	91.7	27.7	15.2				
Queue Delay	0.0	0.6	197.2	84.1	13.4				
Total Delay	37.7	9.8	288.8	111.8	28.7				
Queue Length 50th (ft)	47	0	~264	107	361				
Queue Length 95th (ft)	93	67	#382	m145	#440				
Internal Link Dist (ft)	263		1354		79				
Turn Bay Length (ft)		250							
Base Capacity (vph)	275	495	731	295	787				
Starvation Cap Reductn	0	0	0	139	156				
Spillback Cap Reductn	0	52	215	0	0				
Storage Cap Reductn	0	0	0	0	0				
Reduced v/c Ratio	0.33	0.63	1.53	1.15	0.98				

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Pretimed
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 11: Fairfield Street & US 7



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.94			0.96		1.00	0.99		1.00	0.98	
Flt Protected		0.99			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1725			1765		1736	1815		1770	1834	
Flt Permitted		0.91			0.80		0.10	1.00		0.12	1.00	
Satd. Flow (perm)		1586			1432		190	1815		216	1834	
Volume (vph)	65	100	150	20	45	30	150	655	30	30	535	60
Peak-hour factor, PHF	0.75	0.75	0.75	0.85	0.85	0.85	0.80	0.80	0.80	0.85	0.85	0.85
Adj. Flow (vph)	87	133	200	24	53	35	188	819	38	35	629	71
RTOR Reduction (vph)	0	31	0	0	16	0	0	1	0	0	4	0
Lane Group Flow (vph)	0	389	0	0	96	0	188	856	0	35	696	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	4%	4%	4%	2%	2%	2%
Turn Type	Perm			Perm			pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		20.2			20.2		48.0	40.4		36.1	33.5	
Effective Green, g (s)		21.2			21.2		49.0	41.4		38.1	34.5	
Actuated g/C Ratio		0.25			0.25		0.57	0.48		0.44	0.40	
Clearance Time (s)		5.0			5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		391			353		297	874		161	736	
v/s Ratio Prot							c0.08	c0.47		0.01	0.38	
v/s Ratio Perm		c0.25			0.07		0.28			0.09		
v/c Ratio		1.00			0.27		0.63	0.98		0.22	0.95	
Uniform Delay, d1		32.3			26.2		16.2	21.9		18.8	24.9	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		44.0			0.4		4.4	25.8		0.7	22.4	
Delay (s)		76.3			26.6		20.6	47.7		19.5	47.2	
Level of Service		E			C		C	D		B	D	
Approach Delay (s)		76.3			26.6			42.8			45.9	
Approach LOS		E			C			D			D	

Intersection Summary			
HCM Average Control Delay	49.1	HCM Level of Service	D
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	86.0	Sum of lost time (s)	19.8
Intersection Capacity Utilization	74.5%	ICU Level of Service	D
Analysis Period (min)	15		

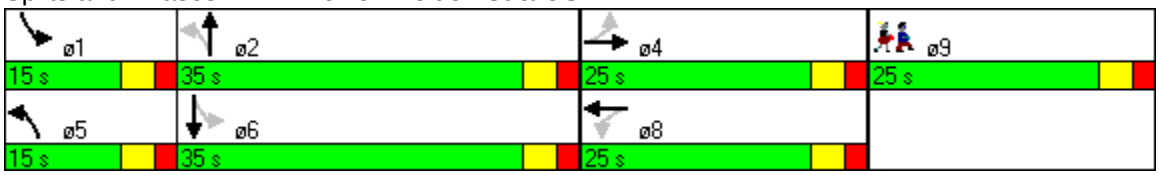
c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	ø9
Lane Configurations									
Volume (vph)	65	100	20	45	150	655	30	535	
Lane Group Flow (vph)	0	420	0	112	188	857	35	700	
Turn Type	Perm		Perm		pm+pt		pm+pt		
Protected Phases		4		8	5	2	1	6	9
Permitted Phases	4		8		2		6		
Detector Phases	4	4	8	8	5	2	1	6	
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0
Minimum Split (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	22.0
Total Split (s)	25.0	25.0	25.0	25.0	15.0	35.0	15.0	35.0	25.0
Total Split (%)	25.0%	25.0%	25.0%	25.0%	15.0%	35.0%	15.0%	35.0%	25%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lead/Lag					Lead	Lag	Lead	Lag	
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	Max	None	Max	None
v/c Ratio		0.94		0.31	0.56	0.90	0.15	0.95	
Control Delay		59.5		23.6	18.7	34.9	12.0	49.7	
Queue Delay		0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay		59.5		23.6	18.7	34.9	12.0	49.7	
Queue Length 50th (ft)		171		33	34	259	6	296	
Queue Length 95th (ft)		#351		92	106	#795	26	#682	
Internal Link Dist (ft)		782		814		1730		1354	
Turn Bay Length (ft)					150		150		
Base Capacity (vph)		445		365	345	954	304	734	
Starvation Cap Reductn		0		0	0	0	0	0	
Spillback Cap Reductn		0		0	0	0	0	0	
Storage Cap Reductn		0		0	0	0	0	0	
Reduced v/c Ratio		0.94		0.31	0.54	0.90	0.12	0.95	

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 78.8
Natural Cycle: 140
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 12: Lower Welden St & US 7



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	60	440	515	135	345	485
Peak Hour Factor	0.86	0.86	0.75	0.75	0.86	0.86
Hourly flow rate (vph)	70	512	687	180	401	564
Pedestrians	2					
Lane Width (ft)	12.0					
Walking Speed (ft/s)	4.0					
Percent Blockage	0					
Right turn flare (veh)		13				
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2145	779			869	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2145	779			869	
tC, single (s)	6.5	6.3			4.1	
tC, 2 stage (s)						
tF (s)	3.6	3.4			2.2	
p0 queue free %	0	0			48	
cM capacity (veh/h)	25	389			774	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	581	867	401	564
Volume Left	70	0	401	0
Volume Right	512	180	0	0
cSH	179	1700	774	1700
Volume to Capacity	3.24	0.51	0.52	0.33
Queue Length 95th (ft)	Err	0	76	0
Control Delay (s)	Err	0.0	14.5	0.0
Lane LOS	F		B	
Approach Delay (s)	Err	0.0	6.0	
Approach LOS	F			

Intersection Summary			
Average Delay	2411.4		
Intersection Capacity Utilization	69.3%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	45	90	140	815	740	45
Peak Hour Factor	0.80	0.80	0.81	0.81	0.86	0.86
Hourly flow rate (vph)	56	112	173	1006	860	52
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2238	887	913			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2238	887	913			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	67	77			
cM capacity (veh/h)	36	343	738			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	169	173	1006	913
Volume Left	56	173	0	0
Volume Right	112	0	0	52
cSH	89	738	1700	1700
Volume to Capacity	1.91	0.23	0.59	0.54
Queue Length 95th (ft)	360	23	0	0
Control Delay (s)	525.7	11.4	0.0	0.0
Lane LOS	F	B		
Approach Delay (s)	525.7	1.7		0.0
Approach LOS	F			

Intersection Summary			
Average Delay	40.1		
Intersection Capacity Utilization	67.5%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	95	75	125	60	60	80
Peak Hour Factor	0.79	0.79	0.76	0.76	0.86	0.86
Hourly flow rate (vph)	120	95	164	79	70	93
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	243				539	204
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	243				539	204
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	91				85	89
cM capacity (veh/h)	1317				454	832

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total	215	243	70	93
Volume Left	120	0	70	0
Volume Right	0	79	0	93
cSH	1317	1700	454	832
Volume to Capacity	0.09	0.14	0.15	0.11
Queue Length 95th (ft)	8	0	13	9
Control Delay (s)	4.8	0.0	14.4	9.9
Lane LOS	A		B	A
Approach Delay (s)	4.8	0.0	11.8	
Approach LOS			B	

Intersection Summary			
Average Delay	4.8		
Intersection Capacity Utilization	32.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	10	250	55	20	205	30	65	65	25	40	65	15
Peak Hour Factor	0.75	0.75	0.75	0.86	0.86	0.86	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	13	333	73	23	238	35	71	71	27	43	71	16
Pedestrians					3						6	
Lane Width (ft)					11.0						12.0	
Walking Speed (ft/s)					4.0						4.0	
Percent Blockage					0						0	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)					862							
pX, platoon unblocked												
vC, conflicting volume	279			407			751	722	373	770	742	262
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	279			407			751	722	373	770	742	262
tC, single (s)	4.1			4.2			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			98			73	79	96	82	79	98
cM capacity (veh/h)	1277			1131			261	340	672	247	332	773

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	420	297	168	130
Volume Left	13	23	71	43
Volume Right	73	35	27	16
cSH	1277	1131	325	318
Volume to Capacity	0.01	0.02	0.52	0.41
Queue Length 95th (ft)	1	2	71	48
Control Delay (s)	0.4	0.8	27.5	24.0
Lane LOS	A	A	D	C
Approach Delay (s)	0.4	0.8	27.5	24.0
Approach LOS			D	C

Intersection Summary			
Average Delay	8.0		
Intersection Capacity Utilization	40.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	55	35	85	65	55	35
Peak Hour Factor	0.76	0.76	0.84	0.84	0.78	0.78
Hourly flow rate (vph)	72	46	101	77	71	45
Pedestrians		1	3			
Lane Width (ft)		12.0	12.0			
Walking Speed (ft/s)		4.0	4.0			
Percent Blockage		0	0			
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	179				334	141
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	179				334	141
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	95				89	95
cM capacity (veh/h)	1409				630	912

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	118	179	115
Volume Left	72	0	71
Volume Right	0	77	45
cSH	1409	1700	716
Volume to Capacity	0.05	0.11	0.16
Queue Length 95th (ft)	4	0	14
Control Delay (s)	4.9	0.0	11.0
Lane LOS	A		B
Approach Delay (s)	4.9	0.0	11.0
Approach LOS			B

Intersection Summary			
Average Delay	4.5		
Intersection Capacity Utilization	28.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	350	335	35	15	275	85	15	65	40	55	40	320
Peak Hour Factor	0.96	0.96	0.96	0.93	0.93	0.93	0.59	0.59	0.59	0.86	0.86	0.86
Hourly flow rate (vph)	365	349	36	16	296	91	25	110	68	64	47	372
Pedestrians		1			4			15			15	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			0			1			1	
Right turn flare (veh)												5
Median type								None			None	
Median storage veh)												
Upstream signal (ft)					605							
pX, platoon unblocked												
vC, conflicting volume	402			400			1695	1546	386	1612	1518	357
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	402			400			1695	1546	386	1612	1518	357
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 %	68			99			0	0	90	0	40	45
cM capacity (veh/h)	1147			1138			13	76	656	0	78	678

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	750	403	203	483
Volume Left	365	16	25	64
Volume Right	36	91	68	372
cSH	1147	1138	58	17
Volume to Capacity	0.32	0.01	3.48	27.58
Queue Length 95th (ft)	34	1	Err	Err
Control Delay (s)	6.7	0.5	Err	Err
Lane LOS	A	A	F	F
Approach Delay (s)	6.7	0.5	Err	Err
Approach LOS			F	F

Intersection Summary			
Average Delay	3732.1		
Intersection Capacity Utilization	83.5%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	200	55	270	200	105	395
Peak Hour Factor	0.97	0.97	0.98	0.98	0.86	0.86
Hourly flow rate (vph)	206	57	276	204	122	459
Pedestrians					4	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)				655		
pX, platoon unblocked						
vC, conflicting volume			267		994	239
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			267		994	239
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			79		43	42
cM capacity (veh/h)			1287		213	798

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	263	480	581
Volume Left	0	276	122
Volume Right	57	0	459
cSH	1700	1287	506
Volume to Capacity	0.15	0.21	1.15
Queue Length 95th (ft)	0	20	505
Control Delay (s)	0.0	5.8	115.0
Lane LOS		A	F
Approach Delay (s)	0.0	5.8	115.0
Approach LOS			F

Intersection Summary			
Average Delay	52.6		
Intersection Capacity Utilization	79.6%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	230	355	90	210	195	5	55	105	215	5	215	190
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	14	14	12
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frt	1.00	0.97		1.00	1.00		1.00	0.90			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			1.00	1.00
Satd. Flow (prot)	1736	1758		1703	1786		1671	1582			1985	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00			0.99	1.00
Satd. Flow (perm)	1736	1758		1703	1786		1671	1582			1966	1583
Peak-hour factor, PHF	0.89	0.89	0.89	0.91	0.91	0.91	0.75	0.75	0.75	0.92	0.92	0.92
Adj. Flow (vph)	258	399	101	231	214	5	73	140	287	5	234	207
RTOR Reduction (vph)	0	8	0	0	1	0	0	45	0	0	0	133
Lane Group Flow (vph)	258	492	0	231	218	0	73	382	0	0	239	74
Confl. Peds. (#/hr)			9	9								
Heavy Vehicles (%)	4%	4%	4%	6%	6%	6%	8%	8%	8%	2%	2%	2%
Turn Type	Prot			Prot			Prot			Perm		pm+ov
Protected Phases	5	2		1	6		3	3 4			4	5
Permitted Phases										4		4
Actuated Green, G (s)	20.0	28.8		15.0	23.8		25.7	51.8			21.1	41.1
Effective Green, g (s)	21.0	29.8		16.0	24.8		26.7	52.8			22.1	43.1
Actuated g/C Ratio	0.18	0.25		0.13	0.21		0.22	0.44			0.18	0.36
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0				5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0				3.0	3.0
Lane Grp Cap (vph)	304	437		227	369		372	696			362	621
v/s Ratio Prot	c0.15	c0.28		c0.14	0.12		0.04	c0.24				0.02
v/s Ratio Perm											c0.12	0.03
v/c Ratio	0.85	1.13		1.02	0.59		0.20	0.55			0.66	0.12
Uniform Delay, d1	48.0	45.1		52.0	43.0		37.9	24.8			45.5	25.7
Progression Factor	1.00	1.00		0.80	0.85		1.00	1.00			1.00	1.00
Incremental Delay, d2	19.3	82.5		62.9	6.5		0.3	0.9			4.5	0.1
Delay (s)	67.2	127.6		104.4	43.2		38.2	25.7			49.9	25.8
Level of Service	E	F		F	D		D	C			D	C
Approach Delay (s)		107.0			74.6			27.5			38.7	
Approach LOS		F			E			C			D	

Intersection Summary			
HCM Average Control Delay	67.7	HCM Level of Service	E
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	21.4
Intersection Capacity Utilization	79.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

1: US Route 7 & Nason St Connector

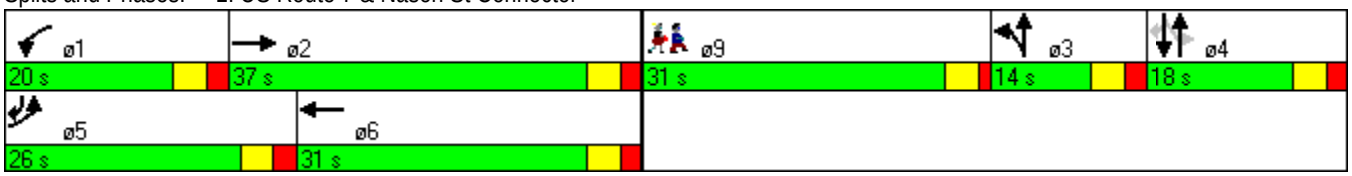
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR	ø9
Lane Configurations										
Volume (vph)	230	355	210	195	55	105	5	215	190	
Lane Group Flow (vph)	258	500	231	219	73	427	0	239	207	
Turn Type	Prot		Prot		Prot		Perm		pm+ov	
Protected Phases	5	2	1	6	3	3 4		4	5	9
Permitted Phases							4		4	
Detector Phase	5	2	1	6	3	3 4	4	4	5	
Switch Phase										
Minimum Initial (s)	5.0	10.0	5.0	10.0	5.0		5.0	5.0	5.0	4.0
Minimum Split (s)	15.0	15.0	15.0	15.0	13.0		15.0	15.0	15.0	31.0
Total Split (s)	26.0	37.0	20.0	31.0	14.0	32.0	18.0	18.0	26.0	31.0
Total Split (%)	21.7%	30.8%	16.7%	25.8%	11.7%	26.7%	15.0%	15.0%	21.7%	26%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lead	Lag	Lead	Lag	Lag				Lead	Lead
Lead-Lag Optimize?										
Recall Mode	None	C-Min	None	C-Min	None		None	None	None	None
v/c Ratio	0.85	1.02	1.02	0.52	0.20	0.58		0.66	0.28	
Control Delay	73.0	87.9	105.7	39.5	42.7	26.4		56.2	4.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	73.0	87.9	105.7	39.5	42.7	26.4		56.2	4.6	
Queue Length 50th (ft)	194	~404	~136	170	44	177		171	0	
Queue Length 95th (ft)	#322	#608	#337	200	88	#344		#363	53	
Internal Link Dist (ft)		422		220		1239		966		
Turn Bay Length (ft)			150						200	
Base Capacity (vph)	318	491	227	418	371	740		363	759	
Starvation Cap Reductn	0	0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0		0	0	
Storage Cap Reductn	0	0	0	0	0	0		0	0	
Reduced v/c Ratio	0.81	1.02	1.02	0.52	0.20	0.58		0.66	0.27	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 55 (46%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow
Natural Cycle: 120
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

1: US Route 7 & Nason St Connector

Splits and Phases: 1: US Route 7 & Nason St Connector



Movement	EBL	EBR	EBR2	NBL	NBT	NBR	SBL	SBT	NWL2	NWT	NWR
Lane Configurations											
Volume (vph)	90	110	50	50	210	90	125	175	35	75	230
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	12	12	12	12	12	14	14	12	12	12
Total Lost time (s)	4.0	4.0			5.0			3.0	4.0	5.0	4.0
Lane Util. Factor	1.00	1.00			1.00			1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00			0.99			1.00	1.00	1.00	0.96
Flpb, ped/bikes	0.99	1.00			1.00			1.00	0.99	1.00	1.00
Frt	1.00	0.85			0.97			1.00	1.00	0.95	0.85
Flt Protected	0.95	1.00			0.99			0.98	0.95	1.00	1.00
Satd. Flow (prot)	1636	1524			1698			1891	1701	1719	1484
Flt Permitted	0.95	1.00			0.99			0.98	0.95	1.00	1.00
Satd. Flow (perm)	1636	1524			1698			1891	1701	1719	1484
Peak-hour factor, PHF	0.72	0.72	0.72	0.80	0.80	0.80	0.86	0.86	0.84	0.84	0.84
Adj. Flow (vph)	125	153	69	62	262	112	145	203	42	89	274
RTOR Reduction (vph)	0	14	0	0	11	0	0	0	0	0	248
Lane Group Flow (vph)	125	208	0	0	425	0	0	348	42	89	26
Confl. Peds. (#/hr)	3		2			14	14		2		3
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	5%	5%	5%	5%	5%
Turn Type		custom		Split			Split		Perm		Perm
Protected Phases	5	2		4	4		3	3		6	
Permitted Phases	2								6		6
Actuated Green, G (s)	26.4	26.4			32.3			37.9	10.5	10.5	10.5
Effective Green, g (s)	27.4	27.4			33.3			40.9	11.5	10.5	11.5
Actuated g/C Ratio	0.23	0.23			0.28			0.34	0.10	0.09	0.10
Clearance Time (s)	5.0	5.0			6.0			6.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0			3.0			3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	374	348			471			645	163	150	142
v/s Ratio Prot	0.03	c0.14			c0.25			c0.18		0.05	
v/s Ratio Perm	0.04								0.02		0.02
v/c Ratio	0.33	0.60			0.90			0.54	0.26	0.59	0.18
Uniform Delay, d1	38.7	41.4			41.8			31.9	50.3	52.7	49.9
Progression Factor	1.00	1.00			0.92			1.00	1.05	1.06	2.24
Incremental Delay, d2	0.5	2.8			20.0			3.2	0.7	5.3	0.5
Delay (s)	39.2	44.1			58.4			35.2	53.7	61.3	112.5
Level of Service	D	D			E			D	D	E	F
Approach Delay (s)	42.4				58.4			35.2		95.2	
Approach LOS	D				E			D		F	

Intersection Summary			
HCM Average Control Delay	59.2	HCM Level of Service	E
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.4
Intersection Capacity Utilization	61.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

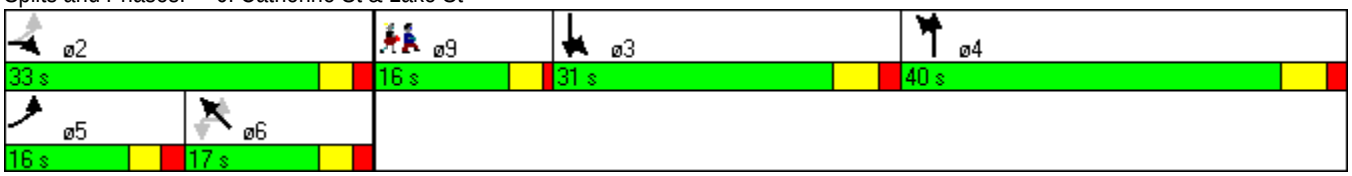
6: Catherine St & Lake St

Lane Group	EBL	EBR	NBT	SBT	NWL2	NWT	NWR	ø9
Lane Configurations								
Volume (vph)	90	110	210	175	35	75	230	
Lane Group Flow (vph)	125	222	436	348	42	89	274	
Turn Type		custom			Perm		Perm	
Protected Phases	5	2	4	3		6		9
Permitted Phases	2				6		6	
Detector Phase	5	2	4	3	6	6	6	
Switch Phase								
Minimum Initial (s)	10.0	10.0	5.0	5.0	4.0	4.0	4.0	4.0
Minimum Split (s)	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0
Total Split (s)	16.0	33.0	40.0	31.0	17.0	17.0	17.0	16.0
Total Split (%)	13.3%	27.5%	33.3%	25.8%	14.2%	14.2%	14.2%	13%
Yellow Time (s)	3.0	3.0	4.0	4.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-3.0	-1.0	0.0	-1.0	
Total Lost Time (s)	4.0	4.0	5.0	3.0	4.0	5.0	4.0	
Lead/Lag	Lead			Lag	Lag	Lag	Lag	Lead
Lead-Lag Optimize?								
Recall Mode	None	None	None	C-Min	None	None	None	None
v/c Ratio	0.33	0.61	0.91	0.50	0.26	0.59	0.70	
Control Delay	41.0	45.8	60.3	35.2	55.8	70.0	22.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	41.0	45.8	60.3	35.2	55.8	70.0	22.7	
Queue Length 50th (ft)	80	141	295	208	17	44	0	
Queue Length 95th (ft)	107	168	397	#349	m61	119	151	
Internal Link Dist (ft)	486		514	140		468		
Turn Bay Length (ft)	300				50		370	
Base Capacity (vph)	374	382	508	696	184	172	405	
Starvation Cap Reductn	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.33	0.58	0.86	0.50	0.23	0.52	0.68	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 28 (23%), Referenced to phase 3:SBTL, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: Catherine St & Lake St



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	85	175	290	150	85	215
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.95
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1752	1568	1698	1792	1776	1438
Flt Permitted	0.95	1.00	0.45	1.00	1.00	1.00
Satd. Flow (perm)	1752	1568	795	1792	1776	1438
Peak-hour factor, PHF	0.85	0.85	0.94	0.94	0.89	0.89
Adj. Flow (vph)	100	206	309	160	96	242
RTOR Reduction (vph)	0	102	0	0	0	216
Lane Group Flow (vph)	100	104	309	160	96	26
Confl. Peds. (#/hr)			6			6
Heavy Vehicles (%)	3%	3%	6%	6%	7%	7%
Turn Type		Prot	pm+pt			Perm
Protected Phases	2	2	3	8	4	
Permitted Phases			8			4
Actuated Green, G (s)	59.6	59.6	42.0	42.0	11.8	11.8
Effective Green, g (s)	60.6	60.6	43.0	43.0	12.8	12.8
Actuated g/C Ratio	0.51	0.51	0.36	0.36	0.11	0.11
Clearance Time (s)	6.0	6.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	885	792	482	642	189	153
v/s Ratio Prot	0.06	c0.07	c0.14	0.09	0.05	
v/s Ratio Perm			c0.09			0.02
v/c Ratio	0.11	0.13	0.64	0.25	0.51	0.17
Uniform Delay, d1	15.6	15.7	30.4	27.1	50.6	48.8
Progression Factor	0.91	0.93	0.91	0.91	1.00	1.00
Incremental Delay, d2	0.2	0.3	2.8	0.2	2.1	0.5
Delay (s)	14.4	14.9	30.6	24.8	52.8	49.3
Level of Service	B	B	C	C	D	D
Approach Delay (s)	14.7			28.6	50.3	
Approach LOS	B			C	D	

Intersection Summary			
HCM Average Control Delay	31.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.4
Intersection Capacity Utilization	38.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

7: Federal St & Lower Newton St

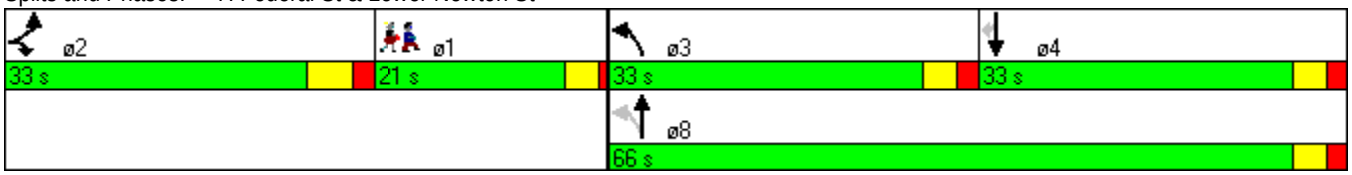
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	ø1
Lane Configurations							
Volume (vph)	85	175	290	150	85	215	
Lane Group Flow (vph)	100	206	309	160	96	242	
Turn Type		Prot	pm+pt			Perm	
Protected Phases	2	2	3	8	4		1
Permitted Phases			8			4	
Detector Phase	2	2	3	8	4	4	
Switch Phase							
Minimum Initial (s)	10.0	10.0	5.0	5.0	5.0	5.0	4.0
Minimum Split (s)	16.0	16.0	16.0	16.0	16.0	16.0	21.0
Total Split (s)	33.0	33.0	33.0	66.0	33.0	33.0	21.0
Total Split (%)	27.5%	27.5%	27.5%	55.0%	27.5%	27.5%	18%
Yellow Time (s)	4.0	4.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lead	Lead	Lead		Lag	Lag	Lag
Lead-Lag Optimize?							
Recall Mode	C-Min	C-Min	None	None	None	None	None
v/c Ratio	0.11	0.22	0.64	0.25	0.51	0.65	
Control Delay	17.5	3.8	32.6	24.0	59.1	14.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	17.5	3.8	32.6	24.0	59.1	14.6	
Queue Length 50th (ft)	25	3	193	91	71	0	
Queue Length 95th (ft)	m84	m47	136	75	121	73	
Internal Link Dist (ft)	2598			579	189		
Turn Bay Length (ft)		225	175			100	
Base Capacity (vph)	931	930	510	926	429	537	
Starvation Cap Reductn	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	
Reduced v/c Ratio	0.11	0.22	0.61	0.17	0.22	0.45	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 8 (7%), Referenced to phase 2:EBL, Start of Yellow
Natural Cycle: 70
Control Type: Actuated-Coordinated

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 7: Federal St & Lower Newton St



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	390	5	10	345	370	10	30	10	170	20	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			0%			-4%			4%	
Total Lost time (s)	4.0	4.0			4.0	4.0		4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00			1.00	1.00		1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00			1.00	0.98		1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00			1.00	1.00		1.00		1.00	1.00	
Frt	1.00	1.00			1.00	0.85		0.97		1.00	0.88	
Flt Protected	0.95	1.00			1.00	1.00		0.99		0.95	1.00	
Satd. Flow (prot)	1702	1788			1824	1521		1866		1717	1568	
Flt Permitted	0.45	1.00			0.99	1.00		0.99		0.95	1.00	
Satd. Flow (perm)	809	1788			1802	1521		1866		1717	1568	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.73	0.73	0.73	0.91	0.91	0.91
Adj. Flow (vph)	46	448	6	11	397	425	14	41	14	187	22	77
RTOR Reduction (vph)	0	0	0	0	0	136	0	8	0	0	65	0
Lane Group Flow (vph)	46	454	0	0	408	289	0	61	0	187	34	0
Confl. Peds. (#/hr)	1		1	1		1	1					1
Heavy Vehicles (%)	6%	6%	6%	4%	4%	4%	0%	0%	0%	3%	3%	3%
Turn Type	Perm			Perm		Perm	Split			Split		
Protected Phases		2			6		3	3		4	4	
Permitted Phases	2			6		6						
Actuated Green, G (s)	71.7	71.7			71.7	71.7		6.4		17.3	17.3	
Effective Green, g (s)	72.7	72.7			72.7	72.7		7.4		18.3	18.3	
Actuated g/C Ratio	0.61	0.61			0.61	0.61		0.06		0.15	0.15	
Clearance Time (s)	5.0	5.0			5.0	5.0		5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0			3.0	3.0		1.0		3.0	3.0	
Lane Grp Cap (vph)	490	1083			1092	921		115		262	239	
v/s Ratio Prot		c0.25						c0.03		c0.11	0.02	
v/s Ratio Perm	0.06				0.23	0.19						
v/c Ratio	0.09	0.42			0.37	0.31		0.53		0.71	0.14	
Uniform Delay, d1	9.9	12.5			12.0	11.5		54.6		48.4	44.0	
Progression Factor	1.49	1.40			1.00	1.00		1.00		0.71	0.47	
Incremental Delay, d2	0.4	1.2			1.0	0.9		2.4		8.8	0.3	
Delay (s)	15.1	18.7			13.0	12.4		57.0		42.9	21.1	
Level of Service	B	B			B	B		E		D	C	
Approach Delay (s)		18.3			12.7			57.0			35.4	
Approach LOS		B			B			E			D	

Intersection Summary			
HCM Average Control Delay	20.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	21.6
Intersection Capacity Utilization	58.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

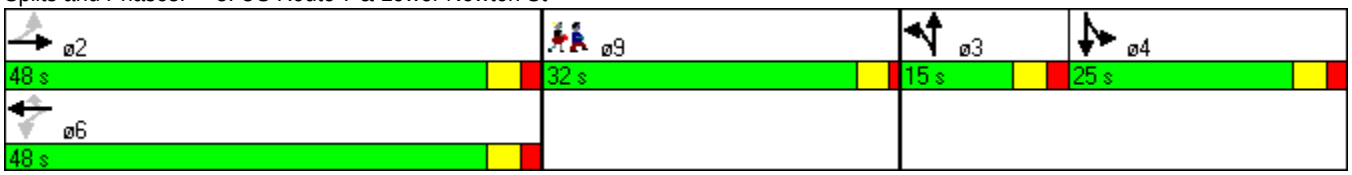
8: US Route 7 & Lower Newton St

Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	SBL	SBT	ø9
Lane Configurations									
Volume (vph)	40	390	10	345	370	30	170	20	
Lane Group Flow (vph)	46	454	0	408	425	69	187	99	
Turn Type	Perm		Perm		Perm		Split		
Protected Phases		2		6		3	4	4	9
Permitted Phases	2		6		6				
Detector Phase	2	2	6	6	6	3	4	4	
Switch Phase									
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	5.0	5.0	5.0	4.0
Minimum Split (s)	16.0	16.0	16.0	16.0	16.0	15.0	16.0	16.0	32.0
Total Split (s)	48.0	48.0	48.0	48.0	48.0	15.0	25.0	25.0	32.0
Total Split (%)	40.0%	40.0%	40.0%	40.0%	40.0%	12.5%	20.8%	20.8%	27%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag						Lead	Lag	Lag	
Lead-Lag Optimize?									
Recall Mode	C-Min	C-Min	C-Min	C-Min	C-Min	None	None	None	None
v/c Ratio	0.09	0.40		0.35	0.39	0.50	0.72	0.33	
Control Delay	23.3	22.5		15.7	5.1	59.4	49.2	9.6	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	23.3	22.5		15.7	5.1	59.4	49.2	9.6	
Queue Length 50th (ft)	8	92		123	20	46	127	5	
Queue Length 95th (ft)	70	460		349	118	73	214	64	
Internal Link Dist (ft)		1214		511		209		579	
Turn Bay Length (ft)	115				150		315		
Base Capacity (vph)	519	1146		1156	1098	178	302	340	
Starvation Cap Reductn	0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	
Reduced v/c Ratio	0.09	0.40		0.35	0.39	0.39	0.62	0.29	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 59 (49%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated

Splits and Phases: 8: US Route 7 & Lower Newton St



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	370	85	35	355	45	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	1.00		1.00	1.00	1.00	1.00
Frt	0.97		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	1781		1736	1827	1787	1599
Flt Permitted	1.00		0.41	1.00	0.95	1.00
Satd. Flow (perm)	1781		752	1827	1787	1599
Peak-hour factor, PHF	0.91	0.91	0.95	0.95	0.92	0.92
Adj. Flow (vph)	407	93	37	374	49	54
RTOR Reduction (vph)	4	0	0	0	0	50
Lane Group Flow (vph)	496	0	37	374	49	4
Heavy Vehicles (%)	4%	4%	4%	4%	1%	1%
Turn Type			pm+pt			Prot
Protected Phases	2		1	6	8	8
Permitted Phases			6			
Actuated Green, G (s)	85.5		94.4	94.4	7.6	7.6
Effective Green, g (s)	86.5		95.4	95.4	8.6	8.6
Actuated g/C Ratio	0.72		0.80	0.80	0.07	0.07
Clearance Time (s)	5.0		5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1284		638	1452	128	115
v/s Ratio Prot	c0.28		0.00	c0.20	c0.03	0.00
v/s Ratio Perm			0.04			
v/c Ratio	0.39		0.06	0.26	0.38	0.03
Uniform Delay, d1	6.5		3.3	3.2	53.2	51.8
Progression Factor	0.26		0.20	0.20	1.00	1.00
Incremental Delay, d2	0.8		0.0	0.4	1.9	0.1
Delay (s)	2.5		0.7	1.0	55.1	52.0
Level of Service	A		A	A	E	D
Approach Delay (s)	2.5			1.0	53.4	
Approach LOS	A			A	D	

Intersection Summary			
HCM Average Control Delay	7.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	39.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBL	WBT	NBL	NBR	ø7
Lane Configurations						
Volume (vph)	370	35	355	45	50	
Lane Group Flow (vph)	500	37	374	49	54	
Turn Type		pm+pt			Prot	
Protected Phases	2	1	6	8	8	7
Permitted Phases		6				
Detector Phase	2	1	6	8	8	
Switch Phase						
Minimum Initial (s)	10.0	5.0	10.0	5.0	5.0	4.0
Minimum Split (s)	16.0	16.0	16.0	16.0	16.0	24.0
Total Split (s)	60.0	16.0	76.0	20.0	20.0	24.0
Total Split (%)	50.0%	13.3%	63.3%	16.7%	16.7%	20%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lag	Lead		Lag	Lag	Lead
Lead-Lag Optimize?						
Recall Mode	C-Min	None	C-Min	None	None	None
v/c Ratio	0.36	0.05	0.24	0.34	0.30	
Control Delay	2.7	1.1	1.2	57.6	17.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	2.7	1.1	1.2	57.6	17.7	
Queue Length 50th (ft)	1	2	17	36	0	
Queue Length 95th (ft)	332	4	31	75	39	
Internal Link Dist (ft)	1628		1214	63		
Turn Bay Length (ft)		150				
Base Capacity (vph)	1391	723	1529	238	260	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.36	0.05	0.24	0.21	0.21	

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 114 (95%), Referenced to phase 2:EBT and 6:WBTL, Start of Yellow
Natural Cycle: 80
Control Type: Actuated-Coordinated

Splits and Phases: 9: US Route 7 & JC Penny Plaza

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	145	400	295	205	140	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1736	1827	3471	1553	1719	1538
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1736	1827	3471	1553	1719	1538
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	158	435	321	223	152	130
RTOR Reduction (vph)	0	0	0	133	0	97
Lane Group Flow (vph)	158	435	321	90	152	33
Heavy Vehicles (%)	4%	4%	4%	4%	5%	5%
Turn Type	Prot			Perm		Over
Protected Phases	5	2 5	6		4	5
Permitted Phases				6		
Actuated Green, G (s)	29.1	59.7	47.2	47.2	15.1	29.1
Effective Green, g (s)	30.1	60.7	48.2	48.2	16.1	30.1
Actuated g/C Ratio	0.25	0.51	0.40	0.40	0.13	0.25
Clearance Time (s)	5.0		5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	435	924	1394	624	231	386
v/s Ratio Prot	0.09	c0.24	c0.09		c0.09	0.02
v/s Ratio Perm				0.06		
v/c Ratio	0.36	0.47	0.23	0.14	0.66	0.08
Uniform Delay, d1	37.1	19.2	23.7	22.8	49.3	34.4
Progression Factor	0.67	0.53	0.81	0.94	0.61	1.02
Incremental Delay, d2	0.5	0.4	0.4	0.5	5.9	0.1
Delay (s)	25.4	10.6	19.6	22.0	36.2	35.1
Level of Service	C	B	B	C	D	D
Approach Delay (s)		14.6	20.6		35.7	
Approach LOS		B	C		D	

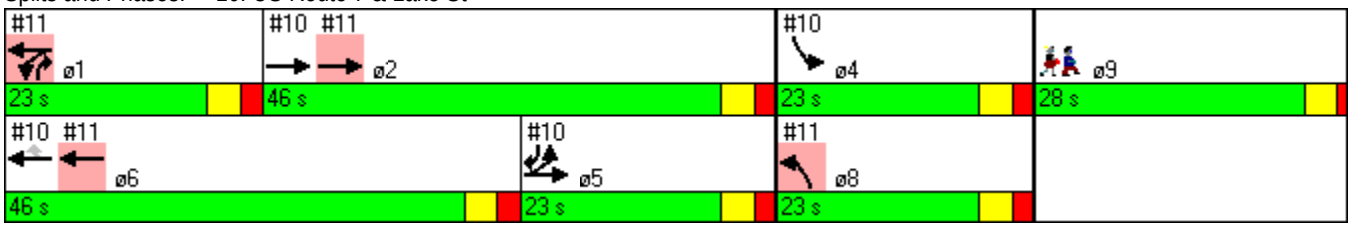
Intersection Summary			
HCM Average Control Delay	21.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	25.6
Intersection Capacity Utilization	35.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	ø1	ø2	ø8	ø9
Lane Configurations										
Volume (vph)	145	400	295	205	140	120				
Lane Group Flow (vph)	158	435	321	223	152	130				
Turn Type	Prot			Perm		Over				
Protected Phases	5	2 5	6		4	5	1	2	8	9
Permitted Phases				6						
Detector Phase	5	2 5	6	6	4	5				
Switch Phase										
Minimum Initial (s)	5.0		10.0	10.0	5.0	5.0	5.0	10.0	5.0	4.0
Minimum Split (s)	16.0		16.0	16.0	16.0	16.0	16.0	16.0	16.0	28.0
Total Split (s)	23.0	69.0	46.0	46.0	23.0	23.0	23.0	46.0	23.0	28.0
Total Split (%)	19.2%	57.5%	38.3%	38.3%	19.2%	19.2%	19%	38%	19%	23%
Yellow Time (s)	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0				
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0				
Lead/Lag	Lag		Lead	Lead		Lag	Lead	Lag		
Lead-Lag Optimize?							Yes	Yes		
Recall Mode	None		C-Min	C-Min	None	None	None	C-Min	None	None
v/c Ratio	0.36	0.45	0.22	0.28	0.66	0.27				
Control Delay	27.6	14.0	21.6	5.0	42.6	8.0				
Queue Delay	94.0	1.3	0.0	0.0	0.0	0.3				
Total Delay	121.7	15.2	21.6	5.0	42.6	8.2				
Queue Length 50th (ft)	83	69	86	20	118	4				
Queue Length 95th (ft)	159	342	76	1	178	53				
Internal Link Dist (ft)		60	1628		514					
Turn Bay Length (ft)				100		275				
Base Capacity (vph)	436	970	1579	828	273	483				
Starvation Cap Reductn	300	326	0	0	0	0				
Spillback Cap Reductn	0	0	46	0	0	92				
Storage Cap Reductn	0	0	0	0	0	0				
Reduced v/c Ratio	1.16	0.68	0.21	0.27	0.56	0.33				

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 6 (5%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow
Natural Cycle: 80
Control Type: Actuated-Coordinated

Splits and Phases: 10: US Route 7 & Lake St



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	315	105	140	275	95	230
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	0.95		1.00	1.00	1.00	1.00
Frt	0.96		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3341		1736	1827	1770	1583
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3341		1736	1827	1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	342	114	152	299	103	250
RTOR Reduction (vph)	21	0	0	0	0	213
Lane Group Flow (vph)	435	0	152	299	103	37
Heavy Vehicles (%)	4%	4%	4%	4%	2%	2%
Turn Type			Prot			Over
Protected Phases	2		1	1 6	8	1
Permitted Phases						
Actuated Green, G (s)	59.7		16.6	47.2	15.1	16.6
Effective Green, g (s)	60.7		17.6	48.2	16.1	17.6
Actuated g/C Ratio	0.51		0.15	0.40	0.13	0.15
Clearance Time (s)	5.0		5.0		5.0	5.0
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Lane Grp Cap (vph)	1690		255	734	237	232
v/s Ratio Prot	c0.13		c0.09	c0.16	c0.06	0.02
v/s Ratio Perm						
v/c Ratio	0.26		0.60	0.41	0.43	0.16
Uniform Delay, d1	16.8		47.9	25.7	47.8	44.7
Progression Factor	0.75		0.68	0.52	1.00	1.00
Incremental Delay, d2	0.3		3.7	0.4	1.3	0.3
Delay (s)	12.9		36.0	13.7	49.0	45.0
Level of Service	B		D	B	D	D
Approach Delay (s)	12.9			21.2	46.2	
Approach LOS	B			C	D	

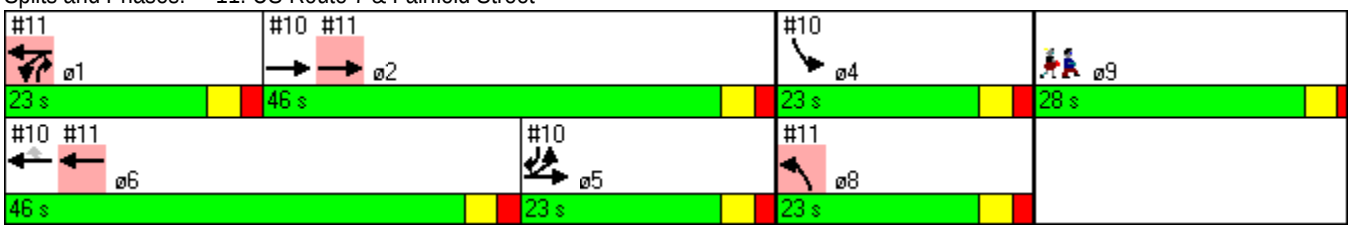
Intersection Summary			
HCM Average Control Delay	25.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	21.6
Intersection Capacity Utilization	35.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBL	WBT	NBL	NBR	ø4	ø5	ø6	ø9
Lane Configurations									
Volume (vph)	315	140	275	95	230				
Lane Group Flow (vph)	456	152	299	103	250				
Turn Type		Prot			Over				
Protected Phases	2	1	1 6	8	1	4	5	6	9
Permitted Phases									
Detector Phase	2	1	1 6	8	1				
Switch Phase									
Minimum Initial (s)	10.0	5.0		5.0	5.0	5.0	5.0	10.0	4.0
Minimum Split (s)	16.0	16.0		16.0	16.0	16.0	16.0	16.0	28.0
Total Split (s)	46.0	23.0	69.0	23.0	23.0	23.0	23.0	46.0	28.0
Total Split (%)	38.3%	19.2%	57.5%	19.2%	19.2%	19%	19%	38%	23%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0				
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0				
Lead/Lag	Lag	Lead			Lead		Lag	Lead	
Lead-Lag Optimize?	Yes	Yes			Yes				
Recall Mode	C-Min	None		None	None	None	None	C-Min	None
v/c Ratio	0.26	0.60	0.39	0.43	0.56				
Control Delay	13.9	41.9	16.5	52.9	10.6				
Queue Delay	0.1	70.3	0.8	0.0	2.3				
Total Delay	13.9	112.2	17.3	52.9	12.9				
Queue Length 50th (ft)	91	60	69	74	0				
Queue Length 95th (ft)	64	97	223	128	74				
Internal Link Dist (ft)	1342		60	263					
Turn Bay Length (ft)					250				
Base Capacity (vph)	1792	286	831	281	469				
Starvation Cap Reductn	0	148	280	0	0				
Spillback Cap Reductn	380	0	0	0	115				
Storage Cap Reductn	0	0	0	0	0				
Reduced v/c Ratio	0.32	1.10	0.54	0.37	0.71				

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 6 (5%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow
Natural Cycle: 80
Control Type: Actuated-Coordinated

Splits and Phases: 11: US Route 7 & Fairfield Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	65	420	30	40	370	25	10	70	45	85	70	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.99		1.00	0.99			0.95			0.99	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.98	
Satd. Flow (prot)	1736	1808		1736	1810			1765			1796	
Flt Permitted	0.43	1.00		0.39	1.00			0.97			0.64	
Satd. Flow (perm)	781	1808		720	1810			1727			1170	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	71	457	33	43	402	27	11	76	49	92	76	16
RTOR Reduction (vph)	0	2	0	0	1	0	0	18	0	0	3	0
Lane Group Flow (vph)	71	488	0	43	428	0	0	118	0	0	181	0
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	2%	2%	2%	2%	2%	2%
Turn Type	pm+pt			pm+pt			Perm			Perm		
Protected Phases	5	2		1	6			4			4	
Permitted Phases	2			6			4			4		
Actuated Green, G (s)	77.0	70.9		75.6	70.2			21.1			21.1	
Effective Green, g (s)	79.0	71.9		77.6	71.2			22.1			22.1	
Actuated g/C Ratio	0.66	0.60		0.65	0.59			0.18			0.18	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	571	1083		520	1074			318			215	
v/s Ratio Prot	c0.01	c0.27		0.00	0.24							
v/s Ratio Perm	0.07			0.05				0.07			c0.15	
v/c Ratio	0.12	0.45		0.08	0.40			0.37			0.84	
Uniform Delay, d1	7.9	13.2		8.5	13.0			42.9			47.3	
Progression Factor	0.97	0.99		1.52	1.24			1.00			1.00	
Incremental Delay, d2	0.1	0.9		0.1	1.1			0.7			24.5	
Delay (s)	7.8	13.9		12.9	17.2			43.6			71.7	
Level of Service	A	B		B	B			D			E	
Approach Delay (s)		13.2			16.8			43.6			71.7	
Approach LOS		B			B			D			E	

Intersection Summary			
HCM Average Control Delay	25.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.6
Intersection Capacity Utilization	54.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

12: US Route 7 & Lower Welden St

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	ø3
Lane Configurations									
Volume (vph)	65	420	40	370	10	70	85	70	
Lane Group Flow (vph)	71	490	43	429	0	136	0	184	
Turn Type	pm+pt		pm+pt		Perm		Perm		
Protected Phases	5	2	1	6		4		4	3
Permitted Phases	2		6		4		4		
Detector Phase	5	2	1	6	4	4	4	4	
Switch Phase									
Minimum Initial (s)	5.0	10.0	5.0	10.0	5.0	5.0	5.0	5.0	4.0
Minimum Split (s)	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	22.0
Total Split (s)	16.0	51.0	16.0	51.0	31.0	31.0	31.0	31.0	22.0
Total Split (%)	13.3%	42.5%	13.3%	42.5%	25.8%	25.8%	25.8%	25.8%	18%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lag	Lag	Lag	Lead
Lead-Lag Optimize?									
Recall Mode	None	C-Min	None	C-Min	None	None	None	None	None
v/c Ratio	0.12	0.43	0.08	0.38		0.40		0.84	
Control Delay	8.2	15.6	13.2	19.5		38.4		76.4	
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0	
Total Delay	8.2	15.6	13.2	19.5		38.4		76.4	
Queue Length 50th (ft)	15	137	4	53		77		135	
Queue Length 95th (ft)	m31	m439	35	330		134		#226	
Internal Link Dist (ft)		1737		1342		813		649	
Turn Bay Length (ft)	150		150						
Base Capacity (vph)	649	1148	610	1138		406		266	
Starvation Cap Reductn	0	0	0	0		0		0	
Spillback Cap Reductn	0	0	0	0		0		0	
Storage Cap Reductn	0	0	0	0		0		0	
Reduced v/c Ratio	0.11	0.43	0.07	0.38		0.33		0.69	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 7 (6%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

12: US Route 7 & Lower Welden St

Splits and Phases: 12: US Route 7 & Lower Welden St

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	55	520	400	20	60	10
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.82	0.82	0.91	0.91	0.82	0.82
Hourly flow rate (vph)	67	634	440	22	73	12
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		TWLTL	None			
Median storage veh)		2				
Upstream signal (ft)		300				
pX, platoon unblocked					0.77	
vC, conflicting volume	462				1219	451
vC1, stage 1 conf vol					451	
vC2, stage 2 conf vol					768	
vCu, unblocked vol	462				1134	451
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)	2.2				3.5	3.3
p0 queue free %	94				80	98
cM capacity (veh/h)	1089				369	609

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	67	634	462	85
Volume Left	67	0	0	73
Volume Right	0	0	22	12
cSH	1089	1700	1700	391
Volume to Capacity	0.06	0.37	0.27	0.22
Queue Length 95th (ft)	5	0	0	21
Control Delay (s)	8.5	0.0	0.0	16.8
Lane LOS	A			C
Approach Delay (s)	0.8		0.0	16.8
Approach LOS				C

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												
Volume (veh/h)	45	245	50	5	275	95	65	5	5	110	15	70
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.77	0.77	0.77	0.64	0.64	0.64	0.73	0.73	0.73
Hourly flow rate (vph)	49	266	54	6	357	123	102	8	8	151	21	96
Pedestrians					2							
Lane Width (ft)					11.0							
Walking Speed (ft/s)					4.0							
Percent Blockage					0							
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		1046										
pX, platoon unblocked												
vC, conflicting volume	481			321			868	885	295	810	850	419
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	481			321			868	885	295	810	850	419
tC, single (s)	4.1			4.2			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	95			99			52	97	99	46	93	85
cM capacity (veh/h)	1082			1217			211	270	743	279	284	636

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	49	321	6	481	117	151	116
Volume Left	49	0	6	0	102	151	0
Volume Right	0	54	0	123	8	0	96
cSH	1082	1700	1217	1700	225	279	522
Volume to Capacity	0.05	0.19	0.01	0.28	0.52	0.54	0.22
Queue Length 95th (ft)	4	0	0	0	68	74	21
Control Delay (s)	8.5	0.0	8.0	0.0	37.3	32.2	13.9
Lane LOS	A		A		E	D	B
Approach Delay (s)	1.1		0.1		37.3	24.2	
Approach LOS					E	C	

Intersection Summary			
Average Delay	9.1		
Intersection Capacity Utilization	44.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	200	30	0	0	0	0	0	45	5	45	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.82	0.92	0.82	0.92	0.65	0.65	0.82	0.82	0.92
Hourly flow rate (vph)	0	217	33	0	0	0	0	0	69	6	55	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)					566							
pX, platoon unblocked												
vC, conflicting volume	0			250			261	234	234	303	250	0
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	0			250			261	234	234	303	250	0
tC, single (s)	4.1			4.2			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	91	99	92	100
cM capacity (veh/h)	1623			1281			647	663	800	591	651	1085

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	250	69	61
Volume Left	0	0	6
Volume Right	33	69	0
cSH	1700	800	645
Volume to Capacity	0.15	0.09	0.09
Queue Length 95th (ft)	0	7	8
Control Delay (s)	0.0	9.9	11.2
Lane LOS		A	B
Approach Delay (s)	0.0	9.9	11.2
Approach LOS		A	B

Intersection Summary			
Average Delay	3.6		
Intersection Capacity Utilization	29.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	180	335	135	175	265	5	60	170	275	5	170	215
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	12	12	12	12	12	14	14	12
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0			4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00			1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frt	1.00	0.96		1.00	1.00		1.00	0.91			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			1.00	1.00
Satd. Flow (prot)	1736	1731		1770	1857		1703	1626			1984	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00			0.98	1.00
Satd. Flow (perm)	1736	1731		1770	1857		1703	1626			1947	1583
Peak-hour factor, PHF	0.75	0.75	0.75	0.86	0.86	0.86	0.86	0.86	0.86	0.92	0.92	0.92
Adj. Flow (vph)	240	447	180	203	308	6	70	198	320	5	185	234
RTOR Reduction (vph)	0	12	0	0	1	0	0	33	0	0	0	172
Lane Group Flow (vph)	240	615	0	203	313	0	70	485	0	0	190	62
Confl. Peds. (#/hr)			9	9								
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	6%	6%	6%	2%	2%	2%
Turn Type	Prot			Prot			Prot			Perm		pm+ov
Protected Phases	5	2		1	6		3	3 4			4	5
Permitted Phases										4		4
Actuated Green, G (s)	17.0	37.0		11.0	31.0		39.0	57.0			13.0	30.0
Effective Green, g (s)	18.0	38.0		12.0	32.0		40.0	58.0			14.0	32.0
Actuated g/C Ratio	0.15	0.32		0.10	0.27		0.33	0.48			0.12	0.27
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0				5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0				3.0	3.0
Lane Grp Cap (vph)	260	548		177	495		568	786			227	475
v/s Ratio Prot	c0.14	c0.36		c0.11	0.17		0.04	c0.30				0.02
v/s Ratio Perm											c0.10	0.02
v/c Ratio	0.92	1.12		1.15	0.63		0.12	0.62			0.84	0.13
Uniform Delay, d1	50.3	41.0		54.0	38.8		27.8	22.8			51.9	33.4
Progression Factor	1.00	1.00		1.11	0.73		1.00	1.00			1.00	1.00
Incremental Delay, d2	35.7	76.5		107.4	5.1		0.1	1.5			22.6	0.1
Delay (s)	86.0	117.5		167.6	33.5		27.9	24.3			74.5	33.6
Level of Service	F	F		F	C		C	C			E	C
Approach Delay (s)		108.7			86.1			24.7			51.9	
Approach LOS		F			F			C			D	

Intersection Summary			
HCM Average Control Delay	73.2	HCM Level of Service	E
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	84.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

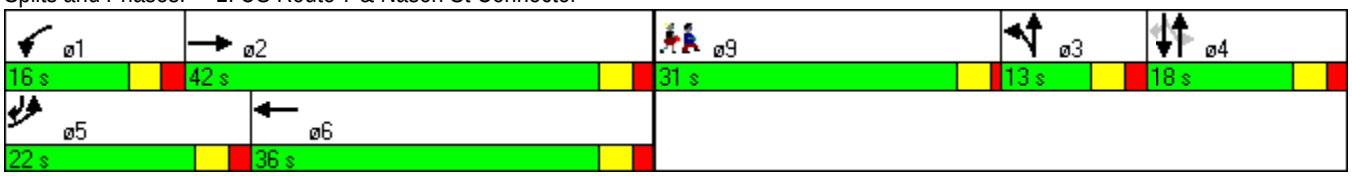
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR	ø9
Lane Configurations										
Volume (vph)	180	335	175	265	60	170	5	170	215	
Lane Group Flow (vph)	240	627	203	314	70	518	0	190	234	
Turn Type	Prot		Prot		Prot		Perm		pm+ov	
Protected Phases	5	2	1	6	3	3 4		4	5	9
Permitted Phases							4		4	
Detector Phase	5	2	1	6	3	3 4	4	4	5	
Switch Phase										
Minimum Initial (s)	5.0	10.0	5.0	10.0	5.0		5.0	5.0	5.0	4.0
Minimum Split (s)	15.0	15.0	15.0	15.0	13.0		15.0	15.0	15.0	31.0
Total Split (s)	22.0	42.0	16.0	36.0	13.0	31.0	18.0	18.0	22.0	31.0
Total Split (%)	18.3%	35.0%	13.3%	30.0%	10.8%	25.8%	15.0%	15.0%	18.3%	26%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lead	Lag	Lead	Lag	Lag				Lead	Lead
Lead-Lag Optimize?										
Recall Mode	None	C-Min	None	C-Min	None		None	None	None	None
v/c Ratio	0.92	1.12	1.15	0.63	0.12	0.63		0.84	0.37	
Control Delay	89.9	112.9	159.5	33.9	28.6	24.2		81.6	5.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	89.9	112.9	159.5	33.9	28.6	24.2		81.6	5.7	
Queue Length 50th (ft)	186	~551	~175	237	38	256		146	0	
Queue Length 95th (ft)	#250	#572	m#325	210	69	348		#273	59	
Internal Link Dist (ft)		422		220		1239		966		
Turn Bay Length (ft)			150						200	
Base Capacity (vph)	260	560	177	496	568	818		227	639	
Starvation Cap Reductn	0	0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0		0	0	
Storage Cap Reductn	0	0	0	0	0	0		0	0	
Reduced v/c Ratio	0.92	1.12	1.15	0.63	0.12	0.63		0.84	0.37	

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 42 (35%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow
Natural Cycle: 150
Control Type: Actuated-Coordinated

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

1: US Route 7 & Nason St Connector

Splits and Phases: 1: US Route 7 & Nason St Connector



Movement	EBL	EBR	EBR2	NBL	NBT	NBR	SBL	SBT	NWL2	NWT	NWR
Lane Configurations											
Volume (vph)	115	215	75	60	280	80	335	260	35	120	270
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	12	12	12	12	12	14	14	12	12	12
Total Lost time (s)	4.0	4.0			5.0			3.0	4.0	5.0	4.0
Lane Util. Factor	1.00	1.00			1.00			1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00			0.99			1.00	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00			1.00			1.00	0.98	1.00	1.00
Frt	1.00	0.85			0.97			1.00	1.00	0.95	0.85
Flt Protected	0.95	1.00			0.99			0.97	0.95	1.00	1.00
Satd. Flow (prot)	1707	1583			1768			1952	1734	1770	1544
Flt Permitted	0.95	1.00			0.99			0.97	0.95	1.00	1.00
Satd. Flow (perm)	1707	1583			1768			1952	1734	1770	1544
Peak-hour factor, PHF	0.92	0.92	0.92	0.93	0.93	0.93	0.96	0.96	0.92	0.92	0.92
Adj. Flow (vph)	125	234	82	65	301	86	349	271	38	130	293
RTOR Reduction (vph)	0	11	0	0	7	0	0	0	0	0	264
Lane Group Flow (vph)	125	305	0	0	445	0	0	620	38	130	29
Confl. Peds. (#/hr)	1		4			15	15		4		1
Heavy Vehicles (%)	2%	2%	2%	3%	3%	3%	1%	1%	2%	2%	2%
Turn Type		custom		Split			Split		Perm		Perm
Protected Phases	5	2		4	4		3	3		6	
Permitted Phases	2								6		6
Actuated Green, G (s)	26.6	26.6			30.0			39.6	10.8	10.8	10.8
Effective Green, g (s)	27.6	27.6			31.0			42.6	11.8	10.8	11.8
Actuated g/C Ratio	0.23	0.23			0.26			0.36	0.10	0.09	0.10
Clearance Time (s)	5.0	5.0			6.0			6.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0			3.0			3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	393	364			457			693	171	159	152
v/s Ratio Prot	0.03	c0.19			c0.25			c0.32		0.07	
v/s Ratio Perm	0.04								0.02		0.02
v/c Ratio	0.32	0.84			0.97			0.89	0.22	0.82	0.19
Uniform Delay, d1	38.4	44.1			44.1			36.6	49.9	53.6	49.7
Progression Factor	1.00	1.00			0.68			1.00	1.00	0.90	2.23
Incremental Delay, d2	0.5	15.4			33.8			16.4	0.6	24.3	0.5
Delay (s)	38.9	59.5			63.9			53.0	50.5	72.3	111.6
Level of Service	D	E			E			D	D	E	F
Approach Delay (s)	53.6				63.9			53.0		95.5	
Approach LOS	D				E			D		F	

Intersection Summary			
HCM Average Control Delay	65.5	HCM Level of Service	E
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.8
Intersection Capacity Utilization	90.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

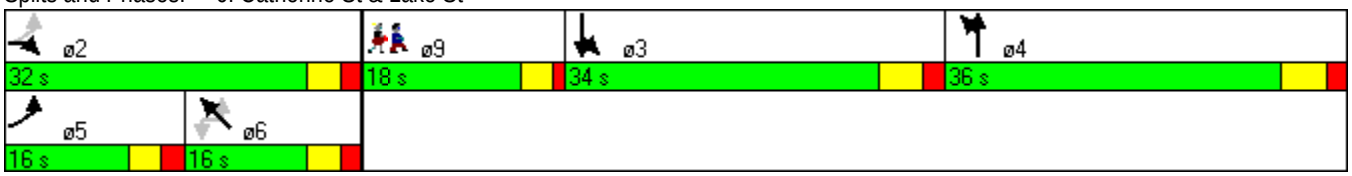
Lane Group	EBL	EBR	NBT	SBT	NWL2	NWT	NWR	ø9
Lane Configurations								
Volume (vph)	115	215	280	260	35	120	270	
Lane Group Flow (vph)	125	316	452	620	38	130	293	
Turn Type		custom			Perm		Perm	
Protected Phases	5	2	4	3		6		9
Permitted Phases	2				6		6	
Detector Phase	5	2	4	3	6	6	6	
Switch Phase								
Minimum Initial (s)	10.0	10.0	5.0	5.0	4.0	4.0	4.0	4.0
Minimum Split (s)	16.0	16.0	16.0	16.0	16.0	16.0	16.0	18.0
Total Split (s)	16.0	32.0	36.0	34.0	16.0	16.0	16.0	18.0
Total Split (%)	13.3%	26.7%	30.0%	28.3%	13.3%	13.3%	13.3%	15%
Yellow Time (s)	3.0	3.0	4.0	4.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-3.0	-1.0	0.0	-1.0	
Total Lost Time (s)	4.0	4.0	5.0	3.0	4.0	5.0	4.0	
Lead/Lag	Lead			Lag	Lag	Lag	Lag	Lead
Lead-Lag Optimize?								
Recall Mode	None	None	None	C-Min	None	None	None	None
v/c Ratio	0.32	0.84	0.97	0.83	0.22	0.82	0.70	
Control Delay	40.9	62.9	66.1	45.6	53.0	81.0	22.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	40.9	62.9	66.1	45.6	53.0	81.0	22.2	
Queue Length 50th (ft)	81	225	351	410	15	65	12	
Queue Length 95th (ft)	138	#376	#532	#819	m54	m#198	200	
Internal Link Dist (ft)	486		514	140		468		
Turn Bay Length (ft)	300				50		370	
Base Capacity (vph)	393	380	464	745	174	163	418	
Starvation Cap Reductn	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.32	0.83	0.97	0.83	0.22	0.80	0.70	

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 102 (85%), Referenced to phase 3:SBTL, Start of Yellow
Natural Cycle: 125
Control Type: Actuated-Coordinated

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: Catherine St & Lake St



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	175	570	295	130	170	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1751	1845	1827	1501
Flt Permitted	0.95	1.00	0.32	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	587	1845	1827	1501
Peak-hour factor, PHF	0.86	0.86	0.98	0.98	0.97	0.97
Adj. Flow (vph)	203	663	301	133	175	88
RTOR Reduction (vph)	0	337	0	0	0	75
Lane Group Flow (vph)	203	326	301	133	175	13
Confl. Peds. (#/hr)			4			4
Heavy Vehicles (%)	2%	2%	3%	3%	4%	4%
Turn Type		Prot	pm+pt			Perm
Protected Phases	2	2	3	8	4	
Permitted Phases			8			4
Actuated Green, G (s)	58.0	58.0	43.6	43.6	16.7	16.7
Effective Green, g (s)	59.0	59.0	44.6	44.6	17.7	17.7
Actuated g/C Ratio	0.49	0.49	0.37	0.37	0.15	0.15
Clearance Time (s)	6.0	6.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	870	778	440	686	269	221
v/s Ratio Prot	0.11	c0.21	c0.13	0.07	0.10	
v/s Ratio Perm			c0.12			0.01
v/c Ratio	0.23	0.42	0.68	0.19	0.65	0.06
Uniform Delay, d1	17.5	19.5	29.3	25.5	48.2	44.0
Progression Factor	0.70	0.65	1.18	0.91	1.00	1.00
Incremental Delay, d2	0.5	1.2	3.6	0.1	5.5	0.1
Delay (s)	12.7	14.0	38.2	23.3	53.8	44.1
Level of Service	B	B	D	C	D	D
Approach Delay (s)	13.7			33.6	50.5	
Approach LOS	B			C	D	

Intersection Summary			
HCM Average Control Delay	25.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.4
Intersection Capacity Utilization	52.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

7: Federal St & Lower Newton St

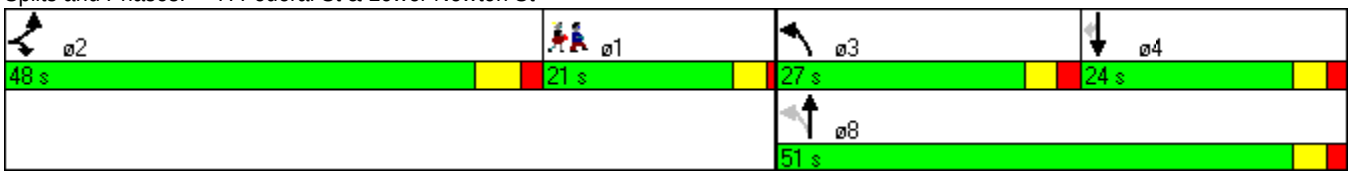
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	ø1
Lane Configurations							
Volume (vph)	175	570	295	130	170	85	
Lane Group Flow (vph)	203	663	301	133	175	88	
Turn Type		Prot	pm+pt			Perm	
Protected Phases	2	2	3	8	4		1
Permitted Phases			8			4	
Detector Phase	2	2	3	8	4	4	
Switch Phase							
Minimum Initial (s)	10.0	10.0	5.0	5.0	5.0	5.0	4.0
Minimum Split (s)	16.0	16.0	16.0	16.0	16.0	16.0	21.0
Total Split (s)	48.0	48.0	27.0	51.0	24.0	24.0	21.0
Total Split (%)	40.0%	40.0%	22.5%	42.5%	20.0%	20.0%	18%
Yellow Time (s)	4.0	4.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	5.0	5.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lead	Lead	Lead		Lag	Lag	Lag
Lead-Lag Optimize?							
Recall Mode	C-Min	C-Min	None	None	None	None	None
v/c Ratio	0.22	0.58	0.68	0.19	0.65	0.30	
Control Delay	14.4	3.2	39.6	22.2	59.2	11.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	14.4	3.2	39.6	22.2	59.2	11.2	
Queue Length 50th (ft)	46	0	171	60	130	0	
Queue Length 95th (ft)	m131	m73	m211	m59	195	45	
Internal Link Dist (ft)	2598			579	189		
Turn Bay Length (ft)		225	175			100	
Base Capacity (vph)	941	1152	455	755	316	332	
Starvation Cap Reductn	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	
Reduced v/c Ratio	0.22	0.58	0.66	0.18	0.55	0.27	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 91 (76%), Referenced to phase 2:EBL, Start of Yellow
Natural Cycle: 70
Control Type: Actuated-Coordinated

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 7: Federal St & Lower Newton St



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	70	595	5	10	605	335	15	20	15	640	30	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			0%			-4%			4%	
Total Lost time (s)	4.0	4.0			4.0	4.0		4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00			1.00	1.00		1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00			1.00	0.98		1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00			1.00	1.00		1.00		1.00	1.00	
Frt	1.00	1.00			1.00	0.85		0.96		1.00	0.90	
Flt Protected	0.95	1.00			1.00	1.00		0.99		0.95	1.00	
Satd. Flow (prot)	1770	1860			1861	1550		1779		1734	1603	
Flt Permitted	0.09	1.00			0.71	1.00		0.99		0.95	1.00	
Satd. Flow (perm)	160	1860			1324	1550		1779		1734	1603	
Peak-hour factor, PHF	0.91	0.91	0.91	0.95	0.95	0.95	0.85	0.85	0.85	0.92	0.92	0.92
Adj. Flow (vph)	77	654	5	11	637	353	18	24	18	696	33	76
RTOR Reduction (vph)	0	0	0	0	0	121	0	13	0	0	47	0
Lane Group Flow (vph)	77	659	0	0	648	232	0	47	0	696	62	0
Confl. Peds. (#/hr)			1	1		1	6					6
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	3%	3%	3%	2%	2%	2%
Turn Type	Perm			Perm		Perm	Split			Split		
Protected Phases		2			6		3	3		4	4	
Permitted Phases	2			6		6						
Actuated Green, G (s)	45.8	45.8			45.8	45.8		5.7		44.5	44.5	
Effective Green, g (s)	46.8	46.8			46.8	46.8		6.7		45.5	45.5	
Actuated g/C Ratio	0.39	0.39			0.39	0.39		0.06		0.38	0.38	
Clearance Time (s)	5.0	5.0			5.0	5.0		5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0			3.0	3.0		1.0		3.0	3.0	
Lane Grp Cap (vph)	62	725			516	605		99		657	608	
v/s Ratio Prot		0.35						c0.03		c0.40	0.04	
v/s Ratio Perm	0.48				c0.49	0.15						
v/c Ratio	1.24	0.91			1.26	0.38		0.47		1.06	0.10	
Uniform Delay, d1	36.6	34.6			36.6	26.2		54.9		37.2	24.1	
Progression Factor	1.24	1.22			1.00	1.00		1.00		0.88	0.81	
Incremental Delay, d2	184.0	15.4			130.3	1.8		1.3		48.8	0.1	
Delay (s)	229.2	57.5			166.9	28.1		56.2		81.6	19.4	
Level of Service	F	E			F	C		E		F	B	
Approach Delay (s)		75.4			117.9			56.2			73.2	
Approach LOS		E			F			E			E	

Intersection Summary			
HCM Average Control Delay	90.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.11		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	107.0%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

8: US Route 7 & Lower Newton St

Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	SBL	SBT	ø9
Lane Configurations									
Volume (vph)	70	595	10	605	335	20	640	30	
Lane Group Flow (vph)	77	659	0	648	353	60	696	109	
Turn Type	Perm		Perm		Perm		Split		
Protected Phases		2		6		3	4	4	9
Permitted Phases	2		6		6				
Detector Phase	2	2	6	6	6	3	4	4	
Switch Phase									
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	5.0	5.0	5.0	4.0
Minimum Split (s)	16.0	16.0	16.0	16.0	16.0	14.0	16.0	16.0	29.0
Total Split (s)	55.0	55.0	55.0	55.0	55.0	14.0	22.0	22.0	29.0
Total Split (%)	45.8%	45.8%	45.8%	45.8%	45.8%	11.7%	18.3%	18.3%	24%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag						Lead	Lag	Lag	
Lead-Lag Optimize?									
Recall Mode	C-Min	C-Min	C-Min	C-Min	C-Min	None	None	None	None
v/c Ratio	1.13	0.83		1.15	0.46	0.47	1.06	0.17	
Control Delay	181.9	46.9		120.0	12.2	54.5	82.2	11.0	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	181.9	46.9		120.0	12.2	54.5	82.2	11.0	
Queue Length 50th (ft)	~71	542		~591	77	35	513	21	
Queue Length 95th (ft)	m#147	#648		#818	158	74	#1150	70	
Internal Link Dist (ft)		1214		511		209		579	
Turn Bay Length (ft)	115				150		315		
Base Capacity (vph)	68	791		563	773	161	657	649	
Starvation Cap Reductn	0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	
Reduced v/c Ratio	1.13	0.83		1.15	0.46	0.37	1.06	0.17	

Intersection Summary

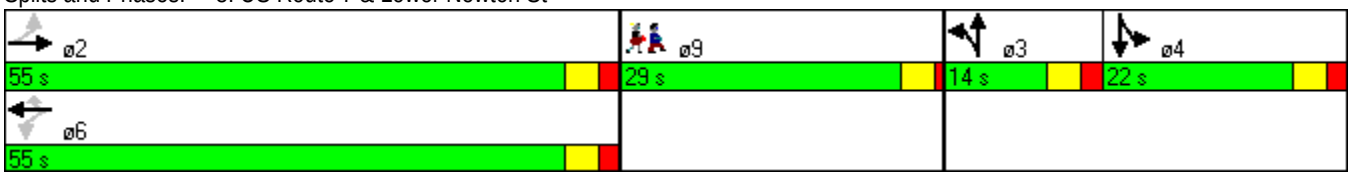
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 11 (9%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 150
Control Type: Actuated-Coordinated

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: US Route 7 & Lower Newton St



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	650	80	30	515	55	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	1.00		1.00	1.00	1.00	1.00
Frt	0.99		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	1835		1770	1863	1787	1599
Flt Permitted	1.00		0.25	1.00	0.95	1.00
Satd. Flow (perm)	1835		474	1863	1787	1599
Peak-hour factor, PHF	0.91	0.91	0.95	0.95	0.92	0.92
Adj. Flow (vph)	714	88	32	542	60	76
RTOR Reduction (vph)	2	0	0	0	0	70
Lane Group Flow (vph)	800	0	32	542	60	6
Heavy Vehicles (%)	2%	2%	2%	2%	1%	1%
Turn Type			pm+pt			Prot
Protected Phases	2		1	6	8	8
Permitted Phases			6			
Actuated Green, G (s)	85.4		94.2	94.2	7.8	7.8
Effective Green, g (s)	86.4		95.2	95.2	8.8	8.8
Actuated g/C Ratio	0.72		0.79	0.79	0.07	0.07
Clearance Time (s)	5.0		5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1321		428	1478	131	117
v/s Ratio Prot	c0.44		0.00	c0.29	c0.03	0.00
v/s Ratio Perm			0.06			
v/c Ratio	0.61		0.07	0.37	0.46	0.05
Uniform Delay, d1	8.3		5.8	3.6	53.3	51.7
Progression Factor	0.43		0.35	0.46	1.00	1.00
Incremental Delay, d2	1.2		0.0	0.1	2.5	0.2
Delay (s)	4.8		2.0	1.7	55.8	51.9
Level of Service	A		A	A	E	D
Approach Delay (s)	4.8			1.7	53.6	
Approach LOS	A			A	D	

Intersection Summary			
HCM Average Control Delay	8.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	50.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBL	WBT	NBL	NBR	ø7
Lane Configurations						
Volume (vph)	650	30	515	55	70	
Lane Group Flow (vph)	802	32	542	60	76	
Turn Type		pm+pt			Prot	
Protected Phases	2	1	6	8	8	7
Permitted Phases		6				
Detector Phase	2	1	6	8	8	
Switch Phase						
Minimum Initial (s)	10.0	5.0	10.0	5.0	5.0	4.0
Minimum Split (s)	16.0	16.0	16.0	16.0	16.0	24.0
Total Split (s)	64.0	16.0	80.0	16.0	16.0	24.0
Total Split (%)	53.3%	13.3%	66.7%	13.3%	13.3%	20%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lag	Lead		Lag	Lag	Lead
Lead-Lag Optimize?						
Recall Mode	C-Min	None	C-Min	None	None	None
v/c Ratio	0.56	0.07	0.35	0.40	0.37	
Control Delay	5.7	1.6	2.2	59.7	16.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	5.7	1.6	2.2	59.7	16.6	
Queue Length 50th (ft)	157	1	25	45	0	
Queue Length 95th (ft)	m0	m3	m53	89	47	
Internal Link Dist (ft)	1628		1214	63		
Turn Bay Length (ft)		150				
Base Capacity (vph)	1429	521	1555	179	228	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.56	0.06	0.35	0.34	0.33	

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 10 (8%), Referenced to phase 2:EBT and 6:WBTL, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 9: US Route 7 & JC Penny Plaza

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	190	600	440	230	175	195
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1736	1827	3539	1583	1770	1583
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1736	1827	3539	1583	1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	207	652	478	250	190	212
RTOR Reduction (vph)	0	0	0	148	0	147
Lane Group Flow (vph)	207	652	478	102	190	65
Heavy Vehicles (%)	4%	4%	2%	2%	2%	2%
Turn Type	Prot			Perm		Over
Protected Phases	5	2 5	6		4	5
Permitted Phases				6		
Actuated Green, G (s)	35.7	52.6	42.4	42.4	13.3	35.7
Effective Green, g (s)	36.7	53.6	43.4	43.4	14.3	36.7
Actuated g/C Ratio	0.31	0.45	0.36	0.36	0.12	0.31
Clearance Time (s)	5.0		5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	531	816	1280	573	211	484
v/s Ratio Prot	0.12	c0.36	c0.14		c0.11	0.04
v/s Ratio Perm				0.06		
v/c Ratio	0.39	0.80	0.37	0.18	0.90	0.13
Uniform Delay, d1	32.8	28.6	28.3	26.1	52.1	30.1
Progression Factor	0.54	0.42	0.61	0.85	1.05	0.99
Incremental Delay, d2	0.4	5.0	0.8	0.7	26.2	0.1
Delay (s)	18.2	16.9	18.1	22.9	81.1	29.9
Level of Service	B	B	B	C	F	C
Approach Delay (s)		17.2	19.8		54.1	
Approach LOS		B	B		D	

Intersection Summary			
HCM Average Control Delay	25.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	25.6
Intersection Capacity Utilization	47.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

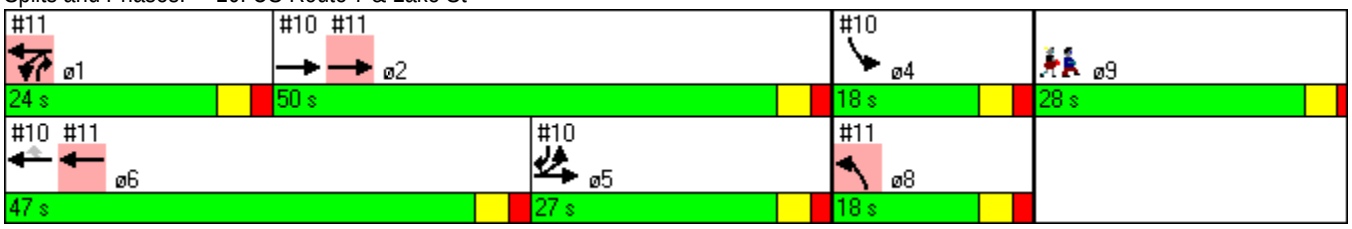
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR	ø1	ø2	ø8	ø9
Lane Configurations										
Volume (vph)	190	600	440	230	175	195				
Lane Group Flow (vph)	207	652	478	250	190	212				
Turn Type	Prot			Perm		Over				
Protected Phases	5	2 5	6		4	5	1	2	8	9
Permitted Phases				6						
Detector Phase	5	2 5	6	6	4	5				
Switch Phase										
Minimum Initial (s)	5.0		10.0	10.0	5.0	5.0	5.0	10.0	5.0	4.0
Minimum Split (s)	16.0		16.0	16.0	16.0	16.0	16.0	16.0	16.0	28.0
Total Split (s)	27.0	77.0	47.0	47.0	18.0	27.0	24.0	50.0	18.0	28.0
Total Split (%)	22.5%	64.2%	39.2%	39.2%	15.0%	22.5%	20%	42%	15%	23%
Yellow Time (s)	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0				
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0				
Lead/Lag	Lag		Lead	Lead		Lag	Lead	Lag		
Lead-Lag Optimize?										
Recall Mode	None		C-Min	C-Min	None	None	None	C-Min	None	None
v/c Ratio	0.39	0.77	0.35	0.33	0.90	0.34				
Control Delay	21.8	20.0	17.4	5.0	84.8	6.5				
Queue Delay	16.5	0.0	0.0	0.0	0.0	1.4				
Total Delay	38.3	20.0	17.4	5.0	84.8	7.9				
Queue Length 50th (ft)	62	246	62	0	158	11				
Queue Length 95th (ft)	218	#707	216	132	m#220	m47				
Internal Link Dist (ft)		60	1628		514					
Turn Bay Length (ft)				100		275				
Base Capacity (vph)	530	852	1352	748	211	631				
Starvation Cap Reductn	303	0	0	0	0	0				
Spillback Cap Reductn	0	0	55	0	0	256				
Storage Cap Reductn	0	0	0	0	0	0				
Reduced v/c Ratio	0.91	0.77	0.37	0.33	0.90	0.57				

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 101 (84%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow
Natural Cycle: 100
Control Type: Actuated-Coordinated

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: US Route 7 & Lake St



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	565	80	160	480	95	245
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	0.95		1.00	1.00	1.00	1.00
Frt	0.98		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3407		1770	1863	1770	1583
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3407		1770	1863	1770	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	614	87	174	522	103	266
RTOR Reduction (vph)	8	0	0	0	0	207
Lane Group Flow (vph)	693	0	174	522	103	59
Heavy Vehicles (%)	4%	4%	2%	2%	2%	2%
Turn Type			Prot			Over
Protected Phases	2		1	1 6	8	1
Permitted Phases						
Actuated Green, G (s)	52.6		25.5	42.4	13.3	25.5
Effective Green, g (s)	53.6		26.5	43.4	14.3	26.5
Actuated g/C Ratio	0.45		0.22	0.36	0.12	0.22
Clearance Time (s)	5.0		5.0		5.0	5.0
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Lane Grp Cap (vph)	1522		391	674	211	350
v/s Ratio Prot	c0.20		0.10	c0.28	c0.06	0.04
v/s Ratio Perm						
v/c Ratio	0.46		0.45	0.77	0.49	0.17
Uniform Delay, d1	23.1		40.4	34.0	49.4	37.8
Progression Factor	0.98		0.74	0.59	1.00	1.00
Incremental Delay, d2	0.8		0.8	5.3	1.8	0.2
Delay (s)	23.3		30.8	25.2	51.2	38.1
Level of Service	C		C	C	D	D
Approach Delay (s)	23.3			26.6	41.7	
Approach LOS	C			C	D	

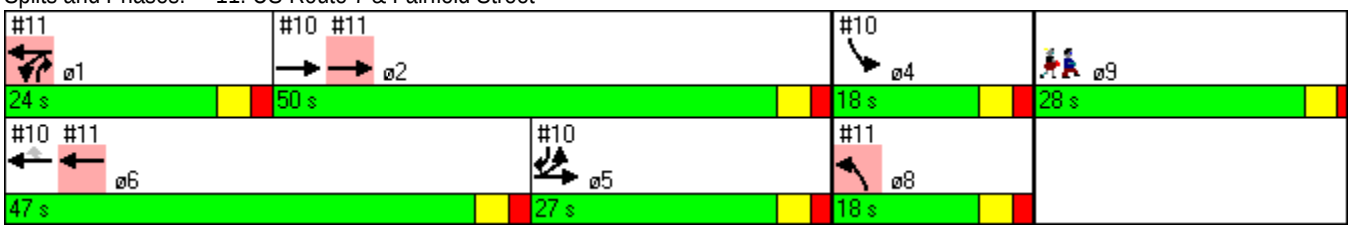
Intersection Summary			
HCM Average Control Delay	28.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	21.6
Intersection Capacity Utilization	42.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBL	WBT	NBL	NBR	ø4	ø5	ø6	ø9
Lane Configurations									
Volume (vph)	565	160	480	95	245				
Lane Group Flow (vph)	701	174	522	103	266				
Turn Type		Prot			Over				
Protected Phases	2	1	1 6	8	1	4	5	6	9
Permitted Phases									
Detector Phase	2	1	1 6	8	1				
Switch Phase									
Minimum Initial (s)	10.0	5.0		5.0	5.0	5.0	5.0	10.0	4.0
Minimum Split (s)	16.0	16.0		16.0	16.0	16.0	16.0	16.0	28.0
Total Split (s)	50.0	24.0	71.0	18.0	24.0	18.0	27.0	47.0	28.0
Total Split (%)	41.7%	20.0%	59.2%	15.0%	20.0%	15%	23%	39%	23%
Yellow Time (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0				
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0				
Lead/Lag	Lag	Lead			Lead		Lag	Lead	
Lead-Lag Optimize?									
Recall Mode	C-Min	None		None	None	None	None	C-Min	None
v/c Ratio	0.44	0.45	0.73	0.49	0.48				
Control Delay	23.0	34.8	25.9	58.2	8.4				
Queue Delay	0.1	121.6	0.0	0.0	3.8				
Total Delay	23.1	156.4	25.9	58.2	12.2				
Queue Length 50th (ft)	104	54	249	76	0				
Queue Length 95th (ft)	250	93	534	135	76				
Internal Link Dist (ft)	1342		60	263					
Turn Bay Length (ft)					250				
Base Capacity (vph)	1597	391	712	211	557				
Starvation Cap Reductn	0	250	0	0	0				
Spillback Cap Reductn	180	0	0	0	207				
Storage Cap Reductn	0	0	0	0	0				
Reduced v/c Ratio	0.49	1.23	0.73	0.49	0.76				

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 101 (84%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow
Natural Cycle: 100
Control Type: Actuated-Coordinated

Splits and Phases: 11: US Route 7 & Fairfield Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	130	590	25	25	465	55	20	45	30	35	110	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.99		1.00	0.98			0.96			0.98	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.99	
Satd. Flow (prot)	1736	1816		1770	1833			1765			1813	
Flt Permitted	0.28	1.00		0.24	1.00			0.83			0.90	
Satd. Flow (perm)	508	1816		442	1833			1483			1640	
Peak-hour factor, PHF	0.80	0.80	0.80	0.85	0.85	0.85	0.85	0.85	0.85	0.75	0.75	0.75
Adj. Flow (vph)	162	738	31	29	547	65	24	53	35	47	147	27
RTOR Reduction (vph)	0	1	0	0	3	0	0	13	0	0	4	0
Lane Group Flow (vph)	162	768	0	29	609	0	0	99	0	0	217	0
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Turn Type	pm+pt			pm+pt			Perm			Perm		
Protected Phases	5	2		1	6			4			4	
Permitted Phases	2			6			4			4		
Actuated Green, G (s)	81.9	73.1		72.1	68.2			20.4			20.4	
Effective Green, g (s)	83.0	74.1		74.1	69.2			21.4			21.4	
Actuated g/C Ratio	0.69	0.62		0.62	0.58			0.18			0.18	
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	452	1121		327	1057			264			292	
v/s Ratio Prot	c0.03	c0.42		0.00	0.33							
v/s Ratio Perm	0.22			0.05				0.07			c0.13	
v/c Ratio	0.36	0.69		0.09	0.58			0.37			0.74	
Uniform Delay, d1	9.9	15.2		11.7	16.1			43.4			46.7	
Progression Factor	0.55	0.68		0.17	0.15			1.00			1.00	
Incremental Delay, d2	0.3	2.4		0.1	1.7			0.9			9.8	
Delay (s)	5.8	12.7		2.1	4.1			44.3			56.5	
Level of Service	A	B		A	A			D			E	
Approach Delay (s)		11.5			4.0			44.3			56.5	
Approach LOS		B			A			D			E	

Intersection Summary			
HCM Average Control Delay	16.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.6
Intersection Capacity Utilization	58.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

12: US Route 7 & Lower Welden St

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	ø3
Lane Configurations									
Volume (vph)	130	590	25	465	20	45	35	110	
Lane Group Flow (vph)	162	769	29	612	0	112	0	221	
Turn Type	pm+pt		pm+pt		Perm		Perm		
Protected Phases	5	2	1	6		4		4	3
Permitted Phases	2		6		4		4		
Detector Phase	5	2	1	6	4	4	4	4	
Switch Phase									
Minimum Initial (s)	5.0	10.0	5.0	10.0	5.0	5.0	5.0	5.0	4.0
Minimum Split (s)	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	22.0
Total Split (s)	16.0	59.0	16.0	59.0	23.0	23.0	23.0	23.0	22.0
Total Split (%)	13.3%	49.2%	13.3%	49.2%	19.2%	19.2%	19.2%	19.2%	18%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lag	Lag	Lag	Lead
Lead-Lag Optimize?									
Recall Mode	None	C-Min	None	C-Min	None	None	None	None	None
v/c Ratio	0.35	0.64	0.08	0.55		0.40		0.75	
Control Delay	5.2	13.1	1.6	4.0		41.8		61.7	
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0	
Total Delay	5.2	13.1	1.6	4.0		41.8		61.7	
Queue Length 50th (ft)	17	114	0	81		64		156	
Queue Length 95th (ft)	m38	m497	m6	100		119		#208	
Internal Link Dist (ft)		1737		1342		813		649	
Turn Bay Length (ft)	150		150						
Base Capacity (vph)	487	1201	443	1110		283		303	
Starvation Cap Reductn	0	0	0	0		0		0	
Spillback Cap Reductn	0	0	0	0		0		0	
Storage Cap Reductn	0	0	0	0		0		0	
Reduced v/c Ratio	0.33	0.64	0.07	0.55		0.40		0.73	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 14 (12%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow
Natural Cycle: 100
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 12: US Route 7 & Lower Welden St

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	35	580	440	15	40	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.81	0.81	0.86	0.86	0.80	0.80
Hourly flow rate (vph)	43	716	512	17	50	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		TWLTL	None			
Median storage veh)		2				
Upstream signal (ft)		300				
pX, platoon unblocked					0.71	
vC, conflicting volume	529				1323	520
vC1, stage 1 conf vol					520	
vC2, stage 2 conf vol					802	
vCu, unblocked vol	529				1249	520
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)	2.2				3.5	3.3
p0 queue free %	96				86	99
cM capacity (veh/h)	1023				348	556

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	43	716	529	56
Volume Left	43	0	0	50
Volume Right	0	0	17	6
cSH	1023	1700	1700	363
Volume to Capacity	0.04	0.42	0.31	0.15
Queue Length 95th (ft)	3	0	0	14
Control Delay (s)	8.7	0.0	0.0	16.7
Lane LOS	A			C
Approach Delay (s)	0.5		0.0	16.7
Approach LOS				C

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	40.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	45	280	30	5	315	155	35	10	5	115	10	40
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.86	0.86	0.86	0.76	0.76	0.76	0.79	0.79	0.79
Hourly flow rate (vph)	49	304	33	6	366	180	46	13	7	146	13	51
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		1046										
pX, platoon unblocked												
vC, conflicting volume	547			337			853	977	321	883	903	456
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	547			337			853	977	321	883	903	456
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 %	95			100			80	94	99	40	95	92
cM capacity (veh/h)	1013			1211			234	236	716	241	262	602

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	49	337	6	547	66	146	63
Volume Left	49	0	6	0	46	146	0
Volume Right	0	33	0	180	7	0	51
cSH	1013	1700	1211	1700	252	241	478
Volume to Capacity	0.05	0.20	0.00	0.32	0.26	0.60	0.13
Queue Length 95th (ft)	4	0	0	0	25	88	11
Control Delay (s)	8.7	0.0	8.0	0.0	24.3	40.2	13.7
Lane LOS	A		A		C	E	B
Approach Delay (s)	1.1		0.1		24.3	32.2	
Approach LOS					C	D	

Intersection Summary			
Average Delay	7.3		
Intersection Capacity Utilization	48.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	320	20	0	0	0	0	0	80	5	30	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.82	0.92	0.82	0.84	0.84	0.84	0.92	0.92	0.92
Hourly flow rate (vph)	0	348	22	0	0	0	0	0	95	5	33	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)					566							
pX, platoon unblocked												
vC, conflicting volume	0			370			375	359	359	454	370	0
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	0			370			375	359	359	454	370	0
tC, single (s)	4.1			4.2			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	86	99	94	100
cM capacity (veh/h)	1623			1157			556	568	686	445	560	1085

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	370	95	38
Volume Left	0	0	5
Volume Right	22	95	0
cSH	1700	686	540
Volume to Capacity	0.22	0.14	0.07
Queue Length 95th (ft)	0	12	6
Control Delay (s)	0.0	11.1	12.2
Lane LOS		B	B
Approach Delay (s)	0.0	11.1	12.2
Approach LOS		B	B

Intersection Summary			
Average Delay	3.0		
Intersection Capacity Utilization	36.3%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix C – Request for Preliminary Jurisdictional Determination and USACE Correspondence

Vanasse Hangen Brustlin, Inc.
Transportation | Environmental | Land Development Services

April 1, 2011

Ref: 57414.00

Marty Abair
Senior Project Manager, Regulatory Division
U.S. Army Corps of Engineers
8 Carmichael Street
Essex Junction, VT 05452

Re: Request for Preliminary Jurisdictional Determination:
Federal Street Multi-Modal Connector Project – CENAE-R-61-NAE-2010-1838
VTrans Project: St. Albans HPP 8000 (17)

Dear Ms. Abair:

Vanasse Hangen Brustlin, Inc. (VHB) has been contracted by the City of St. Albans to perform a wetland delineation within the proposed project area for the Federal Street Multi-Modal Connector Project. The project area is approximately 1.6 miles long, commencing at the intersection of Main Street (US Route 7) at Lower Newton Street westerly to Lower Newton Street and Federal Street and then continuing south to Nason Street (see attached Site Location Map). The project may include geometric improvements, intersection reconfiguration, bicycle facilities, sidewalk improvements, new or upgraded traffic signals, street lighting, utility relocation, drainage improvements, and replacing the bridge on Lemnah Drive over the Stevens Brook.

On behalf of the City of St. Albans, we are requesting U.S. Army Corps of Engineers (USACE) confirmation of the flagged wetland boundary. We understand that current weather and ground conditions may preclude such a confirmation until more favorable weather returns, however, we are submitting this report for your initial review as well as to prompt and respond to any questions you may have regarding this project or the results of the delineation. Contact information, a brief site description, and the wetland report follow hereafter.

Agent for City of St. Albans:
VHB/Vanasse Hangen Brustlin, Inc.
POC: Deborah Finnigan
7056 US Route 7, P.O. Box 120
North Ferrisburgh, VT 05473
(802) 425-7788 X 6429
dfinnigan@vhb.com

Name of Current Property Owner:
City of St. Albans
POC: Dominic Cloud, City Manager
City Hall, P.O. Box 867
100 North Main Street
St. Albans, VT 05478
d.cloud@stalbansvt.com

Written Road Directions:
From I-89 N, take Exit 19 toward St. Albans / US-7 / VT-36 / VT-104. Merge onto St. Albans State Highway. Turn right on South Main Street. Go approximately 0.9 mile and turn left onto Lower Newton Street. The northern terminus of the project commences at Lower Newton Street and Federal Street.

Name of Locality:
City of St. Albans

Site Coordinates:
44°48′7.808″N
73°5′28.814″W

Receiving Vermont Watershed Basin:
Lake Champlain District
(HUD8: 02010008)

Description of Proposed Activity
Multiple improvements to the Federal Street Corridor, that may include geometric improvements, intersection reconfiguration, corridor connectivity to Interstate Access Road via new alignment, bicycle facilities, sidewalk improvements, new or upgraded traffic signals, street lighting, utility relocation, drainage improvements, and replacing the bridge on Lemnah Drive.

Study Area Description
Much of the project area is located along existing alignments and within previously developed areas (see Site Location Map). The northerly section of the project area south to Kingman Street is mixed residential and commercial, with the St. Albans Cooperative Creamery between Aldis Street and Deal Street representing an industrial land use, between Center Street and Stebbin Street, public and commercial buildings occupy the corridor. Continuing south on Allen Street and Lemnah Drive, the eastern side of the street is characterized by an industrial park setting while the western side contains a narrow green belt that separates the road from a rail yard managed by the New England Central Railroad (NECR).

VHB scientists evaluated the entire 1.6 miles of the proposed project area for the occurrence of natural resources. From the northern terminus of the project through to Lemnah Drive at the intersection with Stevens Brook, field scientists made observations on conditions within the existing right-of-way and just beyond where improvements may be carried out. Improvements in this part of the project area would amount to redevelopment activities. The majority of the project area is highly developed and the proposed work would be carried out primarily along existing alignments. The limits of the natural resource investigation area were therefore restricted to a relatively narrow swath along the southern section of the project boundary as shown on the Site Location Map.

The southernmost portion of the project is a proposed new road alignment, which would run west from the current intersection of the Interstate Access Road at South Main Street to join a southerly extension of Lemnah Drive. Accordingly, to account for resource setbacks or to allow for horizontal shifts in road alignment planning, the limits of the investigation from Stevens Brook to the south were expanded to include an area of 500 feet; 250 feet on either side of the preliminary roadway centerline for the proposed new alignment.

Methodology for Wetland Delineation

VHB Senior Environmental Scientist Nancy Rendall, CWS, conducted wetland delineation fieldwork on October 18 and 20, 2010. Wetland delineations were made pursuant to the USACE regional wetland delineation supplement[i]. Wetlands were identified in the field with pink flagging. Field notes were taken to record information such as proposed wetland classifications[ii], general characteristics, potential functions and values of the wetland, and any unique qualities observed during the site assessment, along with other considerations relevant to support site findings. Wetlands were classified in accordance with the *Classification of Wetlands and Deepwater Habitats of the United States*[iii]. Wetland functions and values were evaluated based on the field notes and observations according to the USACE *Highway Methodology Workbook: Supplement*[iv]. Wetland flags were located in the field using a Trimble® ProXT GPS unit capable of sub meter accuracy and the resulting survey data were then post processed using Trimble® Pathfinder software for enhanced accuracy.

Soil Series Descriptions

Based on a review of Natural Resources Conservation Service (NRCS) databases[v] [vi], the entire project area is underlain by just four soil types. These are:

- Copake fine sandy loam, 2 to 8 percent slopes: non-hydric
- Georgia stony loam, 3 to 8 percent slopes: non-hydric
- Massena stony loam, 0 to 3 percent slopes: hydric inclusions
- Rumney variant silt loam: hydric

---

[i] USACE. 2009. *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northeast and North Central Region*.

[ii] Vermont Water Resources Panel (WRB). 2010. Vermont Wetland Rules. (VT. Code R. 12 004 056) Effective September 15, 2010.

[iii] Cowardin, L. M., V. Carter, F. C. Golet, E. T. LaRoe. 1979. *Classification of wetlands and deepwater habitats of the United States*. U. S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. 131pp.

[iv] USACE. 1999. *The Highway Methodology Workbook: Supplement*. New England Division, NAEEP-360-1-30a, 39 pp.

[v] NRCS. 2011. *Web Soil Survey*. http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm.

[vi] NRCS. 2011. *Soil Data Mart – Franklin County, Vermont*. http://soildatamart.nrcs.usda.gov

Massena stony loam can have inclusions of the hydric Lyons stony loam in depression settings approximately 10% of the time. Rumney variant silt loam is itself a hydric soil, with roughly 65% of its mapped extent being hydric in floodplain settings. Rumney variant silt loam can also have inclusions of the hydric Limerick silt loam (20%, depressions and floodplains) and undrained occurrences of Wallkill silt loam (5%, depressions and floodplains).

As previously discussed, due to the urbanized setting of the project, native soils have been significantly disturbed. The relatively undeveloped area south of Nason Street and between the NECR tracks and South Main Street thus represents the primary area of investigation. Soil mapping here is roughly split equally between Massena stony loam and Copake fine sandy loam, with Massena soil mapped under the western half of the area.

Results of the Wetland Delineation

Two wetland bodies were identified within the project area. Wetlands B and F are depicted on the attached Wetland and Stream Delineation Map. During initial investigations, four other areas of interest were flagged (A, C, D, and E) but were deemed non-jurisdictional following further examination. The following summary details the wetland characteristics relative to the criteria for classifying significant wetlands under the Vermont Wetland Rules (VWRs), as well as VHB's proposed classifications for Wetlands B and F under the VWRs. USACE Wetland Determination Data Forms were completed for each wetland feature, which describe in detail information on the vegetation, soils, and hydrology for a location within each wetland as well as the non-jurisdictional upland area just beyond the wetland boundary. Wetland Function and Value Evaluation Forms were also completed for each delineated wetland. The Wetland Determination Data forms, Function and Value Evaluation Forms, and Wetland and Stream Delineation Summary Photographs are attached.

Wetland B

Wetland B is located in the southern portion of the project area to the south of Nason Street (see Wetland and Stream Delineation Map and attached Summary of Delineated Wetlands Table). Within the limits of the project area, Wetland B measures approximately 32,200 square feet (0.74 acres) in size. It continues to the south beyond the limits of the project area.

Wetland B is characterized by a Palustrine Forested wetland vegetation community that has been very disturbed by previous residential trash deposits. Wetland B is proposed by VHB as a Class II wetland based on its ability to provide flood storage

benefits and surface and groundwater protection per criteria 5.1 and 5.2 of the Vermont Wetland Rules (VT Code R. 12 004 056), respectively. The presence of the trash within Wetland B reduces its functional benefit for protection of surface water quality and/or groundwater. However, Wetland B does have the potential to trap sediments and remove them from surface waters. Classification of Wetland B as Class II is preliminary pending forthcoming coordination with the Department of Environmental Conservation (DEC) Wetlands Section.

Wetland F

Wetland F is located adjacent to Wetland B in the southern portion of the project area to the south of Nason Street (see Wetland and Stream Delineation Map and attached Summary of Delineated Wetlands Table). Wetland F measures approximately 2,930 square feet (0.067 acres) in size and is contained entirely within the project area.

Wetland F is characterized by a Palustrine Forested wetland vegetation community. Wetland F is proposed as a Class III wetland due to the small size of the wetland which limits its ability to provide functional benefits per criteria 5.1 and 5.2 of the VWRs. Confirmation of this classification is preliminary pending forthcoming coordination with the DEC Wetlands Section.

Additionally, VHB conducted a cursory survey for those areas with characteristics consistent with the criteria outline for vernal pools in *Wetland, Woodland, Wildland: A Guide to the Natural Communities of Vermont*[vii] and in the *Department of the Army General Permit, State of Vermont*[viii] regulatory guidance. Upon cursory review, no vernal pools were identified within the natural resource investigation area; however, this will be verified in Spring 2011.

[vii] Thompson, E. H., E.S. Sorenson. 2005. *Wetland, Woodland, Wildland: A guide to the natural communities of Vermont.* Vermont Department of Fish and Wildlife and the Nature Conservancy.

[viii] *Department of the Army General Permit, State of Vermont*. General Permit No.: NAE-2007-24. U.S. Army Corps of Engineers. 2007.

Methodology for Stream Delineation

Stream delineation flagging was conducted pursuant to the Agency of Natural Resources (ANR) Riparian Buffer Guidance[ix]. Stream ordinary high water (OHW) width was recorded according to methods detailed in the USACE *Regulatory Guidance Letter: Subject – Ordinary High Water Mark*[x]. OHW was identified using pink wetland flagging and pin flags. Flow regime was preliminarily classified based on qualitative observations of instream hydrology indicators at the time of observation, geomorphic characteristics, and data available from other sources.

Stream features were located in the field using a Trimble® GPS ProXT unit capable of sub meter accuracy and was subsequently post processed for enhanced accuracy using Trimble® Pathfinder software. Stream features collected in the field are described below and represented on the Wetland and Stream Delineation Map.

Results of the Stream Delineation

VHB delineated a portion of the perennial Stevens Brook, which bisects the project area perpendicular to Lemnah Drive. This portion of Stevens Brook is approximately 8 to 10 feet wide with banks ranging from 4 to 8 feet high. The banks of the stream are armored upstream of the bridge and the stream has been artificially channelized through the project area. The water depth was estimated at three inches to greater than one-foot during the site visit. Stevens Brook at this location is classified as a Riverine, Lower Perennial, Unconsolidated Bottom, Mud, Permanently Flooded (R2UB3H) channel. Bank vegetation consists of Japanese knotweed (*Polygonum cuspidatum*), box elder (*Acer negundo*), northern white cedar (*Thuja occidentalis*), and weeping willow (*Salix x sepulcralis*) (see the attached Wetland and Stream Delineation Summary Photographs).

Upon review of the Vermont Water Quality Standards 2008[xi] (VWQS) all the waters within the investigation area are classified as Class B waters. Based on review of FEMA Floodzones (Panel No. 5000580001B), the northern section of the natural resources investigation area, in the vicinity of Stevens Brook, is designated Zone B. Zone B is an area of moderate flood hazard, usually the area between the limits of the 100-year and 500-year floods.

On behalf of the City of St. Albans, VHB respectfully requests a confirmation of the delineated wetlands and streams as presented in this letter report. As mentioned above,

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[ix] ANR 2005. *Guidance for Agency Act 250 and Section 248 Comments Regarding Riparian Buffers.* 30 pp.

[x] USACE 2005. *Ordinary High Water Mark (OHWM) Identification.* Regulatory Guidance Letter 05-05.

[xi] Resources Board – Water Resource Panel. January 1, 2008. Vermont Water Quality Standards.

we understand that it may not be possible to perform the fieldwork necessary to produce such a confirmation until ground conditions improve. However, we invite any interim remarks or requests for additional information and will accompany you on a site visit at a time that is convenient for you. Please contact me at (802) 425-7788, extension 6429, or via email at dfinnigan@vhb.com with any questions or comments.

Very truly yours,
VANASSE HANGEN BRUSTLIN, INC.

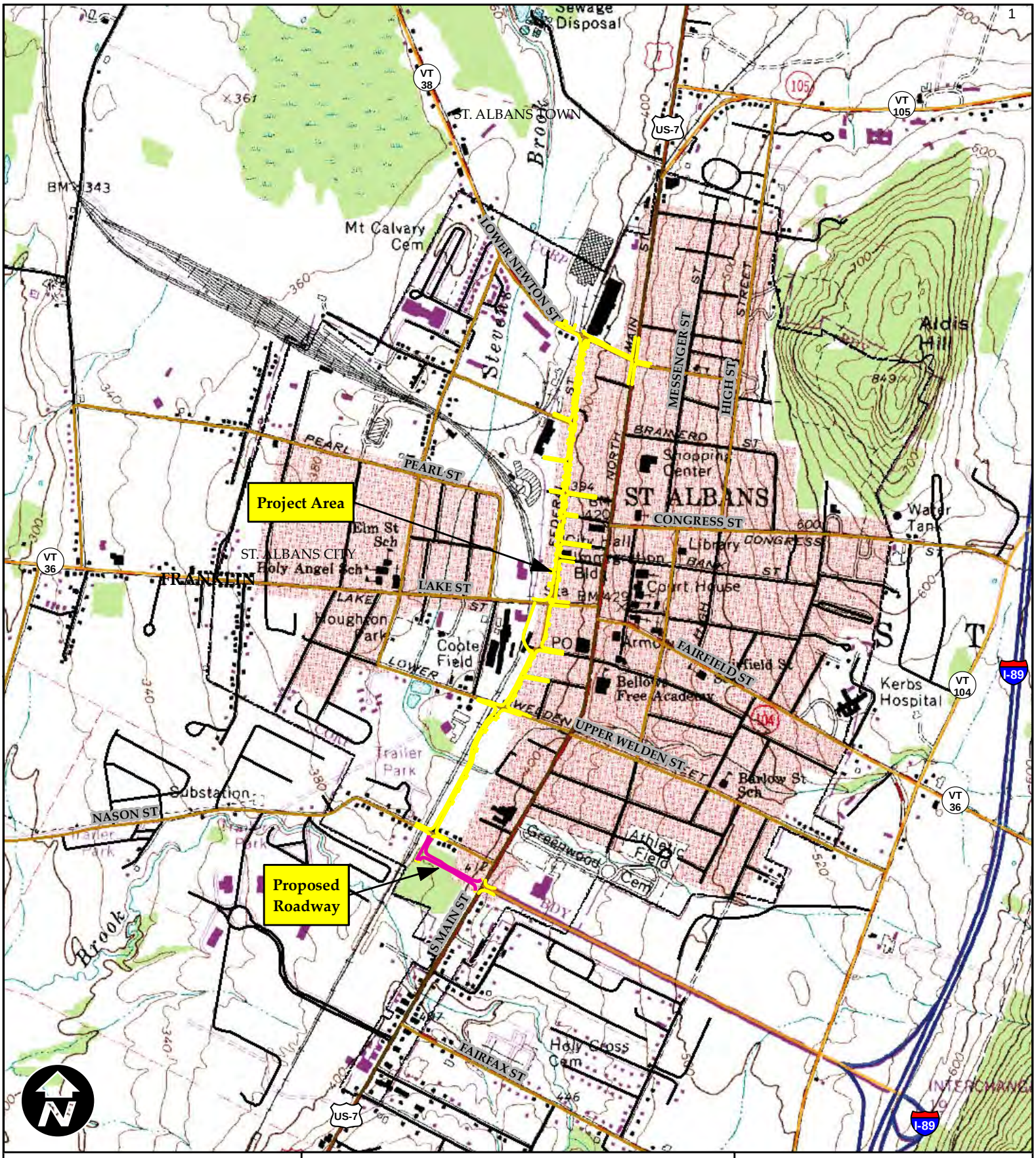
Deborah Finnigan
Deputy Project Manager

Enclosures:

- Wetland Determination Data Forms
- Summary Photographs
- Site Location Map
- Wetland and Stream Delineation Map
- Summary of Wetland Delineations

cc w/encl: Peter Cross, Municipal Project Manager, Cross Consulting Engineers
Dominic Cloud, City Manager, City of St. Albans
Jeff Ramsey, Environmental Specialist, NE Region, VTrans
Jon Kaplan, VTrans

ATTACHMENT



Legend

- Project Boundary
- Proposed Roadway
- Interstate
- Vermont State Highway
- US Highway
- Town Road
- County Boundary
- Town Boundary

F:\57414.00\GIS\Project\SiteLocationMap.mxd

City of Saint Albans, Vermont
Federal Street Multi-Modal Connector
Site Location Map

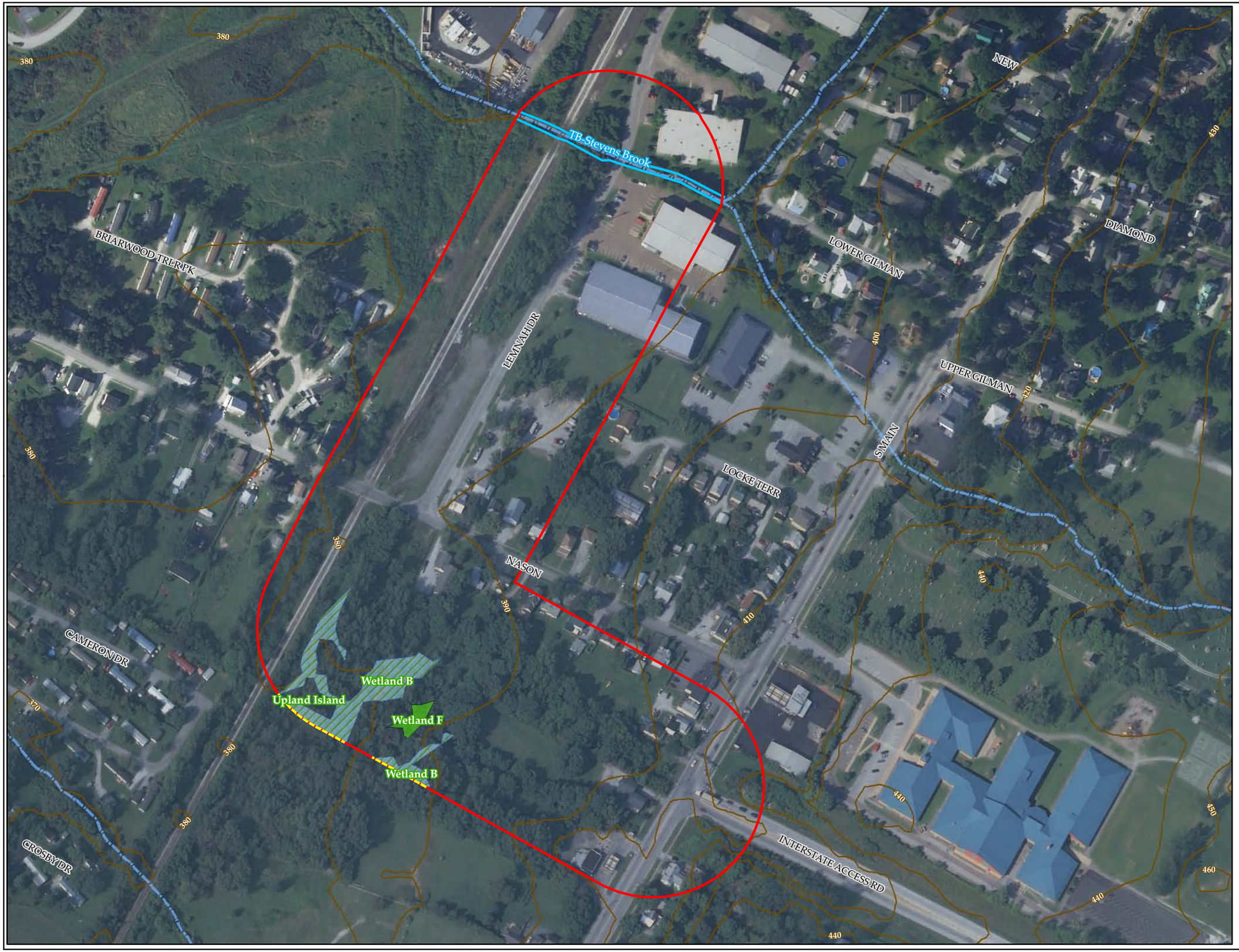
March 15, 2011

1,500 750 0 1,500 Feet

Prepared by: CMM

Sources: Background- USGS Topographic Quadrangle Saint Albans and Bellevue Hill (1996); Project Boundary by VHB (2010); Road Data from VCGI (2008); Boundaries from VCGI (2008).

VHB Vanasse Hangen Brustlin, Inc.



Federal Street Multi-Modal Connector Saint Albans, VT Wetland and Stream Delineation Map

March 15, 2011

200 100 0 200
Feet

Legend

VHB Delineated Wetlands
- Proposed Class II
- Proposed Class III
- Wetland Continues
- VHB Streams
- Natural Resources Investigation Area
- VSWI Wetlands
- VHD Streams
- Contours - 10 ft

Background: High-Res Ortho Photo (2008); e911 Roads (2008) provided by VCGI (2009); VHD Streams and Waterbody (2008) data provided by VCGI (2009); VSWI wetlands downloaded from VCGI (2010); Wetland and Streams delineated by VHB (2010); wetland properties, natural resources investigation area, and contours provided by VHB (2010).

VHB Vanasse Hangen Brustlin, Inc.

Prepared by: LBS
57414.00\GIS\Project\Fed_Street_WetlandDelMap.mxd

Federal Street Multi-Modal Connector Project
St. Albans, Vermont
Summary of Delineated Wetlands
Prepared by VHB
March 15, 2011

Wetland ID	Wetland Area (Square Feet)[1]	Elevation (ft NGVD approx.)	Cowardin Classification[2]	Vegetation Assemblage or Natural Community[3]	Highway Methodology Principal Functions and Values[4]	Contiguous to a VSWI-mapped Wetland?	Riparian Wetland Contiguous to Stream Channel? (Flow Regime)[5]	VWR Section 4.6 Presumptions	VWR Section 5 Functional Criteria Presence/ Significance		VHB Proposed VWR Classification[7]	Comments
									Type[6]	VHB-Proposed Significant?		
B	32,200	400	PFO1C	Regenerating Forested Wetland	FF	NO	NO	Yes (4.6.a)	5.1	YES	Class II	Wetland B is located to south of Nason Street. Wetland B meets Section 4.6.a presumptive criteria. Its size and location on the landscape allow it to provide significant floodflow functional benefits. A 48″ culvert provides stormwater inflows and throughflows to this wetland. A scour channel has developed below the culvert but the channel becomes diffuse as it flows downstream through the wetland.
F	2,930	400	PFO1C	Regenerating Forested Wetland	W	NO	NO	None	-	-	Class III	Wetland F is located south of Nason Street adjacent to Wetland B in a forested area. Wetland F does not meet any of the presumptive criteria of 4.6. This wetland is small so its ability to provide significant functional benefit per 5.1 and 5.2. is limited.

1. Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northeast and North Central Region. U.S. Army Corps of Engineers. 2009.
2. Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitat of the United States.
3. When the wetland is part of a natural community (undisturbed), Wetland Woodland Wildland (Thompson and Sorenson 2005) is used followed by Vermont Community ranking in parentheses (S1=very rare, S2=rare, S3=uncommon, S4=common, S5=very common). The natural community type is used in several instances to evaluate the wetland's significance under the Vermont Wetland Rules.
4. U.S. Army Corps of Engineers (USACE) - New England District. 1999. The Highway Methodology Workbook: Supplement: Wetland Functions and Values - A Descriptive Approach. NAEEP-360-1-30a. Functions and Values are codified as follows: GW=Groundwater Recharge/Discharge, FF=Floodflow Alteration, F= Fish and Shellfish Habitat, STP=Sediment/Toxicant Retention, NUT=Nutrient Removal, PE-Production Export, SS=Sediment/Shoreline Stabilization, W=Wildlife Habitat, R=Recreation, ES=Education/Scientific Value, H=Heritage/Uniqueness, V=Visual/Aesthetics, and RTE=Rare, Threatened, or Endangered Species Habitat.
5. Wetland contiguity to streams as defined in the Vermont ANR 12/9/05 Guidance for Agency Act 250 and Section 248 Comments Regarding Riparian Buffers and confirmed if a delineated perennial or intermittent stream channel inflows, throughflows, and outflows from a delineated wetland (ephemeral channels not typically being subject to ANR Riparian Buffer Guidance). The vegetative assemblage or natural community type is used when determining riparian vegetation function. Flow regime determined based on qualitative observations of instream hydrology indicators and geomorphic characteristic and are subject to professional judgment (P=perennial, I=intermittent, E=ephemeral).
6. VWR Section 5: Functional Criteria for Evaluating a Wetland's Significance: 5.1=Water Storage for Flood Water and Storm Runoff, 5.2=Surface and Groundwater Protection, 5.3=Fish Habitat, 5.4=Wildlife Habitat, 5.5=Exemplary Wetland Natural Community, 5.6=Rare, Threatened or Endangered Species Habitat, 5.7=Education and Research in Natural Sciences, 5.8=Recreational Value and Economic Benefits, 5.9=Open Space and Aesthetics, 5.10=Erosion Control Through Binding and Stabilizing the Soil.
7. As delineated, all wetland resources on-site are proposed for classification under the 2010 Vermont Wetland Rules but have not been reviewed by the ANR-DEC. Unless otherwise designated by the Secretary, Class II wetlands are protected by regulated 50-foot buffers.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project Site: FEDERAL ST. MULTI-MODAL CONNECTOR City/County: ST. ALBANS Samp. Date: 10/18/2010

Applicant/Owner: CITY OF ST. ALBANS State: VERMONT Sampling Point: B-WET

Investigator(s): N. RENDALL (VHB) Section, Township, Range: ST. ALBANS

Landform (hillslope, terrace, etc.): FLAT Local relief (concave, convex, none): CONCAVE Slope (%):

Subregion (LRR or MLRA): LRR R Lat: 73° 5' 28.798" Long: 44° 48' 8.457" Datum: NAD 27

Soil Map Unit: MASSENA STONY LOAM, 0-3% SLOPES NWI Class: PFO1C

Are climatic/hydrologic conditions on the site typical for this time of year? YES (If no, explain in Remarks.)

Are Vegetation, Soil, or Hydrology significantly disturbed? YES (SOIL) Normal Circumstances? YES

Are Vegetation, Soil, or Hydrology naturally problematic? NO (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sample point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	YES	**Is This Sample Area Within a Wetland?**	YES
Hydric Soil Present?	YES		
Wetland Hydrology Present?	YES	**If yes, optional Wetland Site ID:**	WETLAND B

Remarks:

AREA HAS BEEN USED IN THE PAST FOR TRASH/GARBAGE DUMPING (RESIDENTIAL AND DEMO DEBRIS) AND DEBRIS COLLECTION FROM ADJACENT RAILROAD

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

	Surface Water (A1)	X	Water-Stained Leaves (B9)		Surface Soil Cracks (B6)
X	High Water Table (A2)		Aquatic Fauna (B13)	X	Drainage Patterns (B10)
X	Saturation (A3)		Marl Deposits (B15)		Moss Trim Lines (B16)
	Water Marks (B1)		Hydrogen Sulfide Odor (C1)		Dry-Season Water Table (C2)
	Sediment Deposits (B2)		Oxidized Rhizospheres on Living Roots (C3)		Crayfish Burrows (C8)
	Drift Deposits (B3)		Presence of Reduced Iron (C4)		Saturation Visible on Aerial (C9)
	Algal Mat or Crust (B4)		Recent Iron Reduction in Tilled Soils (C6)		Stunted or Stressed Plants (D1)
	Iron Deposits (B5)		Thin Muck Surface (C7)		Geomorphic Position (D2)
	Inundation Visible on Aerial (B7)		Other (Explain in Remarks)		Shallow Aquitard (D3)
	Sparsely Vegetated Concave Surface (B8)				Microtopographic Relief (D4)
					FAC-Neutral Test (D5)

Secondary Indicators (minimum of two required)

Field Observations:

Surface Water Present?		Depth (inches):	
Water Table Present?	X	Depth (inches):	<12
Saturation Present? (includes capillary fringe)	X	Depth (inches):	<12

Wetland Hydrology Present? YES

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants.

Sampling Point: B-WET

Tree Stratum (Plot size: 30' RAD)	Absolute % Cover	Dom. Sp?	Indicator Status
1. Salix ×sepulcralis Simonkai [alba × ?pendulina]	10		FACW
2. Fraxinus nigra Marsh.	20	X	FACW
3. Ulmus americana L.	20	X	FACW
4. Prunus virginiana L.	5		FACU
5. Acer saccharinum L.	15		FACW
6. Acer negundo L.	15		FAC
7. Betula populifolia Marsh.	10		FAC
	95	= Total Cover	
Sapling Stratum (Plot size: 30' RAD)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
		= Total Cover	
Shrub Stratum (Plot size: 15' RAD)			
1. Cornus sericea L.	20	X	FACW
2. Alnus incana (L.) Moench ssp. rugosa (Du Roi) R.T. Clausen	25	X	FACW
3. Photinia melanocarpa (Michx.) K.R. Robertson & Phipps	25	X	FAC
4.			
5.			
6.			
7.			
	70	= Total Cover	
Herb Stratum (Plot size: 5' RAD)			
1. Matteuccia struthiopteris (L.) Todaro	5		FACW
2. Onoclea sensibilis L.	50	X	FACW
3. Doellingeria umbellata (Mill.) Nees var. umbellata	15	X	FACW
4. Equisetum sylvaticum L.	5		FACW
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	75	= Total Cover	
Woody Vines (Plot size: 30' RAD)			
1. Celastrus orbiculatus Thunb.	20	X	UPL
2.			
3.			
4.			
5.			
	20	= Total Cover	

Dominance Test Worksheet:

# Dominants OBL, FACW, FAC:	7	(A)
# Dominants across all strata:	8	(B)
% Dominants OBL, FACW, FAC:	88%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:			Multiply By:
OBL		x 1 =	
FACW	185	x 2 =	370
FAC	50	x 3 =	150
FACU	5	x 4 =	20
UPL		x 5 =	
Sum:	240 (A)		540 (B)

Prevalence Index = B/A = 2.25

Hydrophytic Vegetation Indicators:

X Dominance Test is > 50%

X Prevalence Index is <= 3.0[1]

___ Problematic Hydrophytic Vegetation[1] (explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants, excluding woody vines, approximately 20ft (6m) or more in height and 3in (7.6cm) or larger in diameter at breast height (DBH).

Sapling - Woody plants, excluding woody vines, approximately 20ft (6m) or more in height and less than 3in (7.6cm) DBH.

Shrub - Woody plants, excluding woody vines, approximately 3 to 20ft (1 to 6m) in height.

Herb - All herbaceous (non-woody) plants, including herbaceous vines, regardless of size. Includes woody plants, except woody vines, less than approximately 3ft (1m) in height.

Woody vine - All woody vines, regardless of height.

Hydrophytic Vegetation Present? YES

Remarks: (If observed, list morphological adaptations below).

UNIDENTIFIED SOLIDAGO SP. PRESENT

SOIL

Sampling Point: B-WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (in)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 3/3						SANDY LOAM	MUCKY SURFACE
12-18	10YR 4/2		10YR 4/6		C	M	LOAMY SAND	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ____ Histosol (A1)
- ____ Histic Epipedon (A2)
- ____ Black Histic (A3)
- ____ Hydrogen Sulfide (A4)
- ____ Stratified Layers (A5)
- ____ Depleted Below Dark Surface (A11)
- ____ Thick Dark Surface (A12)
- ____ Sandy Mucky Mineral (S1)
- ____ Sandy Gleyed Matrix (S4)
- ____ Sandy Redox (S5)
- ____ Stripped Matrix (S6)
- ____ Dark Surface (S7) (LRR R, MLRA 149B)
- ____ Polyvalue Below Surface (S8) (LRR R, MLRA 149B
- ____ Thin Dark Surface (S9) (LRR R, MLRA 149B)
- ____ Loamy Mucky Mineral (F1) (LRR K, L)
- ____ Loamy Gleyed Matrix (F2)
- ____ Depleted Matrix (F3)
- ____ Redox Dark Surface (F6)
- ____ Depleted Dark Surface (F7)
- ____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ____ 2cm Muck (A10) (LRR K, L, MLRA 149B)
- ____ Coast Prairie Redox (A16) (LRR K, L, R)
- ____ 5cm Mucky Peat or Peat (S3) (LRR K, L, R)
- ____ Dark Surface (S7) (LRR K, L)
- ____ Polyvalue Below Surface (S8) (LRR K, L)
- ____ Thin Dark Surface (S9) (LRR K, L)
- ____ Iron-Manganese Masses (F12) (LRR K, L, R)
- ____ Piedmont Floodplain Soils (F19) (MLRA 149B)
- ____ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- ____ Red Parent Material (TF2)
- ____ Very Shallow Dark Surface (TF12)
- X Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ____

Depth (inches): ____

Hydric Soil Present? YES

Remarks:

SOILS ARE SIGNIFICANTLY DISTURBED, PARTICULARLY THROUGH REFUSE DUMPING. HYDRIC SOIL DETERMINATION RELIES ON PRESENCE OF MUCK AT SURFACE COMBINED WITH PREVALENCE OF WETLAND HYDROLOGY AND HYDROPHYTIC VEGETATION

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project Site: FEDERAL ST. MULTI-MODAL CONNECTOR City/County: ST. ALBANS Samp. Date: 10/18/2010

Applicant/Owner: CITY OF ST. ALBANS State: VERMONT Sampling Point: B-UPL

Investigator(s): N. RENDALL (VHB) Section, Township, Range: ST. ALBANS

Landform (hillslope, terrace, etc.): TERRACE Local relief (concave, convex, none): SLIGHTLY SLOPING Slope (%):

Subregion (LRR or MLRA): LRR R Lat: 73° 5' 28.798" Long: 44° 48' 8.457" Datum: NAD 27

Soil Map Unit: MASSENA STONY LOAM, 0-3% SLOPES NWI Class: UPLAND

Are climatic/hydrologic conditions on the site typical for this time of year? YES (If no, explain in Remarks.)

Are Vegetation, Soil, or Hydrology significantly disturbed? YES (SOIL) Normal Circumstances? YES

Are Vegetation, Soil, or Hydrology naturally problematic? NO (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sample point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	NO	**Is This Sample Area Within a Wetland?**	NO
Hydric Soil Present?	NO		
Wetland Hydrology Present?	NO	**If yes, optional Wetland Site ID:**	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? ____ Depth (inches): ____

Water Table Present? ____ Depth (inches): ____

Saturation Present? ____ Depth (inches): ____
(includes capillary fringe)

Wetland Hydrology Present? NO

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants.

Sampling Point: B-UPL

Tree Stratum (Plot size: 30' RAD)	Absolute % Cover	Dom. Sp?	Indicator Status
1. Acer saccharum Marsh.	15	X	FACU
2. Fraxinus americana L.	10		FACU
3. Prunus serotina Ehrh.	5		FACU
4. Populus tremuloides Michx.	45	X	UPL
5.			
6.			
7.			
	75	= Total Cover	

Sapling Stratum (Plot size: 30' RAD)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
		= Total Cover	

Shrub Stratum (Plot size: 15' RAD)			
1. Cornus alternifolia L. f.	10		UPL
2. Rubus canadensis L.	15		UPL
3. Lonicera tatarica L.	35	X	FACU
4. Rosa multiflora Thunb.	20	X	FACU
5.			
6.			
7.			
	80	= Total Cover	

Herb Stratum (Plot size: 5' RAD)			
1. Polygonum cuspidatum Siebold & Zucc.	50	X	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	50	= Total Cover	

Woody Vines (Plot size: 30' RAD)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	

Dominance Test Worksheet:

Dominants OBL, FACW, FAC: _____ (A)

Dominants across all strata: 5 (B)

% Dominants OBL, FACW, FAC: _____ (A/B)

Prevalence Index Worksheet:

Total % Cover of:			Multiply By:
OBL		x 1 =	
FACW		x 2 =	
FAC		x 3 =	
FACU	135	x 4 =	540
UPL	70	x 5 =	350
Sum:	205 (A)		890 (B)

Prevalence Index = B/A = 4.34

Hydrophytic Vegetation Indicators:

_____ Dominance Test is > 50%

_____ Prevalence Index is <= 3.0[1]

_____ Problematic Hydrophytic Vegetation[1] (explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree - Woody plants, excluding woody vines, approximately 20ft (6m) or more in height and 3in (7.6cm) or larger in diameter at breast height (DBH).

Sapling - Woody plants, excluding woody vines, approximately 20ft (6m) or more in height and less than 3in (7.6cm) DBH.

Shrub - Woody plants, excluding woody vines, approximately 3 to 20ft (1 to 6m) in height.

Herb - All herbaceous (non-woody) plants, including herbaceous vines, regardless of size. Includes woody plants, except woody vines, less than approximately 3ft (1m) in height.

Woody vine - All woody vines, regardless of height.

Hydrophytic Vegetation Present? NO

Remarks: (If observed, list morphological adaptations below).

UNIDENTIFED VITIS SP. PRESENT IN VINE STRATUM

SOIL

Sampling Point: B-UPL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(in)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-14	10YR 3/4						SANDY LOAM	
14-20+	10YR 4/3						LOAMY SAND	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ____ Histosol (A1)
- ____ Histic Epipedon (A2)
- ____ Black Histic (A3)
- ____ Hydrogen Sulfide (A4)
- ____ Stratified Layers (A5)
- ____ Depleted Below Dark Surface (A11)
- ____ Thick Dark Surface (A12)
- ____ Sandy Mucky Mineral (S1)
- ____ Sandy Gleyed Matrix (S4)
- ____ Sandy Redox (S5)
- ____ Stripped Matrix (S6)
- ____ Dark Surface (S7) (LRR R, MLRA 149B)
- ____ Polyvalue Below Surface (S8) (LRR R, MLRA 149B
- ____ Thin Dark Surface (S9) (LRR R, MLRA 149B)
- ____ Loamy Mucky Mineral (F1) (LRR K, L)
- ____ Loamy Gleyed Matrix (F2)
- ____ Depleted Matrix (F3)
- ____ Redox Dark Surface (F6)
- ____ Depleted Dark Surface (F7)
- ____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ____ 2cm Muck (A10) (LRR K, L, MLRA 149B)
- ____ Coast Prairie Redox (A16) (LRR K, L, R)
- ____ 5cm Mucky Peat or Peat (S3) (LRR K, L, R)
- ____ Dark Surface (S7) (LRR K, L)
- ____ Polyvalue Below Surface (S8) (LRR K, L)
- ____ Thin Dark Surface (S9) (LRR K, L)
- ____ Iron-Manganese Masses (F12) (LRR K, L, R)
- ____ Piedmont Floodplain Soils (F19) (MLRA 149B)
- ____ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
- ____ Red Parent Material (TF2)
- ____ Very Shallow Dark Surface (TF12)
- ____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? NO

Remarks:

Federal Street Multi-Modal Connector Project – Saint Albans, Vermont
Wetland and Stream Delineation Summary Photographs

Photograph 1: Wetland B, in southwest portion of wetland, looking south

Photograph 2: Wetland B, in east portion of wetland, looking northeast

Photographs taken by Patti Kallfelz-Werts of VHB on October 18 and 20, 2010

Federal Street Multi-Modal Connector Project – Saint Albans, Vermont
Wetland and Stream Delineation Summary Photographs

Photograph 3: Wetland F, looking northeast

Photograph 4: Stevens Brook, at Lemnah Road crossing, looking downstream (northwest)

F:\57414.00\SitePhotos\NR Report Photos\Federal St NR Survey_Photos.doc

Photographs taken by Patti Kallfelz-Werts of VHB on October 18 and 20, 2010

From: Adams, Michael S NAE [Michael.S.Adams@usace.army.mil]
Sent: Wednesday, June 01, 2011 12:28 PM
To: Ketterling, Brad
Subject: RE: Confirmation of Wetland Boundary: Federal Street Multi-Modal Connector Project (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Brad,
This is in reference to the City of St. Albans' proposal to extend Interstate Access Road to the southern end of Lemnah Drive in St. Albans, Vermont.
Based on an April 14, 2011 site walk and wetland data sheets, it appears that the flagged wetland boundaries in the project area are acceptable. Once draft plans have been completed, submit them for review and I will provide initial comments. Call me if you have any questions.
Best Regards,

Michael S. Adams
Senior Project Manager
U.S. Army Corps of Engineers
New England District
8 Carmichael Street, Suite 205
Essex Junction, Vermont 05452
(802)872-2893

In order for us to better serve you, we would appreciate your completing our Customer Service Survey located at http://per2.nwp.usace.army.mil/survey.html

-----Original Message-----
From: Ketterling, Brad [mailto:BKetterling@VHB.com]
Sent: Tuesday, May 31, 2011 3:43 PM
To: Adams, Michael S NAE
Subject: Confirmation of Wetland Boundary: Federal Street Multi-Modal Connector Project

Dear Mr. Adams:

Thank you very much for meeting with me in the field on April 14, 2011 to review the wetland delineation that was completed for the Federal Street Multi-Modal Connector Project. During this field visit, we walked the flagged wetland line as shown on the map entitled "Federal Street Multi-Modal Connector, St, Albans, VT: Wetland and Stream Delineation Map," dated March 15, 2011. This map was submitted as an attachment to our wetland report and request for a Preliminary Jurisdictional Determination, dated April 1, 2011 and submitted to Marty Abair, Senior Project Manager, Regulatory Division.
Upon completion of the walkover, you found that the delineation as mapped was accurate and required no modification.

We understand that it is no longer typical for the Corps to issue Preliminary Jurisdictional Determinations in advance of receiving a formal application for a Department of the Army

Section 404 permit. As we discussed during the field visit, as a surrogate approach, the City of St. Albans would appreciate written acknowledgement that you concur with the wetland line as depicted on the map referenced above. This will provide a measure of confidence for further project-related engineering design work. A response to this email would be sufficient.

Should you have any questions, please do not hesitate to contact me.

Many thanks,

Brad Ketterling
Senior Environmental Scientist

VHB | Vanasse Hangen Brustlin, Inc.
Transportation | Land Development | Environmental Services

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bketterling@vhb.com <mailto:ACrary@vhb.com>

www.vhb.com <http://www.vhb.com/>

Appendix D – Air Quality Analysis

Vanasse Hangen Brustlin, Inc.

Appendix
Air Quality Analysis

Air Quality

- MOBILE 6.2 Input Files
- MOBILE 6.2 Output Files
- Microscale Input Files
  - 2010 Existing Condition
  - 2010 Build Condition
  - 2030 No Build Condition
  - 2030 Build Condition
- Microscale Output Files
  - 2010 Existing Condition
  - 2010 Build Condition
  - 2030 No Build Condition
  - 2030 Build Condition
- Traffic Summary
- Microscale Results

Vanasse Hangen Brustlin, Inc.

MOBILE 6.2 Input Files

```
* Calendar Year 2010 Generic MOBILE6 input file
***************     Header Section     ***************
MOBILE6 INPUT FILE
*
POLLUTANTS          : CO
DATABASE OUTPUT     :
WITH FIELDNAMES     :
AGGREGATED OUTPUT   :
REPORT FILE         : VT10CO.txt
*
RUN DATA
***************     Run Section #1    ***************

> ****************************************************
> ********************** WINTER ***********************
> ****************************************************

* Meteorological inputs
MIN/MAX TEMP        : 35. 45.

* Fuel inputs
FUEL RVP            : 13.5


***************     Scenario Section     ***************

**************      Arterial       ***************

SCENARIO RECORD     : VT Arterial 2.5 mph (= minimum allowed arterial speed)
CALENDAR YEAR       : 2010
EVALUATION MONTH    : 1
AVERAGE SPEED       : 2.5 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD     : VT Arterial 3.0 mph
CALENDAR YEAR       : 2010
EVALUATION MONTH    : 1
AVERAGE SPEED       : 3.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD     : VT Arterial 4.0 mph
CALENDAR YEAR       : 2010
EVALUATION MONTH    : 1
AVERAGE SPEED       : 4.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD     : VT Arterial 5.0 mph
CALENDAR YEAR       : 2010
EVALUATION MONTH    : 1
AVERAGE SPEED       : 5.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD     : VT Arterial 6.0 mph
CALENDAR YEAR       : 2010
EVALUATION MONTH    : 1
AVERAGE SPEED       : 6.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD     : VT Arterial 7.0 mph
CALENDAR YEAR       : 2010
EVALUATION MONTH    : 1
AVERAGE SPEED       : 7.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD     : VT Arterial 8.0 mph
CALENDAR YEAR       : 2010
EVALUATION MONTH    : 1
AVERAGE SPEED       : 8.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD     : VT Arterial 9.0 mph
CALENDAR YEAR       : 2010
EVALUATION MONTH    : 1
AVERAGE SPEED       : 9.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD     : VT Arterial 10.0 mph
CALENDAR YEAR       : 2010
EVALUATION MONTH    : 1
AVERAGE SPEED       : 10.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD     : VT Arterial 11.0 mph
CALENDAR YEAR       : 2010
EVALUATION MONTH    : 1
AVERAGE SPEED       : 11.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD     : VT Arterial 12.0 mph
CALENDAR YEAR       : 2010
EVALUATION MONTH    : 1
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AVERAGE SPEED      : 12.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 13.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 13.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 14.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 14.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 15.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 15.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 16.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 16.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 17.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 17.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 18.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 18.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 19.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 19.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 20.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 20.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 21.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 21.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 22.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 22.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 23.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 23.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 24.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 24.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 25.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 25.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 26.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 26.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 27.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 27.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 28.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 28.0 Arterial 0.0 100.0 0.0 0.0
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SCENARIO RECORD    : VT Arterial 29.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 29.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 30.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 30.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 31.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 31.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 32.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 32.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 33.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 33.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 34.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 34.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 35.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 35.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 36.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 36.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 37.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 37.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 38.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 38.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 39.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 39.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 40.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 40.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 41.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 41.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 42.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 42.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 43.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 43.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 44.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 44.0 Arterial 0.0 100.0 0.0 0.0
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SCENARIO RECORD    : VT Arterial 45.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 45.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 46.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 46.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 47.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 47.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 48.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 48.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 49.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 49.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 50.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 50.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 51.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 51.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 52.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 52.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 53.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 53.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 54.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 54.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 55.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 55.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 56.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 56.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 57.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 57.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 58.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 58.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 59.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 59.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 60.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 60.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 61.0 mph
```

```
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 61.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 62.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 62.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 63.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 63.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 64.0 mph
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 64.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 65.0 mph (= maximum allowed arterial speed)
CALENDAR YEAR      : 2010
EVALUATION MONTH   : 1
AVERAGE SPEED      : 65.0 Arterial 0.0 100.0 0.0 0.0

***************     End of This Run     ***************
END OF RUN
```

```
* Calendar Year 2030 Generic MOBILE6 input file
***************     Header Section     ***************
MOBILE6 INPUT FILE
*
POLLUTANTS          : CO
DATABASE OUTPUT     :
WITH FIELDNAMES     :
AGGREGATED OUTPUT   :
REPORT FILE         : VT30CO.txt
*
RUN DATA
***************     Run Section #1    ***************

> ****************************************************
> ********************** WINTER ***********************
> ****************************************************

* Meteorological inputs
MIN/MAX TEMP        : 35. 45.

* Fuel inputs
FUEL RVP            : 13.5


***************     Scenario Section     ***************

**************      Arterial       ***************

SCENARIO RECORD     : VT Arterial 2.5 mph (= minimum allowed arterial speed)
CALENDAR YEAR       : 2030
EVALUATION MONTH    : 1
AVERAGE SPEED       : 2.5 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD     : VT Arterial 3.0 mph
CALENDAR YEAR       : 2030
EVALUATION MONTH    : 1
AVERAGE SPEED       : 3.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD     : VT Arterial 4.0 mph
CALENDAR YEAR       : 2030
EVALUATION MONTH    : 1
AVERAGE SPEED       : 4.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD     : VT Arterial 5.0 mph
CALENDAR YEAR       : 2030
EVALUATION MONTH    : 1
AVERAGE SPEED       : 5.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD     : VT Arterial 6.0 mph
CALENDAR YEAR       : 2030
EVALUATION MONTH    : 1
AVERAGE SPEED       : 6.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD     : VT Arterial 7.0 mph
CALENDAR YEAR       : 2030
EVALUATION MONTH    : 1
AVERAGE SPEED       : 7.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD     : VT Arterial 8.0 mph
CALENDAR YEAR       : 2030
EVALUATION MONTH    : 1
AVERAGE SPEED       : 8.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD     : VT Arterial 9.0 mph
CALENDAR YEAR       : 2030
EVALUATION MONTH    : 1
AVERAGE SPEED       : 9.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD     : VT Arterial 10.0 mph
CALENDAR YEAR       : 2030
EVALUATION MONTH    : 1
AVERAGE SPEED       : 10.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD     : VT Arterial 11.0 mph
CALENDAR YEAR       : 2030
EVALUATION MONTH    : 1
AVERAGE SPEED       : 11.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD     : VT Arterial 12.0 mph
CALENDAR YEAR       : 2030
EVALUATION MONTH    : 1
```

```
AVERAGE SPEED      : 12.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 13.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 13.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 14.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 14.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 15.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 15.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 16.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 16.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 17.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 17.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 18.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 18.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 19.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 19.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 20.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 20.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 21.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 21.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 22.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 22.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 23.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 23.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 24.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 24.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 25.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 25.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 26.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 26.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 27.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 27.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 28.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 28.0 Arterial 0.0 100.0 0.0 0.0
```

```
SCENARIO RECORD    : VT Arterial 29.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 29.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 30.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 30.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 31.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 31.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 32.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 32.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 33.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 33.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 34.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 34.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 35.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 35.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 36.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 36.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 37.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 37.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 38.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 38.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 39.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 39.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 40.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 40.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 41.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 41.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 42.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 42.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 43.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 43.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 44.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 44.0 Arterial 0.0 100.0 0.0 0.0
```

```
SCENARIO RECORD    : VT Arterial 45.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 45.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 46.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 46.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 47.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 47.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 48.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 48.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 49.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 49.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 50.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 50.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 51.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 51.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 52.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 52.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 53.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 53.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 54.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 54.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 55.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 55.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 56.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 56.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 57.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 57.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 58.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 58.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 59.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 59.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 60.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 60.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 61.0 mph
```

```
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 61.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 62.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 62.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 63.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 63.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 64.0 mph
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 64.0 Arterial 0.0 100.0 0.0 0.0

SCENARIO RECORD    : VT Arterial 65.0 mph (= maximum allowed arterial speed)
CALENDAR YEAR      : 2030
EVALUATION MONTH   : 1
AVERAGE SPEED      : 65.0 Arterial 0.0 100.0 0.0 0.0

***************     End of This Run     ***************
END OF RUN
```

Vanasse Hangen Brustlin, Inc.

MOBILE 6.2 Output Files

```
*************************************************************************
* MOBILE6.2.01 (31-Oct-2002)                                            *
* Input file: VT10CO.INP (file 1, run 1).                               *
*************************************************************************
* ****************************************************
* ******************** WINTER **********************
* ****************************************************


* # # # # # # # # # # # # # # # # # # # # # # # # #
* VT Arterial 2.5 mph (= minimum allowed arterial speed)
* File 1, Run 1, Scenario 61.
* # # # # # # # # # # # # # # # # # # # # # # # # #
  M583 Warning:
            The user supplied arterial average speed of  2.5
            will be used for all hours of the day.  100% of VMT
            has been assigned to the arterial/collector roadway
            type for all hours of the day and all vehicle types.
  M 48 Warning:
              there are no sales for vehicle class HDGV8b
```

Calendar Year: 2010

```
                          Month:  Jan.
                       Altitude:  Low
              Minimum Temperature:  35.0 (F)
              Maximum Temperature:  45.0 (F)
                Absolute Humidity:   75. grains/lb
                 Nominal Fuel RVP:  13.5 psi
                    Weathered RVP:  13.5 psi
              Fuel Sulfur Content:   30. ppm

              Exhaust I/M Program:  No
                 Evap I/M Program:  No
                      ATP Program:  No
                 Reformulated Gas:  No
```

Vehicle Type:	LDGV	LDGT12	LDGT34	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
GVWR:		<6000	>6000	(All)						
VMT Distribution:	0.3540	0.3855	0.1315		0.0357	0.0003	0.0019	0.0856	0.0054	1.0000
Composite Emission Factors (g/mi):										
Composite CO :	43.56	45.72	62.11	49.89	50.90	3.381	2.656	8.294	106.62	44.322

```
* # # # # # # # # # # # # # # # # # # # # # # # # #
* VT Arterial 25.0 mph
* File 1, Run 1, Scenario 84.
* # # # # # # # # # # # # # # # # # # # # # # # # #
  M583 Warning:
            The user supplied arterial average speed of 25.0
            will be used for all hours of the day.  100% of VMT has been assigned to the
arterial/collector roadway type for all hours of the day and all vehicle types.
  M 48 Warning:     there are no sales for vehicle class HDGV8b

                    Calendar Year:  2010
                          Month:  Jan.
                       Altitude:  Low
              Minimum Temperature:  35.0 (F)
              Maximum Temperature:  45.0 (F)
                Absolute Humidity:   75. grains/lb
                 Nominal Fuel RVP:  13.5 psi
                    Weathered RVP:  13.5 psi
              Fuel Sulfur Content:   30. ppm

              Exhaust I/M Program:  No
                 Evap I/M Program:  No
                      ATP Program:  No
Reformulated Gas:  No
```

Vehicle Type:	LDGV	LDGT12	LDGT34	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
GVWR:		<6000	>6000	(All)						
VMT Distribution:	0.3540	0.3855	0.1315		0.0357	0.0003	0.0019	0.0856	0.0054	1.0000
Composite Emission Factors (g/mi):										
Composite CO :	16.13	18.21	23.69	19.60	11.08	1.130	0.899	2.011	15.29	16.497

Vanasse Hangen Brustlin, Inc.

```
 ***********************************************************************
* MOBILE6.2.01 (31-Oct-2002)                                           *
* Input file: VT30CO.INP (file 1, run 1).                              *
************************************************************************
* ********************* WINTER ************************
* ****************************************************

* # # # # # # # # # # # # # # # # # # # # # # # # #
* VT Arterial 2.5 mph (= minimum allowed arterial speed)
* File 1, Run 1, Scenario 61.
* # # # # # # # # # # # # # # # # # # # # # # # # #
  M583 Warning:
            The user supplied arterial average speed of  2.5
            will be used for all hours of the day.  100% of VMT has been assigned to the arterial/collector roadway
            type for all hours of the day and all vehicle types.   M 48 Warning: there are no sales for vehicle
class HDGV8b
  M 48 Warning: there are no sales for vehicle class LDDT12
```

Calendar Year: 2030

```
                     Month:  Jan.
                  Altitude:  Low
  Minimum Temperature:  35.0 (F)
  Maximum Temperature:  45.0 (F)
    Absolute Humidity:   75. grains/lb
     Nominal Fuel RVP:  13.5 psi
        Weathered RVP:  13.5 psi
  Fuel Sulfur Content:   30. ppm

  Exhaust I/M Program:  No
     Evap I/M Program:  No
          ATP Program:  No
     Reformulated Gas:  No

       Vehicle Type:      LDGV    LDGT12    LDGT34      LDGT      HDGV      LDDV      LDDT      HDDV        MC
All Veh
             GVWR:                <6000     >6000     (All)
                        ------    ------    ------    ------    ------    ------    ------    ------    ------    -
-----
   VMT Distribution:    0.2790    0.4400    0.1500              0.0363    0.0003    0.0022    0.0872    0.0050
1.0000
  ---------------------------------------------------------------------------------------------------------------
-----
 Composite Emission Factors (g/mi):
     Composite CO  :     30.03     31.53     40.99     33.94     39.79     2.069     1.546     1.145    106.62
30.487
  ---------------------------------------------------------------------------------------------------------------
* # # # # # # # # # # # # # # # # # # # # # # # # #
* VT Arterial 25.0 mph
* File 1, Run 1, Scenario 84.
* # # # # # # # # # # # # # # # # # # # # # # # # #
  M583 Warning:
The user supplied arterial average speed of 25.0
will be used for all hours of the day.  100% of VMT has been assigned to the arterial/collector roadway
type for all hours of the day and all vehicle types.M 48 Warning: there are no sales for vehicle class HDGV8b
  M 48 Warning:   there are no sales for vehicle class LDDT12

                Calendar Year:  2030
                     Month:  Jan.
                  Altitude:  Low
  Minimum Temperature:  35.0 (F)
  Maximum Temperature:  45.0 (F)
    Absolute Humidity:   75. grains/lb
     Nominal Fuel RVP:  13.5 psi
        Weathered RVP:  13.5 psi
  Fuel Sulfur Content:   30. ppm

  Exhaust I/M Program:  No
     Evap I/M Program:  No
          ATP Program:  No
     Reformulated Gas:  No

     Vehicle Type:      LDGV    LDGT12    LDGT34      LDGT      HDGV      LDDV      LDDT      HDDV        MC   All Veh
            GVWR:                <6000     >6000     (All)
                      ------    ------    ------    ------    ------    ------    ------    ------    ------    ------
 VMT Distribution:    0.2790    0.4400    0.1500              0.0363    0.0003    0.0022    0.0872    0.0050    1.0000
-----------------------------------------------------------------------------------------------------------------
Composite Emission Factors (g/mi):
   Composite CO  :     11.98     12.52     15.64     13.31      8.66     0.687     0.499     0.278     15.29    11.614
-----------------------------------------------------------------------------------------------------------------
```

Microscale Input Files

2010 Existing Condition

```
'2010NoBUILD'   60   175   0   0   60   0.3048   1   0
'1'   1489221   845814.4   6
'2'   1489279   845790.6   6
'3'   1489349   845750   6
'4'   1489341   845660.9   6
'5'   1489328   845579.5   6
'6'   1489412   845569.8   6
'7'   1489426   845647.4   6
'8'   1489440   845704.1   6
'9'   1489530   845673.5   6
'10'   1489617   845632.9   6
'11'   1489656   845703.3   6
'12'   1489567   845742.1   6
'13'   1489449   845796.8   6
'14'   1489466   845872.9   6
'15'   1489484   845952.8   6
'16'   1489398   845971.9   6
'17'   1489382   845896.9   6
'18'   1489367   845834.3   6
'19'   1489306   845859.2   6
'20'   1489275   845890.6   6
'1'   1487964   842867.4   6
'2'   1488078   842862.6   6
'3'   1488222   842840.3   6
'4'   1488217   842746.4   6
'5'   1488184   842609.4   6
'6'   1488375   842576.9   6
'7'   1488405   842726.3   6
'8'   1488427   842832.1   6
'9'   1488529   842822.3   6
'10'   1488676   842794.8   6
'11'   1488698   842865.8   6
'12'   1488560   842893.3   6
'13'   1488473   842919   6
'14'   1488489   843011.7   6
'15'   1488502   843110.8   6
'16'   1488408   843121.3   6
'17'   1488392   843023.3   6
'18'   1488350   842940.3   6
'19'   1488254   842931.8   6
'20'   1488086   842939.6   6
'1'   1487355   839638.8   6
'2'   1487443   839590.6   6
'3'   1487538   839527.4   6
'4'   1487528   839479.9   6
'5'   1487425   839318   6
'6'   1487499   839282.9   6
'7'   1487576   839408.6   6
'8'   1487616   839472.9   6
'9'   1487708   839430   6
'10'   1487812   839376.3   6
'11'   1487861   839433.9   6
'12'   1487761   839485.1   6
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'13'   1487672   839546.6   6
'14'   1487707   839631.4   6
'15'   1487782   839759.9   6
'16'   1487714   839798.5   6
'17'   1487645   839674.9   6
'18'   1487592   839616.3   6
'19'   1487486   839659.2   6
'20'   1487382   839710.9   6
'2010 No Build'   22   2   0   'C'
 2
'Lower Newton QL'   'AG'   1489361.51   845789.96   1489201.59
845861.26   1   20   2
120   100   3   505   110.8   1600   1   3
 2
'Rt7 SB QL'   'AG'   1489404.82   845855.02   1489425.54   845942.95
1   20   2
120   71   3   755   110.8   1600   1   3
 2
'Upper Nerton QL'   'AG'   1489462.45   845727.84   1489674.48
845629.79   1   20   2
120   107   3   35   110.8   1600   1   3
 2
'RT 7 NB QL'   'AG'   1489403.52   845706.58   1489394.1   845643.88
1   20   2
120   71   3   730   110.8   1600   1   3
 2
'Lake EB QL'   'AG'   1488298.31   842875.16   1488126.14
842887.92   1   10   1
120   88   3   620   110.8   1600   1   3
 2
'Federal QL'   'AG'   1488398.06   842933.68   1488425.4   843013.29
1   30   3
120   106   3   355   110.8   1600   1   3
 2
'Lake WB QL'   'AG'   1488472.86   842888.3   1488724.17   842841.04
1   10   1
120   86   3   315   110.8   1600   1   3
 2
'Catherine QL'   'AG'   1488396.06   842836.71   1488367.56   842691
1   20   2
120   90   3   100   110.8   1600   1   3
 2
'Rt 7 SB QL'   'AG'   1487660.95   839649.43   1487686.18
839692.76   1   20   2
120   104   3   715   110.8   1600   1   3
 2
'St Albans QL'   'AG'   1487660.72   839510.2   1487755.67
839458.51   1   20   2
120   86   3   430   110.8   1600   1   3
 2
'RT 7 NB QL'   'AG'   1487586.46   839481.76   1487476.52
839293.53   1   20   2
120   91   3   555   110.8   1600   1   3
 1
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'Lower Newton'   'AG'   1489401   845774.6   1488800   846056.9
905   16.6   1   60
 1
'Rt 7 SB'   'AG'   1489401   845774.6   1489545   846440.4   1365
16.6   1   60
 1
'Upper Newton'   'AG'   1489401   845774.6   1490143   845436.5
905   16.6   1   60
 1
'Rt7 NB '   'AG'   1489401   845774.6   1489351   845435.3   1365
16.6   1   60
 1
'Lake EB'   'AG'   1488405   842884.2   1487236   842956.7   685
16.6   1   60
 1
'Federal'   'AG'   1488506   843425.1   1488405   842884.2   705
16.6   1   60
 1
'Lake WB'   'AG'   1488405   842884.2   1489348   842708.6   685
16.6   1   60
 1
'Catherine'   'AG'   1488376   842889.7   1488072   842039.7   705
16.6   1   60
 1
'RT 7 SB'   'AG'   1487603   839526.1   1487908   840064.8   1365
16.6   1   60
 1
'ST Albans'   'AG'   1487603   839526.1   1488372   839129.3   1990
16.6   1   60
 1
'Rt 7 NB'   'AG'   1487603   839526.1   1487145   838782.3   1365
16.6   1   60
1   0   4   1000   0   'Y'   10   0   36
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2010 Build Condition

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'2010BUILD'   60   175   0   0   60   0.3048   1   0
'1'   1489221   845814.4   6
'2'   1489279   845790.6   6
'3'   1489349   845750   6
'4'   1489341   845660.9   6
'5'   1489328   845579.5   6
'6'   1489412   845569.8   6
'7'   1489426   845647.4   6
'8'   1489440   845704.1   6
'9'   1489530   845673.5   6
'10'   1489617   845632.9   6
'11'   1489656   845703.3   6
'12'   1489567   845742.1   6
'13'   1489449   845796.8   6
'14'   1489466   845872.9   6
'15'   1489484   845952.8   6
'16'   1489398   845971.9   6
'17'   1489382   845896.9   6
'18'   1489367   845834.3   6
'19'   1489306   845859.2   6
'20'   1489275   845890.6   6
'1'   1487964   842867.4   6
'2'   1488078   842862.6   6
'3'   1488222   842840.3   6
'4'   1488217   842746.4   6
'5'   1488184   842609.4   6
'6'   1488375   842576.9   6
'7'   1488405   842726.3   6
'8'   1488427   842832.1   6
'9'   1488529   842822.3   6
'10'   1488676   842794.8   6
'11'   1488698   842865.8   6
'12'   1488560   842893.3   6
'13'   1488473   842919   6
'14'   1488489   843011.7   6
'15'   1488502   843110.8   6
'16'   1488408   843121.3   6
'17'   1488392   843023.3   6
'18'   1488350   842940.3   6
'19'   1488254   842931.8   6
'20'   1488086   842939.6   6
'1'   1487355   839638.8   6
'2'   1487443   839590.6   6
'3'   1487538   839527.4   6
'4'   1487528   839479.9   6
'5'   1487425   839318   6
'6'   1487499   839282.9   6
'7'   1487576   839408.6   6
'8'   1487616   839472.9   6
'9'   1487708   839430   6
'10'   1487812   839376.3   6
'11'   1487861   839433.9   6
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'12'   1487761   839485.1   6
'13'   1487672   839546.6   6
'14'   1487707   839631.4   6
'15'   1487782   839759.9   6
'16'   1487714   839798.5   6
'17'   1487645   839674.9   6
'18'   1487592   839616.3   6
'19'   1487486   839659.2   6
'20'   1487382   839710.9   6
'2010Build'   24   2   0   'C'
 2
'Lower Newton QL'   'AG'   1489361.51   845789.96   1489201.59
845861.26   1   20   2
120   100   3   625   110.8   1600   1   3
 2
'Rt7 SB QL'   'AG'   1489404.82   845855.02   1489425.54   845942.95
1   20   2
120   71   3   755   110.8   1600   1   3
 2
'Upper Nerton QL'   'AG'   1489462.45   845727.84   1489674.48
845629.79   1   20   2
120   107   3   35   110.8   1600   1   3
 2
'RT 7 NB QL'   'AG'   1489403.52   845706.58   1489394.1   845643.88
1   20   2
120   71   3   555   110.8   1600   1   3
 2
'Lake EB QL'   'AG'   1488298.31   842875.16   1488126.14
842887.92   1   10   1
120   88   3   315   110.8   1600   1   3
 2
'Federal QL'   'AG'   1488398.06   842933.68   1488425.4   843013.29
1   30   3
120   106   3   430   110.8   1600   1   3
 2
'Lake WB QL'   'AG'   1488472.86   842888.3   1488724.17   842841.04
1   10   1
120   86   3   360   110.8   1600   1   3
 2
'Catherine QL'   'AG'   1488396.06   842836.71   1488367.56   842691
1   20   2
120   90   3   340   110.8   1600   1   3
 2
'Rt 7 SB QL'   'AG'   1487660.95   839649.43   1487686.18
839692.76   1   20   2
120   104   3   365   110.8   1600   1   3
 2
'St Albans QL'   'AG'   1487660.72   839510.2   1487755.67
839458.51   1   20   2
120   86   3   425   110.8   1600   1   3
 2
'RT 7 NB QL'   'AG'   1487586.46   839481.76   1487476.52
839293.53   1   20   2
120   91   3   555   110.8   1600   1   3
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 2
'Nason Conn QL'   'AG'   1487551.07   839551.47   1487357.98
839668.64   1   20   2
120   80   3   355   110.8   1600   1   3
 1
'Lower Newton'   'AG'   1489401   845774.6   1488800   846056.9
1010   16.6   1   60
 1
'Rt 7 SB'   'AG'   1489401   845774.6   1489545   846440.4   1155
16.6   1   60
 1
'Upper Newton'   'AG'   1489401   845774.6   1490143   845436.5
1010   16.6   1   60
 1
'Rt7 NB '   'AG'   1489401   845774.6   1489351   845435.3   1155
16.6   1   60
 1
'Lake EB'   'AG'   1488405   842884.2   1487236   842956.7   640
16.6   1   60
 1
'Federal'   'AG'   1488506   843425.1   1488405   842884.2   950
16.6   1   60
 1
'Lake WB'   'AG'   1488405   842884.2   1489348   842708.6   640
16.6   1   60
 1
'Catherine'   'AG'   1488376   842889.7   1488072   842039.7   950
16.6   1   60
 1
'RT 7 SB'   'AG'   1487603   839526.1   1487908   840064.8   1155
16.6   1   60
 1
'ST Albans'   'AG'   1487603   839526.1   1488372   839129.3   1990
16.6   1   60
 1
'Rt 7 NB'   'AG'   1487603   839526.1   1487145   838782.3   1155
16.6   1   60
 1
'Nason Conn'   'AG'   1487617   839552.7   1486919   839895.8   670
16.6   1   60
1   0   4   1000   0   'Y'   10   0   36
```

2030 No Build Condition

```
'2030 No BUILD'   60   175   0   0   60   0.3048   1   0
'1'   1489221   845814.4   6
'2'   1489279   845790.6   6
'3'   1489349   845750   6
'4'   1489341   845660.9   6
'5'   1489328   845579.5   6
'6'   1489412   845569.8   6
'7'   1489426   845647.4   6
'8'   1489440   845704.1   6
'9'   1489530   845673.5   6
'10'   1489617   845632.9   6
'11'   1489656   845703.3   6
'12'   1489567   845742.1   6
'13'   1489449   845796.8   6
'14'   1489466   845872.9   6
'15'   1489484   845952.8   6
'16'   1489398   845971.9   6
'17'   1489382   845896.9   6
'18'   1489367   845834.3   6
'19'   1489306   845859.2   6
'20'   1489275   845890.6   6
'1'   1487964   842867.4   6
'2'   1488078   842862.6   6
'3'   1488222   842840.3   6
'4'   1488217   842746.4   6
'5'   1488184   842609.4   6
'6'   1488375   842576.9   6
'7'   1488405   842726.3   6
'8'   1488427   842832.1   6
'9'   1488529   842822.3   6
'10'   1488676   842794.8   6
'11'   1488698   842865.8   6
'12'   1488560   842893.3   6
'13'   1488473   842919   6
'14'   1488489   843011.7   6
'15'   1488502   843110.8   6
'16'   1488408   843121.3   6
'17'   1488392   843023.3   6
'18'   1488350   842940.3   6
'19'   1488254   842931.8   6
'20'   1488086   842939.6   6
'1'   1487355   839638.8   6
'2'   1487443   839590.6   6
'3'   1487538   839527.4   6
'4'   1487528   839479.9   6
'5'   1487425   839318   6
'6'   1487499   839282.9   6
'7'   1487576   839408.6   6
'8'   1487616   839472.9   6
'9'   1487708   839430   6
'10'   1487812   839376.3   6
'11'   1487861   839433.9   6
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'12'   1487761   839485.1   6
'13'   1487672   839546.6   6
'14'   1487707   839631.4   6
'15'   1487782   839759.9   6
'16'   1487714   839798.5   6
'17'   1487645   839674.9   6
'18'   1487592   839616.3   6
'19'   1487486   839659.2   6
'20'   1487382   839710.9   6
'2030 No Build'   22   2   0   'C'
 2
'Lower Newton QL'   'AG'   1489361.51   845789.96   1489201.59
845861.26   1   20   2
120   100   3   595   76.3   1600   1   3
 2
'Rt7 SB QL'   'AG'   1489404.82   845855.02   1489425.54   845942.95
1   20   2
120   71   3   885   76.3   1600   1   3
 2
'Upper Nerton QL'   'AG'   1489462.45   845727.84   1489674.48
845629.79   1   20   2
120   107   3   50   76.3   1600   1   3
 2
'RT 7 NB QL'   'AG'   1489403.52   845706.58   1489394.1   845643.88
1   20   2
120   71   3   855   76.3   1600   1   3
 2
'Lake EB QL'   'AG'   1488298.31   842875.16   1488126.14
842887.92   1   10   1
120   88   3   730   76.3   1600   1   3
 2
'Federal QL'   'AG'   1488398.06   842933.68   1488425.4   843013.29
1   30   3
120   106   3   415   76.3   1600   1   3
 2
'Lake WB QL'   'AG'   1488472.86   842888.3   1488724.17   842841.04
1   10   1
120   86   3   375   76.3   1600   1   3
 2
'Catherine QL'   'AG'   1488396.06   842836.71   1488367.56   842691
1   20   2
120   90   3   120   76.3   1600   1   3
 2
'Rt 7 SB QL'   'AG'   1487660.95   839649.43   1487686.18
839692.76   1   20   2
120   104   3   830   76.3   1600   1   3
 2
'St Albans QL'   'AG'   1487660.72   839510.2   1487755.67
839458.51   1   20   2
120   86   3   500   76.3   1600   1   3
 2
'RT 7 NB QL'   'AG'   1487586.46   839481.76   1487476.52
839293.53   1   20   2
120   91   3   650   76.3   1600   1   3
```

```
 1
'Lower Newton'   'AG'   1489401   845774.6   1488800   846056.9
1065   11.7   1   60
 1
'Rt 7 SB'   'AG'   1489401   845774.6   1489545   846440.4   1640
11.7   1   60
 1
'Upper Newton'   'AG'   1489401   845774.6   1490143   845436.5
1065   11.7   1   60
 1
'Rt7 NB '   'AG'   1489401   845774.6   1489351   845435.3   1640
11.7   1   60
 1
'Lake EB'   'AG'   1488405   842884.2   1487236   842956.7   805
11.7   1   60
 1
'Federal'   'AG'   1488506   843425.1   1488405   842884.2   825
11.7   1   60
 1
'Lake WB'   'AG'   1488405   842884.2   1489348   842708.6   805
11.7   1   60
 1
'Catherine'   'AG'   1488376   842889.7   1488072   842039.7   825
11.7   1   60
 1
'RT 7 SB'   'AG'   1487603   839526.1   1487908   840064.8   1640
11.7   1   60
 1
'ST Albans'   'AG'   1487603   839526.1   1488372   839129.3   1990
11.7   1   60
 1
'Rt 7 NB'   'AG'   1487603   839526.1   1487145   838782.3   1640
11.7   1   60
1   0   4   1000   0   'Y'   10   0   36
```

2030 Build Condition

```
'2030BUILD'   60   175   0   0   60   0.3048   1   0
'1'   1489221   845814.4   6
'2'   1489279   845790.6   6
'3'   1489349   845750   6
'4'   1489341   845660.9   6
'5'   1489328   845579.5   6
'6'   1489412   845569.8   6
'7'   1489426   845647.4   6
'8'   1489440   845704.1   6
'9'   1489530   845673.5   6
'10'   1489617   845632.9   6
'11'   1489656   845703.3   6
'12'   1489567   845742.1   6
'13'   1489449   845796.8   6
'14'   1489466   845872.9   6
'15'   1489484   845952.8   6
'16'   1489398   845971.9   6
'17'   1489382   845896.9   6
'18'   1489367   845834.3   6
'19'   1489306   845859.2   6
'20'   1489275   845890.6   6
'1'   1487964   842867.4   6
'2'   1488078   842862.6   6
'3'   1488222   842840.3   6
'4'   1488217   842746.4   6
'5'   1488184   842609.4   6
'6'   1488375   842576.9   6
'7'   1488405   842726.3   6
'8'   1488427   842832.1   6
'9'   1488529   842822.3   6
'10'   1488676   842794.8   6
'11'   1488698   842865.8   6
'12'   1488560   842893.3   6
'13'   1488473   842919   6
'14'   1488489   843011.7   6
'15'   1488502   843110.8   6
'16'   1488408   843121.3   6
'17'   1488392   843023.3   6
'18'   1488350   842940.3   6
'19'   1488254   842931.8   6
'20'   1488086   842939.6   6
'1'   1487355   839638.8   6
'2'   1487443   839590.6   6
'3'   1487538   839527.4   6
'4'   1487528   839479.9   6
'5'   1487425   839318   6
'6'   1487499   839282.9   6
'7'   1487576   839408.6   6
'8'   1487616   839472.9   6
'9'   1487708   839430   6
'10'   1487812   839376.3   6
'11'   1487861   839433.9   6
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'12'   1487761   839485.1   6
'13'   1487672   839546.6   6
'14'   1487707   839631.4   6
'15'   1487782   839759.9   6
'16'   1487714   839798.5   6
'17'   1487645   839674.9   6
'18'   1487592   839616.3   6
'19'   1487486   839659.2   6
'20'   1487382   839710.9   6
'2030Build'   24   2   0   'C'
 2
'Lower Newton QL'   'AG'   1489361.51   845789.96   1489201.59
845861.26   1   20   2
120   100   3   740   44.3   1600   1   3
 2
'Rt7 SB QL'   'AG'   1489404.82   845855.02   1489425.54   845942.95
1   20   2
120   71   3   945   44.3   1600   1   3
 2
'Upper Nerton QL'   'AG'   1489462.45   845727.84   1489674.48
845629.79   1   20   2
120   107   3   50   44.3   1600   1   3
 2
'RT 7 NB QL'   'AG'   1489403.52   845706.58   1489394.1   845643.88
1   20   2
120   71   3   640   44.3   1600   1   3
 2
'Lake EB QL'   'AG'   1488298.31   842875.16   1488126.14
842887.92   1   10   1
120   88   3   595   44.3   1600   1   3
 2
'Federal QL'   'AG'   1488398.06   842933.68   1488425.4   843013.29
1   30   3
120   106   3   425   44.3   1600   1   3
 2
'Lake WB QL'   'AG'   1488472.86   842888.3   1488724.17   842841.04
1   10   1
120   86   3   420   44.3   1600   1   3
 2
'Catherine QL'   'AG'   1488396.06   842836.71   1488367.56   842691
1   20   2
120   90   3   405   44.3   1600   1   3
 2
'Rt 7 SB QL'   'AG'   1487660.95   839649.43   1487686.18
839692.76   1   20   2
120   104   3   450   44.3   1600   1   3
 2
'St Albans QL'   'AG'   1487660.72   839510.2   1487755.67
839458.51   1   20   2
120   86   3   505   44.3   1600   1   3
 2
'RT 7 NB QL'   'AG'   1487586.46   839481.76   1487476.52
839293.53   1   20   2
120   91   3   650   44.3   1600   1   3
```

```
 2
'Nason Conn QL'   'AG'   1487551.07   839551.47   1487357.98
839668.64   1   20   2
120   80   3   390   44.3   1600   1   3
 1
'Lower Newton'   'AG'   1489401   845774.6   1488800   846056.9
1165   11.7   1   60
 1
'Rt 7 SB'   'AG'   1489401   845774.6   1489545   846440.4   1425
11.7   1   60
 1
'Upper Newton'   'AG'   1489401   845774.6   1490143   845436.5
1165   11.7   1   60
 1
'Rt7 NB '   'AG'   1489401   845774.6   1489351   845435.3   1425
11.7   1   60
 1
'Lake EB'   'AG'   1488405   842884.2   1487236   842956.7   790
11.7   1   60
 1
'Federal'   'AG'   1488506   843425.1   1488405   842884.2   1125
11.7   1   60
 1
'Lake WB'   'AG'   1488405   842884.2   1489348   842708.6   790
11.7   1   60
 1
'Catherine'   'AG'   1488376   842889.7   1488072   842039.7   1125
11.7   1   60
 1
'RT 7 SB'   'AG'   1487603   839526.1   1487908   840064.8   1425
11.7   1   60
 1
'ST Albans'   'AG'   1487603   839526.1   1488372   839129.3   1990
11.7   1   60
 1
'Rt 7 NB'   'AG'   1487603   839526.1   1487145   838782.3   1425
11.7   1   60
 1
'Nason Conn'   'AG'   1487617   839552.7   1486919   839895.8   745
11.7   1   60
1   0   4   1000   0   'Y'   10   0   36
```

Microscale Output Files

Vanasse Hangen Brustlin, Inc.

2010 Existing Condition

CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221 PAGE 1

JOB: 2010NoBUILD RUN: 2010 No Build

DATE : 3/11/12
TIME : 12:35:46

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = 0.0 CM/S VD = 0.0 CM/S Z0 = 175. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 0.0 PPM

LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (FT) X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)
1. Lower Newton QL	********	845790.0	********	846094.0	746.	294.	AG	495.	100.0	1.0	20.0	1.27	37.9
2. Rt7 SB QL	********	845855.0	********	845997.5	146.	13.	AG	352.	100.0	1.0	20.0	0.64	7.4
3. Upper Nerton QL	********	845727.8	********	845723.7	10.	115.	AG	530.	100.0	1.0	20.0	0.16	0.5
4. RT 7 NB QL	********	845706.6	********	845566.4	142.	188.	AG	352.	100.0	1.0	20.0	0.62	7.2
5. Lake EB QL	********	842875.2	********	843099.0	3026.	274.	AG	218.	100.0	1.0	10.0	1.73	153.7
6. Federal QL	********	842933.7	********	843046.1	119.	19.	AG	788.	100.0	1.0	30.0	0.99	6.0
7. Lake WB QL	********	842888.3	********	842858.4	162.	101.	AG	213.	100.0	1.0	10.0	0.82	8.2
8. Catherine QL	********	842836.7	********	842812.6	25.	191.	AG	446.	100.0	1.0	20.0	0.15	1.2
9. Rt 7 SB QL	********	839649.5	********	841746.3	2424.	30.	AG	515.	100.0	1.0	20.0	2.45	123.1
10. St Albans QL	********	839510.2	********	839461.8	101.	119.	AG	426.	100.0	1.0	20.0	0.56	5.1
11. RT 7 NB QL	********	839481.8	********	839340.4	164.	210.	AG	451.	100.0	1.0	20.0	0.87	8.3
12. Lower Newton	********	845774.6	********	846056.9	664.	295.	AG	905.	16.6	1.0	60.0		
13. Rt 7 SB	********	845774.6	********	846440.4	681.	12.	AG	1365.	16.6	1.0	60.0		
14. Upper Newton	********	845774.6	********	845436.5	815.	114.	AG	905.	16.6	1.0	60.0		
15. Rt7 NB	********	845774.6	********	845435.3	343.	188.	AG	1365.	16.6	1.0	60.0		
16. Lake EB	********	842884.2	********	842956.7	1171.	274.	AG	685.	16.6	1.0	60.0		
17. Federal	********	843425.2	********	842884.2	550.	191.	AG	705.	16.6	1.0	60.0		
18. Lake WB	********	842884.2	********	842708.6	959.	101.	AG	685.	16.6	1.0	60.0		
19. Catherine	********	842889.7	********	842039.7	903.	200.	AG	705.	16.6	1.0	60.0		
20. RT 7 SB	********	839526.1	********	840064.9	619.	30.	AG	1365.	16.6	1.0	60.0		
21. ST Albans	********	839526.1	********	839129.4	865.	117.	AG	1990.	16.6	1.0	60.0		
22. Rt 7 NB	********	839526.1	********	838782.4	873.	212.	AG	1365.	16.6	1.0	60.0		

PAGE 2

JOB: 2010NoBUILD RUN: 2010 No Build

DATE : 3/11/12
TIME : 12:35:46

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE	RED	CLEARANCE	APPROACH	SATURATION	IDLE	SIGNAL	ARRIVAL

Vanasse Hangen Brustlin, Inc.

	LENGTH (SEC)	TIME (SEC)	LOST TIME (SEC)	VOL (VPH)	FLOW RATE (VPH)	EM FAC (gm/hr)	TYPE	RATE
1. Lower Newton QL	120	100	3.0	505	1600	110.80	1	3
2. Rt7 SB QL	120	71	3.0	755	1600	110.80	1	3
3. Upper Nerton QL	120	107	3.0	35	1600	110.80	1	3
4. RT 7 NB QL	120	71	3.0	730	1600	110.80	1	3
5. Lake EB QL	120	88	3.0	620	1600	110.80	1	3
6. Federal QL	120	106	3.0	355	1600	110.80	1	3
7. Lake WB QL	120	86	3.0	315	1600	110.80	1	3
8. Catherine QL	120	90	3.0	100	1600	110.80	1	3
9. Rt 7 SB QL	120	104	3.0	715	1600	110.80	1	3
10. St Albans QL	120	86	3.0	430	1600	110.80	1	3
11. RT 7 NB QL	120	91	3.0	555	1600	110.80	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. 1	********	845814.4	6.0
2. 2	********	845790.6	6.0
3. 3	********	845750.0	6.0
4. 4	********	845660.9	6.0
5. 5	********	845579.5	6.0
6. 6	********	845569.8	6.0
7. 7	********	845647.4	6.0
8. 8	********	845704.2	6.0
9. 9	********	845673.5	6.0
10. 10	********	845632.9	6.0
11. 11	********	845703.3	6.0
12. 12	********	845742.1	6.0
13. 13	********	845796.8	6.0
14. 14	********	845872.9	6.0
15. 15	********	845952.8	6.0
16. 16	********	845971.9	6.0
17. 17	********	845896.9	6.0
18. 18	********	845834.3	6.0
19. 19	********	845859.2	6.0
20. 20	********	845890.7	6.0
21. 1	********	842867.4	6.0
22. 2	********	842862.6	6.0
23. 3	********	842840.3	6.0
24. 4	********	842746.4	6.0
25. 5	********	842609.4	6.0
26. 6	********	842576.9	6.0
27. 7	********	842726.3	6.0
28. 8	********	842832.1	6.0
29. 9	********	842822.3	6.0
30. 10	********	842794.8	6.0
31. 11	********	842865.8	6.0
32. 12	********	842893.3	6.0
33. 13	********	842919.0	6.0
34. 14	********	843011.7	6.0

JOB: 2010NoBUILD RUN: 2010 No Build

DATE : 3/11/12
TIME : 12:35:46

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
35. 15	********	843110.8	6.0
36. 16	********	843121.3	6.0
37. 17	********	843023.4	6.0
38. 18	********	842940.3	6.0
39. 19	********	842931.8	6.0
40. 20	********	842939.6	6.0
41. 1	********	839638.8	6.0
42. 2	********	839590.6	6.0
43. 3	********	839527.4	6.0
44. 4	********	839479.9	6.0
45. 5	********	839318.0	6.0
46. 6	********	839282.9	6.0
47. 7	********	839408.6	6.0
48. 8	********	839472.9	6.0
49. 9	********	839430.0	6.0
50. 10	********	839376.3	6.0
51. 11	********	839433.9	6.0
52. 12	********	839485.1	6.0
53. 13	********	839546.6	6.0
54. 14	********	839631.4	6.0
55. 15	********	839759.9	6.0
56. 16	********	839798.5	6.0
57. 17	********	839674.9	6.0
58. 18	********	839616.4	6.0
59. 19	********	839659.2	6.0
60. 20	********	839710.9	6.0

JOB: 2010NoBUILD RUN: 2010 No Build

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20

Vanasse Hangen Brustlin, Inc.

0.	*	1.4	1.5	1.5	0.9	0.7	1.9	1.4	1.2	0.6	0.5	0.1	0.2	1.2	0.9	0.8	0.1	0.2	0.3	0.0	0.0
10.	*	1.4	1.6	1.6	1.2	1.1	1.1	0.9	0.9	0.5	0.4	0.0	0.1	0.7	0.6	0.5	0.4	0.5	0.6	0.1	0.0
20.	*	1.5	1.7	1.8	1.4	1.5	0.5	0.5	0.7	0.4	0.4	0.0	0.0	0.3	0.3	0.3	0.7	1.0	1.2	0.2	0.1
30.	*	1.6	1.9	1.7	1.3	1.5	0.2	0.3	0.6	0.4	0.4	0.0	0.0	0.1	0.1	0.1	0.9	1.4	1.5	0.4	0.2
40.	*	1.7	2.1	1.4	1.1	1.4	0.1	0.3	0.7	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.9	1.6	1.6	0.6	0.3
50.	*	1.9	2.1	1.2	1.3	1.4	0.2	0.2	0.8	0.4	0.4	0.0	0.0	0.0	0.0	0.0	1.0	1.5	1.3	0.7	0.4
60.	*	1.9	2.0	1.2	1.2	1.3	0.2	0.2	0.7	0.4	0.4	0.0	0.0	0.0	0.0	0.0	1.2	1.5	1.1	0.8	0.5
70.	*	2.0	2.0	1.0	1.3	1.4	0.2	0.2	0.6	0.5	0.5	0.0	0.0	0.0	0.0	0.0	1.2	1.4	0.9	0.7	0.6
80.	*	2.0	1.9	1.0	1.3	1.3	0.2	0.3	0.6	0.5	0.5	0.0	0.0	0.0	0.0	0.0	1.3	1.4	0.7	0.6	0.6
90.	*	1.9	1.7	1.0	1.3	1.1	0.2	0.3	0.6	0.6	0.6	0.0	0.0	0.0	0.0	0.0	1.3	1.4	0.6	0.5	0.6
100.	*	1.6	1.4	1.3	1.4	1.0	0.1	0.2	0.5	0.6	0.6	0.1	0.1	0.1	0.0	0.0	1.3	1.4	0.7	0.6	0.6
110.	*	1.4	1.2	1.1	1.2	0.8	0.0	0.1	0.4	0.5	0.5	0.3	0.3	0.3	0.0	0.0	1.4	1.5	0.9	0.7	0.6
120.	*	0.7	0.7	0.9	1.1	0.7	0.0	0.0	0.2	0.3	0.3	0.5	0.5	0.5	0.1	0.1	1.5	1.5	1.1	1.1	0.8
130.	*	0.5	0.7	1.0	1.2	0.6	0.0	0.0	0.1	0.1	0.1	0.6	0.6	0.6	0.2	0.1	1.5	1.6	1.3	1.3	1.1
140.	*	0.4	0.6	1.0	1.2	0.6	0.0	0.0	0.0	0.0	0.0	0.6	0.6	0.6	0.2	0.2	1.6	1.5	1.2	1.7	1.4
150.	*	0.3	0.5	1.2	1.1	0.7	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.6	0.2	0.2	1.7	1.4	1.3	1.9	1.6
160.	*	0.2	0.4	1.2	1.0	0.6	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.6	0.2	0.2	1.8	1.5	1.5	1.9	1.7
170.	*	0.1	0.2	1.1	0.8	0.5	0.0	0.0	0.0	0.0	0.0	0.4	0.4	0.5	0.2	0.2	1.8	1.3	1.8	1.7	1.5
180.	*	0.0	0.1	0.7	0.5	0.4	0.1	0.1	0.2	0.0	0.0	0.4	0.4	0.8	0.4	0.4	1.7	1.4	1.6	1.6	1.3
190.	*	0.1	0.1	0.5	0.4	0.3	0.4	0.6	0.6	0.1	0.0	0.4	0.4	1.2	0.9	0.6	1.2	1.1	1.5	1.5	1.1
200.	*	0.0	0.0	0.1	0.1	0.1	0.5	1.0	1.0	0.0	0.0	0.4	0.4	1.4	1.1	1.2	0.7	0.8	1.2	1.3	1.2
210.	*	0.0	0.0	0.0	0.0	0.0	0.6	1.3	1.4	0.1	0.0	0.4	0.5	1.5	1.1	1.5	0.5	0.7	1.2	1.3	1.2
220.	*	0.0	0.0	0.0	0.0	0.0	0.7	1.5	1.5	0.3	0.0	0.5	0.7	1.4	1.2	1.5	0.6	0.7	1.3	1.3	1.0
230.	*	0.0	0.0	0.0	0.0	0.0	0.7	1.5	1.4	0.4	0.1	0.5	0.8	1.2	1.1	1.6	0.6	0.7	1.3	1.3	1.2
240.	*	0.0	0.0	0.0	0.0	0.0	0.8	1.4	1.3	0.5	0.1	0.7	0.9	1.3	1.3	1.8	0.6	0.7	1.4	1.4	1.2
250.	*	0.0	0.0	0.0	0.0	0.0	0.8	1.4	1.3	0.6	0.3	0.8	1.0	1.3	1.5	1.8	0.6	0.8	1.5	1.6	1.3
260.	*	0.0	0.0	0.0	0.0	0.0	1.0	1.4	1.0	0.6	0.4	0.9	1.0	1.5	1.8	1.8	0.6	0.9	1.6	1.7	1.3
270.	*	0.0	0.0	0.0	0.0	0.0	1.1	1.4	0.9	0.6	0.4	1.0	1.3	1.9	1.9	1.6	0.6	0.9	1.8	1.8	1.5
280.	*	0.3	0.3	0.3	0.0	0.0	1.3	1.4	1.1	0.9	0.6	1.1	1.3	2.2	1.8	1.5	0.4	0.8	1.8	2.0	1.5
290.	*	0.9	1.0	0.8	0.1	0.0	1.4	1.7	1.3	1.2	0.9	1.2	1.5	2.0	1.5	1.2	0.1	0.4	1.5	1.6	1.0
300.	*	1.7	1.8	1.5	0.4	0.1	1.7	1.9	1.7	1.6	1.2	0.8	1.0	1.4	1.2	1.1	0.0	0.1	0.8	0.8	0.5
310.	*	2.0	2.2	1.9	0.7	0.4	1.9	2.2	1.9	1.3	1.2	0.5	0.6	0.9	1.2	0.9	0.0	0.0	0.2	0.2	0.1
320.	*	2.0	2.0	1.7	0.8	0.5	2.2	2.3	1.6	1.3	1.0	0.3	0.5	0.8	1.2	0.8	0.0	0.0	0.0	0.0	0.0
330.	*	1.7	1.8	1.6	0.7	0.6	2.2	2.1	1.5	1.1	0.8	0.3	0.5	1.1	1.3	0.8	0.0	0.0	0.0	0.0	0.0
340.	*	1.7	1.7	1.4	0.7	0.6	2.2	1.9	1.4	1.0	0.8	0.2	0.4	1.3	1.3	0.8	0.0	0.0	0.0	0.0	0.0
350.	*	1.5	1.5	1.3	0.6	0.4	2.1	1.6	1.3	0.8	0.6	0.1	0.2	1.4	1.1	0.8	0.0	0.0	0.0	0.0	0.0
360.	*	1.4	1.5	1.5	0.9	0.7	1.9	1.4	1.2	0.6	0.5	0.1	0.2	1.2	0.9	0.8	0.1	0.2	0.3	0.0	0.0
MAX	*	2.0	2.2	1.9	1.4	1.5	2.2	2.3	1.9	1.6	1.2	1.2	1.5	2.2	1.9	1.8	1.8	1.6	1.8	2.0	1.7
DEGR.	*	70	310	310	100	20	320	320	310	300	300	290	290	280	270	250	160	40	170	280	160

JOB: 2010NoBUILD RUN: 2010 No Build

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

Vanasse Hangen Brustlin, Inc.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29	REC30	REC31	REC32	REC33	REC34	REC35	REC36	REC37	REC38	REC39	REC40
0.	0.7	0.7	0.6	0.3	0.2	0.5	1.1	1.5	0.7	0.3	0.0	0.1	0.5	0.2	0.2	0.1	0.1	0.0	0.0	0.0
10.	0.7	0.7	0.6	0.2	0.2	0.5	0.7	1.1	0.6	0.3	0.0	0.0	0.3	0.1	0.1	0.2	0.3	0.2	0.0	0.0
20.	0.6	0.7	0.6	0.4	0.4	0.3	0.5	0.7	0.6	0.3	0.0	0.0	0.1	0.0	0.0	0.4	0.4	0.4	0.1	0.0
30.	0.7	0.7	0.8	0.5	0.5	0.2	0.2	0.5	0.6	0.3	0.0	0.0	0.0	0.0	0.0	0.4	0.6	0.9	0.1	0.0
40.	0.7	0.8	1.0	0.6	0.4	0.2	0.2	0.4	0.6	0.3	0.0	0.0	0.0	0.0	0.0	0.4	0.7	1.5	0.2	0.0
50.	0.8	0.9	1.1	0.5	0.4	0.1	0.2	0.5	0.6	0.3	0.0	0.0	0.0	0.0	0.0	0.4	1.1	1.8	0.4	0.1
60.	1.0	1.2	1.0	0.7	0.3	0.1	0.2	0.5	0.6	0.4	0.0	0.0	0.0	0.0	0.0	0.3	1.5	1.9	0.6	0.2
70.	1.2	1.2	1.0	0.5	0.3	0.1	0.2	0.6	0.6	0.4	0.0	0.0	0.0	0.0	0.0	0.3	1.7	1.8	0.7	0.3
80.	1.0	1.2	0.8	0.3	0.3	0.1	0.1	0.6	0.6	0.5	0.1	0.1	0.0	0.0	0.0	0.3	2.0	1.5	0.7	0.5
90.	0.8	0.9	0.6	0.3	0.2	0.0	0.1	0.5	0.5	0.5	0.2	0.2	0.1	0.0	0.0	0.3	2.1	1.5	0.8	0.7
100.	0.5	0.4	0.3	0.2	0.2	0.0	0.0	0.3	0.4	0.3	0.4	0.5	0.5	0.0	0.0	0.3	2.2	1.3	0.8	0.7
110.	0.1	0.1	0.3	0.2	0.2	0.0	0.0	0.1	0.2	0.2	0.5	0.8	0.7	0.1	0.0	0.4	2.3	1.2	0.9	1.0
120.	0.1	0.1	0.2	0.2	0.2	0.0	0.0	0.0	0.1	0.1	0.5	0.9	0.8	0.2	0.1	0.4	2.5	0.8	0.7	0.8
130.	0.1	0.1	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.4	0.9	0.8	0.3	0.1	0.4	2.5	0.6	0.7	0.8
140.	0.1	0.1	0.2	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.4	0.9	0.7	0.3	0.1	0.7	2.6	0.6	0.8	0.8
150.	0.2	0.2	0.3	0.3	0.3	0.1	0.0	0.0	0.0	0.0	0.4	0.9	0.7	0.2	0.1	1.1	2.6	0.6	0.7	0.8
160.	0.2	0.2	0.3	0.3	0.3	0.1	0.1	0.1	0.1	0.0	0.3	0.9	0.7	0.4	0.2	1.5	2.5	0.6	0.8	0.8
170.	0.2	0.2	0.3	0.3	0.3	0.2	0.1	0.1	0.1	0.1	0.4	0.9	0.7	0.3	0.3	1.7	2.4	0.8	0.9	0.8
180.	0.1	0.2	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.5	0.9	0.7	0.3	0.3	1.5	2.0	0.9	0.9	0.8
190.	0.0	0.1	0.2	0.3	0.3	0.1	0.1	0.2	0.1	0.2	0.5	0.8	0.5	0.4	0.6	1.3	1.3	0.8	0.8	0.7
200.	0.0	0.0	0.1	0.1	0.1	0.2	0.1	0.2	0.1	0.1	0.4	0.8	0.5	0.5	1.1	0.7	0.6	0.6	0.7	0.6
210.	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.3	0.1	0.0	0.3	0.8	0.6	0.9	1.4	0.4	0.3	0.5	0.6	0.6
220.	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.4	0.1	0.1	0.4	0.9	0.7	1.0	1.5	0.2	0.2	0.4	0.6	0.6
230.	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.6	0.1	0.1	0.5	0.9	0.7	1.5	1.2	0.2	0.3	0.5	0.7	0.7
240.	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.8	0.1	0.1	0.5	1.1	0.8	1.8	0.8	0.2	0.4	0.6	0.7	0.8
250.	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.9	0.1	0.1	0.6	1.3	0.9	2.0	0.6	0.2	0.4	0.7	0.9	0.9
260.	0.2	0.2	0.2	0.0	0.0	0.2	0.2	1.1	0.4	0.2	1.0	1.4	1.2	1.9	0.6	0.3	0.4	0.8	0.9	0.9
270.	0.6	0.6	0.5	0.1	0.0	0.2	0.3	1.3	0.7	0.5	1.2	1.4	1.2	1.8	0.4	0.1	0.3	0.6	0.8	0.9
280.	1.0	1.0	0.8	0.3	0.1	0.3	0.5	1.3	0.9	0.8	1.2	1.2	1.1	1.7	0.3	0.0	0.1	0.3	0.4	0.5
290.	1.0	1.1	0.9	0.3	0.2	0.4	0.5	1.2	0.8	0.8	0.8	1.0	1.1	1.3	0.3	0.0	0.0	0.0	0.2	0.2
300.	0.9	0.9	0.7	0.4	0.2	0.4	0.6	0.7	0.7	0.9	0.5	0.7	1.3	1.1	0.3	0.0	0.0	0.0	0.0	0.0
310.	0.8	0.9	0.7	0.4	0.2	0.4	0.5	0.6	1.0	1.0	0.3	0.6	1.4	0.8	0.3	0.0	0.0	0.0	0.0	0.0
320.	0.7	0.7	0.7	0.3	0.2	0.4	0.4	0.6	1.2	0.9	0.2	0.5	1.4	0.5	0.3	0.0	0.0	0.0	0.0	0.0
330.	0.7	0.7	0.6	0.3	0.2	0.4	0.5	0.8	1.2	0.6	0.1	0.3	1.4	0.4	0.3	0.0	0.0	0.0	0.0	0.0
340.	0.7	0.7	0.6	0.3	0.2	0.4	0.5	1.1	1.0	0.5	0.1	0.2	1.1	0.3	0.3	0.0	0.0	0.0	0.0	0.0
350.	0.6	0.7	0.6	0.3	0.2	0.4	0.8	1.4	0.8	0.3	0.0	0.1	0.8	0.3	0.3	0.0	0.0	0.0	0.0	0.0
360.	0.7	0.7	0.6	0.3	0.2	0.5	1.1	1.5	0.7	0.3	0.0	0.1	0.5	0.2	0.2	0.1	0.1	0.0	0.0	0.0
MAX	1.2	1.2	1.1	0.7	0.5	0.5	1.1	1.5	1.2	1.0	1.2	1.4	1.4	2.0	1.5	1.7	2.6	1.9	0.9	1.0
DEGR.	70	60	50	60	30	0	0	0	320	310	270	260	310	250	220	170	140	60	110	110

RUN: 2010 No Build

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

Vanasse Hangen Brustlin, Inc.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC41	REC42	REC43	REC44	REC45	REC46	REC47	REC48	REC49	REC50	REC51	REC52	REC53	REC54	REC55	REC56	REC57	REC58	REC59	REC60
0.	0.0	0.0	0.0	0.0	0.0	1.3	2.1	1.7	2.3	1.5	0.5	0.8	1.3	1.9	1.9	0.0	0.0	0.0	0.0	0.0
10.	0.0	0.0	0.1	0.2	0.1	1.9	2.2	2.2	2.5	1.4	0.5	0.7	1.7	2.1	2.1	0.3	0.3	0.1	0.0	0.0
20.	0.0	0.1	0.5	0.6	0.5	2.4	2.3	2.6	2.4	1.2	0.3	0.6	1.7	2.2	2.0	1.0	1.0	0.5	0.1	0.0
30.	0.2	0.3	1.2	1.4	1.3	2.2	2.1	2.5	2.0	1.1	0.1	0.3	1.2	1.6	1.4	2.0	2.2	1.5	0.3	0.1
40.	0.3	0.6	1.5	1.7	1.7	1.2	1.2	1.7	1.6	0.9	0.0	0.1	0.4	0.7	0.6	2.6	2.8	1.9	0.6	0.3
50.	0.5	0.8	1.1	1.4	1.9	0.6	1.0	1.4	1.3	0.9	0.0	0.0	0.0	0.2	0.2	2.6	2.7	1.8	0.8	0.5
60.	0.6	0.8	1.0	1.3	1.7	0.4	0.8	1.4	1.3	1.0	0.0	0.0	0.0	0.0	0.0	2.3	2.5	1.4	0.8	0.5
70.	0.5	0.6	0.8	1.6	1.6	0.3	0.7	1.6	1.1	1.0	0.0	0.0	0.0	0.0	0.0	2.2	2.3	1.0	0.8	0.5
80.	0.4	0.5	1.0	1.9	1.3	0.3	0.6	1.7	1.2	1.1	0.1	0.1	0.0	0.0	0.0	2.0	2.1	0.8	0.7	0.5
90.	0.3	0.4	1.4	2.0	1.0	0.3	0.5	1.7	1.3	1.3	0.1	0.1	0.0	0.0	0.0	1.8	1.9	0.6	0.5	0.5
100.	0.5	0.6	1.9	2.2	0.8	0.2	0.5	1.7	1.5	1.5	0.2	0.2	0.1	0.0	0.0	1.8	1.9	0.5	0.4	0.4
110.	0.7	1.0	1.9	2.0	0.7	0.1	0.4	1.3	1.4	1.3	0.6	0.7	0.4	0.0	0.0	1.8	1.8	0.7	0.6	0.5
120.	0.8	1.1	1.7	1.6	0.6	0.0	0.1	0.8	0.9	0.8	1.2	1.2	1.0	0.2	0.0	1.8	2.0	1.1	0.8	0.6
130.	0.6	0.8	1.3	1.5	0.6	0.0	0.0	0.3	0.4	0.4	1.5	1.5	1.5	0.4	0.1	1.9	1.9	1.4	1.1	0.8
140.	0.5	0.6	1.0	1.3	0.6	0.0	0.0	0.1	0.1	0.1	1.4	1.4	1.8	0.5	0.2	2.0	1.9	1.6	0.8	0.4
150.	0.4	0.5	1.1	1.4	0.6	0.0	0.0	0.0	0.1	0.1	1.2	1.2	1.8	0.6	0.3	2.1	1.8	1.3	0.7	0.5
160.	0.3	0.6	1.1	1.5	0.6	0.0	0.0	0.0	0.0	0.0	1.1	1.1	1.8	0.5	0.3	2.3	1.7	1.2	0.5	0.3
170.	0.2	0.4	1.3	1.5	0.7	0.0	0.0	0.0	0.0	0.0	1.0	1.0	1.7	0.7	0.2	2.5	1.5	1.0	0.5	0.3
180.	0.2	0.4	1.2	1.5	0.8	0.0	0.0	0.0	0.0	0.0	0.9	1.0	1.5	0.7	0.3	2.5	1.5	1.2	0.5	0.2
190.	0.1	0.3	1.1	1.4	0.9	0.1	0.1	0.1	0.0	0.0	0.9	1.1	1.3	0.8	0.4	2.7	1.5	1.2	0.4	0.1
200.	0.1	0.2	0.9	1.3	0.8	0.2	0.4	0.5	0.0	0.0	0.9	1.3	1.5	1.0	0.7	2.3	1.4	1.0	0.2	0.1
210.	0.0	0.1	0.5	0.8	0.6	0.6	0.9	1.1	0.1	0.0	0.9	1.7	1.7	1.3	1.2	1.5	1.1	0.6	0.1	0.0
220.	0.0	0.0	0.2	0.3	0.3	0.9	1.5	1.7	0.2	0.1	1.0	1.9	2.2	1.6	1.6	0.6	0.5	0.2	0.0	0.0
230.	0.0	0.0	0.0	0.1	0.1	1.0	1.9	2.1	0.4	0.1	1.0	2.3	2.0	1.3	1.7	0.1	0.2	0.0	0.0	0.0
240.	0.0	0.0	0.0	0.0	0.0	0.8	2.0	2.0	0.5	0.2	1.2	2.5	1.7	1.0	1.7	0.0	0.0	0.0	0.0	0.0
250.	0.0	0.0	0.0	0.0	0.0	0.8	2.0	1.9	0.6	0.2	1.4	2.7	1.3	0.7	1.7	0.0	0.0	0.0	0.0	0.0
260.	0.0	0.0	0.0	0.0	0.0	0.7	1.9	1.7	0.7	0.3	1.7	2.9	1.0	0.7	1.6	0.0	0.0	0.0	0.0	0.0
270.	0.0	0.0	0.0	0.0	0.0	0.6	1.7	1.4	0.8	0.5	1.8	2.6	0.9	0.7	1.5	0.0	0.0	0.0	0.0	0.0
280.	0.0	0.0	0.0	0.0	0.0	0.6	1.7	1.3	0.7	0.5	1.8	2.4	0.7	0.8	1.5	0.0	0.0	0.0	0.0	0.0
290.	0.0	0.0	0.0	0.0	0.0	0.6	1.7	1.1	0.8	0.9	1.7	1.8	0.6	1.0	1.5	0.0	0.0	0.0	0.0	0.0
300.	0.0	0.0	0.0	0.0	0.0	0.6	1.7	0.8	1.0	1.3	1.0	1.0	0.5	1.2	1.5	0.0	0.0	0.0	0.0	0.0
310.	0.0	0.0	0.0	0.0	0.0	0.6	1.7	0.8	1.3	1.7	0.7	0.5	0.5	1.4	1.5	0.0	0.0	0.0	0.0	0.0
320.	0.0	0.0	0.0	0.0	0.0	0.6	1.7	0.9	1.6	1.9	0.5	0.5	0.5	1.4	1.4	0.0	0.0	0.0	0.0	0.0
330.	0.0	0.0	0.0	0.0	0.0	0.6	1.7	0.9	1.8	1.7	0.5	0.6	0.6	1.5	1.5	0.0	0.0	0.0	0.0	0.0
340.	0.0	0.0	0.0	0.0	0.0	0.8	1.8	1.3	2.1	1.6	0.5	0.7	0.8	1.6	1.6	0.0	0.0	0.0	0.0	0.0
350.	0.0	0.0	0.0	0.0	0.0	1.0	1.9	1.4	2.3	1.5	0.5	0.7	1.0	1.8	1.7	0.0	0.0	0.0	0.0	0.0
360.	0.0	0.0	0.0	0.0	0.0	1.3	2.1	1.7	2.3	1.5	0.5	0.8	1.3	1.9	1.9	0.0	0.0	0.0	0.0	0.0
MAX	0.8	1.1	1.9	2.2	1.9	2.4	2.3	2.6	2.5	1.9	1.8	2.9	2.2	2.2	2.1	2.7	2.8	1.9	1.1	0.8
DEGR.	120	120	100	100	50	20	20	20	10	320	270	260	220	20	10	190	40	40	130	130

THE HIGHEST CONCENTRATION OF 2.90 PPM OCCURRED AT RECEPTOR REC52.

Vanasse Hangen Brustlin, Inc.

2010 Build Condition

CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221 PAGE 1

JOB: 2010BUILD RUN: 2010Build

DATE : 3/11/12
TIME : 12:36:13

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = 0.0 CM/S VD = 0.0 CM/S Z0 = 175. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 0.0 PPM

LINK VARIABLES

LINK DESCRIPTION	* X1	Y1	X2	Y2	* LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)
1. Lower Newton QL	********	845790.0	********	846356.2	1391.	294.	AG	495.	100.0	1.0	20.0	1.57	70.6
2. Rt7 SB QL	********	845855.0	********	845997.5	146.	13.	AG	352.	100.0	1.0	20.0	0.64	7.4
3. Upper Nerton QL	********	845727.8	********	845723.7	10.	115.	AG	530.	100.0	1.0	20.0	0.16	0.5
4. RT 7 NB QL	********	845706.6	********	845600.2	108.	188.	AG	352.	100.0	1.0	20.0	0.47	5.5
5. Lake EB QL	********	842875.2	********	842888.5	180.	274.	AG	218.	100.0	1.0	10.0	0.88	9.2
6. Federal QL	********	842933.7	********	843296.0	383.	19.	AG	788.	100.0	1.0	30.0	1.20	19.5
7. Lake WB QL	********	842888.3	********	842847.6	220.	101.	AG	213.	100.0	1.0	10.0	0.93	11.2
8. Catherine QL	********	842836.7	********	842754.6	84.	191.	AG	446.	100.0	1.0	20.0	0.51	4.2
9. Rt 7 SB QL	********	839649.5	********	840109.1	531.	30.	AG	515.	100.0	1.0	20.0	1.25	27.0
10. St Albans QL	********	839510.2	********	839462.5	100.	119.	AG	426.	100.0	1.0	20.0	0.55	5.1
11. RT 7 NB QL	********	839481.8	********	839340.4	164.	210.	AG	451.	100.0	1.0	20.0	0.87	8.3
12. Nason Conn QL	********	839551.5	********	839591.6	77.	301.	AG	396.	100.0	1.0	20.0	0.38	3.9
13. Lower Newton	********	845774.6	********	846056.9	664.	295.	AG	1010.	16.6	1.0	60.0		
14. Rt 7 SB	********	845774.6	********	846440.4	681.	12.	AG	1155.	16.6	1.0	60.0		
15. Upper Newton	********	845774.6	********	845436.5	815.	114.	AG	1010.	16.6	1.0	60.0		
16. Rt7 NB	********	845774.6	********	845435.3	343.	188.	AG	1155.	16.6	1.0	60.0		
17. Lake EB	********	842884.2	********	842956.7	1171.	274.	AG	640.	16.6	1.0	60.0		
18. Federal	********	843425.2	********	842884.2	550.	191.	AG	950.	16.6	1.0	60.0		
19. Lake WB	********	842884.2	********	842708.6	959.	101.	AG	640.	16.6	1.0	60.0		
20. Catherine	********	842889.7	********	842039.7	903.	200.	AG	950.	16.6	1.0	60.0		
21. RT 7 SB	********	839526.1	********	840064.9	619.	30.	AG	1155.	16.6	1.0	60.0		
22. ST Albans	********	839526.1	********	839129.4	865.	117.	AG	1990.	16.6	1.0	60.0		
23. Rt 7 NB	********	839526.1	********	838782.4	873.	212.	AG	1155.	16.6	1.0	60.0		
24. Nason Conn	********	839552.7	********	839895.8	778.	296.	AG	670.	16.6	1.0	60.0		

JOB: 2010BUILD RUN: 2010Build

DATE : 3/11/12
TIME : 12:36:13

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
1. Lower Newton QL	120	100	3.0	625	1600	110.80	1	3
2. Rt7 SB QL	120	71	3.0	755	1600	110.80	1	3
3. Upper Nerton QL	120	107	3.0	35	1600	110.80	1	3
4. RT 7 NB QL	120	71	3.0	555	1600	110.80	1	3
5. Lake EB QL	120	88	3.0	315	1600	110.80	1	3
6. Federal QL	120	106	3.0	430	1600	110.80	1	3
7. Lake WB QL	120	86	3.0	360	1600	110.80	1	3
8. Catherine QL	120	90	3.0	340	1600	110.80	1	3
9. Rt 7 SB QL	120	104	3.0	365	1600	110.80	1	3
10. St Albans QL	120	86	3.0	425	1600	110.80	1	3
11. RT 7 NB QL	120	91	3.0	555	1600	110.80	1	3
12. Nason Conn QL	120	80	3.0	355	1600	110.80	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. 1	********	845814.4	6.0
2. 2	********	845790.6	6.0
3. 3	********	845750.0	6.0
4. 4	********	845660.9	6.0
5. 5	********	845579.5	6.0
6. 6	********	845569.8	6.0
7. 7	********	845647.4	6.0
8. 8	********	845704.2	6.0
9. 9	********	845673.5	6.0
10. 10	********	845632.9	6.0
11. 11	********	845703.3	6.0
12. 12	********	845742.1	6.0
13. 13	********	845796.8	6.0
14. 14	********	845872.9	6.0
15. 15	********	845952.8	6.0
16. 16	********	845971.9	6.0
17. 17	********	845896.9	6.0
18. 18	********	845834.3	6.0
19. 19	********	845859.2	6.0
20. 20	********	845890.7	6.0
21. 1	********	842867.4	6.0
22. 2	********	842862.6	6.0
23. 3	********	842840.3	6.0
24. 4	********	842746.4	6.0

25. 5	*	********	842609.4	6.0 *
26. 6	*	********	842576.9	6.0 *
27. 7	*	********	842726.3	6.0 *
28. 8	*	********	842832.1	6.0 *
29. 9	*	********	842822.3	6.0 *
30. 10	*	********	842794.8	6.0 *
31. 11	*	********	842865.8	6.0 *
32. 12	*	********	842893.3	6.0 *
33. 13	*	********	842919.0	6.0 *

DATE : 3/11/12
TIME : 12:36:13

RECEPTOR LOCATIONS

RECEPTOR		COORDINATES (FT) X	Y	Z
34. 14	*	********	843011.7	6.0 *
35. 15	*	********	843110.8	6.0 *
36. 16	*	********	843121.3	6.0 *
37. 17	*	********	843023.4	6.0 *
38. 18	*	********	842940.3	6.0 *
39. 19	*	********	842931.8	6.0 *
40. 20	*	********	842939.6	6.0 *
41. 1	*	********	839638.8	6.0 *
42. 2	*	********	839590.6	6.0 *
43. 3	*	********	839527.4	6.0 *
44. 4	*	********	839479.9	6.0 *
45. 5	*	********	839318.0	6.0 *
46. 6	*	********	839282.9	6.0 *
47. 7	*	********	839408.6	6.0 *
48. 8	*	********	839472.9	6.0 *
49. 9	*	********	839430.0	6.0 *
50. 10	*	********	839376.3	6.0 *
51. 11	*	********	839433.9	6.0 *
52. 12	*	********	839485.1	6.0 *
53. 13	*	********	839546.6	6.0 *
54. 14	*	********	839631.4	6.0 *
55. 15	*	********	839759.9	6.0 *
56. 16	*	********	839798.5	6.0 *
57. 17	*	********	839674.9	6.0 *
58. 18	*	********	839616.4	6.0 *
59. 19	*	********	839659.2	6.0 *
60. 20	*	********	839710.9	6.0 *

MODEL RESULTS

Vanasse Hangen Brustlin, Inc.

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	1.4	1.6	1.4	0.9	0.7	1.7	1.3	1.2	0.6	0.5	0.0	0.1	1.0	0.8	0.7	0.1	0.1	0.2	0.0	0.0
10.	1.4	1.6	1.6	1.1	1.1	1.1	0.8	0.9	0.5	0.4	0.0	0.0	0.6	0.5	0.5	0.3	0.5	0.5	0.1	0.0
20.	1.5	1.8	1.7	1.3	1.4	0.5	0.5	0.7	0.5	0.5	0.0	0.0	0.3	0.2	0.2	0.6	0.9	1.1	0.2	0.1
30.	1.6	2.0	1.6	1.1	1.4	0.2	0.3	0.6	0.5	0.5	0.0	0.0	0.1	0.1	0.1	0.8	1.3	1.4	0.4	0.2
40.	1.7	2.0	1.3	1.0	1.3	0.2	0.4	0.7	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.8	1.5	1.4	0.5	0.2
50.	1.8	2.1	1.1	1.2	1.3	0.2	0.3	0.8	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.9	1.4	1.2	0.6	0.4
60.	2.0	2.1	1.0	1.1	1.1	0.2	0.3	0.7	0.5	0.5	0.0	0.0	0.0	0.0	0.0	1.1	1.4	1.0	0.7	0.4
70.	2.0	1.9	1.0	1.2	1.0	0.2	0.3	0.7	0.5	0.5	0.0	0.0	0.0	0.0	0.0	1.1	1.3	0.8	0.7	0.5
80.	2.0	1.8	1.1	1.3	0.9	0.2	0.3	0.6	0.6	0.6	0.0	0.0	0.0	0.0	0.0	1.2	1.3	0.6	0.6	0.5
90.	1.9	1.7	1.0	1.3	0.8	0.2	0.3	0.7	0.7	0.6	0.0	0.0	0.0	0.0	0.0	1.2	1.3	0.5	0.5	0.5
100.	1.7	1.3	1.3	1.2	0.6	0.1	0.3	0.6	0.7	0.7	0.1	0.1	0.1	0.0	0.0	1.2	1.3	0.6	0.6	0.5
110.	1.3	1.2	1.2	1.1	0.5	0.1	0.2	0.4	0.6	0.6	0.3	0.3	0.4	0.1	0.0	1.3	1.4	0.8	0.8	0.6
120.	0.8	0.7	1.0	1.0	0.5	0.0	0.1	0.2	0.3	0.3	0.5	0.6	0.6	0.2	0.1	1.4	1.5	1.1	1.1	0.8
130.	0.6	0.7	0.9	1.0	0.5	0.0	0.0	0.1	0.1	0.1	0.7	0.7	0.7	0.2	0.1	1.5	1.5	1.2	1.4	1.1
140.	0.3	0.5	0.9	0.9	0.5	0.0	0.0	0.0	0.0	0.0	0.6	0.6	0.6	0.3	0.2	1.5	1.4	1.3	1.7	1.4
150.	0.3	0.5	1.1	0.8	0.6	0.0	0.0	0.0	0.0	0.0	0.6	0.6	0.7	0.3	0.2	1.6	1.4	1.2	2.0	1.5
160.	0.1	0.3	1.0	0.7	0.5	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.6	0.3	0.2	1.7	1.4	1.4	1.9	1.5
170.	0.1	0.2	0.9	0.6	0.5	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.6	0.2	0.2	1.6	1.1	1.7	1.7	1.5
180.	0.0	0.1	0.5	0.5	0.3	0.1	0.1	0.1	0.0	0.0	0.4	0.4	0.8	0.4	0.5	1.5	1.2	1.5	1.5	1.3
190.	0.0	0.0	0.2	0.2	0.1	0.2	0.3	0.5	0.0	0.0	0.4	0.4	1.1	0.8	0.6	1.1	0.9	1.3	1.3	1.1
200.	0.0	0.0	0.1	0.1	0.0	0.4	0.6	0.9	0.0	0.0	0.4	0.5	1.3	1.1	1.0	0.8	0.8	1.3	1.4	1.2
210.	0.0	0.0	0.0	0.0	0.0	0.5	0.9	1.2	0.1	0.0	0.4	0.6	1.5	1.0	1.4	0.5	0.8	1.3	1.4	1.2
220.	0.0	0.0	0.0	0.0	0.0	0.6	1.1	1.3	0.2	0.0	0.4	0.7	1.2	1.1	1.4	0.6	0.8	1.3	1.3	1.1
230.	0.0	0.0	0.0	0.0	0.0	0.6	1.3	1.3	0.3	0.1	0.5	0.7	1.2	1.0	1.6	0.6	0.8	1.3	1.4	1.2
240.	0.0	0.0	0.0	0.0	0.0	0.6	1.2	1.2	0.3	0.1	0.7	0.9	1.2	1.2	1.7	0.6	0.8	1.5	1.5	1.2
250.	0.0	0.0	0.0	0.0	0.0	0.5	1.3	1.2	0.4	0.2	0.7	1.0	1.2	1.5	1.7	0.6	0.9	1.5	1.6	1.4
260.	0.0	0.0	0.0	0.0	0.0	0.5	1.3	1.0	0.5	0.3	0.8	1.0	1.5	1.8	1.7	0.6	0.9	1.7	1.8	1.4
270.	0.0	0.1	0.0	0.0	0.0	0.5	1.3	0.9	0.5	0.3	1.0	1.2	1.9	1.9	1.6	0.7	1.0	1.8	2.0	1.5
280.	0.4	0.4	0.3	0.0	0.0	0.5	1.4	1.1	0.8	0.8	1.2	1.4	2.3	1.8	1.5	0.5	1.0	2.0	2.1	1.6
290.	1.1	1.2	1.0	0.2	0.1	0.6	1.7	1.3	1.4	1.0	1.3	1.6	2.1	1.5	1.2	0.2	0.6	1.7	1.7	1.3
300.	1.9	2.0	1.7	0.6	0.2	1.0	2.1	1.8	1.7	1.3	0.9	1.2	1.4	1.2	1.1	0.1	0.2	0.9	1.0	0.6
310.	2.2	2.3	1.9	0.8	0.5	1.3	2.3	2.0	1.5	1.3	0.4	0.7	0.9	1.1	0.8	0.0	0.0	0.3	0.3	0.2
320.	2.0	2.1	1.8	0.8	0.6	1.7	2.2	1.6	1.3	1.0	0.3	0.4	0.7	1.1	0.7	0.0	0.0	0.0	0.1	0.0
330.	1.8	1.9	1.6	0.7	0.6	1.8	2.1	1.3	1.0	0.9	0.3	0.4	1.0	1.2	0.7	0.0	0.0	0.0	0.0	0.0
340.	1.7	1.7	1.5	0.7	0.6	2.0	1.8	1.3	1.0	0.8	0.2	0.3	1.2	1.1	0.6	0.0	0.0	0.0	0.0	0.0
350.	1.6	1.6	1.4	0.6	0.5	2.1	1.5	1.4	0.8	0.6	0.1	0.2	1.2	1.0	0.7	0.0	0.0	0.0	0.0	0.0
360.	1.4	1.6	1.4	0.9	0.7	1.7	1.3	1.2	0.6	0.5	0.0	0.1	1.0	0.8	0.7	0.1	0.1	0.2	0.0	0.0
MAX	2.2	2.3	1.9	1.3	1.4	2.1	2.3	2.0	1.7	1.3	1.3	1.6	2.3	1.9	1.7	1.7	1.5	2.0	2.1	1.6
DEGR.	310	310	310	20	20	350	310	310	300	300	290	290	280	270	240	160	40	280	280	280

Vanasse Hangen Brustlin, Inc.

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29	REC30	REC31	REC32	REC33	REC34	REC35	REC36	REC37	REC38	REC39	REC40
0.	0.3	0.3	0.5	0.3	0.2	0.9	1.9	2.1	1.2	0.5	0.0	0.4	1.6	1.6	2.0	0.1	0.3	0.2	0.0	0.0
10.	0.3	0.3	0.5	0.3	0.3	0.9	1.5	1.9	0.8	0.5	0.0	0.1	1.0	1.1	1.3	0.4	0.9	0.6	0.0	0.0
20.	0.3	0.3	0.8	0.6	0.7	0.7	0.8	1.1	0.6	0.4	0.0	0.0	0.4	0.5	0.6	0.9	1.9	1.3	0.2	0.0
30.	0.3	0.4	1.1	1.0	0.9	0.3	0.3	0.7	0.6	0.3	0.0	0.0	0.1	0.1	0.1	1.5	2.6	2.0	0.4	0.0
40.	0.4	0.7	1.5	1.0	0.7	0.2	0.2	0.4	0.6	0.3	0.0	0.0	0.0	0.0	0.0	2.0	3.0	2.3	0.9	0.2
50.	0.6	1.0	1.5	0.8	0.7	0.1	0.2	0.5	0.6	0.3	0.0	0.0	0.0	0.0	0.0	2.2	2.9	2.3	1.1	0.4
60.	0.7	1.3	1.2	0.7	0.6	0.1	0.2	0.5	0.7	0.4	0.0	0.0	0.0	0.0	0.0	2.2	2.7	2.2	1.1	0.5
70.	0.9	1.3	1.0	0.6	0.4	0.1	0.2	0.6	0.7	0.4	0.0	0.0	0.0	0.0	0.0	2.0	2.4	1.8	1.0	0.5
80.	0.8	1.2	1.0	0.6	0.4	0.1	0.1	0.6	0.6	0.4	0.1	0.1	0.0	0.0	0.0	1.9	2.4	1.6	0.8	0.6
90.	0.8	1.1	0.8	0.4	0.3	0.0	0.1	0.5	0.6	0.4	0.2	0.3	0.2	0.0	0.0	1.9	2.3	1.6	0.9	0.8
100.	0.5	0.5	0.5	0.3	0.3	0.0	0.0	0.4	0.3	0.3	0.3	0.5	0.4	0.0	0.0	1.9	2.4	1.4	0.9	1.0
110.	0.1	0.2	0.4	0.2	0.3	0.0	0.0	0.1	0.2	0.2	0.5	0.9	0.8	0.1	0.0	1.9	2.4	1.2	1.0	1.0
120.	0.1	0.1	0.4	0.2	0.3	0.0	0.0	0.0	0.1	0.0	0.5	1.0	0.8	0.1	0.1	2.0	2.6	0.9	0.7	0.9
130.	0.1	0.1	0.3	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.4	1.0	0.9	0.3	0.1	2.1	2.6	0.6	0.8	0.9
140.	0.1	0.1	0.2	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.4	0.9	0.7	0.2	0.1	2.2	2.6	0.7	0.8	0.6
150.	0.1	0.1	0.2	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.3	0.8	0.7	0.3	0.2	2.3	2.7	0.8	0.8	0.5
160.	0.1	0.1	0.2	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.3	0.8	0.6	0.3	0.2	2.4	2.6	0.8	0.8	0.5
170.	0.1	0.1	0.2	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.3	0.8	0.6	0.2	0.2	2.3	2.4	0.9	0.8	0.4
180.	0.0	0.1	0.2	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.3	0.7	0.5	0.2	0.2	1.9	2.0	0.9	0.8	0.4
190.	0.0	0.0	0.2	0.2	0.2	0.0	0.0	0.2	0.0	0.0	0.4	0.7	0.6	0.4	0.6	1.4	1.3	0.8	0.8	0.3
200.	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.6	0.0	0.0	0.5	0.8	0.7	0.6	1.4	0.7	0.8	0.6	0.7	0.3
210.	0.0	0.0	0.0	0.0	0.0	0.2	0.3	1.1	0.1	0.0	0.6	0.8	0.8	1.1	2.2	0.4	0.4	0.6	0.6	0.3
220.	0.0	0.0	0.0	0.0	0.0	0.3	0.3	1.3	0.2	0.1	0.8	1.1	0.9	1.2	2.5	0.2	0.3	0.4	0.6	0.3
230.	0.0	0.0	0.0	0.0	0.0	0.3	0.3	1.4	0.3	0.1	0.9	1.2	0.9	1.6	2.6	0.2	0.2	0.5	0.6	0.4
240.	0.0	0.0	0.0	0.0	0.0	0.3	0.3	1.4	0.3	0.1	1.0	1.2	0.8	1.9	2.6	0.1	0.3	0.5	0.7	0.4
250.	0.0	0.0	0.0	0.0	0.0	0.2	0.3	1.2	0.5	0.1	1.2	1.4	0.8	2.0	2.3	0.1	0.3	0.5	0.6	0.4
260.	0.1	0.1	0.0	0.0	0.0	0.2	0.3	1.2	0.6	0.2	1.3	1.3	1.0	1.8	2.3	0.1	0.1	0.5	0.6	0.5
270.	0.2	0.2	0.2	0.0	0.0	0.2	0.3	1.3	0.8	0.4	1.5	1.2	1.1	1.7	2.1	0.0	0.1	0.4	0.4	0.4
280.	0.3	0.4	0.4	0.1	0.0	0.2	0.4	1.3	0.7	0.7	1.1	1.2	1.0	1.6	2.1	0.0	0.0	0.1	0.2	0.2
290.	0.4	0.4	0.5	0.1	0.1	0.3	0.5	1.2	0.8	0.9	0.8	1.0	1.2	1.6	2.1	0.0	0.0	0.0	0.1	0.1
300.	0.4	0.4	0.6	0.1	0.1	0.3	0.7	0.8	0.8	1.0	0.6	0.8	1.3	1.7	2.1	0.0	0.0	0.0	0.0	0.0
310.	0.3	0.3	0.6	0.1	0.1	0.3	0.8	0.6	1.1	1.2	0.6	0.9	1.5	1.8	2.1	0.0	0.0	0.0	0.0	0.0
320.	0.3	0.3	0.6	0.2	0.1	0.4	1.0	0.7	1.2	1.3	0.6	0.9	1.6	1.8	2.2	0.0	0.0	0.0	0.0	0.0
330.	0.3	0.3	0.6	0.2	0.1	0.4	1.3	0.9	1.4	1.1	0.5	0.9	1.7	1.9	2.3	0.0	0.0	0.0	0.0	0.0
340.	0.3	0.3	0.5	0.2	0.1	0.5	1.4	1.3	1.5	1.0	0.3	0.9	1.7	1.9	2.4	0.0	0.0	0.0	0.0	0.0
350.	0.3	0.3	0.5	0.3	0.2	0.7	1.7	1.7	1.5	0.8	0.1	0.8	1.8	1.9	2.4	0.0	0.1	0.0	0.0	0.0
360.	0.3	0.3	0.5	0.3	0.2	0.9	1.9	2.1	1.2	0.5	0.0	0.4	1.6	1.6	2.0	0.1	0.3	0.2	0.0	0.0
MAX	0.9	1.3	1.5	1.0	0.9	0.9	1.9	2.1	1.5	1.3	1.5	1.4	1.8	2.0	2.6	2.4	3.0	2.3	1.1	1.0
DEGR.	70	60	40	30	30	0	0	0	340	320	270	250	350	250	230	160	40	40	50	100

Vanasse Hangen Brustlin, Inc.

2030 No Build Condition

CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221 PAGE 1

JOB: 2030 No BUILD RUN: 2030 No Build

DATE : 3/11/12
TIME : 12:36:53

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = 0.0 CM/S VD = 0.0 CM/S Z0 = 175. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 0.0 PPM

LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (FT) X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)
1. Lower Newton QL	********	845790.0	********	846290.7	1230.	294.	AG	341.	100.0	1.0	20.0	1.49	62.5
2. Rt7 SB QL	********	845855.0	********	846022.1	172.	13.	AG	242.	100.0	1.0	20.0	0.75	8.7
3. Upper Nerton QL	********	845727.8	********	845721.7	15.	115.	AG	365.	100.0	1.0	20.0	0.24	0.7
4. RT 7 NB QL	********	845706.6	********	845542.6	166.	188.	AG	242.	100.0	1.0	20.0	0.73	8.4
5. Lake EB QL	********	842875.2	********	843185.1	4190.	274.	AG	150.	100.0	1.0	10.0	2.03	212.9
6. Federal QL	********	842933.7	********	843244.6	329.	19.	AG	542.	100.0	1.0	30.0	1.16	16.7
7. Lake WB QL	********	842888.3	********	842842.1	250.	101.	AG	147.	100.0	1.0	10.0	0.97	12.7
8. Catherine QL	********	842836.7	********	842807.7	30.	191.	AG	307.	100.0	1.0	20.0	0.18	1.5
9. Rt 7 SB QL	********	839649.5	********	842289.0	3051.	30.	AG	355.	100.0	1.0	20.0	2.84	155.0
10. St Albans QL	********	839510.2	********	839454.0	118.	119.	AG	293.	100.0	1.0	20.0	0.65	6.0
11. RT 7 NB QL	********	839481.8	********	839214.7	309.	210.	AG	310.	100.0	1.0	20.0	1.02	15.7
12. Lower Newton	********	845774.6	********	846056.9	664.	295.	AG	1065.	11.7	1.0	60.0		
13. Rt 7 SB	********	845774.6	********	846440.4	681.	12.	AG	1640.	11.7	1.0	60.0		
14. Upper Newton	********	845774.6	********	845436.5	815.	114.	AG	1065.	11.7	1.0	60.0		
15. Rt7 NB	********	845774.6	********	845435.3	343.	188.	AG	1640.	11.7	1.0	60.0		
16. Lake EB	********	842884.2	********	842956.7	1171.	274.	AG	805.	11.7	1.0	60.0		
17. Federal	********	843425.2	********	842884.2	550.	191.	AG	825.	11.7	1.0	60.0		
18. Lake WB	********	842884.2	********	842708.6	959.	101.	AG	805.	11.7	1.0	60.0		
19. Catherine	********	842889.7	********	842039.7	903.	200.	AG	825.	11.7	1.0	60.0		
20. RT 7 SB	********	839526.1	********	840064.9	619.	30.	AG	1640.	11.7	1.0	60.0		
21. ST Albans	********	839526.1	********	839129.4	865.	117.	AG	1990.	11.7	1.0	60.0		
22. Rt 7 NB	********	839526.1	********	838782.4	873.	212.	AG	1640.	11.7	1.0	60.0		

Vanasse Hangen Brustlin, Inc.

JOB: 2030 No BUILD RUN: 2030 No Build

DATE : 3/11/12
TIME : 12:36:53

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
1. Lower Newton QL	120	100	3.0	595	1600	76.30	1	3
2. Rt7 SB QL	120	71	3.0	885	1600	76.30	1	3
3. Upper Nerton QL	120	107	3.0	50	1600	76.30	1	3
4. RT 7 NB QL	120	71	3.0	855	1600	76.30	1	3
5. Lake EB QL	120	88	3.0	730	1600	76.30	1	3
6. Federal QL	120	106	3.0	415	1600	76.30	1	3
7. Lake WB QL	120	86	3.0	375	1600	76.30	1	3
8. Catherine QL	120	90	3.0	120	1600	76.30	1	3
9. Rt 7 SB QL	120	104	3.0	830	1600	76.30	1	3
10. St Albans QL	120	86	3.0	500	1600	76.30	1	3
11. RT 7 NB QL	120	91	3.0	650	1600	76.30	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. 1	********	845814.4	6.0
2. 2	********	845790.6	6.0
3. 3	********	845750.0	6.0
4. 4	********	845660.9	6.0
5. 5	********	845579.5	6.0
6. 6	********	845569.8	6.0
7. 7	********	845647.4	6.0
8. 8	********	845704.2	6.0
9. 9	********	845673.5	6.0
10. 10	********	845632.9	6.0
11. 11	********	845703.3	6.0
12. 12	********	845742.1	6.0
13. 13	********	845796.8	6.0
14. 14	********	845872.9	6.0
15. 15	********	845952.8	6.0
16. 16	********	845971.9	6.0
17. 17	********	845896.9	6.0
18. 18	********	845834.3	6.0
19. 19	********	845859.2	6.0
20. 20	********	845890.7	6.0
21. 1	********	842867.4	6.0
22. 2	********	842862.6	6.0
23. 3	********	842840.3	6.0
24. 4	********	842746.4	6.0
25. 5	********	842609.4	6.0

26. 6	*	********	842576.9	6.0 *
27. 7	*	********	842726.3	6.0 *
28. 8	*	********	842832.1	6.0 *
29. 9	*	********	842822.3	6.0 *
30. 10	*	********	842794.8	6.0 *
31. 11	*	********	842865.8	6.0 *
32. 12	*	********	842893.3	6.0 *
33. 13	*	********	842919.0	6.0 *
34. 14	*	********	843011.7	6.0 *

JOB: 2030 No BUILD RUN: 2030 No Build

DATE : 3/11/12
TIME : 12:36:53

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
35. 15	********	843110.8	6.0
36. 16	********	843121.3	6.0
37. 17	********	843023.4	6.0
38. 18	********	842940.3	6.0
39. 19	********	842931.8	6.0
40. 20	********	842939.6	6.0
41. 1	********	839638.8	6.0
42. 2	********	839590.6	6.0
43. 3	********	839527.4	6.0
44. 4	********	839479.9	6.0
45. 5	********	839318.0	6.0
46. 6	********	839282.9	6.0
47. 7	********	839408.6	6.0
48. 8	********	839472.9	6.0
49. 9	********	839430.0	6.0
50. 10	********	839376.3	6.0
51. 11	********	839433.9	6.0
52. 12	********	839485.1	6.0
53. 13	********	839546.6	6.0
54. 14	********	839631.4	6.0
55. 15	********	839759.9	6.0
56. 16	********	839798.5	6.0
57. 17	********	839674.9	6.0
58. 18	********	839616.4	6.0
59. 19	********	839659.2	6.0
60. 20	********	839710.9	6.0

MODEL RESULTS

REMARKS : In search of the angle corresponding to

the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	1.0	1.0	1.0	0.8	0.5	1.5	1.0	1.1	0.5	0.4	0.0	0.1	1.0	0.9	0.7	0.1	0.1	0.2	0.0	0.0
10.	1.0	1.1	1.3	0.9	0.9	1.0	0.7	0.8	0.4	0.3	0.0	0.0	0.6	0.6	0.5	0.3	0.5	0.5	0.1	0.0
20.	1.1	1.2	1.5	1.0	1.2	0.4	0.5	0.6	0.3	0.3	0.0	0.0	0.3	0.2	0.2	0.7	0.9	1.0	0.2	0.1
30.	1.2	1.4	1.3	1.1	1.1	0.1	0.3	0.5	0.3	0.3	0.0	0.0	0.1	0.1	0.1	0.9	1.2	1.2	0.4	0.2
40.	1.3	1.5	1.1	0.9	1.1	0.1	0.3	0.6	0.3	0.3	0.0	0.0	0.0	0.0	0.0	1.0	1.3	1.1	0.5	0.2
50.	1.3	1.5	1.0	1.1	1.1	0.1	0.2	0.7	0.3	0.3	0.0	0.0	0.0	0.0	0.0	1.0	1.2	1.0	0.5	0.4
60.	1.5	1.6	0.8	1.0	1.0	0.1	0.2	0.6	0.4	0.4	0.0	0.0	0.0	0.0	0.0	1.1	1.2	0.8	0.6	0.4
70.	1.5	1.5	0.9	1.0	1.0	0.1	0.2	0.7	0.4	0.4	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.7	0.6	0.4
80.	1.5	1.4	0.9	1.1	1.0	0.1	0.2	0.6	0.4	0.4	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.6	0.5	0.4
90.	1.4	1.3	0.9	1.1	1.0	0.1	0.2	0.5	0.5	0.5	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.5	0.4	0.4
100.	1.3	1.1	1.0	1.1	1.0	0.1	0.2	0.4	0.5	0.5	0.1	0.1	0.1	0.0	0.0	1.0	1.0	0.6	0.6	0.3
110.	0.9	0.8	1.0	1.0	0.8	0.0	0.1	0.3	0.4	0.4	0.2	0.3	0.3	0.0	0.0	1.0	1.1	0.7	0.6	0.4
120.	0.6	0.6	0.8	0.9	0.7	0.0	0.0	0.2	0.2	0.2	0.4	0.4	0.5	0.1	0.0	1.1	1.1	1.0	0.9	0.6
130.	0.4	0.5	0.8	0.9	0.7	0.0	0.0	0.1	0.1	0.1	0.5	0.5	0.5	0.2	0.1	1.1	1.2	1.0	1.0	0.8
140.	0.3	0.5	0.8	1.0	0.6	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.2	0.1	1.1	1.1	1.1	1.3	1.2
150.	0.3	0.5	1.0	1.0	0.6	0.0	0.0	0.0	0.0	0.0	0.4	0.4	0.5	0.2	0.1	1.3	1.1	1.1	1.5	1.1
160.	0.1	0.3	1.0	0.9	0.5	0.0	0.0	0.0	0.0	0.0	0.4	0.4	0.5	0.2	0.1	1.4	1.3	1.2	1.5	1.1
170.	0.1	0.2	0.9	0.8	0.5	0.0	0.0	0.0	0.0	0.0	0.4	0.4	0.5	0.2	0.1	1.4	1.1	1.4	1.3	1.1
180.	0.0	0.1	0.5	0.6	0.3	0.1	0.2	0.2	0.0	0.0	0.3	0.3	0.7	0.4	0.3	1.4	1.1	1.3	1.0	0.9
190.	0.0	0.0	0.4	0.3	0.2	0.3	0.6	0.6	0.1	0.0	0.3	0.3	0.9	0.7	0.6	1.0	0.9	1.1	0.9	0.8
200.	0.0	0.0	0.1	0.1	0.0	0.4	0.8	0.9	0.0	0.0	0.3	0.3	1.1	1.0	0.9	0.6	0.7	0.9	1.0	0.8
210.	0.0	0.0	0.0	0.0	0.0	0.6	1.1	1.1	0.1	0.0	0.3	0.4	1.2	1.0	1.2	0.3	0.5	0.9	1.0	0.8
220.	0.0	0.0	0.0	0.0	0.0	0.8	1.2	1.2	0.3	0.0	0.3	0.6	1.0	1.0	1.2	0.4	0.5	0.9	0.9	0.8
230.	0.0	0.0	0.0	0.0	0.0	0.9	1.2	1.1	0.3	0.1	0.4	0.7	1.0	0.9	1.3	0.4	0.6	0.9	1.0	0.8
240.	0.0	0.0	0.0	0.0	0.0	1.0	1.1	1.0	0.4	0.1	0.6	0.8	0.9	1.1	1.3	0.4	0.6	1.1	1.1	0.9
250.	0.0	0.0	0.0	0.0	0.0	1.0	1.0	1.0	0.4	0.3	0.6	0.8	1.0	1.2	1.3	0.4	0.6	1.1	1.1	0.9
260.	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.9	0.4	0.3	0.6	0.8	1.2	1.4	1.3	0.4	0.6	1.2	1.3	1.0
270.	0.0	0.0	0.0	0.0	0.0	1.1	1.0	0.8	0.4	0.3	0.7	0.9	1.5	1.4	1.3	0.4	0.7	1.3	1.4	1.1
280.	0.3	0.3	0.3	0.0	0.0	1.1	1.0	0.9	0.5	0.5	0.8	1.2	1.8	1.5	1.3	0.4	0.7	1.4	1.5	1.1
290.	0.8	0.9	0.7	0.1	0.0	1.2	1.2	1.1	1.1	0.8	1.0	1.2	1.6	1.3	1.0	0.1	0.4	1.1	1.3	0.9
300.	1.3	1.5	1.2	0.4	0.2	1.3	1.5	1.4	1.4	1.1	0.6	0.8	1.1	1.0	0.9	0.0	0.1	0.6	0.7	0.4
310.	1.5	1.6	1.4	0.5	0.4	1.5	1.7	1.5	1.2	0.9	0.3	0.5	0.8	0.9	0.8	0.0	0.0	0.2	0.2	0.1
320.	1.4	1.5	1.2	0.6	0.4	1.6	1.6	1.4	1.1	0.7	0.3	0.3	0.7	0.9	0.8	0.0	0.0	0.0	0.0	0.0
330.	1.3	1.3	1.2	0.6	0.4	1.7	1.7	1.1	0.8	0.7	0.3	0.3	0.9	1.0	0.8	0.0	0.0	0.0	0.0	0.0
340.	1.2	1.2	1.1	0.5	0.4	1.6	1.5	1.1	0.8	0.7	0.2	0.3	1.1	1.0	0.7	0.0	0.0	0.0	0.0	0.0
350.	1.1	1.2	0.9	0.5	0.3	1.7	1.3	1.2	0.7	0.5	0.1	0.2	1.1	1.0	0.7	0.0	0.0	0.0	0.0	0.0
360.	1.0	1.0	1.0	0.8	0.5	1.5	1.0	1.1	0.5	0.4	0.0	0.1	1.0	0.9	0.7	0.1	0.1	0.2	0.0	0.0
MAX	1.5	1.6	1.5	1.1	1.2	1.7	1.7	1.5	1.4	1.1	1.0	1.2	1.8	1.5	1.3	1.4	1.3	1.4	1.5	1.2
DEGR.	70	310	20	30	20	330	310	310	300	300	290	280	280	280	230	160	160	170	150	140

Vanasse Hangen Brustlin, Inc.

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29	REC30	REC31	REC32	REC33	REC34	REC35	REC36	REC37	REC38	REC39	REC40
0.	0.4	0.5	0.4	0.2	0.2	0.4	1.1	1.4	0.9	0.5	0.0	0.2	1.0	1.0	1.1	0.1	0.2	0.0	0.0	0.0
10.	0.4	0.5	0.4	0.2	0.3	0.4	0.9	1.2	0.6	0.5	0.0	0.0	0.6	0.6	0.6	0.2	0.5	0.3	0.0	0.0
20.	0.4	0.5	0.5	0.5	0.4	0.4	0.5	0.8	0.5	0.5	0.0	0.0	0.2	0.2	0.2	0.5	1.2	0.8	0.0	0.0
30.	0.5	0.5	0.8	0.7	0.6	0.2	0.3	0.4	0.4	0.3	0.0	0.0	0.0	0.0	0.0	0.8	1.7	1.2	0.3	0.0
40.	0.6	0.7	1.0	0.7	0.5	0.2	0.2	0.3	0.5	0.4	0.0	0.0	0.0	0.0	0.0	1.1	2.0	1.5	0.5	0.0
50.	0.7	0.9	1.0	0.5	0.4	0.1	0.2	0.4	0.5	0.4	0.0	0.0	0.0	0.0	0.0	1.3	1.9	1.5	0.7	0.2
60.	0.9	1.0	0.8	0.3	0.3	0.1	0.2	0.5	0.5	0.3	0.0	0.0	0.0	0.0	0.0	1.4	1.8	1.4	0.7	0.4
70.	0.9	0.9	0.8	0.4	0.3	0.1	0.2	0.5	0.5	0.3	0.0	0.0	0.0	0.0	0.0	1.4	1.7	1.3	0.6	0.4
80.	0.7	0.8	0.6	0.2	0.3	0.1	0.1	0.5	0.6	0.4	0.1	0.0	0.0	0.0	0.0	1.2	1.6	1.1	0.5	0.5
90.	0.6	0.6	0.6	0.2	0.2	0.0	0.1	0.4	0.5	0.4	0.1	0.2	0.2	0.0	0.0	1.3	1.6	1.1	0.7	0.6
100.	0.4	0.4	0.3	0.1	0.2	0.0	0.0	0.3	0.3	0.3	0.3	0.5	0.4	0.0	0.0	1.3	1.6	1.0	0.7	0.6
110.	0.1	0.1	0.1	0.1	0.2	0.0	0.0	0.1	0.1	0.1	0.4	0.7	0.6	0.1	0.0	1.3	1.7	0.9	0.7	0.8
120.	0.1	0.1	0.1	0.2	0.3	0.1	0.0	0.0	0.0	0.0	0.5	0.8	0.7	0.1	0.1	1.3	1.7	0.8	0.6	0.7
130.	0.2	0.2	0.2	0.2	0.3	0.1	0.1	0.1	0.1	0.0	0.5	0.8	0.6	0.2	0.1	1.4	1.8	0.4	0.6	0.7
140.	0.2	0.2	0.2	0.2	0.3	0.1	0.1	0.1	0.1	0.1	0.6	0.8	0.7	0.3	0.1	1.5	1.9	0.6	0.6	0.7
150.	0.2	0.2	0.2	0.3	0.3	0.1	0.1	0.1	0.1	0.1	0.7	0.7	0.7	0.3	0.3	1.7	2.0	0.7	0.6	0.7
160.	0.2	0.2	0.2	0.3	0.3	0.1	0.1	0.1	0.1	0.1	0.7	0.7	0.5	0.3	0.3	1.6	1.8	0.6	0.6	0.7
170.	0.1	0.2	0.2	0.3	0.3	0.1	0.1	0.1	0.1	0.1	0.7	0.6	0.5	0.3	0.3	1.6	1.7	0.6	0.6	0.7
180.	0.1	0.1	0.2	0.3	0.3	0.1	0.1	0.1	0.1	0.1	0.7	0.7	0.4	0.3	0.3	1.4	1.4	0.6	0.7	0.6
190.	0.0	0.0	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.7	0.7	0.4	0.3	0.6	1.0	0.9	0.6	0.7	0.5
200.	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.7	0.6	0.3	0.3	0.8	0.5	0.6	0.4	0.4	0.5
210.	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.3	0.1	0.0	0.6	0.6	0.5	0.5	1.3	0.3	0.2	0.4	0.5	0.5
220.	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.4	0.1	0.0	0.7	0.7	0.5	0.7	1.8	0.2	0.2	0.3	0.5	0.5
230.	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.5	0.1	0.1	0.7	0.7	0.7	1.0	1.9	0.2	0.2	0.4	0.5	0.5
240.	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.6	0.1	0.1	0.8	0.9	0.5	1.2	1.8	0.2	0.2	0.5	0.5	0.6
250.	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.7	0.1	0.1	0.9	0.9	0.6	1.3	1.7	0.2	0.2	0.5	0.7	0.7
260.	0.2	0.2	0.1	0.0	0.0	0.1	0.2	0.9	0.3	0.1	1.1	0.9	1.0	1.4	1.6	0.2	0.3	0.6	0.7	0.7
270.	0.5	0.5	0.3	0.1	0.0	0.1	0.3	1.0	0.5	0.4	1.0	1.0	1.0	1.3	1.5	0.1	0.2	0.4	0.7	0.7
280.	0.7	0.7	0.5	0.3	0.1	0.2	0.5	1.1	0.7	0.4	0.8	0.9	0.9	1.2	1.4	0.0	0.1	0.2	0.4	0.4
290.	0.8	0.8	0.6	0.3	0.1	0.3	0.5	0.9	0.6	0.7	0.5	0.6	0.9	1.1	1.4	0.0	0.0	0.0	0.1	0.1
300.	0.6	0.7	0.6	0.2	0.2	0.3	0.4	0.7	0.6	0.9	0.4	0.5	0.9	1.1	1.4	0.0	0.0	0.0	0.0	0.0
310.	0.6	0.6	0.6	0.2	0.2	0.3	0.4	0.3	0.7	0.9	0.4	0.6	1.0	1.1	1.4	0.0	0.0	0.0	0.0	0.0
320.	0.6	0.6	0.4	0.2	0.2	0.3	0.4	0.6	0.9	0.9	0.4	0.6	1.0	1.1	1.4	0.0	0.0	0.0	0.0	0.0
330.	0.6	0.6	0.4	0.2	0.2	0.4	0.4	0.6	1.0	0.9	0.3	0.6	1.1	1.2	1.6	0.0	0.0	0.0	0.0	0.0
340.	0.5	0.5	0.4	0.2	0.2	0.3	0.4	0.8	1.1	0.8	0.1	0.6	1.2	1.3	1.6	0.0	0.0	0.0	0.0	0.0
350.	0.4	0.5	0.4	0.2	0.2	0.3	0.8	1.3	0.9	0.5	0.0	0.4	1.2	1.3	1.5	0.0	0.0	0.0	0.0	0.0
360.	0.4	0.5	0.4	0.2	0.2	0.4	1.1	1.4	0.9	0.5	0.0	0.2	1.0	1.0	1.1	0.1	0.2	0.0	0.0	0.0
MAX	0.9	1.0	1.0	0.7	0.6	0.4	1.1	1.4	1.1	0.9	1.1	1.0	1.2	1.4	1.9	1.7	2.0	1.5	0.7	0.8
DEGR.	60	60	40	30	30	0	0	0	340	310	260	270	340	260	230	150	40	40	50	110

Vanasse Hangen Brustlin, Inc.

JOB: 2030 No BUILD RUN: 2030 No Build

MODEL RESULTS

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC41	REC42	REC43	REC44	REC45	REC46	REC47	REC48	REC49	REC50	REC51	REC52	REC53	REC54	REC55	REC56	REC57	REC58	REC59	REC60
0.	0.0	0.0	0.0	0.0	0.0	1.7	1.6	1.3	1.7	1.0	0.3	0.5	1.0	1.5	1.5	0.0	0.0	0.0	0.0	0.0
10.	0.0	0.0	0.1	0.1	0.0	1.9	1.6	1.7	1.7	1.0	0.4	0.6	1.2	1.7	1.5	0.2	0.2	0.1	0.0	0.0
20.	0.0	0.1	0.4	0.5	0.4	2.0	1.8	2.0	1.6	0.9	0.2	0.5	1.3	1.6	1.5	0.7	0.8	0.4	0.1	0.0
30.	0.1	0.2	0.9	1.1	1.0	1.7	1.6	1.8	1.6	0.8	0.1	0.2	0.9	1.2	1.1	1.5	1.7	1.1	0.2	0.1
40.	0.3	0.5	1.1	1.3	1.4	1.0	0.9	1.2	1.2	0.6	0.0	0.1	0.3	0.5	0.5	2.0	2.1	1.4	0.5	0.2
50.	0.4	0.6	0.9	1.1	1.5	0.5	0.6	0.9	1.0	0.6	0.0	0.0	0.0	0.1	0.0	1.9	2.1	1.4	0.6	0.4
60.	0.4	0.5	0.6	1.0	1.4	0.3	0.5	1.0	1.0	0.7	0.0	0.0	0.0	0.0	0.0	1.8	1.8	1.1	0.6	0.4
70.	0.4	0.4	0.6	1.1	1.4	0.2	0.5	1.1	0.9	0.7	0.0	0.0	0.0	0.0	0.0	1.6	1.7	0.8	0.5	0.3
80.	0.4	0.3	0.7	1.4	1.3	0.2	0.5	1.3	0.9	0.8	0.0	0.0	0.0	0.0	0.0	1.5	1.5	0.6	0.5	0.3
90.	0.2	0.3	1.0	1.5	1.2	0.2	0.5	1.3	0.9	0.9	0.1	0.1	0.0	0.0	0.0	1.3	1.4	0.5	0.4	0.3
100.	0.2	0.5	1.3	1.7	1.1	0.1	0.4	1.3	1.0	1.0	0.2	0.2	0.1	0.0	0.0	1.3	1.4	0.4	0.3	0.2
110.	0.6	0.7	1.5	1.5	1.1	0.0	0.2	1.0	1.0	0.9	0.4	0.5	0.3	0.0	0.0	1.3	1.4	0.5	0.4	0.3
120.	0.6	0.8	1.2	1.2	1.0	0.0	0.1	0.5	0.6	0.6	0.8	0.9	0.7	0.1	0.0	1.3	1.4	0.9	0.7	0.5
130.	0.4	0.5	0.9	1.1	1.0	0.0	0.0	0.2	0.3	0.2	1.0	1.1	1.1	0.3	0.1	1.4	1.4	1.1	0.8	0.6
140.	0.3	0.5	0.8	1.0	1.0	0.0	0.0	0.1	0.1	0.1	1.0	1.0	1.3	0.3	0.1	1.4	1.5	1.1	0.7	0.3
150.	0.4	0.4	0.8	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.9	1.0	1.3	0.4	0.2	1.5	1.3	1.1	0.4	0.2
160.	0.4	0.4	1.0	1.2	1.0	0.0	0.0	0.0	0.0	0.0	0.8	1.0	1.2	0.4	0.2	1.7	1.4	1.0	0.4	0.3
170.	0.3	0.4	1.0	1.2	1.0	0.0	0.0	0.0	0.0	0.0	0.7	1.0	1.2	0.5	0.2	1.8	1.2	0.8	0.4	0.3
180.	0.2	0.4	1.0	1.3	1.0	0.0	0.0	0.0	0.0	0.0	0.6	1.1	1.1	0.5	0.3	2.0	1.1	0.8	0.4	0.3
190.	0.1	0.3	1.1	1.4	0.8	0.1	0.1	0.1	0.0	0.0	0.6	1.2	0.9	0.5	0.3	2.1	1.2	1.0	0.3	0.1
200.	0.1	0.2	0.9	1.2	0.7	0.3	0.4	0.4	0.0	0.0	0.7	1.4	1.0	0.8	0.7	1.8	1.3	0.9	0.2	0.1
210.	0.0	0.1	0.5	0.8	0.5	0.7	1.0	1.0	0.1	0.0	0.7	1.5	1.4	1.2	1.0	1.1	0.9	0.6	0.1	0.0
220.	0.0	0.0	0.2	0.4	0.2	1.2	1.6	1.6	0.3	0.0	0.7	1.6	1.6	1.4	1.3	0.5	0.4	0.3	0.0	0.0
230.	0.0	0.0	0.0	0.1	0.1	1.5	1.7	1.7	0.5	0.1	0.7	1.7	1.6	1.2	1.4	0.1	0.2	0.0	0.0	0.0
240.	0.0	0.0	0.0	0.0	0.0	1.5	1.6	1.6	0.6	0.3	1.0	1.9	1.3	0.7	1.3	0.0	0.0	0.0	0.0	0.0
250.	0.0	0.0	0.0	0.0	0.0	1.5	1.5	1.4	0.6	0.3	1.0	2.0	1.1	0.6	1.3	0.0	0.0	0.0	0.0	0.0
260.	0.0	0.0	0.0	0.0	0.0	1.5	1.4	1.3	0.6	0.4	1.3	2.0	0.8	0.6	1.2	0.0	0.0	0.0	0.0	0.0
270.	0.0	0.0	0.0	0.0	0.0	1.3	1.3	1.1	0.5	0.4	1.3	1.9	0.7	0.6	1.1	0.0	0.0	0.0	0.0	0.0
280.	0.0	0.0	0.0	0.0	0.0	1.3	1.2	1.0	0.5	0.5	1.4	1.7	0.5	0.6	1.1	0.0	0.0	0.0	0.0	0.0
290.	0.0	0.0	0.0	0.0	0.0	1.3	1.2	0.8	0.6	0.6	1.3	1.2	0.4	0.8	1.1	0.0	0.0	0.0	0.0	0.0
300.	0.0	0.0	0.0	0.0	0.0	1.3	1.2	0.7	0.7	1.1	0.8	0.7	0.5	0.9	1.1	0.0	0.0	0.0	0.0	0.0
310.	0.0	0.0	0.0	0.0	0.0	1.3	1.2	0.7	0.9	1.3	0.5	0.4	0.4	1.0	1.1	0.0	0.0	0.0	0.0	0.0
320.	0.0	0.0	0.0	0.0	0.0	1.3	1.2	0.7	1.2	1.3	0.3	0.4	0.4	1.1	1.1	0.0	0.0	0.0	0.0	0.0
330.	0.0	0.0	0.0	0.0	0.0	1.3	1.2	0.7	1.3	1.3	0.3	0.4	0.5	1.1	1.1	0.0	0.0	0.0	0.0	0.0
340.	0.0	0.0	0.0	0.0	0.0	1.4	1.3	0.9	1.4	1.3	0.4	0.4	0.6	1.2	1.2	0.0	0.0	0.0	0.0	0.0
350.	0.0	0.0	0.0	0.0	0.0	1.5	1.5	1.0	1.7	1.1	0.3	0.5	0.7	1.3	1.3	0.0	0.0	0.0	0.0	0.0
360.	0.0	0.0	0.0	0.0	0.0	1.7	1.6	1.3	1.7	1.0	0.3	0.5	1.0	1.5	1.5	0.0	0.0	0.0	0.0	0.0
MAX	0.6	0.8	1.5	1.7	1.5	2.0	1.8	2.0	1.7	1.3	1.4	2.0	1.6	1.7	1.5	2.1	2.1	1.4	0.8	0.6
DEGR.	110	120	110	100	50	20	20	20	0	310	280	250	220	10	0	190	40	50	130	130

THE HIGHEST CONCENTRATION OF 2.10 PPM OCCURRED AT RECEPTOR REC57.

Vanasse Hangen Brustlin, Inc.

2030 Build Condition

CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221 PAGE 1

JOB: 2030BUILD RUN: 2030Build

DATE : 3/11/12
TIME : 12:37:32

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = 0.0 CM/S VD = 0.0 CM/S Z0 = 175. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 0.0 PPM

LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (FT) X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)
1. Lower Newton QL	********	845790.0	********	846609.7	2013.	294.	AG	198.	100.0	1.0	20.0	1.86	102.3
2. Rt7 SB QL	********	845855.0	********	846040.3	190.	13.	AG	141.	100.0	1.0	20.0	0.81	9.7
3. Upper Nerton QL	********	845727.8	********	845721.7	15.	115.	AG	212.	100.0	1.0	20.0	0.24	0.7
4. RT 7 NB QL	********	845706.6	********	845583.7	124.	188.	AG	141.	100.0	1.0	20.0	0.55	6.3
5. Lake EB QL	********	842875.2	********	843079.4	2762.	274.	AG	87.	100.0	1.0	10.0	1.66	140.3
6. Federal QL	********	842933.7	********	843275.4	361.	19.	AG	315.	100.0	1.0	30.0	1.18	18.4
7. Lake WB QL	********	842888.3	********	842770.7	636.	101.	AG	85.	100.0	1.0	10.0	1.09	32.3
8. Catherine QL	********	842836.7	********	842739.1	99.	191.	AG	178.	100.0	1.0	20.0	0.61	5.1
9. Rt 7 SB QL	********	839649.5	********	840511.4	996.	30.	AG	206.	100.0	1.0	20.0	1.54	50.6
10. St Albans QL	********	839510.2	********	839453.5	119.	119.	AG	170.	100.0	1.0	20.0	0.65	6.0
11. RT 7 NB QL	********	839481.8	********	839214.7	309.	210.	AG	180.	100.0	1.0	20.0	1.02	15.7
12. Nason Conn QL	********	839551.5	********	839595.7	85.	301.	AG	158.	100.0	1.0	20.0	0.42	4.3
13. Lower Newton	********	845774.6	********	846056.9	664.	295.	AG	1165.	11.7	1.0	60.0		
14. Rt 7 SB	********	845774.6	********	846440.4	681.	12.	AG	1425.	11.7	1.0	60.0		
15. Upper Newton	********	845774.6	********	845436.5	815.	114.	AG	1165.	11.7	1.0	60.0		
16. Rt7 NB	********	845774.6	********	845435.3	343.	188.	AG	1425.	11.7	1.0	60.0		
17. Lake EB	********	842884.2	********	842956.7	1171.	274.	AG	790.	11.7	1.0	60.0		
18. Federal	********	843425.2	********	842884.2	550.	191.	AG	1125.	11.7	1.0	60.0		
19. Lake WB	********	842884.2	********	842708.6	959.	101.	AG	790.	11.7	1.0	60.0		
20. Catherine	********	842889.7	********	842039.7	903.	200.	AG	1125.	11.7	1.0	60.0		
21. RT 7 SB	********	839526.1	********	840064.9	619.	30.	AG	1425.	11.7	1.0	60.0		
22. ST Albans	********	839526.1	********	839129.4	865.	117.	AG	1990.	11.7	1.0	60.0		
23. Rt 7 NB	********	839526.1	********	838782.4	873.	212.	AG	1425.	11.7	1.0	60.0		
24. Nason Conn	********	839552.7	********	839895.8	778.	296.	AG	745.	11.7	1.0	60.0		

PAGE 2

JOB: 2030BUILD RUN: 2030Build

DATE : 3/11/12
TIME : 12:37:32

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE	RED	CLEARANCE	APPROACH	SATURATION	IDLE	SIGNAL	ARRIVAL

Vanasse Hangen Brustlin, Inc.

	LENGTH (SEC)	TIME (SEC)	LOST TIME (SEC)	VOL (VPH)	FLOW RATE (VPH)	EM FAC (gm/hr)	TYPE	RATE
1. Lower Newton QL	120	100	3.0	740	1600	44.30	1	3
2. Rt7 SB QL	120	71	3.0	945	1600	44.30	1	3
3. Upper Nerton QL	120	107	3.0	50	1600	44.30	1	3
4. RT 7 NB QL	120	71	3.0	640	1600	44.30	1	3
5. Lake EB QL	120	88	3.0	595	1600	44.30	1	3
6. Federal QL	120	106	3.0	425	1600	44.30	1	3
7. Lake WB QL	120	86	3.0	420	1600	44.30	1	3
8. Catherine QL	120	90	3.0	405	1600	44.30	1	3
9. Rt 7 SB QL	120	104	3.0	450	1600	44.30	1	3
10. St Albans QL	120	86	3.0	505	1600	44.30	1	3
11. RT 7 NB QL	120	91	3.0	650	1600	44.30	1	3
12. Nason Conn QL	120	80	3.0	390	1600	44.30	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. 1	********	845814.4	6.0
2. 2	********	845790.6	6.0
3. 3	********	845750.0	6.0
4. 4	********	845660.9	6.0
5. 5	********	845579.5	6.0
6. 6	********	845569.8	6.0
7. 7	********	845647.4	6.0
8. 8	********	845704.2	6.0
9. 9	********	845673.5	6.0
10. 10	********	845632.9	6.0
11. 11	********	845703.3	6.0
12. 12	********	845742.1	6.0
13. 13	********	845796.8	6.0
14. 14	********	845872.9	6.0
15. 15	********	845952.8	6.0
16. 16	********	845971.9	6.0
17. 17	********	845896.9	6.0
18. 18	********	845834.3	6.0
19. 19	********	845859.2	6.0
20. 20	********	845890.7	6.0
21. 1	********	842867.4	6.0
22. 2	********	842862.6	6.0
23. 3	********	842840.3	6.0
24. 4	********	842746.4	6.0
25. 5	********	842609.4	6.0
26. 6	********	842576.9	6.0
27. 7	********	842726.3	6.0
28. 8	********	842832.1	6.0
29. 9	********	842822.3	6.0
30. 10	********	842794.8	6.0
31. 11	********	842865.8	6.0
32. 12	********	842893.3	6.0
33. 13	********	842919.0	6.0

JOB: 2030BUILD RUN: 2030Build

DATE : 3/11/12
TIME : 12:37:32

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
34. 14	********	843011.7	6.0
35. 15	********	843110.8	6.0
36. 16	********	843121.3	6.0
37. 17	********	843023.4	6.0
38. 18	********	842940.3	6.0
39. 19	********	842931.8	6.0
40. 20	********	842939.6	6.0
41. 1	********	839638.8	6.0
42. 2	********	839590.6	6.0
43. 3	********	839527.4	6.0
44. 4	********	839479.9	6.0
45. 5	********	839318.0	6.0
46. 6	********	839282.9	6.0
47. 7	********	839408.6	6.0
48. 8	********	839472.9	6.0
49. 9	********	839430.0	6.0
50. 10	********	839376.3	6.0
51. 11	********	839433.9	6.0
52. 12	********	839485.1	6.0
53. 13	********	839546.6	6.0
54. 14	********	839631.4	6.0
55. 15	********	839759.9	6.0
56. 16	********	839798.5	6.0
57. 17	********	839674.9	6.0
58. 18	********	839616.4	6.0
59. 19	********	839659.2	6.0
60. 20	********	839710.9	6.0

JOB: 2030BUILD RUN: 2030Build

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND * CONCENTRATION
ANGLE * (PPM)

Vanasse Hangen Brustlin, Inc.

(DEGR)*	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0. *	0.8	0.8	0.7	0.5	0.4	1.1	0.8	1.0	0.6	0.5	0.0	0.1	0.8	0.7	0.6	0.1	0.1	0.1	0.0	0.0
10. *	0.7	0.9	0.9	0.9	0.7	0.7	0.7	0.7	0.5	0.4	0.0	0.0	0.6	0.4	0.4	0.3	0.4	0.4	0.1	0.0
20. *	0.9	0.9	1.2	1.0	1.0	0.3	0.4	0.5	0.4	0.4	0.0	0.0	0.2	0.2	0.2	0.6	0.7	0.7	0.2	0.1
30. *	0.9	1.1	1.0	1.0	0.8	0.1	0.3	0.4	0.4	0.4	0.0	0.0	0.1	0.1	0.1	0.7	0.9	0.9	0.4	0.2
40. *	0.9	1.2	0.9	0.8	0.9	0.1	0.2	0.5	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.8	0.9	0.9	0.4	0.2
50. *	1.1	1.2	0.8	0.8	0.8	0.1	0.2	0.5	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.8	0.9	0.8	0.4	0.3
60. *	1.1	1.1	0.9	0.9	0.8	0.1	0.2	0.6	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.8	0.8	0.7	0.5	0.3
70. *	1.2	1.0	0.9	0.8	0.7	0.2	0.2	0.6	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.7	0.7	0.5	0.3	0.3
80. *	1.1	1.1	0.8	0.8	0.6	0.2	0.2	0.5	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.7	0.7	0.4	0.3	0.3
90. *	1.0	1.2	0.9	0.8	0.6	0.1	0.2	0.5	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.7	0.7	0.4	0.3	0.3
100. *	1.1	1.0	1.0	0.8	0.5	0.1	0.2	0.5	0.6	0.6	0.1	0.1	0.1	0.0	0.0	0.7	0.7	0.5	0.4	0.3
110. *	0.8	0.8	0.8	0.7	0.4	0.0	0.1	0.4	0.5	0.5	0.2	0.3	0.3	0.0	0.0	0.7	0.8	0.7	0.5	0.4
120. *	0.6	0.5	0.7	0.6	0.4	0.0	0.0	0.2	0.3	0.2	0.4	0.5	0.5	0.1	0.0	0.8	0.9	0.9	0.9	0.5
130. *	0.4	0.4	0.6	0.7	0.4	0.0	0.0	0.1	0.1	0.1	0.5	0.6	0.6	0.2	0.1	0.8	0.9	1.1	1.0	0.7
140. *	0.3	0.3	0.7	0.7	0.5	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.2	0.1	1.0	0.9	0.9	1.0	0.8
150. *	0.2	0.3	0.7	0.6	0.5	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.6	0.2	0.1	1.0	1.0	1.0	1.2	1.0
160. *	0.1	0.2	0.7	0.6	0.5	0.0	0.0	0.0	0.0	0.0	0.4	0.4	0.5	0.2	0.1	0.9	0.9	1.0	1.2	1.0
170. *	0.1	0.1	0.6	0.5	0.4	0.0	0.0	0.0	0.0	0.0	0.4	0.4	0.5	0.2	0.1	1.0	1.0	1.1	1.1	0.7
180. *	0.0	0.1	0.5	0.4	0.3	0.1	0.1	0.1	0.0	0.0	0.4	0.4	0.7	0.3	0.3	1.0	1.0	1.0	0.9	0.7
190. *	0.0	0.0	0.2	0.2	0.1	0.2	0.3	0.3	0.0	0.0	0.3	0.4	0.8	0.6	0.5	0.7	0.6	0.8	0.8	0.6
200. *	0.0	0.0	0.1	0.1	0.0	0.4	0.5	0.6	0.0	0.0	0.4	0.4	1.0	0.8	0.6	0.4	0.5	0.8	0.8	0.6
210. *	0.0	0.0	0.0	0.0	0.0	0.5	0.7	0.8	0.1	0.0	0.4	0.5	1.1	0.9	0.8	0.2	0.4	0.7	0.8	0.6
220. *	0.0	0.0	0.0	0.0	0.0	0.5	0.8	0.8	0.1	0.0	0.3	0.5	0.9	0.8	1.0	0.2	0.4	0.8	0.8	0.6
230. *	0.0	0.0	0.0	0.0	0.0	0.5	0.8	0.8	0.2	0.1	0.5	0.7	0.9	0.9	0.9	0.2	0.4	0.8	0.8	0.6
240. *	0.0	0.0	0.0	0.0	0.0	0.5	0.8	0.7	0.3	0.1	0.5	0.7	1.0	0.8	0.9	0.3	0.4	0.8	0.8	0.6
250. *	0.0	0.0	0.0	0.0	0.0	0.4	0.7	0.7	0.3	0.1	0.5	0.7	1.0	0.9	1.0	0.4	0.4	0.8	0.8	0.7
260. *	0.0	0.0	0.0	0.0	0.0	0.4	0.7	0.6	0.3	0.2	0.7	0.6	1.2	0.9	0.9	0.4	0.5	0.9	1.0	0.8
270. *	0.0	0.0	0.0	0.0	0.0	0.4	0.7	0.6	0.3	0.2	0.6	0.7	1.2	1.1	0.9	0.3	0.5	1.0	1.1	0.8
280. *	0.2	0.2	0.2	0.0	0.0	0.5	0.7	0.7	0.6	0.4	0.9	1.0	1.5	1.1	0.9	0.3	0.5	1.1	1.2	0.8
290. *	0.6	0.7	0.5	0.1	0.0	0.6	0.8	0.9	0.7	0.6	0.8	0.9	1.3	0.9	0.7	0.1	0.3	1.0	1.0	0.7
300. *	1.0	1.1	0.9	0.3	0.1	0.7	1.1	1.1	1.1	1.0	0.6	0.7	0.9	0.7	0.6	0.0	0.1	0.6	0.6	0.3
310. *	1.1	1.2	1.0	0.5	0.3	1.0	1.2	1.3	1.1	0.8	0.3	0.5	0.7	0.6	0.6	0.0	0.0	0.2	0.2	0.0
320. *	1.1	1.1	1.0	0.4	0.3	1.2	1.2	1.1	0.9	0.6	0.2	0.3	0.6	0.7	0.7	0.0	0.0	0.0	0.0	0.0
330. *	1.0	1.0	0.8	0.4	0.3	1.3	1.3	1.0	0.7	0.7	0.1	0.3	0.7	0.7	0.7	0.0	0.0	0.0	0.0	0.0
340. *	0.9	0.9	0.8	0.4	0.2	1.3	1.2	1.0	0.7	0.6	0.1	0.3	0.8	0.8	0.7	0.0	0.0	0.0	0.0	0.0
350. *	0.8	0.8	0.8	0.4	0.2	1.1	1.0	0.9	0.7	0.5	0.1	0.2	0.8	0.8	0.7	0.0	0.0	0.0	0.0	0.0
360. *	0.8	0.8	0.7	0.5	0.4	1.1	0.8	1.0	0.6	0.5	0.0	0.1	0.8	0.7	0.6	0.1	0.1	0.1	0.0	0.0
MAX *	1.2	1.2	1.2	1.0	1.0	1.3	1.3	1.3	1.1	1.0	0.9	1.0	1.5	1.1	1.0	1.0	1.0	1.1	1.2	1.0
DEGR. *	70	40	20	20	20	340	330	310	300	300	280	280	280	270	220	180	170	130	150	150

JOB: 2030BUILD RUN: 2030Build

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

Vanasse Hangen Brustlin, Inc.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28	REC29	REC30	REC31	REC32	REC33	REC34	REC35	REC36	REC37	REC38	REC39	REC40
0.	0.3	0.4	0.3	0.2	0.1	0.4	1.0	1.1	0.6	0.3	0.0	0.2	0.8	0.8	0.9	0.1	0.1	0.0	0.0	0.0
10.	0.3	0.4	0.3	0.2	0.1	0.5	0.7	1.1	0.5	0.4	0.0	0.0	0.5	0.5	0.5	0.3	0.5	0.2	0.0	0.0
20.	0.3	0.3	0.5	0.4	0.4	0.3	0.4	0.6	0.3	0.3	0.0	0.0	0.2	0.2	0.3	0.5	1.0	0.7	0.1	0.0
30.	0.3	0.4	0.6	0.4	0.5	0.1	0.2	0.4	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.8	1.3	0.9	0.2	0.0
40.	0.5	0.7	0.8	0.5	0.5	0.1	0.1	0.3	0.4	0.4	0.0	0.0	0.0	0.0	0.0	1.0	1.4	1.1	0.5	0.1
50.	0.7	0.7	0.7	0.4	0.4	0.1	0.2	0.3	0.4	0.4	0.0	0.0	0.0	0.0	0.0	1.0	1.3	1.1	0.5	0.2
60.	0.7	0.8	0.6	0.5	0.3	0.1	0.2	0.4	0.4	0.4	0.0	0.0	0.0	0.0	0.0	1.1	1.3	1.0	0.5	0.3
70.	0.7	0.7	0.7	0.4	0.3	0.1	0.2	0.4	0.4	0.4	0.0	0.0	0.0	0.0	0.0	1.0	1.2	0.9	0.5	0.3
80.	0.7	0.8	0.5	0.5	0.3	0.1	0.2	0.4	0.5	0.5	0.1	0.0	0.0	0.0	0.0	0.9	1.1	0.8	0.3	0.4
90.	0.4	0.5	0.7	0.4	0.2	0.0	0.1	0.4	0.5	0.5	0.2	0.2	0.2	0.0	0.0	0.9	1.2	0.9	0.5	0.5
100.	0.4	0.4	0.4	0.2	0.2	0.0	0.0	0.3	0.4	0.4	0.5	0.5	0.3	0.0	0.0	1.0	1.2	0.9	0.7	0.5
110.	0.1	0.1	0.3	0.2	0.2	0.0	0.0	0.1	0.1	0.1	0.6	0.7	0.5	0.1	0.0	0.9	1.3	0.8	0.8	0.7
120.	0.1	0.1	0.3	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.7	0.7	0.5	0.2	0.1	1.0	1.2	0.7	0.6	0.6
130.	0.1	0.1	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.6	0.6	0.5	0.2	0.1	1.2	1.4	0.5	0.6	0.5
140.	0.1	0.1	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.2	0.2	1.2	1.4	0.5	0.7	0.5
150.	0.1	0.1	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.2	0.1	1.1	1.3	0.7	0.7	0.5
160.	0.1	0.1	0.2	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.3	0.2	0.1	1.2	1.3	0.5	0.5	0.5
170.	0.1	0.1	0.2	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.4	0.4	0.3	0.2	0.1	1.2	1.4	0.6	0.5	0.4
180.	0.0	0.1	0.2	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.3	0.1	0.1	1.0	1.2	0.7	0.6	0.5
190.	0.0	0.0	0.1	0.2	0.2	0.0	0.0	0.2	0.0	0.0	0.5	0.5	0.3	0.2	0.4	0.8	0.9	0.7	0.5	0.4
200.	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.4	0.0	0.0	0.5	0.5	0.5	0.5	0.7	0.5	0.6	0.5	0.4	0.3
210.	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.6	0.1	0.0	0.4	0.5	0.6	0.7	1.1	0.2	0.2	0.4	0.4	0.4
220.	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.7	0.2	0.1	0.6	0.7	0.7	0.8	1.3	0.1	0.1	0.3	0.4	0.4
230.	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.7	0.2	0.1	0.6	0.8	0.8	0.9	1.3	0.1	0.2	0.3	0.4	0.4
240.	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.7	0.3	0.1	0.6	0.8	0.6	0.9	1.2	0.2	0.2	0.4	0.4	0.4
250.	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.7	0.3	0.1	0.6	0.8	0.7	1.0	1.2	0.2	0.2	0.4	0.6	0.6
260.	0.1	0.2	0.0	0.0	0.0	0.2	0.2	0.7	0.2	0.1	0.8	0.8	0.8	1.0	1.2	0.2	0.2	0.4	0.6	0.6
270.	0.3	0.4	0.2	0.0	0.0	0.2	0.2	0.9	0.4	0.5	0.8	0.8	0.9	1.0	1.0	0.0	0.2	0.3	0.6	0.6
280.	0.5	0.5	0.4	0.2	0.0	0.2	0.5	1.0	0.6	0.5	0.7	0.8	0.8	0.8	1.0	0.0	0.0	0.2	0.3	0.3
290.	0.6	0.6	0.5	0.2	0.1	0.3	0.6	0.8	0.7	0.7	0.4	0.5	0.7	0.8	1.0	0.0	0.0	0.0	0.1	0.1
300.	0.5	0.5	0.5	0.2	0.2	0.4	0.7	0.5	0.6	0.7	0.3	0.3	0.7	0.8	1.0	0.0	0.0	0.0	0.0	0.0
310.	0.5	0.5	0.5	0.2	0.1	0.3	0.7	0.4	0.5	0.7	0.3	0.5	0.8	0.8	1.0	0.0	0.0	0.0	0.0	0.0
320.	0.5	0.5	0.3	0.2	0.1	0.3	0.7	0.5	0.8	0.7	0.3	0.5	0.8	0.8	1.0	0.0	0.0	0.0	0.0	0.0
330.	0.5	0.5	0.3	0.2	0.1	0.3	0.7	0.6	0.9	0.7	0.2	0.5	0.8	0.9	1.2	0.0	0.0	0.0	0.0	0.0
340.	0.3	0.4	0.3	0.2	0.1	0.3	0.8	0.7	0.9	0.6	0.2	0.5	0.8	1.0	1.2	0.0	0.0	0.0	0.0	0.0
350.	0.3	0.3	0.3	0.2	0.1	0.5	0.9	1.1	0.8	0.4	0.0	0.3	0.9	0.9	1.2	0.0	0.0	0.0	0.0	0.0
360.	0.3	0.4	0.3	0.2	0.1	0.4	1.0	1.1	0.6	0.3	0.0	0.2	0.8	0.8	0.9	0.1	0.1	0.0	0.0	0.0
MAX	0.7	0.8	0.8	0.5	0.5	0.5	1.0	1.1	0.9	0.7	0.8	0.8	0.9	1.0	1.3	1.2	1.4	1.1	0.8	0.7
DEGR.	50	60	40	40	30	10	0	0	330	290	260	250	270	250	220	130	130	40	110	110

JOB: 2030BUILD RUN: 2030Build

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum

Vanasse Hangen Brustlin, Inc.

concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC41	REC42	REC43	REC44	REC45	REC46	REC47	REC48	REC49	REC50	REC51	REC52	REC53	REC54	REC55	REC56	REC57	REC58	REC59	REC60
0.	0.2	0.2	0.6	0.3	0.1	1.3	1.2	1.3	1.3	0.8	0.2	0.4	0.8	1.0	1.0	0.0	0.0	0.0	0.0	0.0
10.	0.2	0.2	0.5	0.2	0.1	1.5	1.4	1.6	1.3	0.8	0.2	0.4	1.0	1.2	1.1	0.2	0.2	0.0	0.0	0.0
20.	0.2	0.2	0.7	0.5	0.4	1.5	1.4	1.6	1.2	0.7	0.1	0.2	0.9	1.1	0.9	0.4	0.5	0.2	0.0	0.0
30.	0.2	0.3	1.0	0.8	0.6	1.2	1.1	1.2	1.1	0.7	0.0	0.1	0.6	0.7	0.6	0.9	1.0	0.6	0.1	0.0
40.	0.3	0.5	1.0	1.0	1.0	0.8	0.8	1.0	0.9	0.6	0.0	0.0	0.2	0.3	0.2	1.3	1.4	0.9	0.3	0.1
50.	0.4	0.6	0.9	1.0	1.2	0.4	0.4	0.8	0.9	0.6	0.0	0.0	0.0	0.1	0.0	1.3	1.4	0.9	0.4	0.1
60.	0.5	0.7	0.7	0.8	1.2	0.2	0.4	0.9	0.9	0.7	0.0	0.0	0.0	0.0	0.0	1.2	1.2	0.8	0.4	0.2
70.	0.5	0.7	0.6	0.9	1.0	0.2	0.4	1.0	0.8	0.7	0.0	0.0	0.0	0.0	0.0	1.2	1.2	0.6	0.4	0.2
80.	0.5	0.8	0.7	1.2	1.0	0.2	0.5	1.1	0.9	0.8	0.0	0.0	0.0	0.0	0.0	1.0	1.1	0.5	0.4	0.2
90.	0.5	0.9	1.0	1.2	1.0	0.2	0.4	1.1	0.9	0.9	0.1	0.1	0.0	0.0	0.0	1.0	1.0	0.4	0.3	0.2
100.	0.6	0.8	1.2	1.3	0.8	0.1	0.4	1.2	1.0	1.0	0.2	0.2	0.1	0.0	0.0	0.9	0.9	0.4	0.3	0.2
110.	0.8	1.2	1.2	1.1	0.8	0.0	0.2	1.0	1.0	0.9	0.4	0.5	0.3	0.0	0.0	1.0	1.0	0.5	0.5	0.3
120.	0.6	0.9	1.2	1.0	0.7	0.0	0.1	0.5	0.6	0.6	0.8	0.9	0.7	0.1	0.0	1.0	1.1	0.9	0.9	0.6
130.	0.5	0.6	0.8	0.8	0.7	0.0	0.0	0.2	0.3	0.2	1.0	1.1	1.0	0.3	0.1	1.0	1.1	1.0	0.9	0.9
140.	0.2	0.4	0.7	0.7	0.7	0.0	0.0	0.1	0.1	0.1	1.0	1.0	1.1	0.3	0.1	1.0	1.0	1.1	0.9	0.7
150.	0.2	0.3	0.6	0.8	0.7	0.0	0.0	0.0	0.0	0.0	0.9	1.0	1.1	0.3	0.2	1.2	1.1	1.1	0.8	0.6
160.	0.2	0.3	0.7	0.8	0.8	0.0	0.0	0.0	0.0	0.0	0.8	0.9	1.0	0.4	0.2	1.2	1.0	1.0	0.8	0.5
170.	0.2	0.3	0.7	0.8	0.7	0.0	0.0	0.0	0.0	0.0	0.7	0.9	0.9	0.4	0.2	1.4	1.0	1.0	0.8	0.5
180.	0.1	0.3	0.8	1.0	0.7	0.0	0.0	0.0	0.0	0.0	0.6	0.9	0.9	0.4	0.2	1.5	1.0	0.9	0.7	0.3
190.	0.1	0.2	0.8	1.0	0.7	0.1	0.1	0.1	0.0	0.0	0.6	0.9	0.7	0.4	0.3	1.4	1.0	1.0	0.6	0.3
200.	0.1	0.1	0.7	0.9	0.6	0.2	0.3	0.3	0.0	0.0	0.7	1.1	0.9	0.7	0.5	1.4	1.1	0.8	0.4	0.3
210.	0.0	0.1	0.4	0.6	0.4	0.5	0.8	0.8	0.1	0.0	0.7	1.1	1.2	0.8	0.8	1.0	0.8	0.7	0.3	0.2
220.	0.0	0.0	0.1	0.3	0.2	1.0	1.1	1.2	0.1	0.0	0.6	1.1	1.3	1.1	1.1	0.5	0.6	0.4	0.2	0.2
230.	0.0	0.0	0.0	0.1	0.1	1.1	1.2	1.2	0.3	0.1	0.7	1.3	1.3	1.0	1.1	0.2	0.2	0.4	0.2	0.2
240.	0.0	0.0	0.0	0.0	0.0	1.1	1.1	1.1	0.4	0.1	0.9	1.4	1.2	0.8	1.1	0.1	0.2	0.4	0.3	0.3
250.	0.0	0.0	0.0	0.0	0.0	1.1	1.1	1.1	0.4	0.2	0.9	1.6	0.9	0.7	1.0	0.1	0.1	0.4	0.3	0.3
260.	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.9	0.4	0.2	1.0	1.6	0.8	0.7	1.0	0.1	0.1	0.4	0.3	0.3
270.	0.0	0.0	0.0	0.0	0.0	1.0	0.9	0.8	0.4	0.2	1.2	1.6	0.9	0.7	1.0	0.1	0.1	0.4	0.3	0.3
280.	0.1	0.0	0.0	0.0	0.0	0.9	0.8	0.7	0.4	0.3	1.3	1.5	0.9	0.6	0.7	0.0	0.1	0.3	0.4	0.4
290.	0.2	0.1	0.1	0.0	0.0	0.9	0.8	0.7	0.6	0.6	1.3	1.3	0.8	0.7	0.7	0.0	0.1	0.3	0.3	0.3
300.	0.3	0.3	0.3	0.1	0.0	0.9	0.9	0.8	0.9	0.9	0.8	0.8	0.7	0.7	0.8	0.0	0.0	0.1	0.2	0.2
310.	0.4	0.3	0.4	0.1	0.0	0.9	0.9	0.9	1.1	1.2	0.5	0.4	0.5	0.7	0.7	0.0	0.0	0.0	0.1	0.1
320.	0.3	0.3	0.6	0.2	0.0	1.0	0.9	0.9	1.1	1.3	0.3	0.3	0.5	0.7	0.7	0.0	0.0	0.0	0.0	0.0
330.	0.3	0.3	0.6	0.3	0.1	1.1	1.1	1.0	1.3	1.1	0.2	0.3	0.4	0.9	0.9	0.0	0.0	0.0	0.0	0.0
340.	0.3	0.3	0.6	0.2	0.1	1.1	1.1	1.0	1.3	1.1	0.2	0.3	0.5	0.9	0.9	0.0	0.0	0.0	0.0	0.0
350.	0.3	0.2	0.6	0.3	0.1	1.1	1.1	1.1	1.3	0.9	0.2	0.4	0.6	1.0	0.9	0.0	0.0	0.0	0.0	0.0
360.	0.2	0.2	0.6	0.3	0.1	1.3	1.2	1.3	1.3	0.8	0.2	0.4	0.8	1.0	1.0	0.0	0.0	0.0	0.0	0.0
MAX	0.8	1.2	1.2	1.3	1.2	1.5	1.4	1.6	1.3	1.3	1.3	1.6	1.3	1.2	1.1	1.5	1.4	1.1	0.9	0.9
DEGR.	110	110	100	100	50	10	10	10	330	320	280	260	220	10	10	180	40	140	120	130

THE HIGHEST CONCENTRATION OF 1.60 PPM OCCURRED AT RECEPTOR REC52.

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC41	REC42	REC43	REC44	REC45	REC46	REC47	REC48	REC49	REC50	REC51	REC52	REC53	REC54	REC55	REC56	REC57	REC58	REC59	REC60
0.	0.3	0.3	1.1	0.6	0.1	1.4	2.1	1.7	2.3	1.3	0.3	0.6	1.2	1.8	1.8	0.0	0.0	0.0	0.0	0.0
10.	0.3	0.3	1.0	0.7	0.2	1.9	2.0	2.1	2.2	1.2	0.2	0.6	1.4	1.9	1.8	0.2	0.2	0.1	0.0	0.0
20.	0.3	0.3	1.1	0.9	0.5	2.1	2.0	2.3	2.0	1.0	0.0	0.3	1.3	1.7	1.4	0.6	0.8	0.4	0.0	0.0
30.	0.3	0.4	1.4	1.3	1.3	1.8	1.7	2.1	1.8	0.9	0.0	0.1	0.8	1.1	0.9	1.4	1.7	1.0	0.1	0.0
40.	0.4	0.7	1.6	1.4	1.4	1.0	1.1	1.4	1.4	0.9	0.0	0.0	0.3	0.4	0.4	2.1	2.4	1.6	0.3	0.0
50.	0.6	0.9	1.2	1.4	1.8	0.6	0.9	1.3	1.3	0.9	0.0	0.0	0.0	0.1	0.0	2.3	2.6	1.6	0.6	0.2
60.	0.7	1.0	1.0	1.3	1.5	0.4	0.8	1.4	1.2	1.0	0.0	0.0	0.0	0.0	0.0	2.2	2.3	1.3	0.7	0.4
70.	0.8	1.0	0.9	1.4	1.5	0.3	0.7	1.6	1.1	1.0	0.0	0.0	0.0	0.0	0.0	2.0	2.2	0.9	0.7	0.4
80.	0.8	1.1	0.9	1.8	1.2	0.3	0.6	1.7	1.2	1.1	0.1	0.1	0.0	0.0	0.0	1.9	2.0	0.7	0.6	0.4
90.	0.7	1.3	1.3	1.9	0.9	0.3	0.5	1.7	1.3	1.3	0.1	0.1	0.0	0.0	0.0	1.7	1.8	0.6	0.5	0.4
100.	1.1	1.6	1.7	2.1	0.7	0.2	0.5	1.7	1.5	1.5	0.2	0.2	0.1	0.0	0.0	1.7	1.8	0.4	0.4	0.4
110.	1.2	1.8	1.9	1.9	0.6	0.1	0.4	1.3	1.4	1.3	0.6	0.7	0.4	0.0	0.0	1.7	1.7	0.6	0.7	0.5
120.	1.1	1.5	1.6	1.5	0.5	0.0	0.1	0.8	0.9	0.8	1.2	1.2	1.0	0.2	0.0	1.7	1.9	1.0	1.0	1.0
130.	0.7	1.0	1.2	1.4	0.5	0.0	0.0	0.3	0.4	0.4	1.5	1.5	1.5	0.4	0.1	1.8	1.8	1.4	1.5	1.4
140.	0.4	0.6	0.9	1.2	0.5	0.0	0.0	0.1	0.1	0.1	1.4	1.4	1.8	0.5	0.2	1.9	1.8	1.6	1.4	1.0
150.	0.4	0.5	1.0	1.3	0.5	0.0	0.0	0.0	0.1	0.1	1.2	1.2	1.8	0.6	0.3	2.0	1.7	1.3	1.4	0.9
160.	0.3	0.5	1.1	1.4	0.5	0.0	0.0	0.0	0.0	0.0	1.1	1.1	1.8	0.5	0.3	2.2	1.6	1.3	1.4	0.6
170.	0.2	0.3	1.2	1.4	0.6	0.0	0.0	0.0	0.0	0.0	1.0	1.0	1.7	0.7	0.2	2.3	1.4	1.1	1.1	0.6
180.	0.2	0.3	1.1	1.4	0.7	0.0	0.0	0.0	0.0	0.0	0.9	1.0	1.5	0.7	0.3	2.4	1.3	1.3	1.0	0.5
190.	0.1	0.2	1.0	1.3	0.7	0.1	0.1	0.1	0.0	0.0	0.9	1.1	1.3	0.7	0.3	2.5	1.4	1.3	0.8	0.4
200.	0.1	0.2	0.8	1.1	0.7	0.2	0.3	0.4	0.0	0.0	0.9	1.2	1.4	1.0	0.7	2.2	1.4	1.3	0.6	0.4
210.	0.0	0.1	0.5	0.7	0.5	0.5	0.8	1.0	0.1	0.0	0.9	1.6	1.7	1.2	1.1	1.5	1.2	1.1	0.4	0.3
220.	0.0	0.0	0.2	0.3	0.2	0.7	1.4	1.6	0.2	0.0	1.0	1.9	2.0	1.5	1.4	0.8	0.7	0.8	0.3	0.3
230.	0.0	0.0	0.0	0.1	0.1	0.8	1.7	1.9	0.4	0.1	1.0	2.1	1.9	1.4	1.8	0.3	0.5	0.7	0.3	0.3
240.	0.0	0.0	0.0	0.0	0.0	0.7	1.8	1.9	0.5	0.2	1.2	2.5	1.6	1.1	1.8	0.1	0.4	0.7	0.3	0.3
250.	0.0	0.0	0.0	0.0	0.0	0.6	1.8	1.7	0.6	0.2	1.4	2.6	1.4	1.0	1.7	0.1	0.3	0.7	0.4	0.3
260.	0.0	0.0	0.0	0.0	0.0	0.6	1.8	1.6	0.7	0.3	1.7	2.8	1.1	0.9	1.6	0.1	0.2	0.5	0.4	0.4
270.	0.0	0.0	0.0	0.0	0.0	0.5	1.6	1.3	0.7	0.5	1.7	2.6	1.2	0.9	1.5	0.1	0.2	0.5	0.4	0.4
280.	0.1	0.1	0.0	0.0	0.0	0.5	1.6	1.2	0.6	0.5	1.9	2.5	1.2	0.9	1.5	0.0	0.2	0.4	0.5	0.5
290.	0.2	0.2	0.1	0.0	0.0	0.5	1.6	1.2	0.9	0.9	1.9	2.0	1.1	1.0	1.4	0.0	0.1	0.3	0.4	0.4
300.	0.4	0.3	0.4	0.1	0.0	0.5	1.7	1.1	1.2	1.5	1.2	1.3	0.9	1.1	1.4	0.0	0.0	0.2	0.3	0.2
310.	0.5	0.4	0.7	0.2	0.0	0.5	1.7	1.3	1.5	1.9	0.7	0.6	0.6	1.3	1.4	0.0	0.0	0.1	0.1	0.1
320.	0.4	0.4	1.0	0.3	0.1	0.6	1.8	1.3	1.9	1.9	0.4	0.4	0.5	1.3	1.3	0.0	0.0	0.0	0.0	0.0
330.	0.4	0.4	1.2	0.4	0.1	0.6	2.0	1.2	1.9	1.7	0.4	0.5	0.5	1.4	1.4	0.0	0.0	0.0	0.0	0.0
340.	0.4	0.3	1.3	0.5	0.1	0.8	2.0	1.4	2.0	1.6	0.5	0.6	0.7	1.5	1.5	0.0	0.0	0.0	0.0	0.0
350.	0.3	0.3	1.3	0.6	0.1	1.1	2.1	1.4	2.3	1.5	0.4	0.6	0.9	1.6	1.6	0.0	0.0	0.0	0.0	0.0
360.	0.3	0.3	1.1	0.6	0.1	1.4	2.1	1.7	2.3	1.3	0.3	0.6	1.2	1.8	1.8	0.0	0.0	0.0	0.0	0.0
MAX	1.2	1.8	1.9	2.1	1.8	2.1	2.1	2.3	2.3	1.9	1.9	2.8	2.0	1.9	1.8	2.5	2.6	1.6	1.5	1.4
DEGR.	110	110	110	100	50	20	0	20	0	310	290	260	220	10	230	190	50	40	130	130

THE HIGHEST CONCENTRATION OF 3.00 PPM OCCURRED AT RECEPTOR REC37.

Traffic Summary

Vanasse Hangen Brustlin, Inc.

Microscale Analysis

	Roadways	Lengths Miles	Peak Hour Free flow Volumes 2010 Existing	2010 Build	2030 No Build	2030 Build
	Newton St	0.13	905	1010	1065	1165
	Route 7	1.18	1365	1155	1640	1425
	Newton St	0.13	905	1010	1065	1165
	Route 7	1.18	1365	1155	1640	1425
	Lake St	0.15	685	640	805	790
	*LACA	1.29	705	950	825	1125
	Lake St	0.15	685	640	805	790
	*LACA	1.29	705	950	825	1125
	Route 7	1.18	1365	1155	1640	1425
	St Albans	1.11	1990	1990	1990	1990
	Route 7	1.18	1365	1155	1640	1425
	Nason St Connector	0.20	0	670	0	745

* (LACA) Lenmach St, Allen St, Catherine St, Federal St

#	Roadways	CO 2010 Emisison Factor	CO 2030 Emisison Factor	Peak Hour Queue Volumes 2010 Existing	2010 Build	2030 No Build	2030 Build	Red Time	Total Cycle
	Intersection Apprach Streets								
1	Lower Newton St EB	16.6	11.7	505	625	595	740	100	120
	Rt 7 SB	16.6	11.7	755	755	885	945	71	
	Upper Newton St WB	16.6	11.7	35	35	50	50	107	
	Rt 7 NB	16.6	11.7	730	555	855	640	71	
		16.6	11.7						
2	Lake St EB	16.6	11.7	620	315	730	595	88	120
	Federal St SB	16.6	11.7	355	430	415	425	106	
	Lake St WB	16.6	11.7	315	360	375	420	86	
	Catherine St NB	16.6	11.7	100	340	120	405	90	
3									
	Rt 7 SB	16.6	11.7	715	365	830	450	86	120
	St Albans State Highway WB	16.6	11.7	430	425	500	505	91	
	Rt 7 NB	16.6	11.7	555	555	650	650	80	
	Nason St Connector EB	16.6	11.7	0	355	0	390	104	

	2010
Idle CO	**Idle EF**
44.3	**110.75**

	2030
Idle CO	**Idle EF**
30.5	**76.25**

Microscale Results

Vanasse Hangen Brustlin, Inc.

Pollutant: Carbon Monoxide (CO)						
Concentrations: 1-Hour Final						
Background (ppm)	2					
Persistence Factor	-					
Intersection	**Receptor**		**2010 Existing**	**2010 Build**	**2030 No Build**	**2030 Build**
Rt 7/ Newton	SW	1	4.0	4.2	3.5	3.2
	SW	**2**	**4.2**	**4.3**	**3.6**	**3.2**
	SW	3	3.9	3.9	3.5	3.2
	SW	4	3.4	3.3	3.1	3.0
	SW	5	3.5	3.4	3.2	3.0
	SE	6	4.2	4.1	3.7	3.3
	SE	**7**	**4.3**	**4.3**	**3.7**	**3.3**
	SE	8	3.9	4.0	3.5	3.3
	SE	9	3.6	3.7	3.4	3.1
	SE	10	3.2	3.3	3.1	3.0
	NE	11	3.2	3.3	3.0	2.9
	NE	12	3.5	3.6	3.2	3.0
	NE	**13**	**4.2**	**4.3**	**3.8**	**3.5**
	NE	14	3.9	3.9	3.5	3.1
	NE	15	3.8	3.7	3.3	3.0
	NW	16	3.8	3.7	3.4	3.0
	NW	17	3.6	3.5	3.3	3.0
	NW	18	3.8	4.0	3.4	3.1
	NW	**19**	**4.0**	**4.1**	**3.5**	**3.2**
	NW	20	3.7	3.6	3.2	3.0
Lake/Federal	SW	1	3.2	2.9	2.9	2.7
	SW	**2**	**3.2**	**3.3**	**3.0**	**2.8**
	SW	3	3.1	3.5	3.0	2.8
	SW	4	2.7	3.0	2.7	2.5
	SW	5	2.5	2.9	2.6	2.5
	SE	6	2.5	2.9	2.4	2.5
	SE	7	3.1	3.9	3.1	3.0
	SE	**8**	**3.5**	**4.1**	**3.4**	**3.1**
	SE	9	3.2	3.5	3.1	2.9
	SE	10	3.0	3.3	2.9	2.7
	NE	11	3.2	3.5	3.1	2.8
	NE	12	3.4	3.4	3.0	2.8
	NE	13	3.4	3.8	3.2	2.9
	NE	14	4.0	4.0	3.4	3.0
	NE	**15**	**3.5**	**4.6**	**3.9**	**3.3**
	NW	16	3.7	4.4	3.7	3.2
	NW	**17**	**4.6**	**5.0**	**4.0**	**3.4**
	NW	18	3.9	4.3	3.5	3.1
	NW	19	2.9	3.1	2.7	2.8
	NW	20	3.0	3.0	2.8	2.7
Nason Conn/Rt 7	SW	1	2.8	3.2	2.6	2.8
	SW	2	3.1	3.8	2.8	3.2
	SW	3	3.9	3.9	3.5	3.2
	SW	**4**	**4.2**	**4.1**	**3.7**	**3.3**
	SW	5	3.9	3.8	3.5	3.2
	SE	6	4.4	4.1	4.0	3.5
	SE	7	4.3	4.1	3.8	3.4
	SE	**8**	**4.6**	**4.3**	**4.0**	**3.6**
	SE	9	4.5	4.3	3.7	3.3
	SE	10	3.9	3.9	3.3	3.3
	NE	11	3.8	3.9	3.4	3.3
	NE	**12**	**4.9**	**4.8**	**4.0**	**3.6**
	NE	13	4.2	4.0	3.6	3.3
	NE	14	4.2	3.9	3.7	3.2
	NE	15	4.1	3.8	3.5	3.1
	NW	16	4.7	4.5	4.1	3.5
	NW	**17**	**4.8**	**4.6**	**4.1**	**3.4**
	NW	18	3.9	3.6	3.4	3.1

Bolded Values represent highest CO concentrations in each Quadrent

Vanasse Hangen Brustlin, Inc.

Pollutant: Carbon Monoxide (CO)						
Concentrations: 8-Hour Final						
Background (ppm)	2					
Persistence Factor	0.7					
Intersection	**Receptor**		**2010 Existing**	**2010 Build**	**2030 No Build**	**2030 Build**
Rt 7/ Newton	SW	1	3.4	3.5	3.1	2.8
	SW	**2**	**3.5**	**3.6**	**3.1**	**2.8**
	SW	3	3.3	3.3	3.1	2.8
	SW	4	3.0	2.9	2.8	2.7
	SW	5	3.1	3.0	2.8	2.7
	SE	6	3.5	3.5	3.2	2.9
	SE	**7**	**3.6**	**3.6**	**3.2**	**2.9**
	SE	8	3.3	3.4	3.1	2.9
	SE	9	3.1	3.2	3.0	2.8
	SE	10	2.8	2.9	2.8	2.7
	NE	11	2.8	2.9	2.7	2.6
	NE	12	3.1	3.1	2.8	2.7
	NE	**13**	**3.5**	**3.6**	**3.3**	**3.1**
	NE	14	3.3	3.3	3.1	2.8
	NE	15	3.3	3.2	2.9	2.7
	NW	16	3.3	3.2	3.0	2.7
	NW	17	3.1	3.1	2.9	2.7
	NW	18	3.3	3.4	3.0	2.8
	NW	**19**	**3.4**	**3.5**	**3.1**	**2.8**
	NW	20	3.2	3.1	2.8	2.7
Lake/Federal	SW	1	2.8	2.6	2.6	2.5
	SW	2	2.8	2.9	2.7	2.6
	SW	**3**	**2.8**	**3.1**	**2.7**	**2.6**
	SW	4	2.5	2.7	2.5	2.4
	SW	5	2.4	2.6	2.4	2.4
	SE	6	2.4	2.6	2.3	2.4
	SE	7	2.8	3.3	2.8	2.7
	SE	**8**	**3.1**	**3.5**	**3.0**	**2.8**
	SE	9	2.8	3.1	2.8	2.6
	SE	10	2.7	2.9	2.6	2.5
	NE	11	2.8	3.1	2.8	2.6
	NE	12	3.0	3.0	2.7	2.6
	NE	13	3.0	3.3	2.8	2.6
	NE	**14**	**3.4**	**3.4**	**3.0**	**2.7**
	NE	15	3.1	3.8	3.3	2.9
	NW	16	3.2	3.7	3.2	2.8
	NW	**17**	**3.8**	**4.1**	**3.4**	**3.0**
	NW	18	3.3	3.6	3.1	2.8
	NW	19	2.6	2.8	2.5	2.6
	NW	20	2.7	2.7	2.6	2.5
Nason Conn/Rt 7	SW	1	2.6	2.8	2.4	2.6
	SW	2	2.8	3.3	2.6	2.8
	SW	3	3.3	3.3	3.1	2.8
	SW	**4**	**3.5**	**3.5**	**3.2**	**2.9**
	SW	5	3.3	3.3	3.1	2.8
	SE	6	3.7	3.5	3.4	3.1
	SE	7	3.6	3.5	3.3	3.0
	SE	**8**	**3.8**	**3.6**	**3.4**	**3.1**
	SE	9	3.8	3.6	3.2	2.9
	SE	10	3.3	3.3	2.9	2.9
	NE	11	3.3	3.3	3.0	2.9
	NE	**12**	**4.0**	**4.0**	**3.4**	**3.1**
	NE	13	3.5	3.4	3.1	2.9
	NE	14	3.5	3.3	3.2	2.8
	NE	15	3.5	3.3	3.1	2.8
	NW	**16**	**3.9**	**3.8**	**3.5**	**3.1**
	NW	17	4.0	3.8	3.5	3.0
	NW	18	3.3	3.1	3.0	2.8

Appendix E – Noise Analysis

Appendix
Noise Analysis

- Noise Monitoring Data
  - M1
  - M2
  - M3
  - M4
- Traffic Noise Model (TNM)
  - Calibration
  - 2010 No Build
  - 2030 Build

Vanasse Hangen Brustlin, Inc.

Noise Monitoring Data

M1

Summary	
Filename	12022800.LD0
Serial Number	2555
Model	831
Firmware Version	2.000
User	
Location	**M1 - Federal St 125' s/o Lower Newton**
Job Description	**Federal St - St Albans**
Note	
Measurement Description	
Start	2012/02/28 14:18:04
Stop	2012/02/28 14:38:11
Duration	0:20:07.5
Run Time	0:20:07.5
Pause	0:00:00.0
Pre Calibration	2012/02/28 13:35:22
Post Calibration	None
Calibration Deviation	---
Overall Settings	
RMS Weight	A Weighting
Peak Weight	A Weighting
Detector	Slow
Preamp	PRM831
Integration Method	Linear
OBA Range	Normal
OBA Bandwidth	1/3 Octave
OBA Freq. Weighting	A Weighting
OBA Max Spectrum	Bin Max
Gain	0.0 dB
Overload	143.6 dB

	A	C	Z
Under Range Peak	**76.1**	73.1	78.1 dB
Under Range Limit	**26.2**	26.5	32.1 dB
Noise Floor	17.1	17.4	22.7 dB

Results		
LAeq	**64.8 dB**	
LAE	95.6 dB	
EA	406.842 µPa²h	
LApeak (max)	2012/02/28 14:30:05	98.9 dB
LASmax	2012/02/28 14:33:01	79.5 dB
LASmin	2012/02/28 14:25:29	42.5 dB
SEA	-99.9 dB	
LAS > 65.0 dB (Exceedence Counts / Duration)	73	446.3 s
LAS > 85.0 dB (Exceedence Counts / Duration)	0	0.0 s
LApeak > 135.0 dB (Exceedence Counts / Duration)	0	0.0 s
LApeak > 137.0 dB (Exceedence Counts / Duration)	0	0.0 s
LApeak > 140.0 dB (Exceedence Counts / Duration)	0	0.0 s

Community Noise	**Ldn**	**LDay 07:00-22:00**	**LNight 22:00-07:00**	**Lden**	**LDay 07:00-19:00**
	64.8	64.8	-99.9	64.8	64.8

LCeq	73.5 dB
LAeq	64.8 dB
LCeq - LAeq	8.7 dB
LAIeq	66.8 dB
LAeq	64.8 dB
LAIeq - LAeq	2.0 dB
# Overloads	0
Overload Duration	0.0 s
# OBA Overloads	0
OBA Overload Duration	0.0 s
Statistics	
LAS1.00	75.0 dB
LAS5.00	70.1 dB
LAS10.00	68.2 dB
LAS50.00	61.1 dB
LAS70.00	56.3 dB
LAS90.00	50.1 dB

Vanasse Hangen Brustlin, Inc.

Noise Monitoring Data

M2

Summary			
Filename	12022802.LD0		
Serial Number	2555		
Model	831		
Firmware Version	2.000		
User			
Location	**M2 - at Police Dept on Lower Welden**		
Job Description	**Federal St - St Albans**		
Note			
Measurement Description			
Start	2012/02/28 15:04:09		
Stop	2012/02/28 15:26:51		
Duration	0:22:41.9		
Run Time	0:22:41.9		
Pause	0:00:00.0		
Pre Calibration	2012/02/28 13:35:22		
Post Calibration	None		
Calibration Deviation	---		
Overall Settings			
RMS Weight	A Weighting		
Peak Weight	A Weighting		
Detector	Slow		
Preamp	PRM831		
Integration Method	Linear		
OBA Range	Normal		
OBA Bandwidth	1/3 Octave		
OBA Freq. Weighting	A Weighting		
OBA Max Spectrum	Bin Max		
Gain	0.0 dB		
Overload	143.6 dB		
	A	**C**	**Z**
Under Range Peak	**76.1**	73.1	78.1 dB
Under Range Limit	**26.2**	26.5	32.1 dB
Noise Floor	17.1	17.4	22.7 dB

Results		
LAeq	**65.1 dB**	
LAE	96.4 dB	
EA	485.851 µPa²h	
LApeak (max)	2012/02/28 15:24:07	101.5 dB
LASmax	2012/02/28 15:24:08	87.8 dB
LASmin	2012/02/28 15:26:31	38.1 dB
SEA	-99.9 dB	
LAS > 65.0 dB (Exceedence Counts / Duration)	56	299.7 s
LAS > 85.0 dB (Exceedence Counts / Duration)	1	3.7 s
LApeak > 135.0 dB (Exceedence Counts / Duration)	0	0.0 s
LApeak > 137.0 dB (Exceedence Counts / Duration)	0	0.0 s
LApeak > 140.0 dB (Exceedence Counts / Duration)	0	0.0 s

Community Noise	**Ldn**	**LDay 07:00-22:00**	**LNight 22:00-07:00**	**Lden**	**LDay 07:00-19:00**
	65.1	65.1	-99.9	65.1	65.1

LCeq	73.7 dB
LAeq	65.1 dB
LCeq - LAeq	8.6 dB
LAIeq	66.5 dB
LAeq	65.1 dB
LAIeq - LAeq	1.4 dB
# Overloads	0
Overload Duration	0.0 s
# OBA Overloads	0
OBA Overload Duration	0.0 s
Statistics	
LAS1.00	73.4 dB
LAS5.00	69.4 dB
LAS10.00	67.3 dB
LAS50.00	55.3 dB
LAS70.00	50.0 dB
LAS90.00	45.1 dB

Vanasse Hangen Brustlin, Inc.

Noise Monitoring Data

M3

Summary	
Filename	12022803.LD0
Serial Number	2555
Model	831
Firmware Version	2.000
User	
Location	**M3 - Nason Street (5' off EOP)**
Job Description	**Federal St - St Albans**
Note	
Measurement Description	
Start	2012/02/28 15:36:26
Stop	2012/02/28 15:56:28
Duration	0:20:01.8
Run Time	0:20:01.8
Pause	0:00:00.0
Pre Calibration	2012/02/28 13:35:22
Post Calibration	None
Calibration Deviation	---
Overall Settings	
RMS Weight	A Weighting
Peak Weight	A Weighting
Detector	Slow
Preamp	PRM831
Integration Method	Linear
OBA Range	Normal
OBA Bandwidth	1/3 Octave
OBA Freq. Weighting	A Weighting
OBA Max Spectrum	Bin Max
Gain	0.0 dB
Overload	143.6 dB

	A	C	Z
Under Range Peak	**76.1**	73.1	78.1 dB
Under Range Limit	**26.2**	26.5	32.1 dB
Noise Floor	17.1	17.4	22.7 dB

Results		
LAeq	**64.9 dB**	
LAE	95.7 dB	
EA	409.823 µPa²h	
LApeak (max)	2012/02/28 15:54:18	98.1 dB
LASmax	2012/02/28 15:54:19	82.5 dB
LASmin	2012/02/28 15:36:26	34.7 dB
SEA	-99.9 dB	
LAS > 65.0 dB (Exceedence Counts / Duration)	54	300.7 s
LAS > 85.0 dB (Exceedence Counts / Duration)	0	0.0 s
LApeak > 135.0 dB (Exceedence Counts / Duration)	0	0.0 s
LApeak > 137.0 dB (Exceedence Counts / Duration)	0	0.0 s
LApeak > 140.0 dB (Exceedence Counts / Duration)	0	0.0 s

Community Noise	**Ldn**	**LDay 07:00-22:00**	**LNight 22:00-07:00**	**Lden**	**LDay 07:00-19:00**
	64.9	64.9	-99.9	64.9	64.9

LCeq	74.3 dB
LAeq	64.9 dB
LCeq - LAeq	9.4 dB
LAIeq	66.9 dB
LAeq	64.9 dB
LAIeq - LAeq	2.1 dB
# Overloads	0
Overload Duration	0.0 s
# OBA Overloads	0
OBA Overload Duration	0.0 s
Statistics	
LAS1.00	76.2 dB
LAS5.00	71.7 dB
LAS10.00	69.1 dB
LAS50.00	53.7 dB
LAS70.00	47.5 dB
LAS90.00	40.8 dB

Vanasse Hangen Brustlin, Inc.

Noise Monitoring Data

M4

Summary	
Filename	12022804.LD0
Serial Number	2555
Model	831
Firmware Version	2.000
User	
Location	M4 - Nason Street -s/o Back yard
Job Description	Federal St - St Albans
Note	
Measurement Description	
Start	2012/02/28 16:08:29
Stop	2012/02/28 16:26:33
Duration	0:18:03.4
Run Time	0:18:03.4
Pause	0:00:00.0
Pre Calibration	2012/02/28 13:35:22
Post Calibration	None
Calibration Deviation	---
Overall Settings	
RMS Weight	A Weighting
Peak Weight	A Weighting
Detector	Slow
Preamp	PRM831
Integration Method	Linear
OBA Range	Normal
OBA Bandwidth	1/3 Octave
OBA Freq. Weighting	A Weighting
OBA Max Spectrum	Bin Max
Gain	0.0 dB
Overload	143.6 dB

	A	C	Z
Under Range Peak	**76.1**	73.1	78.1 dB
Under Range Limit	**26.2**	26.5	32.1 dB
Noise Floor	17.1	17.4	22.7 dB

Results		
LAeq	**45.9 dB**	
LAE	76.3 dB	
EA	4.711 µPa²h	
LApeak (max)	2012/02/28 16:08:48	90.0 dB
LASmax	2012/02/28 16:17:45	57.4 dB
LASmin	2012/02/28 16:11:41	40.3 dB
SEA	-99.9 dB	
LAS > 65.0 dB (Exceedence Counts / Duration)	0	0.0 s
LAS > 85.0 dB (Exceedence Counts / Duration)	0	0.0 s
LApeak > 135.0 dB (Exceedence Counts / Duration)	0	0.0 s
LApeak > 137.0 dB (Exceedence Counts / Duration)	0	0.0 s
LApeak > 140.0 dB (Exceedence Counts / Duration)	0	0.0 s

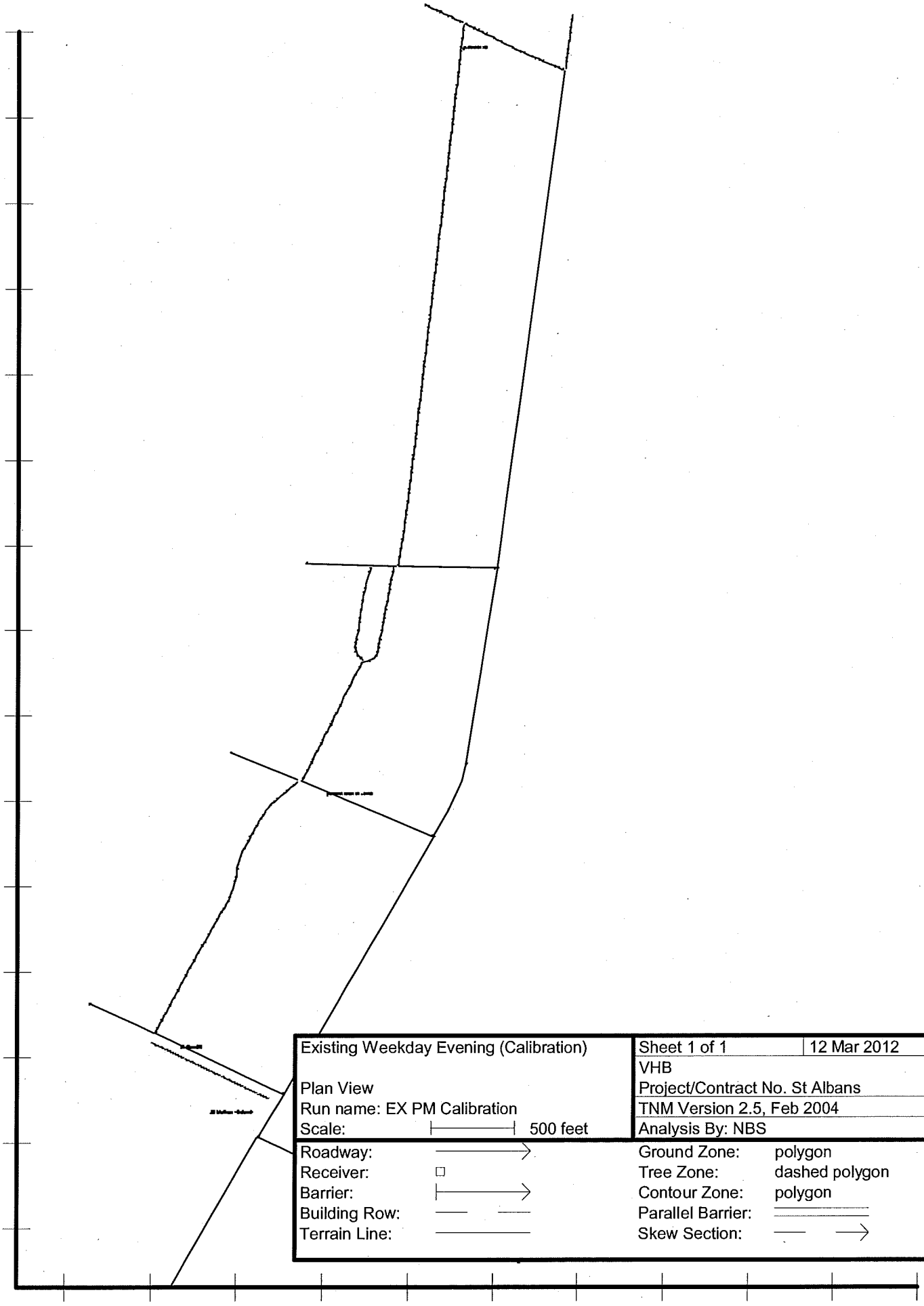
Community Noise	**Ldn**	**LDay 07:00-22:00**	**LNight 22:00-07:00**	**Lden**	**LDay 07:00-19:00**
	45.9	45.9	-99.9	45.9	45.9

LCeq	60.9 dB
LAeq	45.9 dB
LCeq - LAeq	15.0 dB
LAIeq	48.0 dB
LAeq	45.9 dB
LAIeq - LAeq	2.0 dB
# Overloads	0
Overload Duration	0.0 s
# OBA Overloads	0
OBA Overload Duration	0.0 s
Statistics	
LAS1.00	52.2 dB
LAS5.00	49.1 dB
LAS10.00	47.9 dB
LAS50.00	44.9 dB
LAS70.00	43.8 dB
LAS90.00	42.3 dB

Vanasse Hangen Brustlin, Inc.

Traffic Noise Model

Calibration


Existing Weekday Evening (Calibration)
Plan View
Run name: EX PM Calibration
Scale: 500 feet
Sheet 1 of 1
12 Mar 2012
VHB
Project/Contract No. St Albans
TNM Version 2.5, Feb 2004
Analysis By: NBS
Roadway:
Receiver:
Barrier:
Building Row:
Terrain Line:
Ground Zone: polygon
Tree Zone: dashed polygon
Contour Zone: polygon
Parallel Barrier:
Skew Section:
36500
1487000
1487500
1488000
1488500
1489000
1489500
1490000
1490500
1491000
1491500

VHB
NBS

12 March 2012
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: St Albans
RUN: Existing Weekday Evening (Calibration)
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
M1 (Federal St)	1	1	0.0	65.2	66	65.2	10	----	65.2	0.0	8	-8.0
M2 (Lower Welden St - SAPD)	3	1	0.0	63.6	66	63.6	10	----	63.6	0.0	8	-8.0
M3 (Nason St)	5	1	0.0	62.2	66	62.2	10	----	62.2	0.0	8	-8.0
M4 (s/o Nason - Backyard)	7	1	0.0	48.6	66	48.6	10	----	48.6	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	4	0.0	0.0	0.0
All Impacted	0	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

Noise Monitoring / TNM Calibration

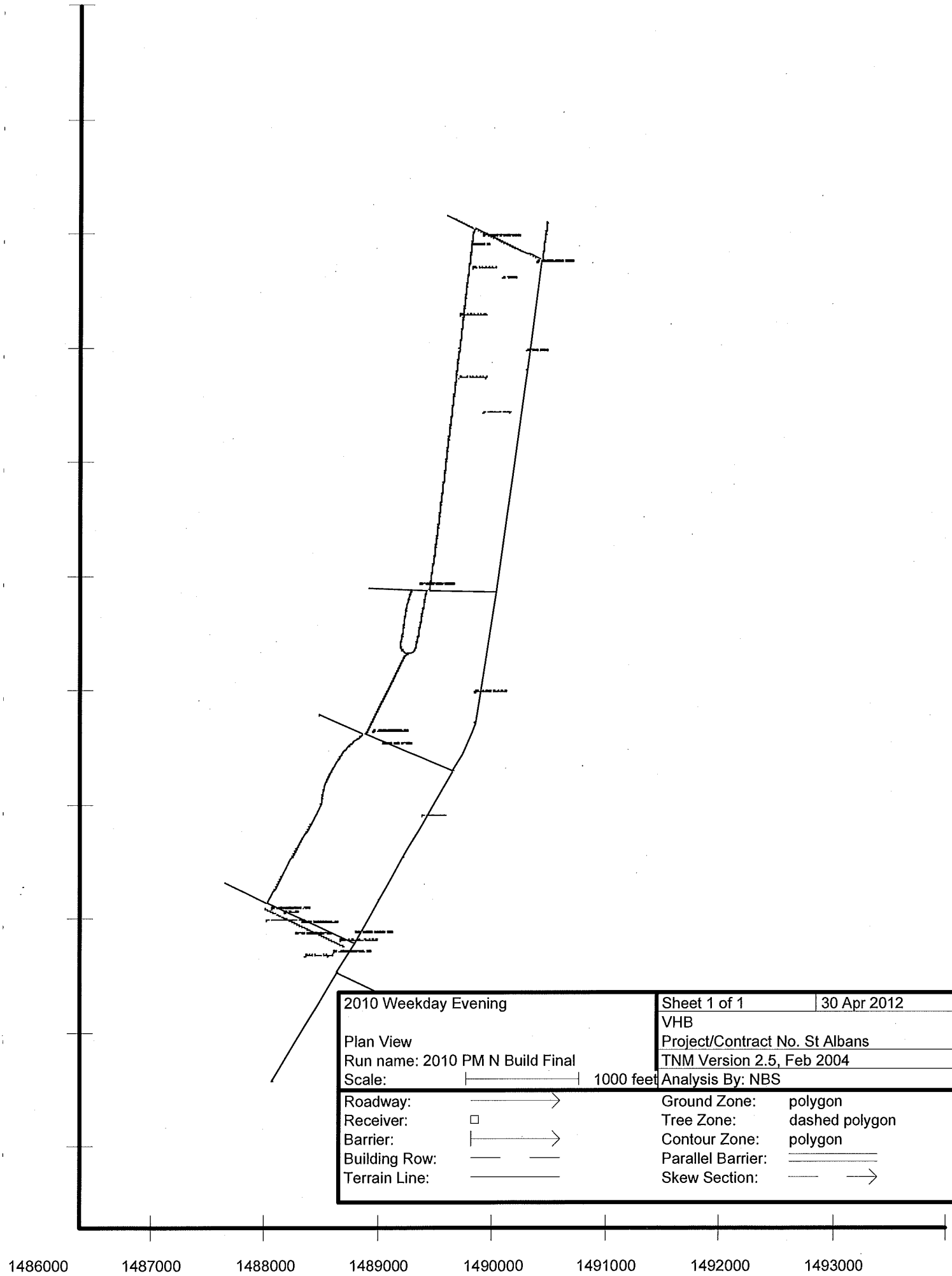
	Existing Sound Level		
Locations	Monitored	TNM	delta
M1 (Federal St)	64.8	65.2	0.4
M2 (Lower Welden St - SAPD)	65.1	63.6	-1.5
M3 (Nason St)	64.9	62.2	-2.7
M4 (s/o Nason St)	45.9	48.6	2.7

Calibration: YES

Vanasse Hangen Brustlin, Inc.

Traffic Noise Model

2010 No Build


2010 Weekday Evening
Plan View
Run name: 2010 PM N Build Final
Scale:
1000 feet
Sheet 1 of 1
30 Apr 2012
VHB
Project/Contract No. St Albans
TNM Version 2.5, Feb 2004
Analysis By: NBS
Roadway:
Receiver:
Barrier:
Building Row:
Terrain Line:
Ground Zone: polygon
Tree Zone: dashed polygon
Contour Zone: polygon
Parallel Barrier:
Skew Section:
1486000
1487000
1488000
1489000
1490000
1491000
1492000
1493000

VHB
NBS

30 April 2012
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: St Albans
RUN: 2010 Weekday Evening
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
M1 (Federal St)	1	1	0.0	65.2	66	65.2	10	----	65.2	0.0	8	-8.0
M2 (Lower Welden St - SAPD)	3	1	0.0	63.6	66	63.6	10	----	63.6	0.0	8	-8.0
M3 (Nason St)	5	1	0.0	62.2	66	62.2	10	----	62.2	0.0	8	-8.0
M4 (s/o Nason - Backyard)	7	1	0.0	48.6	66	48.6	10	----	48.6	0.0	8	-8.0
R2 - SW corner of N Main & Newton	9	1	0.0	65.2	66	65.2	10	----	65.2	0.0	8	-8.0
R3 - Federal w/o Best	11	1	0.0	62.2	66	62.2	10	----	62.2	0.0	8	-8.0
R5 - w/o Federal n/o Alds	12	1	0.0	62.2	66	62.2	10	----	62.2	0.0	8	-8.0
R8 - e/o Federal n/o Hoyt	14	1	0.0	51.1	66	51.1	10	----	51.1	0.0	8	-8.0
R9 - n/o Lake (Market-Catherine)	16	1	0.0	61.9	66	61.9	10	----	61.9	0.0	8	-8.0
R10 - w/o S Main St n/o Stowll	18	1	0.0	60.0	66	60.0	10	----	60.0	0.0	8	-8.0
R11 - NE corner of Welden & Allen	19	1	0.0	60.2	66	60.2	10	----	60.2	0.0	8	-8.0
R13 - NW corner of S Main & Nason	21	1	0.0	65.0	66	65.0	10	----	65.0	0.0	8	-8.0
R14 - s/o Nason (Front Yard - West)	22	1	0.0	58.8	66	58.8	10	----	58.8	0.0	8	-8.0
R15 - s/o Nason (Back Yard - West)	23	1	0.0	50.3	66	50.3	10	----	50.3	0.0	8	-8.0
R16 - s/o Nason (Front Yard - Mid)	25	1	0.0	56.7	66	56.7	10	----	56.7	0.0	8	-8.0
R17 - s/o Nason (Back Yard - Mid)	26	1	0.0	48.5	66	48.5	10	----	48.5	0.0	8	-8.0
R18 - s/o Nason (Fron Yard - East)	27	1	0.0	57.5	66	57.5	10	----	57.5	0.0	8	-8.0
R19 - s/o Nason (Back Yard - East)	28	1	0.0	55.3	66	55.3	10	----	55.3	0.0	8	-8.0
R1 - SE corner of Federal & Newton	30	1	0.0	64.1	66	64.1	10	----	64.1	0.0	8	-8.0
R4 - Best Ct	31	1	0.0	51.4	66	51.4	10	----	51.4	0.0	8	-8.0
R7 - e/o Federal n/o Hoyt	33	1	0.0	63.0	66	63.0	10	----	63.0	0.0	8	-8.0
R6 - N Main n/o Hoyt	35	1	0.0	65.1	66	65.1	10	----	65.1	0.0	8	-8.0
R12 - S Main s/o Welden	36	1	0.0	63.9	66	63.9	10	----	63.9	0.0	8	-8.0

RESULTS: SOUND LEVELS

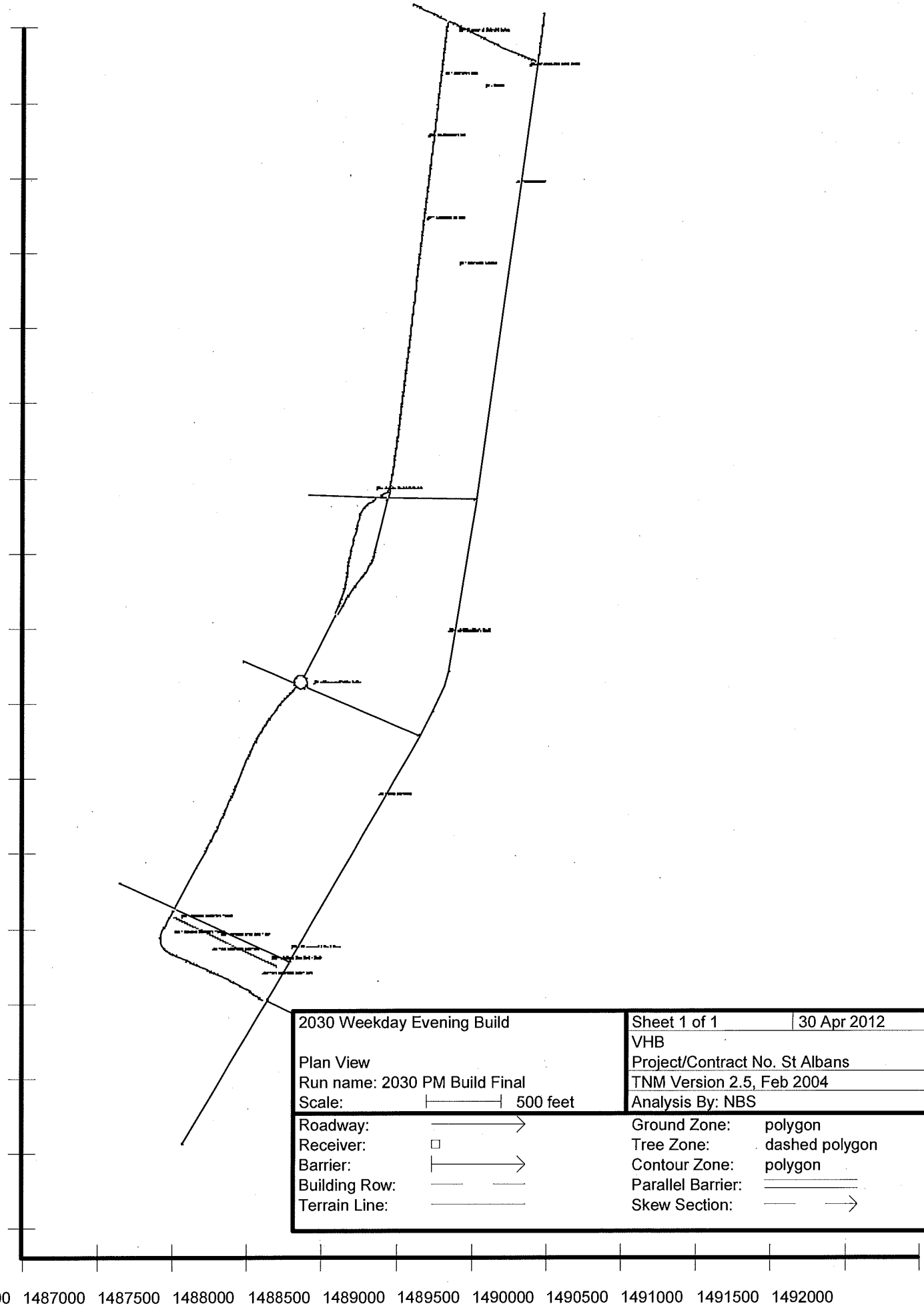
St Albans

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	23	0.0	0.0	0.0
All Impacted	0	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

Vanasse Hangen Brustlin, Inc.

Traffic Noise Model

2030 Build



2030 Weekday Evening Build	Sheet 1 of 1 — 30 Apr 2012
	VHB
Plan View	Project/Contract No. St Albans
Run name: 2030 PM Build Final	TNM Version 2.5, Feb 2004
Scale: 500 feet	Analysis By: NBS

Roadway:		Ground Zone:	polygon
Receiver:		Tree Zone:	dashed polygon
Barrier:		Contour Zone:	polygon
Building Row:		Parallel Barrier:	
Terrain Line:		Skew Section:	

VHB
NBS

30 April 2012
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: St Albans
RUN: 2030 Weekday Evening Build
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
R2 - SW corner of N Main & Newton	9	1	0.0	65.9	66	65.9	10	----	65.9	0.0	8	-8.0
R3 - Federal w/o Best	11	1	0.0	63.6	66	63.6	10	----	63.6	0.0	8	-8.0
R5 - w/o Federal n/o Alds	12	1	0.0	63.6	66	63.6	10	----	63.6	0.0	8	-8.0
R8 - e/o Federal n/o Hoyt	14	1	0.0	52.2	66	52.2	10	----	52.2	0.0	8	-8.0
R9 - n/o Lake (Market-Catherine)	16	1	0.0	63.5	66	63.5	10	----	63.5	0.0	8	-8.0
R10 - w/o S Main St n/o Stowll	18	1	0.0	60.0	66	60.0	10	----	60.0	0.0	8	-8.0
R11 - NE corner of Weldon & Allen	19	1	0.0	61.2	66	61.2	10	----	61.2	0.0	8	-8.0
R13 - NW corner of S Main & Nason	21	1	0.0	64.5	66	64.5	10	----	64.5	0.0	8	-8.0
R14 - s/o Nason (Front Yard - West)	22	1	0.0	59.7	66	59.7	10	----	59.7	0.0	8	-8.0
R15 - s/o Nason (Back Yard - West)	23	1	0.0	58.6	66	58.6	10	----	58.6	0.0	8	-8.0
R16 - s/o Nason (Front Yard - Mid)	25	1	0.0	54.1	66	54.1	10	----	54.1	0.0	8	-8.0
R17 - s/o Nason (Back Yard - Mid)	26	1	0.0	55.6	66	55.6	10	----	55.6	0.0	8	-8.0
R18 - s/o Nason (Fron Yard - East)	27	1	0.0	55.2	66	55.2	10	----	55.2	0.0	8	-8.0
R19 - s/o Nason (Back Yard - East)	28	1	0.0	56.5	66	56.5	10	----	56.5	0.0	8	-8.0
R1 - SE corner of Federal & Newton	30	1	0.0	65.3	66	65.3	10	----	65.3	0.0	8	-8.0
R4 - Best Ct	31	1	0.0	52.5	66	52.5	10	----	52.5	0.0	8	-8.0
R7 - e/o Federal n/o Hoyt	32	1	0.0	64.5	66	64.5	10	----	64.5	0.0	8	-8.0
R6 - N Main n/o Hoyt	33	1	0.0	65.4	66	65.4	10	----	65.4	0.0	8	-8.0
R12 - S Main s/o Welden	34	1	0.0	63.6	66	63.6	10	----	63.6	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	19	0.0	0.0	0.0

RESULTS: SOUND LEVELS

St Albans

All Impacted	0	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

Federal Street Corridor - St Albans, VT
TNM Sound Level Resutls (Leq)

Receptor Location	2010 No Build	2030 Build	Increase over Existing
R1 - SE corner of Federal & Newton	64.1	65.3	1.2
R2 - SW corner of N Main & Newton	65.2	65.9	0.7
R3 - Federal w/o Best	62.2	63.6	1.4
R4 - Best Ct	51.4	52.5	1.1
R5 - w/o Federal n/o Alds	62.2	63.6	1.4
R6 - N Main n/o Hoyt	65.1	65.4	0.3
R7 - e/o Federal n/o Hoyt	63.0	64.5	1.5
R8 - e/o Federal n/o Hoyt	51.1	52.2	1.1
R9 - n/o Lake (Market-Catherine)	61.9	63.5	1.6
R10 - w/o S Main St n/o Stowll	60.0	60.0	0.0
R11 - NE corner of Weldon & Allen	60.2	61.2	1.0
R12 - S Main s/o Welden	63.9	63.6	-0.3
R13 - NW corner of S Main & Nason	65.0	64.5	-0.5
R14 - s/o Nason (Front Yard - West)	58.8	59.7	0.9
R15 - s/o Nason (Back Yard - West)	50.3	58.6	8.3
R16 - s/o Nason (Front Yard - Mid)	56.7	54.1	-2.6
R17 - s/o Nason (Back Yard - Mid)	48.5	55.6	7.1
R18 - s/o Nason (Fron Yard - East)	57.5	55.2	-2.3
R19 - s/o Nason (Back Yard - East)	55.3	56.5	1.2

Appendix F – National Register of Historic Places Eligibility Analyses

- Lake / Federal / Catherine Streets Intersection
- Three Federal Street Homes

Transportation
Land Development
Environmental
Services

Vanasse Hangen Brustlin, Inc.

7056 U.S. Route 7
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05473
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Memorandum

To: Scott Newman, Historic Preservation Officer, Vermont Agency of Transportation

Date: March 18, 2011

Project No.: 57414.00

From: Rita Walsh, Senior Preservation Planner and Deborah Finnigan, P. E., Deputy Project Manager

Re: St. Albans HPP 8000 (17) Analysis of the National Register eligibility/Significance of the Lake/Federal/Catherine Street intersection, St. Albans, Vermont

Introduction

This memo was prepared at your request to further understand the significance and National Register eligibility of the intersection of Lake, Federal, and Catherine Streets and the buildings that front it in the city of St. Albans. Proposed road and intersection improvements are being studied at this location for the Federal Street multi-modal connector project that may physically change its current appearance.

Discussion

All four corners of this irregularly-configured intersection contain buildings that are already either individually listed in the National Register of Historic Places (NRHP) or are within an established National Register historic district. The intersection is included in one of the listings – the Central Vermont Railroad Headquarters Historic District – although the boundaries of this district are not well-justified in relationship to the complex's significance and the buildings discussed in the nomination.[1] These buildings and the intersection, however, have not been evaluated for their collective historic association with the Central Vermont Railroad and corollary commercial/industrial activities. More specifically, these buildings and their National Register status is as follows (see Figure 1 for their location):

[1] Rita Walsh of Vanasse Hangen Brustlin, Inc. (VHB) conferred with Devin Colman of the Vermont Division for Historic Preservation on the boundaries for the Central Vermont Railroad Headquarters Historic District as the written boundary description encompasses a much larger area than is discussed in the nomination. Vermont's nomination reviewer from the National Register (NR) office in Washington DC determined that the written boundary as stated in the NRHP nomination remains the boundary today and will not be changed or re-worded. Buildings located within that boundary, even if they are not described in the nomination, should be considered to be listed in the NRHP provided they meet the following criteria:
* Based on the dates listed for the buildings, the period of significance would be c. 1862 - 1924.
* The areas of significance are architecture, engineering, and transportation.
* Historic resources within the district boundary, within the period of significance, and with ties to one of the listed areas of significance should be considered contributing.

- General Offices, Central Vermont Railroad (CVRR), Northwest corner of Lake and Federal Streets, listed in the NRHP as part of the Central Vermont RR Headquarters Historic District (listed 1974)

- St. Albans Foundry and Implement Company, Northeast corner of Lake and Federal Streets (1 Federal Street) – listed in the NRHP as part of the St. Albans Historic District (listed 1980)

- St. Albans Hotel, Southeast corner of Lake and Catherine Streets, 60 Lake Street, listed in the NRHP as part of the St. Albans Historic District (listed 1980)

- Giroux Furniture Company Building, Southwest corner of Lake and Catherine Streets, 10-18 Catherine Street, individually listed in the NRHP (listed 2006)[2]

The intersection retains approximately the same configuration that it had in the mid-19th century when the railroad line was first built to St. Albans. The two main thoroughfares of this complicated intersection are Lake Street, which was the original stage coach road that led west from the village to St. Albans Bay, and the north-south Federal Street, originally called Furnace Street, and then re-named Foundry Street for its proximity to the St. Albans Foundry that was established at this intersection in 1840. Federal Street intersects Lake Street to the north; this intersection is the south terminus of Federal Street. The narrower north-south Catherine Street intersects with Lake Street to the south, but does not directly align with Federal Street. Catherine Street only runs from Lake Street at the north to Stebbins Street on the south. Catherine Street functioned more as an alley/back street in the 19th and early 20th centuries, while Market Street, west of and parallel to Catherine Street, previously functioned as the main entry to and hub for the freight loading/unloading area next to the railroad line. In the 19th century this wide thoroughfare was known as Market Square, with a large, long freight station, presumably built in the 1860s with the other headquarters structures, anchoring the square at its south end with Stebbins Street. While the configuration of these streets at this intersection made sense in the 19th century and early 20th century when the railroad line was more active and served several functional purposes, its uneven layout today is hazardous for motorists and pedestrians alike.

Even before the railroad line was built to St. Albans, the intersection of Lake and Federal streets hosted the St. Albans House hotel, which originally served stagecoach traffic and the St. Albans Foundry, both of which were established in 1840 at the two eastern corners. After the railroad line (originally called the Vermont and Canada Railroad) came to St. Albans in 1850 and the subsequent merger in 1860 that resulted in the Central Vermont Railroad, this intersection served as the new nexus for a variety of businesses and railroad-related activities. These activities included an updated St. Albans House in the 1870s which then mainly served railroad passengers and an expanded St. Albans Foundry operation (with extant buildings that date to ca. 1870 and ca. 1890 on the northeast corner of Lake and Federal Street) and several additional ancillary structures closer to the railroad line on Catherine Street and Market Square (now demolished). Along with these two older businesses, the area hosted the general office building of the Central Vermont Railroad at the northwest corner of Lake and Federal streets, which was built in 1867, and the passenger depot (removed in 1963) just west of the general office building. These two buildings were part of the Central Vermont Railroad's extensive infrastructure investment in the railroad yard beginning in the early 1860s and continuing to 1923.

Other businesses at this intersection included Hiram B. Week's flour, feed and phosphate store on the southwest corner of Lake and Market Street/Catherine Street by the early 1880s, if not earlier, and a

[2] The Giroux Furniture Building is technically within the boundaries of the Central Vermont Railroad Headquarters Historic District as it is currently defined.

saloon that served an obvious clientele. Weeks built the existing structure known as the Giroux Furniture Company/City Feed Store in 1896 with an addition in 1905. A number of businesses, which included the St. Albans Foundry storehouse, were housed in small buildings south of Week's business throughout the 19th and early 20th centuries. These businesses, or more specifically their warehouses or storage functions, located here due to the adjacent freight loading/unloading activities that took place in Market Square. Both the Giroux Furniture Company/City Feed Store at 10-18 Catherine Street and the Willard Manufacturing Company building further south at Stowell and Allen streets had railroad sidings leading to the main railroad line. A large lumber yard – the W. B. Fonda Lumber, Coal and Wood yard – on the east side of Catherine Street north of Stebbins Street was another business that relied on the railroad line for its successful operations. However, the fire that leveled much of downtown St. Albans in 1895 started at this lumber yard, causing many nearby building owners to construct their new structures with more fireproof resistance materials. Other businesses nearby on Catherine Street included associated services including liveries, blacksmith shops, and harness/wheel repair shops.

While many businesses were concentrated and flourished in this area in the 19th and early 20th centuries due to the proximity of the freight station and railroad lines, an increase in shipping by truck in the early 20th century and the reduction of the Central Vermont Railroad's operations in St. Albans in the 1950s caused many of the businesses to either close or leave the area. Based on Sanborn map research, National Register and inventory form documentation, and field observation of the existing buildings, it is apparent that the area no longer contains many remnants of the wholesale/shipping activities that predominated here in the 19th and early 20th centuries. The only other major building that remains within the vicinity is the Willard Manufacturing Building at Allen and Stowell Street (25 Stowell Street) to the south (listed individually in the NRHP in 2007); the building housed a garment factory and other later industries that were dependent on the railroad line for shipping.

Conclusion

The Federal, Lake, and Catherine Street intersection and the buildings that front it are recommended eligible for the National Register of Historic Places as a small, cohesive district that conveys a strong association with the Central Vermont Railroad and the attendant commercial activities that resulted from its location just west of this intersection.

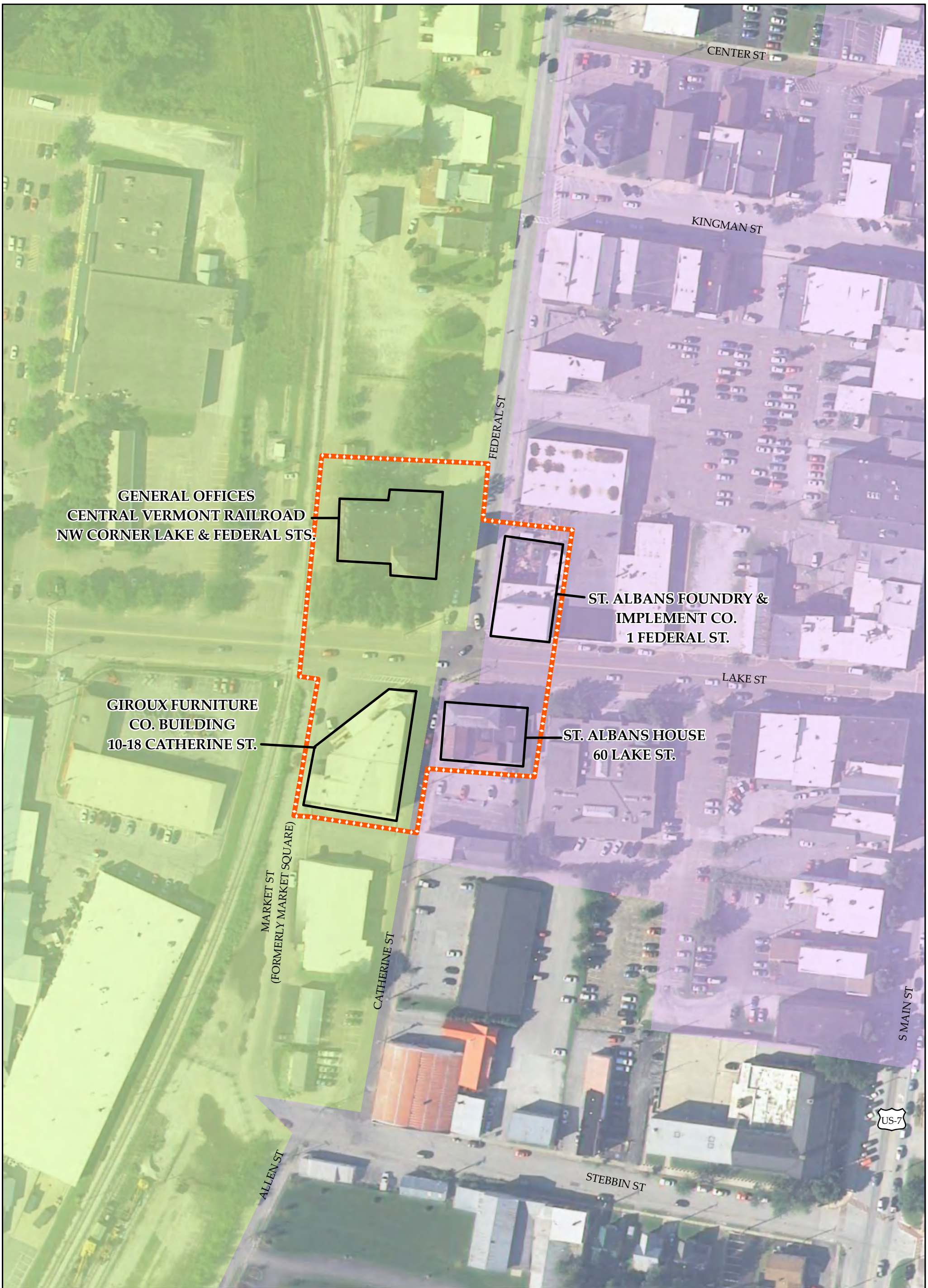
The current configuration of the intersection itself is the result of two major roads that were connected at a T-shaped intersection prior to the railroad line. The configuration then changed after the railroad line came through as Market Square and the narrower Catherine Street behind and east of it both were intersected with Lake Street. Catherine Street in some respects has become an extension of Furnace/Federal Street, although the connection at Lake Street between the two streets is at an angle. The intersection's configuration is not considered a significant element in the important events associated with the Central Vermont Railroad and its contributions to St. Alban's development and growth. The intersection, however, is included within the boundaries of a recommended historic district discussed below.

It is the buildings at the four corners of the Lake, Federal and Catherine streets that most effectively and strongly display the area's historic association with the Central Vermont Railroad line. These buildings are the Central Vermont Railroad general office building, the St. Alban's Foundry buildings, the St. Albans House, and the Giroux building. Although the city's industrial, warehouse, and railroad-related functions were spread over a larger area historically, the removal of many of these structures in the 20th century and the lack of integrity of the few that do remain negates the possibility of a larger significant complex that might be considered eligible for the NRHP.

The general office building of the Central Vermont Railroad is the most visible and prominent of the complex's structures and is one of the earliest buildings that remain. The St. Albans House at the

southeast corner of Lake and Federal streets, although originally built in 1840 to serve travelers on the stage road that would become Lake Street, was greatly expanded in the 1870s and thrived for decades on its proximity to the railroad. The two remaining structures associated with the St. Albans Foundry – one of the most extensive industrial concerns in the city – are on the intersection's northeast corner at 1 Federal Street. The ca. 1890 corner building was part of the foundry until 1911 when it closed and became a cigar-making shop. There is no doubt that the product's shipment via the railroad line contributed to its location here. Two other buildings associated with the foundry were located on the east side of Catherine Street as late as 1980 and were included in the St. Albans Historic District boundaries, but the buildings have since been demolished. The 1980 St. Albans Historic District nomination noted that the buildings in this area were not associated with Taylor Park, the focus of most of the buildings within the district, but with the industrial growth of the community after the railroad line was established here.

The more recent National Register nomination of the Giroux building, the fourth building at the intersection, recognized the strong association of this building with the railroad line. The Giroux Furniture Company/City Feed Store building at 10-18 Catherine Street was originally erected in 1896 to replace an earlier group of buildings that had the same function and owner. The building originally had a Market Street address, signifying the dominance of this street. The flour, feed, and phosphate store and warehouse function is documented here as early as 1884, and likely existed earlier in the 1870s. Although the building did not have its own railroad siding connection to the railroad until after 1920, its long-term occupation of this corner next to Market Square and the freight operations also demonstrates its significant association with the railroad line.



Legend

- Recommended National Register Boundary
- Central VT Railroad Headquarters Historic District
- St. Albans Historic District
- City/Town Boundary

Prepared by: JAT

Figure 1:
Federal Street Multi-Modal Connector
St. Albans, VT
Location of Buildings within
Federal/Lake Street Intersection

March 16, 2011

100 50 0 100 Feet

Sources: Background - Imagery by 3001 Inc. (2008) downloaded from VCGI (2009); County and Town boundary data (2008) downloaded from VCGI (2009); VTrans roads data downloaded from VCGI (2009); Recommended National Registry boundary by VHB (2011); Historic data gathered and collected by VHB (2010-11).

VHB Vanasse Hangen Brustlin, Inc.

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Transportation
Land Development
Environmental
Services

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Memorandum

To: Scott Newman, Historic Preservation Officer, Vermont Agency of Transportation

Date: March 18, 2011

Project No.: 57414.00

From: Rita Walsh, Senior Preservation Planner, Nicole Benjamin-Ma, Preservation Planner, and Deborah Finnigan, P.E., Deputy Project Manager

Re: St. Albans HPP 8000 (17) Individual National Register Eligibility Analysis for three St. Albans' Federal Street houses

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Introduction

This memo was prepared at your request to examine the individual National Register of Historic Places (NRHP) eligibility of several houses on Federal Street that are adjacent to the Federal Street section of the Federal Street multi-modal connector project. We understood from you that the collection of houses on the street does not constitute a historic district, due mainly to the serious level of alterations and additions to many of the buildings. However, you asked for National Register evaluation of certain houses on the street that should be considered for individual eligibility. This assessment focused on three candidates: 163 Federal Street, 174 Federal Street, and 180 Federal Street.[1] Current photographs, the relevant pages of the Federal Street inventory form, and a figure (Figure 1) showing the locations of these three houses are attached to this memo.

In summary, our conclusion is that none of the three houses considered exhibit the potential to be individually eligible for the National Register of Historic Places. Individual recommendations for all three houses are included below. All three are representative of the house types seen on Federal Street and are associated with the housing boom that occurred on the street after 1850 when the Central Vermont Railroad was established in St. Albans. Although each one of them exhibits a less altered appearance than many of their neighbors and most possess some important original features, they do not meet the higher standard of integrity required for individually eligible properties.

Methods

Rita Walsh of VHB conducted a field reconnaissance of the street to determine which houses possessed characteristics that presented the best potential for individual National Register eligibility. The characteristics considered included the retention of original features and form and uniqueness of style or form. Assessment of the National Register eligibility involved review of historic maps, assessment of the

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[1] We also preliminarily considered the double house (with a small ell holding a third residence) at 128 Federal Street, a side gable, 4-bay rectangular plan house with paired front entrances. The house has a small ell with what appears to be an original Queen Anne porch. We determined that the house form was not unusual and that alterations, including vinyl siding, door hood and window sash replacement, and chimney removal, resulted in issues with its integrity that would negate its individual National Register eligibility.

current integrity of the buildings, and comparison of the 1985 Federal Street Historic Sites and Structures Survey form information, which provides limited detail about and a contemporary photograph of each building on the street, with the current appearance of the building.

Historic/Architectural Context

Federal Street is located near the center of St. Albans, between the Main Street commercial core and the Central Vermont Railroad (CVRR) complex, and running south to north between Lake Street and Lower Newton Street. The street has a mix of primarily 19th and early 20th century commercial and residential structures, with commercial uses concentrated on the south end and residential buildings located along the northerly portion of the street.

The street was originally laid out as Furnace Street in the early 19th century, and soon renamed Foundry Street in the 1840s in recognition of the St. Albans Foundry built at the south end near Lake Street. A number of wood-frame commercial blocks were constructed near the foundry around Kingman Street, but were lost in the 1895 St. Albans City fire. Subsequently, the south end of Federal Street was filled in with several turn-of-the-century flat roofed two- and three-story brick commercial blocks with storefronts in the first story and apartments on the upper levels. The two-story brick courthouse on Kingman Street was constructed ca. 1900, and the street was once again renamed Federal Street.
Commercial development expanded north along Federal Street in the early and mid-20th century; two gas stations dating from the 1920s and 1930s are still extant north of Kingman Street. Other automotive and office-based businesses were established nearby in the center section of the street in the first half of the 20th century, including a mix of earlier structures converted to other uses and new development.

Many of the commercial structures along the south portion of Federal Street have been extensively altered during the 20th century, including reconstructed facades, entrance additions with new doors, and replacement siding. Many of the original windows with 6/6 and 2/2 sash have been replaced.

The north end of Federal Street beyond Hoyt and Hudson Streets is dominated by residential buildings, constructed in the 1860s and 1870s for employees of the CVRR, with a smaller number of later houses indicating continuing residential development into the early 20th century. The houses were built for both single and two-family occupancy. Many of the single-family dwellings are 1 ½ to 2 ½ story wood houses in a vernacular Italianate style, featuring sidehall plans, front gable roofs, rear kitchen ells, short cornice returns and full-width porches. Other styles utilized include Greek Revival details such as corner pilasters, as well as Gothic Revival and Colonial Revival structures. Many of the houses still have intact brick chimneys and late 19th century details added to the houses include decorative wood shingles and Queen Anne turned porch supports. A number of gable and hipped roof duplexes were also constructed to serve employees of the railroad, some featuring Italianate bay windows on the front elevation and paired entrances with sheltered either by a single full-width porch or individual door hoods. The large St. Albans Co-op Creamery complex represents the main departure from this residential trend, occupying the entire area on the west side of Federal Street between Deal Street and Aldis Street and serving as a major commercial draw west of the Main Street commercial corridor. The numerous buildings in the complex date from the 1930s to the end of the 20th century.

The residential structures concentrated at the north end of Federal Street have had a number of late 20th century alterations, with the most common being replacement window sash and siding, asphalt shingle roofing, and enclosure of the front full-width porches. Some of the houses have had their facades reconfigured in order to move the primary entrances elsewhere on the façade or to another elevation.

Houses Examined for Individual National Register Eligibility

163 Federal Street – Old Newton House/ Bilodeau House

This 1 ½ story sidehall front gable house is dated c. 1860 according to the Federal Street survey form. The house was owned by "D. Newton" on the 1871 Beers Atlas of St. Albans. Short-return boxed cornices are typical of the houses on the north end of Federal Street, but its brick exterior marks this house as the only extant example of this construction material on the street. The facade has three bays on the first story and two centered windows above, with a south entrance. A façade porch that was enclosed in the 20th century with a shed roof and paired windows, which appears in the photograph of the house on the Federal Street survey form, has been removed recently; it has been replaced by a small porch deck with a concrete floor and metal porch rail. There is a small addition in the rear of the house, dating to the original construction. While an internal brick chimney in the roof ridge is still extant, the windows have been replaced with aluminum 1/1 sash, and the roof has been covered in new sheet metal roofing. An entrance porch on the east side of the south elevation dates to ca. 1945, and a gable dormer on the north elevation with paired 2/2 sash windows was added ca. 1915. Decorative vergeboards were added under the front gable ca. 1970, at the same time that an attached garage was constructed in the rear of the house.

Despite the relatively uncommon use of brick for the house, numerous alterations have greatly affected the integrity. As one of the numerous extant examples of modest vernacular houses constructed on the north half of Federal Street for employees of the CVRR, this house retains integrity of feeling, location, and association. The house is notable as an example of brick construction in an area dominated by wood-framed dwellings which were originally clad in clapboard siding. However, the extensive alterations including addition of the dormer, replacement windows, and the enclosure and recent replacement of the front porch with a concrete deck have diminished the house's integrity of materials, workmanship, and design.

This house is recommended not individually eligible for the National Register of Historic Places. As with many of the surrounding dwellings, this house was associated with the CVRR's activities during the mid-19th century, when a number of company-built houses and those developed by others for railroad employees were constructed. Its brick construction is uncommon on the street. However, the extensive alterations during the 20th century have severely diminished the house's integrity as a significant example of the housing of the period.

174 Federal Street – Wagner House

This three-bay house is 1 ½ stories tall, and was recorded on the Federal Street survey form as dating ca. 1870. The house has a sidehall plan, with an original side ell and an enclosed glazed porch with 3/1 sash placed in the space between the main block and the ell. A brick end chimney is visible at the rear of the house. A one-story Queen Anne porch with a hip roof, turned posts, and diagonal brackets extends the full width of the façade. The house retains Italianate details such as a boxed cornice with short returns on the front gable, as well as an Italianate style door with round arched windows. Despite the addition of clapboard siding, original clapboards remain underneath. Likewise, original 2/2 sash windows are extant behind added storm windows.

The house is located in a residential area which contains a number of houses of similar scale and form, and retains integrity of feeling, association, and location. The addition of a glazed porch between the main block and ell has adversely affects integrity of design. However, the retention of original details such as the Italianate door and windows and clapboard siding beneath modern materials contributes to the structure's higher level of integrity of materials and workmanship than that of a number of its neighbors.

The house is not recommended eligible for the National Register of Historic Places. The time period and style for this house likely associate it with the extensive residential development along the north side of Federal Street after the CVRR was established nearby. Despite the retention of some original architectural details, the house has sustained a number of physical alterations and is therefore not considered a significant individual example of housing built during the period of the railroad's initial development.

180 Federal Street – Thuot House

This two-story duplex has a center entrance flanked by a three-sided two story bay on each side. Recorded on the 1985 Federal Street survey form as an example of Colonial Revival style constructed ca. 1910, the three-bay house has a hipped roof with wide overhanging eaves. A recessed center entrance is echoed on the second floor of the façade, which has a wood deck with a square balustrade outside the door. A distinctive pierced valance runs beneath the eaves along the second story deck and the outside of each bay, featuring rounded pendants at the front corners of the house. Square-edge wood window surrounds contain replacement 1/1 sash windows. A hipped dormer located above the center entrances is recorded on the Federal Street survey form, but has since been removed. Aluminum siding is a fairly recent addition to the duplex, although clapboard siding remains underneath.

Located at the north end of Federal Street in an area developed as a residential district for employees of the CVRR, this relatively well-preserved duplex retains many original details and exhibits integrity of location, feeling, setting, and association. Extant details such as the balustrade, valance, and pendants contribute to integrity of materials and workmanship, as do the original clapboards retained beneath the modern aluminum siding. However, the removal of the hip dormer and replacement of window sash throughout the duplex compromise integrity of design, materials, and workmanship.

This house is recommended not eligible for the National Register of Historic Places. It is located in a residential area associated with the development of the CVRR, which included both single- and multi-family houses built by the company itself and by individual owners. The significant alterations, including the removal of the dormer, have diminished the integrity of the duplex as a significant representative of the early 20th century housing developed along Federal Street for railroad employees and other workers in St. Albans.

Legend

Subject Building

City/Town Boundary

Prepared by: JAT

Figure 1:
Federal Street Multi-Modal Connector
St. Albans, VT
Location of Three Buildings Assessed for National Register Eligibility

March 16, 2011

120 60 0 120 Feet

Sources: Background - Imagery by 3001 Inc. (2008) downloaded from VCGI (2009); County and Town boundary data (2008) downloaded from VCGI (2009); VTrans roads data downloaded from VCGI (2009); Project centerline and segment divides done by VHB (2010, 2011).

VHB Vanasse Hangen Brustlin, Inc.

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163 Federal Street

The Old Newton House/The Bilodeau House

A 1½ story, 3 x 2 bay, gable front, brick, vernacular style house built c.1860 by "D. Newton" (see 1871 Beer's Atlas man). Sidehall plan. Concrete-reinforces stone foundation. Sheet metal gable roof. One original, brick stove chimney remains on trait interior gable end. Molded box cornice at eaves, returning slightly on gable ends. New "vergeboards" added c.1970. Newer 1/1 sash. Aluminum storms. Gable front facade. Right side entrance, shelttered under a c.1945 shed roof vernacular porch. 1/1 sash. Clapboard base. Some 2/2 sash and original 6/6 sash on north eaves elevation. Attached garage at rear c.1970. Smaller, rear wing built at same time as main house. Gabled dormer added to north roof slope c.1915. (85-A-526 #3A)

164 Federal Street

The Tool House

A modest, 1½ story, 3 x 2 bay, gable front vernacular style house built c.1872. Sidehall plan. Concrets-faced stone foundation. Sheet metal gable roof. Pair of cinder block stove chimney on interior gable ends, replacing original, brick stove chimneys. Asbestos siding over original clapboards. Molded box cornice at eaves, returning slightly on gable ends. Friezeboard. Corner posts. Original 2/2 sash with lip molded heads. Newer aluminum storms. Gable front facade. Right side entrance, sheltered under a c.1930 glazed in porch. 1/1 sash, Right side entry bay. Small kneewall window on north eaves elevation. Attached, rear shed ell (c.1900). Door with large glazed top light. 2/2 sash. (85-A-526 #4A)

165 Federal Street

The St. Pierre House

A large, 2½ story, 3 x 2 bay, gable front vernacular style house built c.1885. Sidehall plan. Concrete-faced stone foundation. Original slate roof. Newer cinder block chimney at rear. Original clapboard sheathing. Fascia trim and corner boards. Molded box cornice at eaves. Original 2/2 sash with wooden storms. Gable front facade. Fishscale shingles in gable peak. Right side entrance, sheltered under a c.1970 shed roof glazed-in porch with Chicago window on gable end. Small 1/1 sash in gable peaks. Well-preserved. (85-A-526, #5A)

173 Federal Street
The Old S. C. Noble House/The Robinson House
A 1½ story, 3 x 2 bay, gable front vernacular style house built c.1862. Sidehall plan. Stone foundation. Asphalt shingled gable roof. Pair of brick stove chimney's on interior gable ends. Asbestos over original clapboards. Plain box cornice at eaves. Newer 1/1 sash with aluminum storms. Plain surrounds. Gable front facade. Left side entrance. c.1900 door with large, glazed top light. Alumunim storm door. Full-length, hip roof Queen Anne style porch. Turned posts. Square balvstrade and valance. Lattice skirt. Rear wing added c.1880. Screened in Bungoloid style porch at south eaves elevation. Wood shingled apron. (85-A-526 #9A)

Carriage Barn: c.1865/Garage: c.1915
A detached, 1½ story, carriage barn. Asphalt shingle wall & roof sheathing. Gable roof. Wide box carnice at eaves. 6 set sash & hay loft bay on south gable end elevation. Pair of pass doors on west eaves elevation. Attached shed roofed section to north with original, hinged double doors on facade. Well-preserved example of an early carriage barn converted to a garage c.1915. (85-A-526 #9A)

174 Federal Street
The Wagner House
A 1½ story, 3 x 2 bay, gable front, vernacular style house with a contemparaneous, 1½ story recessed side ell built c.1870. Sidehall plan. Stone foundation. Asphalt shingled gable roof. Rear gable end stove chimney. Asbestos over original clapboards. Molded box cornice at eaves, returning slightly on gable ends. Original 2/2 sash. New aluminum storms. Gable front facade. Left side entrance. Italianate style door with round-headed lights in it. Wooden storm door. One story hip roof Queen Anne style porch. Turned posts with angle brackets. Square balvstrade. Side ell with eaves center entrance. Ell fronted by 1-stroy vernacular porch, now glazed in with 3/1 sash (c.1940). (85-A-526 #10A)

179 Federal Street
The Old Goulen House

A modest, 1½ story gable front vernacular style house with an L-plan. Built c.1868 for "W. Goulen" (see Beers 1871 Atlas map). Concrete-reinforces stone foundation. Asphalt shingled gable roof. Center, brick stove chimney. Asbestos shingle over original clapboards. Plain box cornice at eaves. Some original 2/2 sash and newer 1/1 sash. Wooden storms. Entrance on south eaves elevation of main block. Newer doors. Full length, vernacular wraparound porch on facade and side sheltering the entrance. Turned posts. Cattice skirt. Attached side ell with shed roof added c.1900. (85-A-526 #15A)

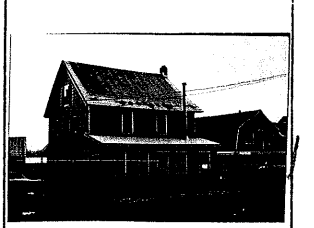
180 Federal Street
The Thuot House

A 2½ story, 3 x 3 bay, vernacular Colonial Revival style duplex built c. 1910. Stove-faced concrete foundation. Asphalt shingled hip roof. Brick stove chimney. Aluminum siding over original clapboards. Molded box cornice at eaves. 1/1 sash with aluminum storms. Eaves facade. Center entrance. period door with lare, glazed top light. Flanked by two story trapezoidal bay windows. Center entrance in second story with similar door opens out onto a period porch. Square balustrade and valance. Valance with pendant drops on front corners (2nd story level) of house. Hipped dormer on roof above entrances. Small 1/1 sash. A well-preserved, 20th century duplex. (85-A-526 #14A)

81 Federal Street

A modest, 1½ story, vernacular style house with L-plan. Built c.1868. Concrete-faced stone foundation. Aluminum siding. Asphalt shingled gable roof with center cinder block stove chimney. Plain box cornice at eaves. Original 2/2 sash with plain surrounds. Entrance on south eaves elevation of sheltered under a c.1925 porch with wood shingled base. Now screened in. (85-A-526 #16A)

182 Federal Street
The Himingway House



Non-contributing. A 2½ story, 3 x 2 bay vernacular house built c.1880. Concrete-faced stone foundation. Asphalt shingled gable roof. Block stove chimney. Wide clapboards added c.1965. Molded box cornice at eaves. Newer, smaller 1/1 sash put in on south & north gable ends, changing character of design. Wooden shutters are new. Vernacular, vertical board front porch. Center entrance. New door. Alters original appearance of building greatly. Non-contributing due to alterations. (85-A-526 #17A)

Appendix G – Section 106 Determination of Effect Memorandum

Historic Resource Group, Environmental Section
Vermont Agency of Transportation
National Life Building, Drawer 33
Montpelier, VT 05633

Archaeology 802-828-3981 (fax) 828-2334 jeannine.russell@state.vt.us
Historic Preservation 802-595-5119 (fax) 828-2334 scott.newman@state.vt.us

MEMORANDUM

To: Rob Sikora, FHWA

Date: November 20, 2012

Subject: NO ADVERSE EFFECT
(Cover Letter for Attached Consultant Section 106 Report)

Project Name: St. Albans Federal Street Multimodal Connector

Project Number: St. Albans HPP 8000(17)

Location: St. Albans, VT

Distribution: State Historic Preservation Officer
Jeff Ramsey, VTrans Environmental Specialist
Environmental Files via John Narowski

The Vermont Agency of Transportation has reviewed this undertaking according to the standards and procedures detailed in the 4/5/99 Programmatic Agreement to implement the Federal-Aid Highway Program in Vermont and, the PA Manual of Standards and Guidelines. Project review consists of identifying the project's potential impacts to historic buildings, structures, historic districts, historic landscapes, and settings, and to known or potential archeological resources.

The following details the VAOT Officers' findings supporting our effect determination of NO ADVERSE EFFECT for the above-subject project. Completion of this document evidences that FHWA has satisfied its obligations under Section 106 for this undertaking.

NOTE: This document serves as a cover letter and formal finding of effect by the archaeological and historic preservation officers for the attached detailed Section 106 report. The officers participated in the review of the project including site meetings as well as meetings with stakeholders and town officials. We concur with the attached document generated by VHB and submitted November 20, 2012, as well as the determination of effect of No Adverse Effect.

Project Description: This project will reconstruct the Federal Street corridor to improve its use by automobiles, trucks, pedestrians, bicyclists, and public transit. The project is intended to provide a parallel urban collector route to divert through and truck traffic from the City's downtown and

create an attractive alternative access to Interstate 89. The full description of the project is found beginning on page 10 of the attached report.

Above-Ground Historic Resources: Historic properties are detailed in the attached report beginning on page 4; the list has been generated in consultation with the VTrans HPO. None will be adversely affected by this project.

Archaeological Resources:
The VTrans Archaeology Officer has reviewed this project and has concluded that it will not impact archaeological resources.

Section 4(f) de minimis finding
By copy of this document, and as required by Section 4(f) regulations, VTrans hereby informs the State Historic Preservation Officer that based on the finding of No Adverse Effect detailed in this letter, we will be recommending to FHWA a Section 4(f) de minimis impact finding for this project wherever minor amounts of property are to be acquired as needed for construction.

Above Ground Historic Resource Stipulations:

1. Final project plans and any subsequent changes thereto will be subject to review and written approval by the VTrans Historic Preservation Officer before work begins.
2. See stipulations under Heading No. 7 in the attached document for additional stipulations.

11/20/2012		11/20/2012	
Archaeology Officer	Date	Historic Preservation Officer	Date

VHB Vanasse Hangen Brustlin, Inc.
Transportation | Land Development | Environmental Services

November 20, 2012

Ref: 57414.00

Scott Newman, Historic Preservation Officer
Vermont Agency of Transportation
One National Life Drive
Montpelier, VT 05633-5001

Jeannine Russell, Archaeology Officer
Vermont Agency of Transportation
One National Life Drive
Montpelier, VT 05633-5001

RE: Recommendations on Finding of Conditional No Adverse Effect,
St. Albans Federal Street Multimodal Connector, VTrans # HPP 8000 (17)

Dear Scott and Jen:

Pursuant to the Section 106 review of the St. Albans Federal Street Multimodal Connector Project, I am providing in this letter our recommendations and background information to support a finding of conditional no adverse effect. Project review consisted of identifying the Project's potential impacts to historic buildings, structures, historic districts, historic landscapes and settings, and to known or potential archeological resources. The following information details our recommended findings to support the conditional no adverse effect. Your concurrence with these findings will evidence that the Federal Highway Administration (FHWA) has satisfied its obligations under Section 106 for this undertaking.

1. Project Description

The Federal Street Multimodal Connector (the Project), proposed by the City of St. Albans, Vermont (the City), would reconstruct the Federal Street Corridor to improve its use by automobiles, trucks, pedestrians, bicyclists, and public transit. Currently, US Route 7 (North and South Main Street) bisects the City's downtown which results in heavy north-south passenger and commercial traffic and congestion which detracts from the downtown human environment. The Project is intended to provide a parallel urban collector route to divert through and truck traffic from the City's downtown and create an attractive alternative access to Interstate 89.

7056 US Route 7
Post Office Box 120
North Ferrisburgh, VT 05473
802.425.7788 • FAX 802.425.7799
www.vhb.com

The purpose of the Federal Street Multimodal Connector Project has been defined in accordance with the requirements of NEPA, CEQ Regulations 40 CFR Part 1500-1508, and FHWA's Technical Advisory T6640.8A as follows:

- To increase economic competitiveness and livability in Downtown St. Albans by providing an efficient and convenient alternate north-south route for truck and automobile traffic currently using Main Street (US Route 7);
- To resolve long-standing traffic flow problems that have impacted the competitiveness of commercial and industrial properties using "Complete Street" design principles where appropriate; and
- To harness the economic power of multiple transportation modes located in close proximity to one another in an environment containing commercial, residential, and industrial uses.

Additional information regarding the Project's Purpose and Need can be found in Appendix A of the Environmental Assessment (EA). The EA was prepared to describe and assess the environmental consequences that may result from the construction of the Project and discloses the direct, indirect, and cumulative impacts that would result. Environmental, social, and cultural resources were considered, and impacts to these resources were avoided and minimized to the greatest extent practicable where appropriate, mitigation of impacts was incorporated into the Project. This analysis is conducted in compliance with the requirements of the National Environmental Policy Act of 1969 (NEPA), the Council on Environmental Quality (CEQ) Regulations 40 CFR 1500 and 1508, and Federal Highway Administration (FHWA) Technical Advisory T6640.8A as well as FHWA regulations implementing NEPA as described in 23 CFR 771.

The Project involves five segments of existing roadway totaling approximately 2.1miles. The Project area is shown in **Figures 1.2-1** and **1.2-2** of the EA. A brief description of each segment is provided below:

Project Segments

The "Nason Street Connector," South Main Street to Nason Street (0.30 miles). The Nason Street Connector is a proposed two-lane roadway which would extend the Interstate Access Road (St. Albans State Highway) westerly past South Main Street (US Route 7) across City-owned property to the intersection of Lemnah Drive and Nason Street. The proposed alignment of this connector road lies within an undeveloped area running parallel to Nason Street, which is a residential neighborhood.

Lemnah Drive and Allen Street from Nason Street to Stowell Street (0.42 miles). Lemnah Drive is situated within commercial/industrial properties including the City's municipal complex. Buildings are restricted to the eastern side of the road, with undeveloped lands adjacent to the New England Central Railroad (NECR) line lying to the west acting as open air storage yards. The only bridge in the Project area is located within this reach, crossing over Stevens Brook about midway between Lower Welden Street and Nason Street.

Allen/Catherine/Federal Streets from Stowell Street to Kingman Street (0.36 miles). This area is more urban in character and considered a portion of the downtown area of the City. A variety of businesses and multiple-family properties are the predominant land use. The headquarters of the NECR are located within this segment at the intersection of Federal Street with Lake Street. Catherine and Allen Streets are a mixture of high-density residential and commercial/industrial properties.

Federal Street from Lower Newton Street to Kingman Street (0.61 miles). Federal Street is a mixed neighborhood of single-family homes and small businesses on the east side of the road and commercial/industrial uses on the west. These commercial properties include the St. Albans Cooperative Creamery and portions of the NECR along with associated industrial and commercial buildings.

Lower Newton Street from US Route 7 (North Main Street) to Federal Street (0.17 miles). Land use within this portion of the Project area is a mix of residential and commercial, with single-family homes and a few businesses lining the street. At the intersection of Lower Newton and Federal Streets is the now vacant industrial factory known as the Fonda Group Property, vacated in 2005 when the Solo Cup Company closed the plant. In 2006, the City purchased the plant and with financial assistance from the Environmental Protection Agency (EPA) brownfield cleanup program. The buildings were demolished in 2011. Additional cleanup activities will be conducted.

2. Area of Potential Effects, Identification of Historic Properties and Archeologically Sensitive Areas

The Area of Potential Effects (APE) consists of the entire 2.1 mile Project area, shown in **Figure 2.4-1** of the EA. The Project area includes two historic districts and two properties which are individually listed in the National Register of Historic Places (National Register). Additionally, through the studies conducted as part of the EA, one new historic district and two new individual properties were identified that have since been determined eligible for listing in the National Register. Each of these historic properties is described in this section, beginning with the listed properties, followed by those determined eligible for the National Register. Lastly,

archeologically sensitive areas within the Project area and the results of studies performed therein are discussed.

Listed Districts

The Central Vermont Railroad Headquarters Historic District

The Central Vermont Railroad (CVR) Headquarters Historic District was listed in the National Register in 1974. The district is recognized as the most intact 19th century railroad complex surviving in Vermont, which included passenger facilities, freight stations, repair and fabricating shops, and the general offices. The historic district nomination states that the district consists of 12 major structures along the main line and yard tracks; however, the nomination's written boundary description circumscribes a much larger area (see **Figure 3.13-1** of the EA for the boundaries) which encompasses a number of non-related buildings. These boundaries are not clearly justified in relationship to the complex's significance and the 12 buildings discussed in the nomination.[1] There are five properties within the district that lie within the Project's APE:

- The CVR General Office building at the northwest corner of Federal and Lake Streets. This is the only property of those affected that is mentioned in the National Register nomination;

- The Giroux Furniture Company Building at the southwest corner of Federal and Lake Streets; and;

- Three commercial buildings adjacent and to the south of the Giroux Furniture Company Building.

The CVR General Office building is a 2-1/2 story brick Second Empire style structure with two flanking three-story mansard-roofed corner towers and fenestration featuring narrow paired and single round-arched windows, with a grass-covered lawn in front. Sidewalks are present on both the Lake and Federal Street sides of the parcel.

[1] The written boundary description for the CVR Headquarters Historic District encompasses a much larger area than is discussed in the nomination. Vermont's nomination reviewer from the National Register office in Washington DC determined that the written boundary as stated in the National Register nomination cannot be changed or re-worded. (Devin Colman, Vermont Division for Historic Preservation, personal communication to Rita Walsh, VHB, 1/16/2011) Buildings located within that boundary, even if they are not described in the nomination, should be considered to be listed in the NRHP provided they meet the following criteria: 1) Based on the dates listed for the buildings, the period of significance would be ca. 1862–1924; 2) The areas of significance are architecture, engineering, and transportation.

The Giroux Furniture Company Building, a 2-story brick-veneered wood frame structure dating from 1892 and 1905, is also individually listed in the National Register and is further described below.

The three buildings to the south of the Giroux Building all post-date the 1924 ending date for the period of significance for the CVR Headquarters Historic District and none have any associations with the areas of significance – architecture, transportation, and engineering – for which the district was listed. This indicates that these buildings are not contributing elements.

The largest of the three, directly south of the Giroux Furniture Company Building, at 26-34 Catherine Street, currently houses commercial offices and is a one-story brick and vinyl-sided building with a wide gable roof and narrow grouped windows. The building dates from after 1962, based on a review of an aerial photograph from that year. A second small building is directly south of it on the same lot and assigned the same address of 26-34 Catherine Street. This building is a shed-roofed one-story warehouse or garage clad with vertical metal profile siding, which dates from between 1946 and 1962, based on a review of Sanborn maps and an aerial photograph dated 1962. South of this building is a one-story structure at the northeast corner of Allen and Market Streets. The small gable front building has a raised concrete foundation, vinyl siding, and metal corrugated roof covering. It dates from between 1946 and 1962, based on a review of Sanborn maps and an aerial photograph dated 1962.

St. Albans Historic District

The St. Albans Historic District, which includes the central business area, Taylor Park, and the buildings to the east of the park on Fairfield and Church Streets and Maiden Lane, was listed in the National Register in 1980. The western boundary of the district is contiguous to sections of the eastern boundary line of the CVR Headquarters Historic District. The district is composed of many of the City's most prominent institutional and commercial buildings, which date from 1812 to 1932. Centered around Taylor Park, a large open park established in 1792, the district is significant for its association with the City's growth as a major commercial and governmental center in northern Vermont and the prosperity engendered by the establishment of the CVR here in the 1850s.

The buildings within the St. Albans Historic District that located with the Project's APE are at the intersection of Federal and Lake Streets. These buildings are the St. Albans Foundry and Implement Company Building at 1 Federal Street, a two-story brick and frame corner building dating to *ca.* 1870 that has been converted to a restaurant use. Other buildings associated with this company are adjacent to the corner buildings. The other building is the 1840 St. Albans House at 60 Lake Street, on the southeast corner of the Federal, Lake and Catherine Street

intersections. The four-story structure of brick and wood frame construction features a mansard roof, added with the two upper wood frame stories in the 1870s to the original Greek Revival building.

Listed Individual Properties

Willard Manufacturing Company Building

The Willard Manufacturing Company Building at 25 Stowell Street was individually listed in the National Register in 2007. The large, flat-roofed two-story timber-framed industrial building from 1896 housed a garment factory and other later industries that were dependent on the CVR line for shipping. Its significance lies in its association with the City's industrial history and its ties with several prominent manufacturing companies in the City and with the CVR. The building's front setback is next to the sidewalk, although this section is a one-story, three-car garage section of the larger main building behind it.

Giroux Furniture Company Building

The Giroux Furniture Company Building at 10-18 Catherine Street, at the southwest corner of Lake and Catherine Streets was individually listed in the National Register in 2006.[2] The building is a large two-story brick-veneered wood frame commercial building, which was built in two sections in 1896 and 1905. The building's north elevation contains a projecting full-width glass-enclosed storefront space that dates to *ca.* 1950-1960. A small number of pull-in parking spaces are located at the storefront's west end.

Properties Determined Eligible

Federal/Lake/Catherine Streets Intersection Historic District

The four buildings at the intersection of Federal, Lake, and Catherine Streets were evaluated as an entity at the request of the VTrans Historic Preservation Officer as the area had not been evaluated for its collective historic association with the CVR and corollary commercial / industrial activities. The area was determined eligible for the National Register by the VTrans Historic Preservation Officer for its significance as a small, cohesive district that conveys a strong association with the CVR and the attendant commercial activities that resulted from its location just west of this intersection. No other buildings were recommended to be included within this eligible district.

All four corners of this irregularly-configured intersection contain buildings that are already either individually listed in the National Register or are within an established National Register

[2] The Giroux Furniture Building is technically within the boundaries of the CVR Headquarters Historic District as it is currently defined.

historic district. The intersection is included in one of the district listings – the CVR Headquarters Historic District – although the boundaries of this district are not clearly justified in relationship to the complex's significance and the buildings discussed in the nomination. The four buildings are the CVR General Office building at the northwest corner, the St. Albans Foundry and Implement Company building at 1 Federal Street at the northeast corner, the St. Albans House at 60 Federal Street at the southeast corner and the Giroux Furniture Company Building at 10-18 Catherine Street at the southwest corner.

The CVR General Office building is the most visible and prominent of the complex's structures and is one of the earliest buildings that remain. The St. Albans House at the southeast corner of Lake and Federal streets, although originally built in 1840 to serve travelers on the stage road that would become Lake Street, was greatly expanded in the 1870s and thrived for decades due to its proximity to the railroad. The two remaining structures associated with the St. Albans Foundry – one of the most extensive industrial concerns in the City – are on the intersection's northeast corner at 1 Federal Street. The *ca.* 1890 corner building was part of the foundry until 1911 when it closed and became a cigar-making shop. There is no doubt that the product's shipment via the railroad line contributed to its location here. Two other buildings associated with the foundry were located on the east side of Catherine Street as late as 1980 and were included in the St. Albans Historic District boundaries, but the buildings have since been demolished. The 1980 St. Albans Historic District nomination noted that the buildings in this area were not associated with Taylor Park, the focus of most of the buildings within the district, but with the industrial growth of the community after the railroad line was established here.

The more recent National Register nomination of the Giroux Furniture Company Building, the fourth building at the intersection, recognized the strong association of this building with the railroad line. The Giroux Furniture Company/City Feed Store building at 10-18 Catherine Street was originally erected in 1896 to replace an earlier group of buildings that had the same function and owner. The building originally had a Market Street address, signifying the dominance of this street. The flour, feed, and phosphate store and warehouse function is documented here as early as 1884, and likely existed earlier in the 1870s. Although the building did not have its own railroad siding connection to the railroad until after 1920, its long-term occupation of this corner next to Market Square and the freight operations also demonstrates its significant association with the railroad line.

<u>163 Federal Street – Old Newton House/ Bilodeau House</u>

This 1½ story side hall front gable house is dated *ca*. 1860 according to the Federal Street survey form. The house was determined eligible for the National Register by the VTrans Historic Preservation Officer as a rare example of brick construction for the modest vernacular houses constructed on Federal Street for railroad workers' housing.

The house was owned by "D. Newton" on the 1871 Beers Atlas of St. Albans. Short-return boxed cornices are typical of the houses on the north end of Federal Street, but its brick exterior marks this house as the only extant example of this construction material on the street. The facade has three bays on the first story and two centered windows above, with a south entrance. A front porch that was enclosed in the 20th century with a shed roof and paired windows, which appears in the photograph of the house on the Federal Street survey form, has been removed recently; it has been replaced by a small porch deck with a concrete floor and metal porch rail. There is a small addition in the rear of the house, dating to the original construction. While an internal brick chimney in the roof ridge is still extant, the windows have been replaced with aluminum 1/1 sash, and the roof has been covered in new sheet metal roofing. An entrance porch on the east side of the south elevation dates to *ca*. 1945, and a gable dormer on the north elevation with paired 2/2 sash windows was added *ca.* 1915. Decorative vergeboards were added under the front gable *ca.* 1970, at the same time that an attached garage was constructed in the rear of the house.

174 Federal Street – Wagner House

This three-bay house is 1 ½ stories tall, and was recorded on the Federal Street survey form as dating to *ca.* 1870. The house was determined eligible for the National Register by the VTrans Historic Preservation Officer as a relatively intact example of the modest workers' housing built on Federal Street in the mid-to-late 19th century for employees of the CVR.

The house has a side hall plan, with an original side ell and an enclosed glazed porch with 3/1 sash placed in the space between the main block and the ell. A brick end chimney is visible at the rear of the house. A one-story Queen Anne porch with a hip roof, turned posts, and diagonal brackets extends the full width of the façade. The house retains Italianate details such as a boxed cornice with short returns on the front gable, as well as an Italianate style door with round arched windows. Despite the addition of clapboard siding, original clapboards remain underneath. Likewise, original 2/2 sash windows are extant behind added storm windows.

Archeologically Sensitive Areas

Historic Site File Search and Site Inspection

A site file search performed at the Vermont Division for Historic Preservation (DHP) revealed that there are no previously identified archeological sites or cemeteries located within the APE. The closest known site is located about 1 mile northwest of the intersection of Lower Newton and Federal Streets and consists of prehistoric debris (chipped stone scatter, flakes, and one scraper). The site period for these resources is unknown. Additional information regarding previously reported sites within 3 miles of the Project area can be found in the Archeological

Resources Assessment (ARA) provided with the EA. None of the sites studied contained particularly high densities of prehistoric debris.

A walkover of the APE was conducted in October 2010 by a professional archaeologist qualified under the Secretary of the Interior Guidelines. The focus of the fieldwork was the area of the proposed Nason Street Connector, as this area has the greatest potential for intact soils and the presence of pre-contact sites. A single archeological feature was noted during the walkover: a pile of building debris, probably a collapsed outbuilding. The feature is associated with miscellaneous trash including plastic gas cans, various metal objects, and rope and it may have originally functioned as a utility shed of some sort. However, the valley slope, which is relatively gradual, offers easy access to the lower wetland areas and it is marked by occasional flat benches. The proximity of potable water in the basal wetlands and the presence of a channelized stream rising at the stormwater outfall suggest that the valley slope would have been attractive for Native American use. The ARA recognized the portion of the proposed Nason Street Connector on the west-facing valley slope (i.e., east half of the proposed roadway segment) as a location of archeological sensitivity.

Other segments of the APE have been previously disturbed, developed, and redeveloped over time, both within the right-of-way (ROW) and in areas beyond the ROW limits into which the Proposed Action will extend. For this reason, the likelihood of identifying intact archeological features in either of these areas is considered low to moderate and additional studies were not deemed to be warranted.

Phase I Archeological Site Identification Survey

The currently undeveloped and southernmost portion of the Federal Street corridor where the Nason Street Connector is proposed was identified in the ARA as being archeologically sensitive as described above. For this reason, a Phase I Archeological Site Identification Survey was completed in June 2012 and supplemental testing completed in July 2012. These surveys included the excavation of a total of 49 test pits oriented along 11 linear transects that bisected the proposed route of the Nason Street Connector.

Of the 38 test pits excavated during the Phase I Archeological Site Identification survey (each 20 inches by 20 inches in size), only one test pit was positive, returning a single piece of lithic debitage (a by-product of stone tool making or refurbishment) at a depth between 16 and 20 inches below ground surface. This test pit was located near the proposed centerline of the Nason Street Connector.

In an attempt to determine if the positive test pit was indicative of a larger and potentially significant site, 4 additional close interval test pits were completed during the Phase I survey,

each of which was negative. Supplemental Phase I testing was performed in July 2012 to better define the extent, context and integrity of the site. This testing included the excavation of 7 additional test pits and expansion of the original positive test pit to a dimension of 3.3 ft by 3.3 feet. All additional test pits were negative. One additional specimen of lithic debitage was produced from the expanded pit, indicating that minimal lithic reduction activities occurred within this portion of the APE.

3. Proposed Action

The Project will include pavement and related infrastructure reconstruction, bike and pedestrian enhancements, lighting, landscape and utility improvements. To satisfy the Project's Purpose and Need with respect to realizing the potential of multiple transportation modes in close proximity to one another, the typical roadway section for the Project corridor includes the following elements (see **Figure 2.6-2** of the EA):

- 11-foot wide travel lanes for each direction of vehicular traffic;
- 4-foot wide (min.) bicycle lanes (5-foot wide where on-street parking is provided);
- 2 to 4-foot wide grass utility strips; and
- 5-foot wide sidewalk (on both sides of the road along Federal Street, on one side elsewhere).

Depending on the age and condition of the road surface and the need to repair or relocate buried utilities, full depth reconstruction may be required. In areas where recent roadwork has been performed, road surface rehabilitation may be possible. The stormwater collection system along the entire corridor would be reconstructed during this process, with runoff collected by curbing and catch basins and routed to treatment areas. As part of making the Federal Street Corridor more attractive to businesses and residents, the City would strive to move the overhead utilities underground so they would be more reliable and unobtrusive. Street trees would be planted in the grass utility strip where appropriate, and energy efficient street lights would also be provided. Access management improvements such as driveway formalization and consolidation would be implemented, and traffic and wayfinding signage would be added and improved as appropriate.

For much of the Project area, because of constraints posed by existing buildings, the relative simplicity of the roadway segment, or the relative lack of traffic flow problems, no alternative actions were deemed possible for these improvements. However, alternative actions were assessed for two locations:

- The intersection of Lower Welden Street at Allen Street and Lemnah Drive; and

- The intersection of Lake Street at Catherine and Federal Streets.

The impacts to historic properties are focused on the latter location. This intersection is within two listed historic districts (CVR Headquarters Historic District and St. Albans Historic District) and one eligible historic district (Federal/Lake/Catherine Streets Intersection Historic District). One individually listed property is also present: the Giroux Furniture Company Building.

The Proposed Action at the intersection of Lake Street at Catherine Street and Federal Street is to signalize the intersection, with Catherine Street 1-way northbound and Market Street 1-way southbound (see **Figure 2.8-1** of the EA). This alternative includes modifications to the existing intersection geometric configuration. Improvements include the addition of continuous 5 ft.-wide bike lanes on both sides of the road, fully-actuated signal with left turn only lanes provided on Federal Street and Catherine Street, right turn only lane on Federal Street and a right turn slip lane from Lake Street to Market Street.

This alternative would improve the overall operation of the intersection. The traffic would have assigned right-of-way for each conflicting traffic movement. It does this by permitting conflicting streams of traffic to share the same intersection by means of time separation. The pedestrian facilities are better defined and the routes would be shorter than the existing condition. This alternative would provide a desirable centralized location for a municipal parking lot, or a mix of parking, green space or buildings. The Giroux Furniture Company Building would be preserved, which is not the case in other alternatives that were explored.

Additional information on the alternatives considered at these locations and the Proposed Action can be found in **Chapter 2** of the EA.

4. Nature of Project Effects to Historic Properties

Project impacts are considered minor and would have no adverse effect on the historic properties. The impacts from the Proposed Action and alternatives considered are presented below.

Impacts to each of the historic properties in the Project area that would result from the Proposed Action are discussed in this section. Maps depicting ROW takings and slope impacts to these properties are included in the EA as **Figures 4.4-1** to **4.4-8**.

<u>The CVR Headquarters Historic District</u>

The Proposed Action has several impacts to the historic district as it is currently defined. A roundabout at the intersection of Lower Welden, Allen Street and Lemnah Drive requires

shifting the centerline of Allen Street to the west to minimize impacts to residential properties on the east side of Allen Street and to achieve appropriate geometry to connect Lemnah Drive on the south to Allen Street on the north of the intersection (see **Figure 4.4-1** of the EA). This action requires taking a small portion of the west side parcel within the district on Allen Street.

Within this district, the Proposed Action also involves the demolition of three buildings in the block bounded by Lake, Catherine, Stebbins and Market Street for a municipal parking lot (see **Figure 4.4-2** of the EA). The three buildings to the south of the Giroux Building all post-date the 1924 ending date for the period of significance for the CVR Headquarters Historic District and none have any associations with the areas of significance – architecture, transportation, and engineering – for which the district was listed. As previously mentioned on page 4, we recommend that these buildings are not contributing elements to the district, as the boundaries stand.

North of the three buildings in the same block, the Giroux Furniture Company Building parcel would only be impacted by the Proposed Action through the taking of a small amount of ROW from the east (Catherine Street) side of the historic property parcel and would have slope impacts, basically re-grading, on the south side of the parcel to reconfigure the existing parking spaces.

At the northwest corner of the intersection of Federal and Lake Streets, the Proposed Action would involve a ROW taking of the parcel that contains the CVR General Office building in order to construct a required three-lane approach to the intersection from the north.

North of this intersection, there would be minor re-grading involved to the parcel opposite Center Street on the west side of Federal Street for a raised island with new sidewalks and some new parking spaces that would help define the street edge (see **Figure 4.4-3** of the EA). Further north of this area, new sidewalks would be added to the front of the parcels on the west side of Federal Street, which currently have no such amenities.

St. Albans Historic District

The Proposed Action would involve several changes at the intersection of Lake and Catherine Streets and along the east side of Federal Street near Center Street (see **Figure 4.4-4** of the EA). At the St. Albans House parcel on the southeast corner of Lake and Catherine Streets, there would be minimal use of the property during construction to reconstruct the existing sidewalk along the property's west side (Catherine Street) and north side (Lake Street). Between Kingman and Center Streets, there would be a minor impact to the district to build streetscape improvements. However, no permanent ROW impacts are proposed.

Willard Manufacturing Company Building

The Proposed Action would add streetscape improvements in front (west) of the building; there would be no ROW impact to the parcel. The sidewalk that is currently in front of the building would remain, but would be rebuilt as part of the Project.

Giroux Furniture Company Building

The Proposed Action would only take a small amount of ROW from the east (Catherine Street) side of the historic property parcel. Additionally, there would be minor slope impacts to re-grade the existing parking lot on the south side of the parcel to reconfigure the existing parking spaces.

Federal/Lake/Catherine Street Intersection Historic District

The Proposed Action would substantially reconfigure the Federal/Lake/Catherine Street Intersection, but there would be no full acquisition or demolition of any building within this district. A permanent ROW acquisition would affect the CVR General Office building on the northwest corner in order to construct a three-lane approach to the intersection from the north. The Proposed Action would also involve re-grading the south end of the Giroux Furniture Company parcel to reconfigure an existing parking lot. Additionally, there would be a minor permanent ROW acquisition along Catherine Street on the east side of the Giroux parcel in order to obtain acceptable geometry at the intersection. At the St. Albans House parcel on the southeast corner, there would be temporary use of the property during construction to reconstruct the existing sidewalk along the property's west (Catherine Street) and north (Lake Street) sides.

163 Federal Street

The Proposed Action would involve minor re-grading of the existing driveway of this property to tie into the new grade of the reconstructed Federal Street. There could also be a temporary use of a small portion of the front of the property in order to reconstruct the existing sidewalk adjacent to the parcel.

174 Federal Street

The Proposed Action would make no changes to this property.

Archeological Resources (Nason Street Connector)

The conclusions of the Supplemental Phase I study at the location of the proposed Nason Street Connector was that the limited artifact density and the negative pits excavated indicate that the portion of the archeological site within the APE is not significant. These finds may relate to a larger site area outside of the proposed corridor to the south and west. Based on the results of the Phase I and Supplemental Phase I study, no further archeological work is recommended at the location of the positive test pit and the construction of the Project will have no adverse effect on archeological resources.

5. Public Participation

Three Public Meetings were held during development of this Project, one of which was with the St. Albans City Council. A list of the meetings along with the date, locations and topics are provided below:

Public Meeting
November 10, 2010
Library, Bellows Free Academy
Local Concerns Meeting to introduce Project limits and proposed intersection improvements and solicit public comment.

Public Meeting
November 29, 2011
Library, Bellows Free Academy
Alternatives Presentation Meeting to provide residents, business owners, City officials, VTrans, and regulatory and consulting agencies with the proposed alternatives and to solicit feedback in order to identify an alternative to move forward as the Proposed Action.

City Council Meeting
December 28, 2011
St. Albans City Hall
Description of the Project Alternatives formulated through the refinement of conceptual designs, the public outreach process, and coordination with City officials, VTrans and FHWA.

6. Analysis

The Proposed Action was developed in consultation with the City, FHWA and VTrans to eliminate or reduce impacts to historic properties in the Project area, particularly the Giroux Furniture Company Building. The following features of the Proposed Action help to minimize its impact on these resources:

- To the degree possible, all improvements were designed to maintain the existing roadway alignment and to remain within the existing documented ROW.

- Demolition of the Giroux Furniture Company Building was eliminated by refining the design to use existing site access drives and roadways versus new connector roads and driveways.

- Additionally, impacts to the three historic districts in the Project area were minimized by alteration of traffic patterns in a manner that would minimize property impacts (i.e., providing one-way circulation).

7. Conditions

1) The City of St. Albans agrees to include the VTrans Historic Preservation Officer in the discussions regarding the balance of parking spaces and green spaces within the area south of the Giroux Furniture Company Building.

2) The City of St. Albans agrees that the VTrans Historic Preservation Officer will review and approve the final plans and will not proceed with the proposed work until the VTrans Historic Preservation Officer provides written approval to the final plans.

3) The City of St. Albans will insure that the entity responsible for Project construction is familiar with the content and requirements of the following sections of the Vermont Statewide Federal Aid Highway Programmatic Agreement:

    a. Section 4(I) Discovery of Archaeological Sites During Project Construction; and
    b. Section 4(J) Treatment of Human Remains.

Please sign below to indicate your concurrence with these findings.

11/20/12

Scott Newman, VTrans Historic Preservation Officer Date

11-20-12

Jeannine Russell, VTrans Archaeology Officer Date

Very truly yours,

VANASSE HANGEN BRUSTLIN, INC.

Rita Walsh

Rita Walsh
Senior Preservation Planner

Appendix H – Archeological Information

- Archeological Resources Assessment
- Excerpts from Vermont Statewide Federal Aid Highway Programmatic Agreement Regarding Discovery of Archaeological Sites During Project Construction and Treatment of Human Remains

Archaeological Resource Assessment

Federal Street Multimodal Connector Project

City of St. Albans, Franklin County, Vermont

Prepared for **City of St. Albans**
Vermont Agency of Transportation

Prepared by **Vanasse Hangen Brustlin, Inc. (VHB)**
North Ferrisburgh, VT

March 2011

Table of Contents

Table of Contents ii

List of Tables iii

List of Figures iii

List of Plates iv

Project Description and Area of Potential Effect 1

- Project Description 1
- Area of Potential Effect 1

Research Methods and Results of Review 19

- Research and Field Methods 19
- Site File Results and Context Review 20
- Walkover Field Observations 25
- Archaeological Sensitivity 26

Conclusions and Recommendations 29

References Cited 30

List of Tables

Table No.	Description	Page
1	Previously Reported Archaeological Sites	20

List of Figures

Figure No.	Description	Page
1	Site Location in City of St. Albans, Franklin County, Vermont	2
2	Federal Street Multimodal Connector Project Route Showing Project Segments and Photo Locations	3
3	Federal Street Multimodal Connector Project Route Showing Detail of Alternatives 2, 3, and 4 and Their Impact to the 'Island' Bounded by Lake, Catherine, Stebbins, Allen, and Market Streets	6
4	Federal Street Multimodal Connector Segment 5 Showing 150-foot Wide Study Corridor Boundaries Relative to Wetlands B and F Boundaries and Buffer	9
5	Segment 5 Showing Detail of Field Site 57414-CRM-01	27
6	Definition of Archaeologically Sensitive Areas	29

List of Plates

Plate No.	Description	Page
1	Segment 1, view west from Main Street at Lower Newton Street (VHB Photo: 2010-08-18-TTC_004)	10
2	Segment 1, view east from Lower Newton Street toward Federal Street intersection [right] (VHB Photo: 2010-08-18-TTC_017)	10
3	Segment 2, view south from Lower New Street toward Federal Street [left] and New England Central Railroad tracks [right] (VHB Photo: 2010-08-18-TTC_005)	11
4	Segment 3, looking north at Federal Street (VHB Photo: St. Albans_059, 10/14/10)	11
5	Segment 3, Clarence Brown Inc., gas station on east side of Federal Street	12
6	Segment 3, view southwest from Federal Street toward City Park and NECR Building (VHB Photo: St Albans_072, 10/14/10)	12
7	Segment 3, intersection of Federal and Lake streets, view east from Market Street	13
8	Segment 3, view northeast from Stebbins Street up Catherine Street (VHB Photo: 2010-08-18-TTC_054)	13
9	Segment 3, view south from Lake Street down Market Street. NECR tracks to picture right (VHB Photo: 2010-08-18-TTC_052)	14
10	Segment 3, view southwest from Stebbins Street to its intersection ..... With Allen Street (VHB Photo: 2010-08-18-TTC_057)	14
11	Segment 4, view north from the south side of Lower Welden ..... Street toward Allen Street (VHB Photo: St Albans_107, 10/14/10)	15
12	Segment 4, view north from Lemnah Drive toward bridge over Stevens Brook (VHB Photo: 10-08-2010_001)	15

List of Plates, cont.

Plate No.	Description	Page
13	Segment 4, view northwest at Stevens Brook from Lemnah Drive bridge (VHB Photo: IMGP4271, Federal St NR Survey_ Photos)	16
14	Segment 4, view southwest from Lemnah Drive toward Nason Street (VHB Photo: St. Albans_117, 10/14/10)	16
15	Segment 5, new right-of-way, view east along lower slope (VHB Photo: CSW 10/14/10)	17
16	Segment 6, view east from New Road right-of-way toward Intersection of Main Street (US ROUTE 7) and State Highway Access Highway (SASH) (VHB Photo: IMGP4323)	17

1

Project Description and Area of Potential Effect

Project Description

Vanasse Hangen Brustlin, Inc., (VHB), North Ferrisburg, Vermont, is conducting final design and permitting services for the City of St. Albans, in cooperation with the Vermont Agency of Transportation (VTrans) for the proposed Federal Street Multimodal Connector (the project), City of St. Albans (the City), Franklin County, Vermont (see Figure 1 for Project Site Map). The purpose of the project is to reduce truck traffic and vehicle delay on Main Street (US Route 7) in the City by establishing an alternative north-south route through the City. The goal of the project is to design, permit and build roadway and intersection improvements that will facilitate improved mobility for all modes of transportation including pedestrian, bicycle and vehicular, in the City's downtown. The Federal Highway Administration (FHWA) is providing a portion of the funding to the City for the design of this project. For this reason, the Project is subject to the National Environmental Policy Act of 1969, as amended (NEPA) and its implementing regulations.

This Archaeological Resource Assessment (ARA) Letter has been prepared in support of the NEPA process and Vermont's Act 250 Land Use Law, as local and state permits will be needed for the project. As of this writing, the following local, state, and federal permits may be required by the project: Act 250 land use law; Title 19 Section 1111 Utilities and Access Permit; Operational Phase Stormwater Discharge Permit; Construction Phase Stormwater Discharge Permit (NPDES); Stream Alteration Permit; Wetlands Conditional Use Determination; Section 401 Water Quality Certificate; Threatened & Endangered Species Takings Permit; and Section 404 US Army Corps of Engineers Permit. In addition, it is considered likely that an Act 250 permit amendment to the Lemnah Drive extension permit (LUP# 6F0277-8) will be prepared and filed on behalf of the City and either an Environmental Assessment (EA) or a Categorical Exclusion (CE) for the NEPA process.

Area of Potential Effect

The project route and the proposed locations of roadway and intersection improvements are depicted on Figure 2. Figure 2 also shows various photo locations which are referenced subsequently in the discussion.

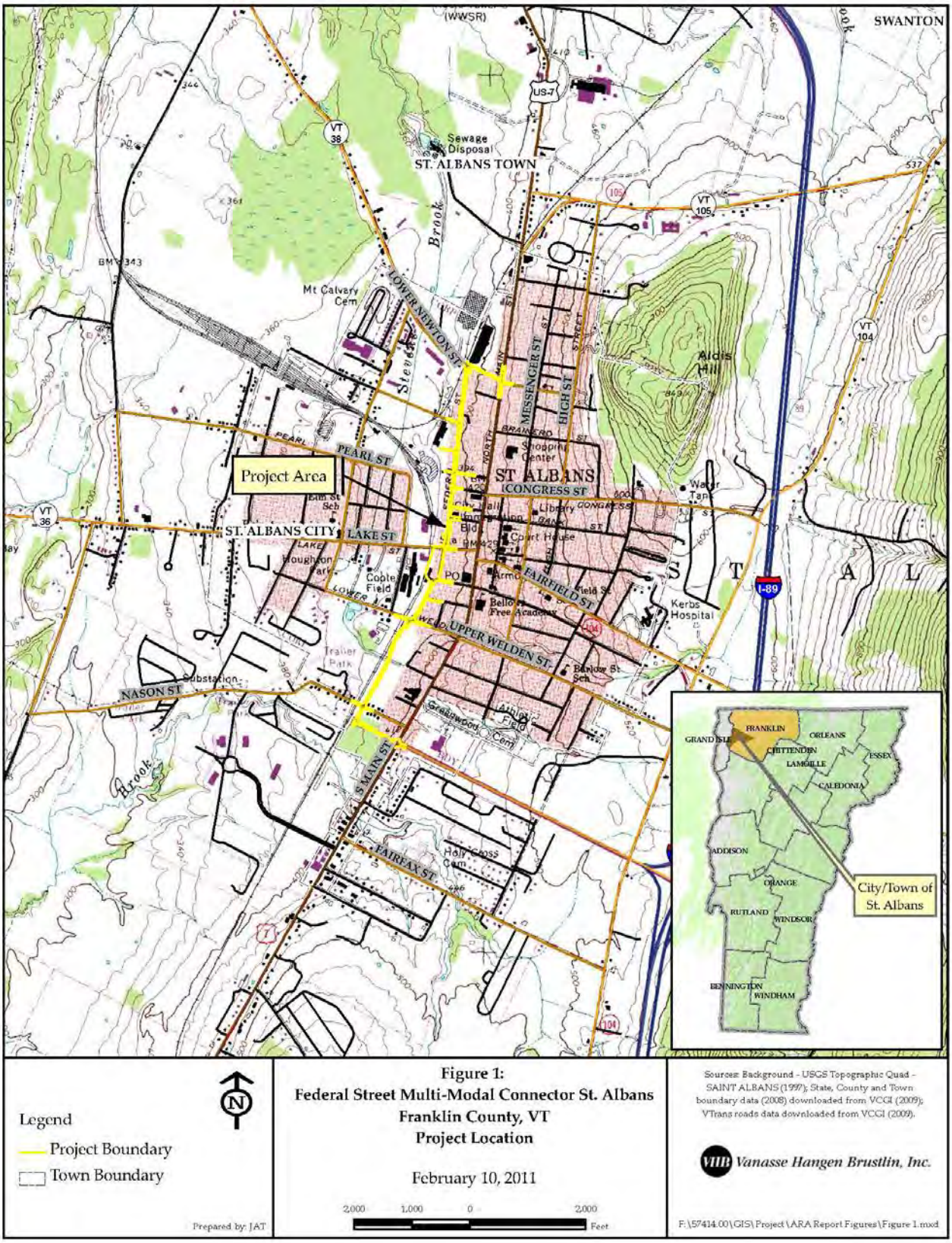


Figure 1: USGS 7.5 minute quadrangle, City of St. Albans, Franklin County, Vermont

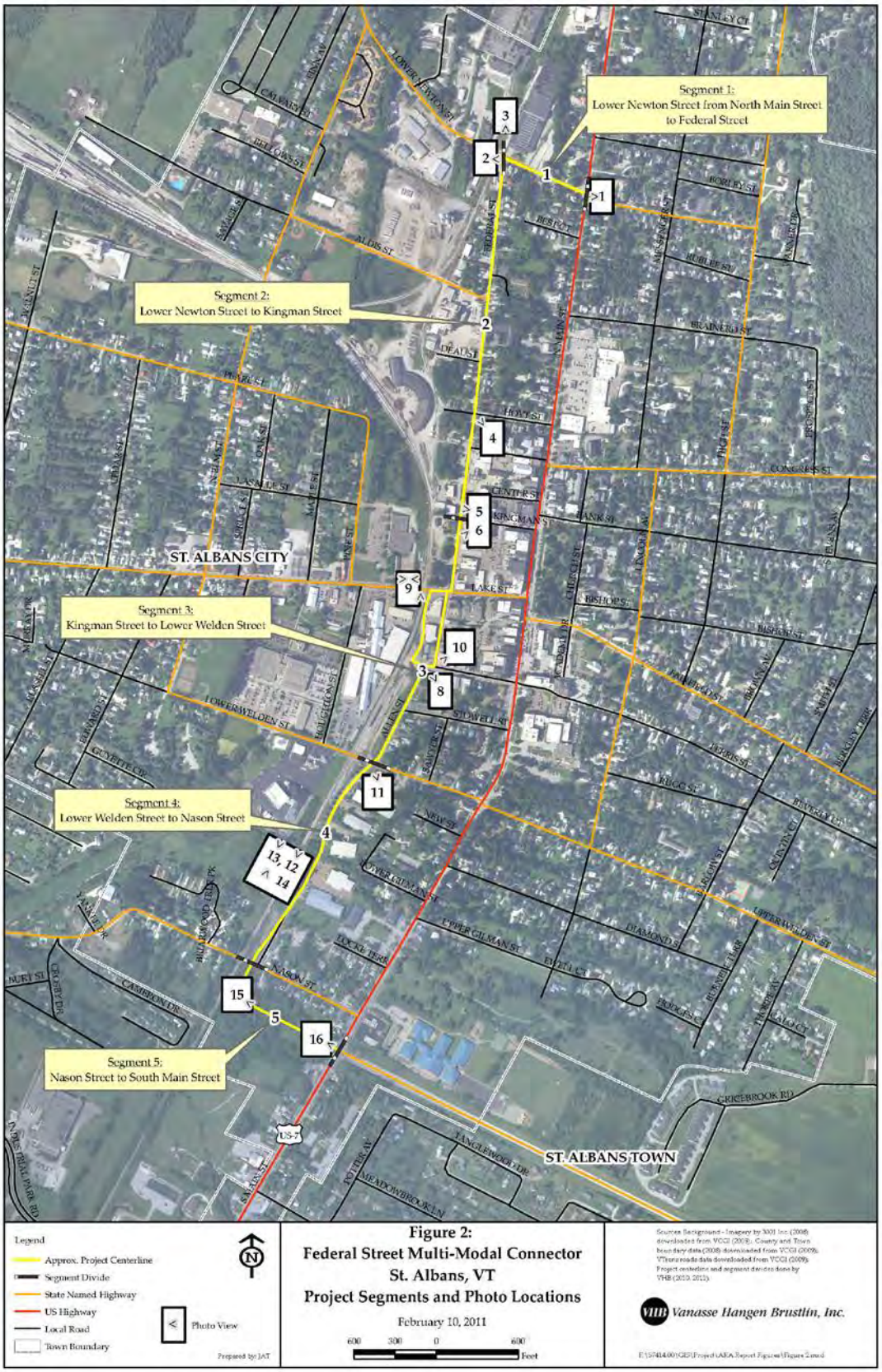


Figure 2: Federal Street Multimodal Connector Project Route Showing Project Segments and Photo Locations

The project is divided into five segments:

- Segment 1: Lower Newton Street (Vermont State Route [VT] 38) from North Main Street (US Route [US] 7) west to Federal Street
- Segment 2: Federal Street from Lower Newton Street (VT 38) south to Kingman Street
- Segment 3: Federal Street/Catherine Street/Allen Street south from Kingman Street to Lower Welden Street
- Segment 4: Allen Street/Lemnah Drive south from Lower Welden Street to Nason Street
- Segment 5: New Roadway from Nason Street/Lemnah Drive east to South Main Street (US Route 7) / St. Albans State Highway (Interstate Access Road).

The project is needed to 1) improve access and capacity for the City's downtown and its west side industrial and commercial areas; 2) reduce traffic congestion on Main Street (US Route 7); 3) improve the intersection of Lake Street, Federal Street, and Catherine Streets; 4) provide an intermodal connection between I-89 (on the east side of the City) and the New England Central Railroad (NECR) railyard transfer facility adjacent to Federal Street near Lake Street; 4) improve transit route connections and access to the Amtrak Station near Lake and Federal streets; and 5) improve bicycle and pedestrian travel along Main Street and the Federal Street corridor.

In order to address these needs, various responses are being evaluated as part of the alternatives analysis. The project cannot be implemented without changes in pavement widths, pedestrian and bicycle accommodations, and intersection modification. In addition, the project would include the creation of a new through street at its southerly end to connect the St. Albans State Highway/US Route 7 (Main Street) to Lemnah Drive (Anonymous 2010). The new roadway would alleviate truck traffic on the various residential streets that lie between Main Street (US Route 7) and the Federal Street corridor (see Figure 2).

Although plans are still in development, the project would result in the following alterations along the five segments. As will be noted, only Segments 2, 3, and 5 would entail breaking ground outside existing road rights-of-way.

Segment 1 consists of two parts: 1) the intersection of Main Street (US Route 7) with Lower Newton Street (VT 38; Plate 1); and 2) Lower Newton Street between the Main Street (US Route 7) intersection and the Federal Street intersection, a length of about 1600 feet (ft; 488 meters [m]) (Plate 2). In this segment, Lower Newton Street consists of one lane in each direction with an existing sidewalk on the south side of the street. All proposed modifications will be made within the existing ROW.

Segment 2 encompasses Federal Street between its intersection with Lower Newton Street and Kingman Street (Plate 3). In this segment, Federal Street is two-lane roadway, with an existing sidewalk on the east side. Proposed improvements to Federal Street include

constructing bike lanes and curbs on both sides of the existing street and installing a sidewalk on the west side of the street. These proposed modifications can be made between Lower Newton Street and Hoyt Street within the existing ROW. However, between Hoyt and Kingman Streets the existing ROW is 49.5 ft (15 m) wide and the proposed improvements would require an additional 10.5 ft (3.2 m) of ROW width. Where the taking/easement would occur is currently under study.

Segment 3 is comprised of three north-south legs which are slightly off-set from one another(Plates 4-9). The three streets, from north to south, are Federal, Catherine, and Allen Streets. These roads form a continuous corridor between Kingman and Lower Welden Streets. Two intersections link the off-set legs. The first is at Lake Street forming the intersection between Federal and Catherine Streets. The second is Stebbins Street which forms the intersection between Catherine and Allen Streets. As shown in detail on Figure 3, Stebbins Street deadends west of the intersection of Catherine and Allen Streets at Market Street. Market Street, in turn, connects to Lake Street west of Catherine Street, effectively delimiting a commercial parcel bounded by Stebbins and Market Streets on the south and west, Catherine Street on the east, and Lake Street on the north. Federal, Catherine, and Allen Streets are one-lane in each direction and each has an existing sidewalk on the east side. Stebbins Street also has two opposing lanes and it has a sidewalk on the north side. Market Street is a private roadway with a lane in each direction. Parking is allowed on the east side of the roadway; there are no sidewalks.

Resource Systems Group, Inc. (RSG; 2005), in the 2005 Federal Street Corridor Study Update, proposed four alternative alignments each of which affected both the Lake Street and Stebbins Street intersections. The following describes the possible changes to Segment 3:

1) Alternative 1 would close Market Street and it would upgrade Catherine Street. Stebbins Street would either terminate at Catherine Street or continue to the now-closed Market Street which would be modified to serve as a parking lot.
2) Alternative 2 closes thru traffic between Federal and Catherine streets. Rather, the traffic flow in the Federal/Lake intersection is altered so that traffic flows from southbound Federal and east and westbound Lake Street to one-way, southbound Market Street. Two-way traffic is maintained on Catherine Street but the street is restricted access servicing only the existing businesses.
3) Alternatives 3 and 4 are variations on Alternative 2, with roundabouts replacing the intersection of Federal, Lake, and Catherine Streets and the traffic flowing onto Federal, Lake, and Market Streets. Catherine Street is closed. In Alternatives 2, 3, and 4, the Giroux Furniture store building at the north end of the commercial 'island' now bounded by Catherine, Stebbins, Lake, and Market Streets would be taken and the island footprint significantly changed.

The four alternatives described above affect the intersections of Catherine, Allen, and Stebbins Streets as well. Under Alternative 1, the intersection is slightly realigned to

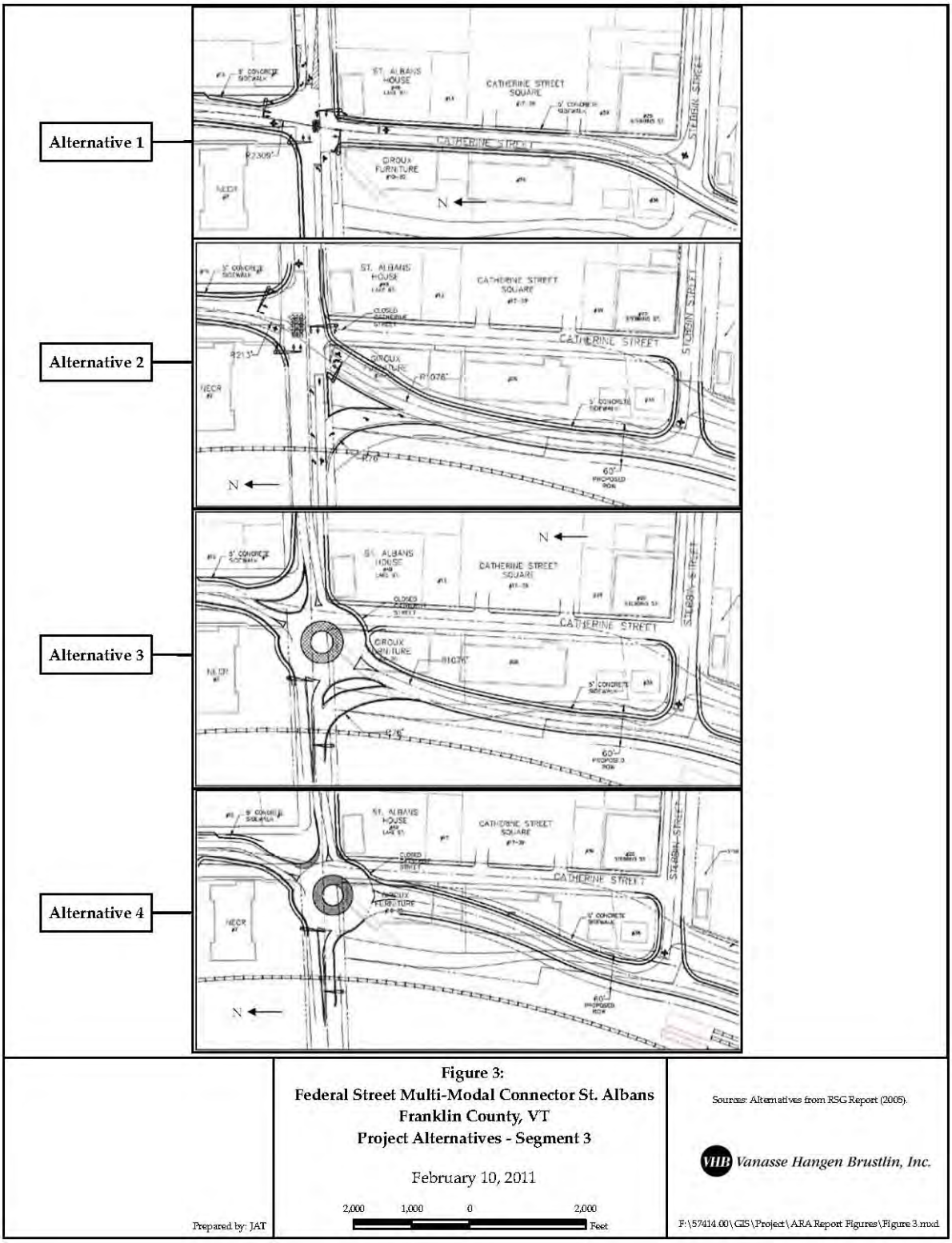


Figure 3: Federal Street Multimodal Connector Project Route Showing Detail of Alternatives 2, 3, and 4 and Their Impact to the 'Island' Bounded by Lake, Catherine, Stebbins, Allen, and Market Streets

improve the off-set alignment between the south end of Catherine Street and the north end of Allen Street. For Alternatives 2, 3, and 4, the intersection is completely re-aligned to accommodate a new alignment for Allen Street. The existing Allen Street alignment would be shifted west into the grass strip adjacent to the western edge of the existing curbline. This boundary strip is currently owned by NECR and is part of the railyard facility.

Overall, depending on the alternative chosen, the direct impacts outside of existing road ROWs would range from virtually none (Alternative 1) to multiple (Alternatives 2-4). Most of the direct impacts would result from the new alignments across the commercial island bounded by Catherine, Lake, Stebbins, and Market Streets and from the new alignment of Allen Street between Stebbins and Lower Welden Streets.

Segment 4 has three parts: Allen Street; the intersections of Allen, Lemnah, and Lower Welden Streets; and Lemnah Drive (Plates 10-14). As noted for Segment 3, Allen Street's footprint could be significantly altered under Alternatives 2, 3, and 4. At present, Allen Street is two-way with no on-street parking. A sidewalk does exist on the east side of the current street. Under the proposed project, the re-alignment of Allen Street would bring that street in-line with Lemnah Drive. At present, Lemnah Drive is off-set west of Allen Street's intersection with Lower Welden Street. The realigned intersection of Allen Street, Lemnah Drive, and Lower Welden Street would facilitate through traffic. It is proposed to have dedicated left-turn lanes on the four legs of the intersection (RSG 2005:75). Although Lemnah Drive was constructed within the last decade, sidewalk and bicycle lanes were not constructed nor was the bridge over Stevens Brook rated for truck traffic. The project would address these issues by adding a sidewalk on the east side, bicycle lanes on both sides, and by widening the existing bridge over the brook and designing the bridge to current AASHTO LRFD Bridge Design Specifications. The Allen Street modification could shift that road west westerly outside of existing ROW. The proposed modifications to the intersection of Allen Street, Lemnah Drive, and Lower Welden Street are confined to the existing ROW. The addition of a sidewalk on the east side of Lemnah Drive can be accommodated within the existing ROW.

Segment 5 begins at the south end of Lemnah Drive at that street's intersection with Nason Street and it ends at the intersection of South Main Street (US Route 7) and St. Albans State Highway (Interstate Access Road) (Plates 15-16). The intersection of Lemnah Drive at Nason Street will be upgraded to include a left-hand turn lane on Nason Street eastbound. The proposed roadway would be constructed to connect Lemnah Drive with US Route 7 and the existing St. Albans State Highway connector. The new road will have three, 11-ft (3.3-m) wide travel lanes and two, 4-ft (1.2-m) wide shoulders and it will be 1090 ft (332.3 m) long between the Nason Street intersection and US Route 7. There is no mention of sidewalks in the RSG (2005:77) description of the road. The new connector will meet with US Route 7 at a signalized intersection and new turn lanes will be developed at the US Route 7 intersection and at the St. Albans State Highway connector. Overall, the proposed developments in Segment 5 would represent the most extensive new construction on the

project. To allow for design modifications during the planning process, a 150-ft (45.7-m) wide corridor is being studied between Nason Street and US Route 7 (see Figure 4).

In summary, the project could result in direct impacts outside of existing ROWs at the following locations:

- Segment 3, Alternatives 2, 3, 4: within the area bounded by Lake, Catherine, Stebbins, Allen, and Market Streets
- Segments 3 and 4: Allen Street shift to the west on to the NECR property and outside of the existing street ROW
- Segment 4: The Allen Street, Lemnah Drive, and Lower Welden Street intersection.

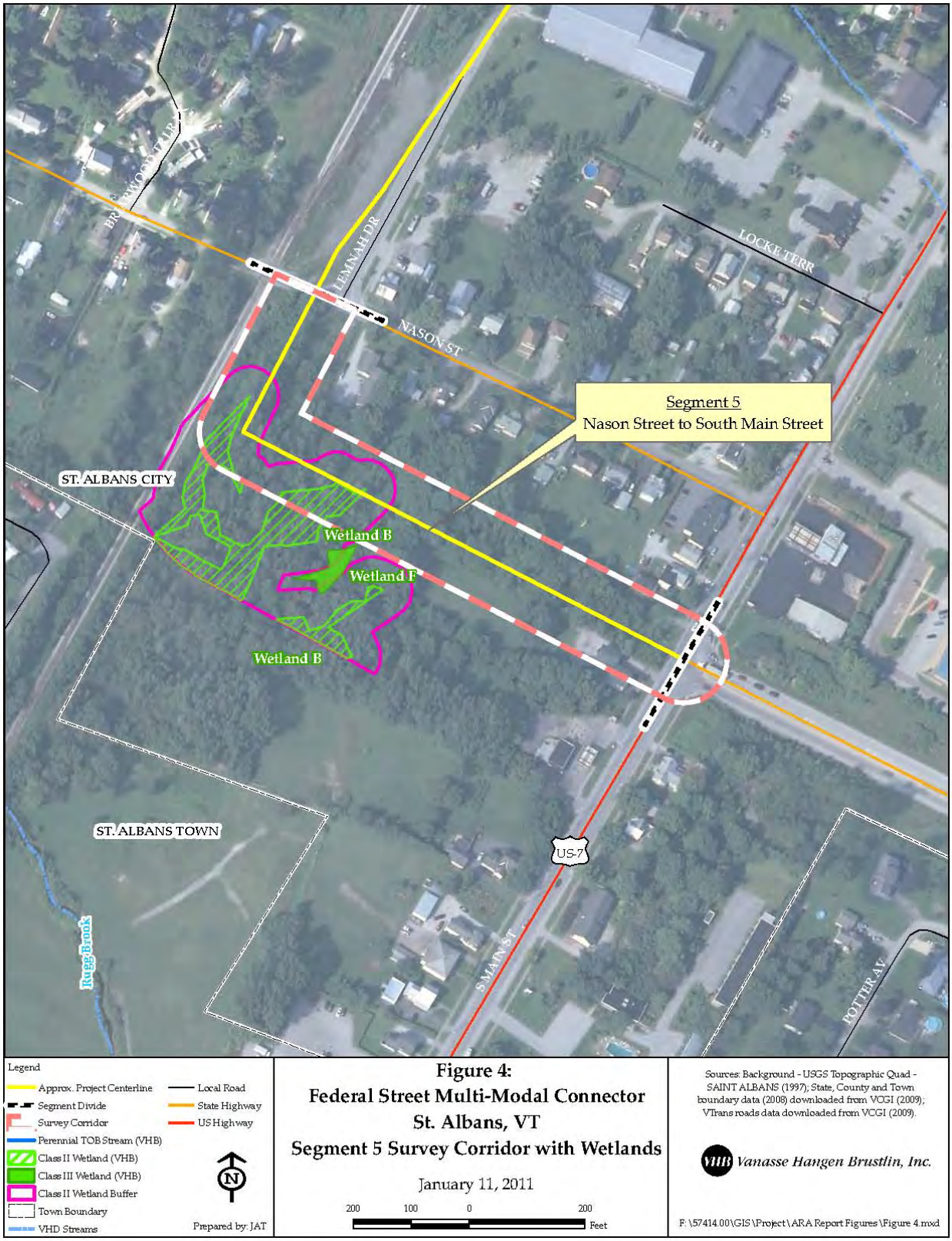


Figure 4: Federal Street Multimodal Connector Segment 5 detail showing 150-wide study corridor boundaries relative to the Wetlands B and F boundaries and wetland buffer.

Plate 1. Segment 1, view east from Lower Newton Street toward Federal Street intersection [right] (VHB Photo: 2010-08-18-TTC __017).

Plate 2. Segment 1, view west from Main Street at Lower Newton Street (VHB Photo: 2010-08-18-TTC _004).

Plate 3. Segment 2, view south from Lower Newton Street toward Federal Street [left] and New England Central Railroad tracks [right] (VHB Photo: 2010-08-18-TTC_005).

Plate 4. Segment 3, looking north at Federal Street (VHB Photo: St Albans_059, 10/14/10).

Plate 5. Segment 3, Clarence Brown Inc., gas station on east side of Federal Street

Plate 6. Segment 3, View southwest from Federal Street toward City Park and NECR Building (VHB Photo: St Albans_072, 10/14/10).

Plate 7. Segment 3, Intersection of Federal and Lake Streets, view east from Market Street

Plate 8. Segment 3, view northeast from Stebbins Street up Catherine Street (VHB Photo: 2010-08-18-TTC_054)

Plate 9. Segment 3, View south from Lake Street down Market Street. NECR tracks to picture right (VHB Photo: 2010-08-18-TTC_052).

Plate 10. Segment 3, view southwest from Stebbins Street to its intersection with Allen Street (VHB Photo: 2010-08-18-TTC_057).

Plate 11. Segment 4, View north from the south side of Lower Welden Street toward Allen Street (VHB Photo: St. Albans_107, 10/14/10).

Plate 12. Segment 4, View N from Lemnah Drive toward bridge over Stevens Brook (VHB Photo: 10-08-2010 001).

Plate 13. Segment 4, view northwest at Stevens Brook from Lemnah Drive bridge (VHB Photo: IMGP4271, Federal St NR Survey_Photos).

Plate 14. Segment 4, View southwest from Lemnah Drive toward Nason Street (VHB Photo: St. Albans_117, 10/14/10).

Plate 15. Segment 5, New right-of-way view east along lower slope (VHB Photo: CSW 10/14/10).

Plate 16. Segment 5, view east from new road ROW toward intersection of Main Street (US Route 7) and State Highway Access (SASH) (VHB Photo: IMGP4323).

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Research Methods and Results of Review

The results of background and literature review in conjunction with data from field inspections form the bases for conclusions concerning archaeological sensitivity. This chapter summarizes the results of the research methods, site file research and context review, the walkover, and the Archaeological Sensitivity GIS-based modeling.

Research and Field Methods

The background and literature review included a site file check and an on-line literature review of published sources. These included review of USDA soil and hydrological information, prior Federal Street Corridor studies (RSG 2005), and area survey reports (Frink and Hathaway 2000; Frink and Norman 1997, 1998; Koier 1977a, 1977b; Neudorfer 1977; Robinson et al. 1992). Also included was a review of various regional literature concerning applicable cultural sequences and summaries of siting characteristics. Pertinent sources include Florentin and Thomas (1993), Hartgen Archaeological Associates, Inc. (1993), Lewis (1974), and Pebbles (1984).

The site file research was conducted by Carol S. Weed, Rita Walsh, and Brad Ketterling on October 13, 2010, at the Vermont Division of Historic Resources office, Montpelier. On-line sources were accessed at various times subsequent to that visit and their dates are cited in References.

The site area walkover was completed on October 14, 2010, by Weed, Walsh, and Deborah Finnigan (VHB Deputy Project Manager). This trio walked Segments 1, 2, and 3. Weed and Walsh walked Segment 4. Weed walked the undeveloped part of Segment 5 and Walsh walked Nason Street and US Route 7 in the vicinity of its intersection with the existing St. Albans Highway Connector.

Site File Results and Context Review

Site File Research

There are no previously reported archaeological sites in the project area. The closest known site is VT-FR-29 which lies about 1 mile (1.6 kilometers [km]) northwest of the intersection of Lower Newton and Federal Streets. Other recorded sites in the site file review area are north of VT 105 (VT-FR-199), east of Aldis Hill (VT-FR-205 to 207 and VT-FR-210 to 216), or southeast of Lake Street (VT-FR-314). Summary data about each of the sites is presented in Table 1 below.

Table 1. Previously Reported Archaeological Sites Within 3 Miles of the Project

Site Designation (Field Designation)	Recorded	Site Type	Site Period	Distance to Project	Comments
VT-FR-29	1977	Chipped stone scatter: flakes and 1 scraper	Unknown period	>1 mile NW of Segment 1	Site was identified during survey for the St. Albans Interceptor Sewer Line in 1977. It was subsequently subjected to boundary definition. Site is located on the Stevens Brook floodplain about 85 ft (26 m) east of the brook. Subsurface testing resulted in the recovery of flakes within the plowzone but not below that horizon.
VT-FR-199	1989	Chipped stone scatter	Unknown period	> 2 miles NE of Segment 1	Site was identified during survey for the Vermont Segment of the Champlain Pipeline Project (Robinson et al. 1992). Site is located on a terrace immediately west of Hungerford Brook.
VT-FR-205 (UMF M13-SU22)	1989; 1990 (recorded)	Isolated Find (IF): argillite flake	Unknown period	> 2 miles NE of Segment 1	IF was identified during survey for the Vermont Segment of the Champlain Pipeline Project (Robinson et al. 1992). IF was found in a terrace of Hungerford Brook in a shovel test. Flake may have been in disturbed context.
VT-FR-205 (UMF M13-SU24)	1989	Chipped stone and historic scatter: flakes and 2 biface fragments in addition to bone, coal, glass, nails and other metal	Unknown periods	> 2 miles NE of Segment 1	Site was identified during survey for the Vermont Segment of the Champlain Pipeline Project (Robinson et al. 1992). Site is located on a Hungerford Brook terrace. Plowing and other disturbance in the general area. The historic and Native American materials apparently were not contemporary with one another.
VT-FR-207 (UMF M14-SU2)	1989	Chipped stone and historic scatter: 4 flakes, brick, glass, ceramic, and nails	Unknown periods	> 2 miles NE of Segment 1	Site was identified during survey for the Vermont Segment of the Champlain Pipeline Project (Robinson et al. 1992). Site is located on a Hungerford Brook terrace. Plowing and other disturbance in the general area. The historic and Native American materials apparently were not contemporary with one another.
VT-FR-210 (UMF M14-SU1)	1989	Chipped stone and historic scatter: 2 flakes, 1 fire-cracked rock (FCR), metal, glass, brick and coal	Unknown periods	> 2 miles NE of Segment 1	Site was identified during survey for the Vermont Segment of the Champlain Pipeline Project (Robinson et al. 1992). Site is located on a Hungerford Brook terrace. Plowing and other disturbance in the general area. The historic and Native American materials apparently were not contemporary with one another.

Table 1. Previously Reported Archaeological Sites Within 3 Miles of the Project					
Site Designation (Field Designation)	**Recorded**	**Site Type**	**Site Period**	**Distance to Project**	**Comments**
VT-FR-211 (UMF M14-SU4)	1989	Chipped stone and historic scatter: 3 flakes and ceramic whiteware, glass, and a cut nail.	Unknown periods	> 2 miles NE of Segment 1	Site was identified during survey for the Vermont Segment of the Champlain Pipeline Project (Robinson et al. 1992). Site is located on Hungerford Brook terrace. One flake and 1 whiteware fragment were recovered from the same shovel test. No context relationship between the other Native American and historic materials.
VT-FR-212 (UMF M14-SU5)	1989	Chipped stone and historic scatter: flakes , ceramic, glass, and bone.	Unknown periods	> 2 miles NE of Segment 1	Site was identified during survey for the Vermont Segment of the Champlain Pipeline Project (Robinson et al. 1992). Site is located on a Hungerford Brook terrace. Some artifacts were recovered as deep as 40-50cm below surface (bs).
VT-FR-213 (UMF M14-SU7)	1989	Chipped stone and historic scatter: flakes and 'historic material' (type unspecified)	Unknown periods	> 2 miles NE of Segment 1	Site was identified during survey for the Vermont Segment of the Champlain Pipeline Project (Robinson et al. 1992). Site is located on a Hungerford Brook terrace. Flakes and historic debris were found in separate test pits.
VT-FR-214 (UMF M14-SU9)	1989	Isolated Find:: quartz flake	Unknown period	> 2 miles NE of Segment 1	IF was identified during survey for the Vermont Segment of the Champlain Pipeline Project (Robinson et al. 1992). Site is located on a Hungerford Brook terrace. Single flake found just beneath plowzone. No other materials recovered in vicinity of this find.
VT-FR-215 (UMF M14-SU10)	1989	Chipped stone and historic scatter: 1 flake in addition to glass and nails.	Unknown periods	> 2 miles NE of Segment 1	Site was identified during survey for the Vermont Segment of the Champlain Pipeline Project (Robinson et al. 1992). Site is on a Hungerford Brook terrace. One flake recovered from plowzone; historic artifacts recovered from separate test pits.
VT-FR-216 (UMF M14-SU11)	1989	Isolated Finds: 1 flake and 1 glass fragment.	Unknown periods	> 2 miles NE of Segment 1	IF was identified during survey for the Vermont Segment of the Champlain Pipeline Project (Robinson et al. 1992). Artifacts were found in separate test pits and no relationship is implied.
VT-FR-314	1998	Chipped stone scatter: flakes and 1 biface fragment	Unknown periods	> 1 mile E of Segment 3	Site was identified during survey of proposed medical office bldg. All Native American material was recovered from the surface or plowzone. There were scattered historic debris in the field as well but they were not attributed to the site.

At least five surveys have been conducted in the vicinity of the project though none directly within any of the segments. The earliest of these surveys was completed in 1977 in support of the St. Albans sewer interceptor project (Koier 1977a, 1977b; Neudrofer 1977). The project was divided into six lettered areas (A through F) with Area A at the north and Area F at the south. The survey ran parallel, in part, with Stevens Brook (Areas A and B) and then moved overland crossing Lower Newton Street (Area C), Aldis Street (Area D), Pearl Street (Area E) and Welden Street (Area F) before terminating at Nason Street. This routing was west of the existing NECR railroad but it crossed topographic settings similar to those being crossed by

the Federal Street Multimodal Connector project. Systematic shovel testing was apparently confined to Area A though walkover was conducted of the entire project and subsurface testing was recommended for Area B. Native American chipped stone objects were noted in both Areas A and B; the remainder of the project was dismissed because of prior disturbance much of which resulted from railroad activities. Site VT-FR-29 was identified in Area A and shovel testing indicated that its cultural deposits were confined to a disturbed plowzone.

Robinson et al. (1992) reported on the results of the survey for the Vermont Segment of the Champlain Pipeline Project. The proposed line near St. Albans ran northwest to southeast north of St. Albans and then north-south east of Aldis Hill and I-89. Along this routing, the line was laying parallel to Hungerford Brook and was crossing floodplains, terraces, and intermittent drainages. Survey effort focused on pre-selected survey units which contained upwards to 23 test pits laid out on a systematic grid. The shovel testing revealed the presence of a persistent scatter of Native American chipped stone and historic debris in the survey units tested. Concentrations of prehistoric debris consisted of as few as four flakes to several dozen items though none of the sites near St. Albans had particularly high densities. The shovel testing also found a constant expression of historic debris consisting of ceramic and glass fragments, miscellaneous metal objects, coal, and occasional bone. All of these materials were attributed as field scatter and none was apparently related to specific historic buildings or structures.

In the recent decade, three projects have been completed for land development and public projects. In 1997, Frink and Norman reported on the results of a Phase IB survey of a proposed Price Chopper Supermarket site adjacent to US Route 7 about 2 miles (3.2 km) north of the center of St. Albans. The overall project encompassed about 73 acres; of this acreage, Vermont Division of Historic Preservation (VDHP) defined about 8 acres as archaeologically sensitive because of its proximity to a headwater wetland tributary to Stevens Brook. The fieldwork consisted of 109 shovel tests placed systematically in 22 clusters. No Native American artifacts were found. Historic, EuroAmerican artifacts were recovered from 18 shovel tests and were evaluated as field scatter.

Frink and Norman (1998) also reported on the testing of a an area of high archaeological sensitivity located at the northwest corner of the intersection of Fairfield Street and VT-104 east of the St. Albans city center. The project area lay adjacent to a secondary tributary of Stevens Brook on gently sloping ground. About one acre of the 4 acre area was subjected to plowing and systematic walkover. Three shovel tests also were excavated. The field investigations resulted in the recovery of 3 flakes, a biface fragment, and a small number of historic artifacts. The Native American chipped stone artifacts were designated site VT-FR-314. The EuroAmerican debris again was evaluated as field scatter.

In 2000, Frink and Hathaway completed a Phase IA sensitivity assessment of the proposed Vermont Gas System, Inc., Natural Gas Transmission Pipeline Project, Phase V, in St. Albans. The project alternatives (1 and 2) that were investigated were between Kellogg Road and Nason Street running across the outwash terraces of both Stevens Brook and Rugg Brook.

Several high sensitivity areas were defined most within 200 ft (61 m) of a permanent or intermittent water source.

Context Review

The lack of temporal diagnostics pertaining to the Native American pre-European occupations hinders conclusions by time period as to siting strategies in the project vicinity. However, it is apparent that floodplains and first terraces are preferred settings.

In general, human occupation in northern Vermont begins with the Paleoindian period at the end of the Pleistocene. It continues uninterrupted through the pre-European contact Archaic and Woodland periods, the period of European contact, and the subsequent Historic eras. Short summaries of the pre-European Contact and post-European Contract cultural sequences are presented below. The latter discussion is focused on events in St. Albans.

Pre-European Contact Cultural Sequence

Evidence for human occupation of the U.S. Northeast in general dates to about 14,000 years before present (BP), though in northern Vermont the initiation date is likely more recent. As elsewhere in the Northeast, the prehistoric sequence is divided into Paleoindian, Archaic, and Woodland; each has subperiods and phases which are regionally defined. The Native Americans in the region were effectively following Woodland subsistence patterns when European incursions began in Newfoundland in the 1100s.

Paleoindian

Evidence for Paleoindian presence in Vermont is low. Ritchie (1953) conducted investigations at the Reagan Site, near Highgate and south of the St. Albans project, in the early 1950s. Subsequent regional investigations support a conclusion that the Reagan artifact assemblage contained both Holcomb-like and Crowfield-like projectile points. The presence of these two projectile point types would support a terminal Paleoindian date for the site.

One of the only Paleoindian sites investigated in the state, the Reagan Site, is located in Highgate within one mile of the Project line. The Vermont Division of Historic Preservation (DHP) 1991 state-wide historic preservation plan notes that most Paleoindian evidence has been restricted to isolated finds.

Archaic

Subsequent Early, Middle, Late, and Transitional Archaic occupations have been identified in all of the counties intersected by the Project line. As elsewhere in the glaciated Northeast, the Archaic sites identified to date have been found within the river valleys, some in deeply stratified contexts. Other preferred site locations are wetland/swamp margins, valley floor kames and knolls, and terraces. Upland presence is not well documented and only a single rockshelter site was identified within the study corridor during the background and literature review for the Project.

The suite of Archaic diagnostics does not differ significantly from that identified in New York, to the west, and in New Hampshire, to the east. The sites encountered with confirmed or likely Archaic period components are marked by the presence of both local chipped stone materials and trade stone from both local till and bedrock sources, and from upper Hudson sources including Normanskill cherts. Some jasper and rhyolite form southern New York sources have been recovered but these occurrences are more common in southern Vermont. Other common artifact classes at the Archaic sites include fire-cracked rock (FCR) and, less frequently, groundstone. Bone and shell tools are sometimes recovered from rockshelters or middens but, as elsewhere in the U.S. Northeast, such finds are rare.

In Transitional Archaic times, steatite groundstone is documented from sites in northern Vermont. The incidence of both, however, seems very low. Soapstone varieties documented from Delaware and Susquehanna river quarries do not appear to have been traded-in to the area. Rather, sources may be local. Although Susquehanna Broads, a diagnostic projectile point form that co-occurs with both steatite and early ceramics, are present in northern Vermont along with steatite, the early ceramic types like Vinette I do not seem to appear until Early Woodland. The reasons for this are not clear in the literature reviewed but it may be related to accessibility to usable clay sources.

Woodland
The Woodland periods herald the establishment of formal villages, an increasing variety of ceramic wares and types, and expanding groundstone industries. Limited agricultural production also was in force through the era though it never replaces hunting and gathering as the preferred economic mainstay. By terminal Late Woodland, northern Vermont was occupied by the Algonkian-speaking tribes.

Native American Tribes at Contact
Native American tribal members continue to reside in northern Vermont and an Abenaki enclave community is present in Swanton. The tribes, however, were reduced in number by the early 1700s.

Post-European Contact Developments

The history of St. Albans City is folded into that of Franklin County, and the Town of St. Albans in which it is located. Parts of Vermont were claimed by the Dutch, French, and the "colonies of Massachusetts, New Hampshire and New York" (St. Albans Board of Trade [BOD] 1889:12). The so-called New Hampshire Grants seem to have taken precedence and by 1776, the Grants were treated as a separate District within the colonies. In 1791, the Grants were admitted to the new Union under the second session of Congress as Vermont (BOD 1889:13).

St. Albans, the "shire-town" for Franklin County, was chartered by Benning Wentworth, New Hampshire's royal governor, in 1763 (BOD 1889:13). By 1889, the St. Albans Board of Trade claimed that the town "stands third in commercial importance in the State" (BOD

1889:14). The township includes several islands in the St. Albans Bay portion of Lake Champlain including Ball's, Popasquash, Potter's, Rock, Ram, and Wood's (BOD 1889:14). Today's City of St. Albans was incorporated as a village by the Vermont state legislature in 1859 and at that time it encompassed about two square miles.

St. Albans banks were robbed of $208,000 by Confederates on October 19, 1864. While Canadian magistrates took the raiders into custody, they were released but not before the provincial parliament appropriated $50,000 in gold for repayment to the St. Albans banks.

By 1889, the BOD noted the following about the village of St. Albans:

> The streets of St. Albans are regularly laid out, at right angles, and beautifully shaded; and all the streets are broad. The location of the village is admirable for complete drainage. There is no swamp or sluggish stream near it. (BOD 1889: 15, 17).

St. Albans prosperity in the 1800s and 1900s was linked to the Central Vermont Railroad and then the New England Central Railroad. The Central Vermont RR headquarters were in St. Albans and from this center they managed the system's 800 miles of main line extending "from Ogdensburg, N.Y., Sherbroke and the St. Lawrence River in Canada, to Long Island Sound…" (BOD 1889:18). According to BOD (1889:20), St. Albans operations dispatched some 150 trains daily through the center which at that time encompassed some 67 acres, with two round house and 12 miles of track servicing the passenger terminal and car and machine shops.

The Central Vermont RR serviced both passengers and freight and was a primary port of entry for northern New England (BOD 1889:20). It serviced the flour, butter, and general dairy industries throughout the region (BOD 1889: 20, 22) and the dairy products were held at the St. Albans Cold Storage Company facility off of Federal Street. In addition to the cold storage facility, the village was supported by the Vermont Construction Co. (bridges), the St. Albans Foundry (machinery, castings, and iron work), and the Willard Manufacturing Co. (clothing), National Car Co. (freight cars) (BOD 1889: 36-40).

Walkover Field Observations

Segment 5 was subjected to a judgmental walkover which was completed by Carol Weed. Weed traversed the study area criss-crossing the corridor between the parcel fencelines and the southern margin. The west end of the segment was very wet and defined wetlands are present. Run-off from a channelized stream inundates the area from a drain which is located along the south margin of the corridor approximately halfway between the segment ends. Secondarily deposited debris is scattered across the wetlands and down the existing slope. Some of the debris may be coming in via the storm drain; however, much of it appears to have originated from the houses that back onto the corridor from the north.

A single pile of building debris, probably a collapsed outbuilding, was noted during the walkover. It is referenced on Figure 5 as Site 57414-CRM-01. Its location is east of Wetland B (Figure 4) and at the toe of the existing valley slope. The feature is associated with miscellaneous trash including plastic gas cans, various metal objects, and rope and it may originally functioned as a utility shed of some sort.

The valley slope, which is relatively gradual, offers easy access to the basal wetlands and it is marked by occasional flat benches. The proximity of potable water in the basal wetlands and the presence of a now-channelized stream suggests that the valley slope would have been attractive for Native American use. The historic period houses are located nearer to the crest of the ridge but have outbuildings located on the valley slope as well. The presence of the collapsed outbuilding suggests that the dry slope was utilized for various purposes in the historic era.

Archaeological Sensitivity

The project, with relatively minor exceptions, will be confined to existing road rights-of-way. For this reason, a full archaeological sensitivity assessment was not implemented. However, proximity to potable water was mapped and the results of that exercise are presented on Figure 6. The 90-meter buffer, in conjunction with other wetlands information and contour data suggests that the part of Segment 5 on the valley slope should be identified as a location of archaeological sensitivity. The other two locations of possible archaeological concern are along the grassy strip on Allen Street, an area that once hosted historic era warehouses, and Market Street between the railroad and the existing building complex south of Lake Street.

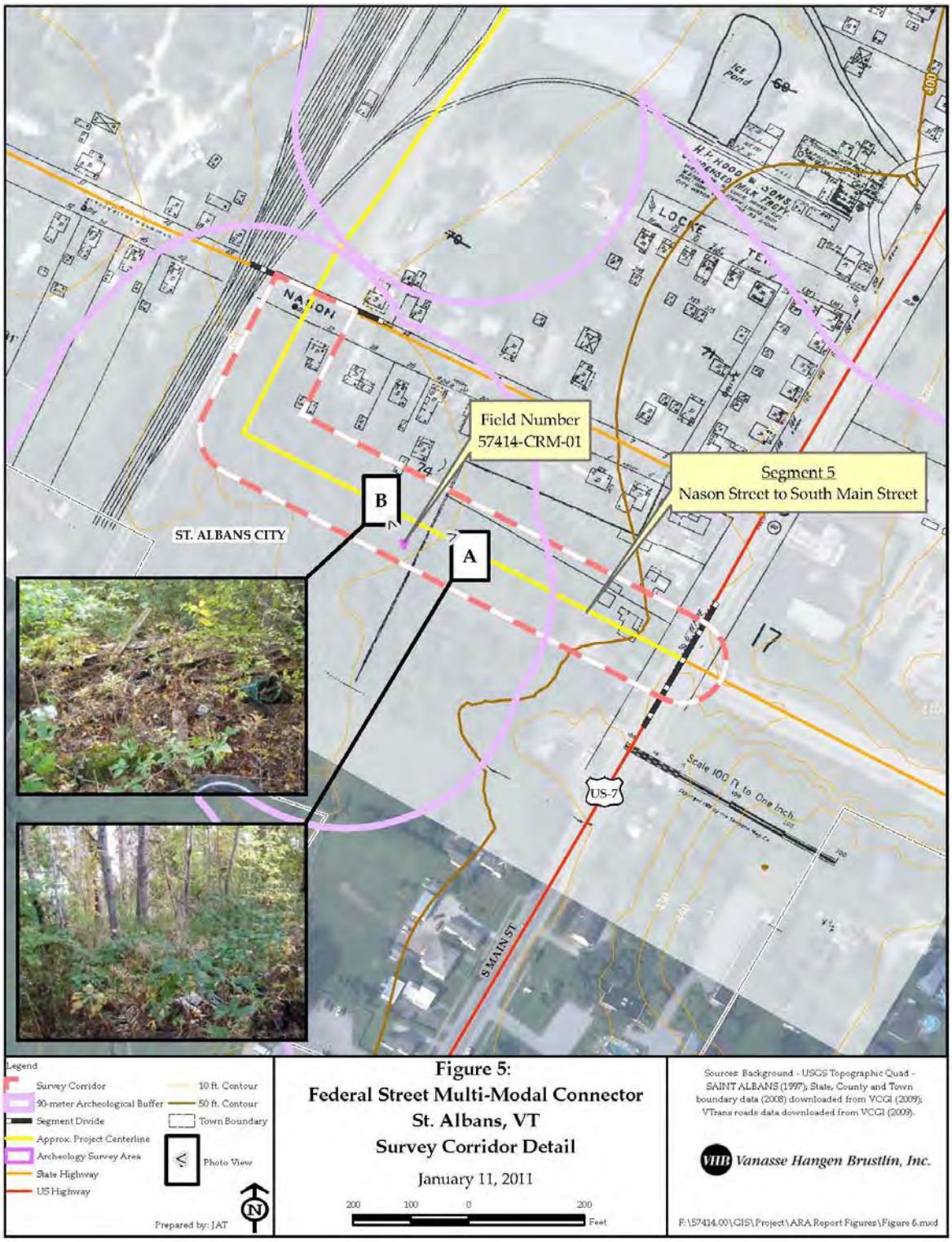

Figure 5: Segment 5 Showing Detail of Field Site 57414-CRM-01.

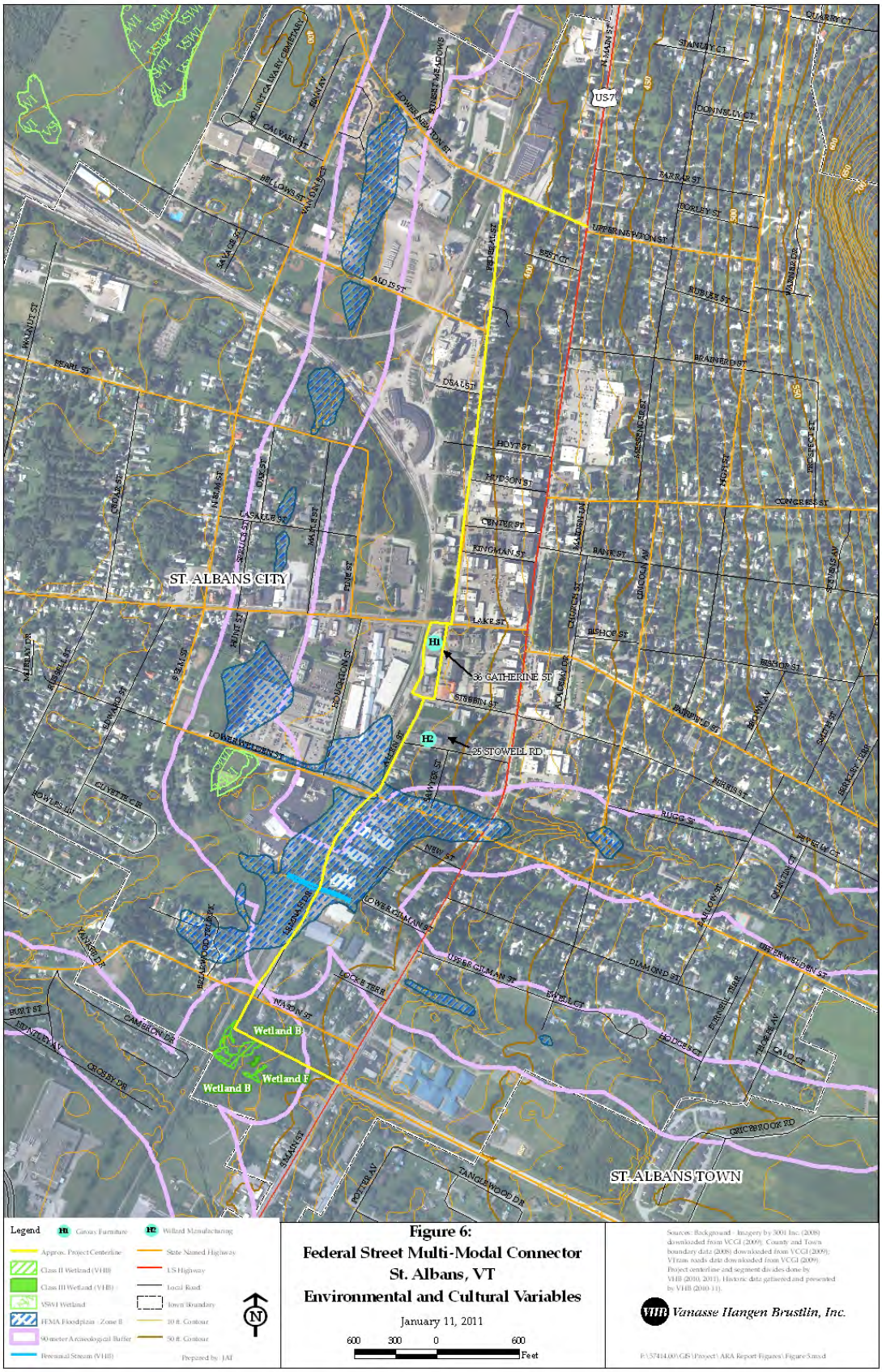

Figure 6: Definition of Archaeologically Sensitive Areas.

3

Conclusions and Recommendations

The proposed Federal Street project would, if moved forward, impact one undeveloped area south of Nason Street in St. Albans, a grassy strip along the west side of Allen Street, and possible areas of Market Street. Much of the remaining work would be confined to the existing road rights-of-way.

A single archaeological feature, a collapsed utility shed, was noted on Segment 5 during the walkover. It is without significance and further work at it is not recommended. Segment 5, however, does host an area of potential archaeological sensitivity based the presence of gently sloped land, well-drained soils, and proximity to seasonal potable water sources. It is recommended that the east half of Segment 5 be subjected to shovel testing to determine if intact soils are present.

The portion of the grassy strip along the west side of Allen Street once hosted historic warehouses. The possibility exists that the strip has been profoundly disturbed by actions resulting from both road and railroad yard maintenance. Similarly, the configuration of Market Street has changed through time as have the footprints of the buildings in the block between Market and Catherine streets. While the likelihood of identifying intact archaeological features in either of these areas is considered low to moderate, it is recommended that an Unanticipated Finds Plan be formulated prior to construction which clearly outlines the needed responses if intact archaeological features are encountered during construction.

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Examples of archaeological sites that may be discovered during project construction:

1. Native American sites that are not anticipated by the general predictive model or sensitivity studies
2. Human remains which are unanticipated
3. Foundations and other structural remains including wells obscured by later disturbances
4. Deeply buried sites in flood plains which are missed by standard testing methods
5. Historic archaeological sites which are not identified on historic maps (Beers, Wallings, etc.)

4(I) DISCOVERY OF ARCHAEOLOGICAL SITES DURING PROJECT CONSTRUCTION

Laws, Regulations, Guidelines

- 36 CFR 800.13(b) (Discoveries without Prior Planning)
- Guidelines for Archaeological Studies (1989)

Key Definitions

- *Discoveries without prior planning:* "Historic properties" (specifically archaeological sites) which are discovered, or the unanticipated effects on such properties which are found after the VAOT Archaeologist or Archaeology Officer has completed the Section 106 process [36CFR 800.13(b)].

Implementation

- The project will stop immediately if previously unidentified archaeological sites, including human remains and/or cultural items, are discovered during project construction [see also Manual Section 4(J) and 4C].
- Burials are considered archaeological sites under state & federal laws.
- The Construction Company or Resident Engineer will immediately notify the VAOT Archaeology Officer who will notify the SHPO.
- No further construction will proceed in the site area until it has been reviewed and documented according to 36 CFR 800.11.

Documentation

- The VAOT Archaeology Officer will conduct a field inspection of the site to determine its potential National Register eligibility and the project's potential effects.
- The VAOT Archaeologist or the Archaeology Officer may hire an Archaeological Consultant if additional information is necessary to determine site boundaries and NR eligibility.
- If the site is determined NR eligible, the preferred treatment is to avoid it and protect it in place.
- Site significance and treatment options should be discussed with the appropriate interested public parties and documented.
- If site avoidance is not possible, then data recovery of the site must be completed in accordance with 36 CFR 800 and the Guidelines for Archaeological Studies.
- [see also Section 4(J) if human remains are discovered]

Copies to:	FHWA	SHPO	VT AC	Env Sp	Pr Mgr	Cons	CP

Unauthorized Removal of Human Remains: a person who, not being authorized by law, intentionally excavates, disinters, removes or carries away a human body or the remains thereof, interred or entombed in this state, or intentionally excavates, disinters, removes or carries away an object interred or entombed with a human body in this state, or knowingly aids in such excavation, disinterment, removal or carrying away, or is accessory thereto, shall be imprisoned not more than 15 years or fined not more than $10,000.00 or both [Title 13 VSA Section 3761].

4(J) TREATMENT OF HUMAN REMAINS

***Note: This section applies to *any* human remains which are discovered at *any* time either during Section 106 review studies before construction or accidental discovery during construction.**
***If human remains are discovered, the project will stop immediately.**

Laws, Regulations, Guidelines

- Council Memorandum on Archaeological Burial Sites
- Native American Grave Protection and Repatriation Act, 1989 (NAGPRA)
- Native American Burial Site Preservation act of 1989
- Title 13 Vermont Statutes Annotated Sections 3761(Unauthorized Removal of Human Remains)
- Title 13 VSA Section 3764 (Cemeteries and Monuments – Grave markers and historical tablets)
- Title 18 VSA Section 5212 (Permit to Remove Dead Bodies)
- Advisory Council for Historic Preservation Policy Statements: Native American Concerns (1988)

Key Definitions

- *Burial Site:* "any natural or prepared physical location, whether originally below, on, or above the surface of the earth, into which as a part of the death rite or ceremony of a culture, individual human remains are deposited." [NAGPRA Section 2(1)]
- *Native American:* "of, or relating to, a tribe, people, or culture that is indigenous to the United States." [NAGPRA Section 2(9)].
- See sidebar for additional key definitions

Other Key Definitions Related to Native American Grave Sites

Cultural Items: human remains and
(A) *"associated funerary objects"* and
(B) *"unassociated funerary objects"* "which shall mean objects that, as a part of the death rite or ceremony of a culture, are reasonably believed to have been placed with individual human remains either at the time of death or later…" [see NAGPRA Section 2(3A and 3B) for full definitions]
Sacred Objects: "specific ceremonial objects which are needed by traditional Native American religious leaders for the practice of traditional Native American religions by their present day adherents" [NAGPRA Section 2(3C)].
Cultural Patrimony: "an object having ongoing historical, traditional, or cultural importance central to the Native American group or culture itself, rather than property owned by an individual native American…" [see NAGPRA Section 2(3D) for full definition]

Implementation

- Avoidance and preservation in place is the preferred option for treating human remains.
- The Transportation Archaeology Officer or Archaeological Consultant will evaluate the potential for burial sites or associated cultural items within the project area. If the project area is considered sensitive for Native American burials, then the appropriate Native American group(s) will be contacted. Native American groups may also notify VAOT of burial site potential concerns.
- Examples of these appropriate groups are identified as the Abenaki Self-Help Organization and the Governor's Advisory Council on Native American Affairs.
- If human remains and/or associated cultural items are discovered, the project will stop and the Archaeological Consultant will immediately contact the Archaeology Officer who will notify the SHPO.
- If human remains and/or associated cultural items are discovered during construction, the resident engineer will contact the VAOT Archaeology Officer.
- The VAOT Archaeology Officer will also contact the Town Sheriff, Town Clerk, Chief Medical Examiner and State Police as well as Native Americans when appropriate.
- If the human remains are identified as Native American, then a treatment and reburial plan will be developed in full consultation with the appropriate Native American group(s) as identified above.
- Human remains and cultural items should not be disturbed or removed from their original location if at all possible. [refer to Advisory Council Policy Statement, 1988]
- All determinations will be made or approved by the Archaeology Officer.

Copies to:	FHWA	SHPO	VT AC	Env Sp	Pr Mgr	Cons	CP

Documentation

- If human remains are identified, a written treatment plan will be developed in consultation with the VAOT Archaeology Officer, SHPO and with public parties such as Native Americans, local government and others as appropriate.
- Recovery when necessary, should be done carefully, respectfully and completely in accordance with the proper archaeological methods (as outlined in 36 CFR 800 and the Guidelines for Archaeological Studies, 1989) [refer to Advisory Council Policy Statement, 1988].

Copies to:	FHWA	SHPO	VT AC	Env Sp	Pr Mgr	Cons	CP

Appendix I – Right-of-Way Acquisition Impacts

Table I-1
City of St. Albans, Vermont
Federal Street Multimodal Connector
Anticipated ROW Impacts by Property Listing

Property ID	Owner[1]	Full Acquisition	ROW Impact Type	Impact Area (SF)	Property Type[2]
12033159	N/F CARR	No	Temporary Easement	335	Residential
22033137	N/F GRIFFIN	No	Temporary Easement	1,108	Residential
22033141	N/F MAGOON	No	Temporary Easement	561	Residential
22033143	N/F CHAMBERLAIN	No	Temporary Easement	562	Residential
22033145	N/F WILSON	No	Temporary Easement	445	Residential
22033147	N/F CARR	No	Temporary Easement	490	Residential
22033153	N/F BETH-EL COURT ASSOCIATES	No	Temporary Easement	1,894	Business
22033161	N/F SAMPSON	No	Temporary Easement	287	Residential
22033163	N/F VUCKOVIC	No	Temporary Easement	471	Residential
22033165	N/F ST. PIERE	No	Temporary Easement	392	Residential
22033173	N/F RILEY	No	Temporary Easement	1,261	Residential
22033175	N/F BILODEAU	No	Temporary Easement	510	Residential
22033179	N/F BILODEAU	No	Temporary Easement	320	Residential
22033181	N/F McMAHON	No	Temporary Easement	482	Residential
22033183	N/F HEMOND	No	Temporary Easement	515	Residential
22033185	N/F HEMOND	No	Temporary Easement	283	Residential
22033187	N/F HARVEY	No	Temporary Easement	452	Residential
22033189	N/F LANGLAIS	No	Temporary Easement	569	Residential
22033190	N/F MESSIER	No	Temporary Easement	63	Residential
22033192	N/F MASSEY	No	Temporary Easement	240	Residential

Table I-1
City of St. Albans, Vermont
Federal Street Multimodal Connector
Anticipated ROW Impacts by Property Listing

Property ID	Owner[1]	Full Acquisition	ROW Impact Type	Impact Area (SF)	Property Type[2]
22033193	N/F BOUCHARD	No	Temporary Easement	692	Residential
22033195	N/F PERRAULT	No	Temporary Easement	497	Residential
22043033	N/F TITAN PROPERTIES, LLC	No	Temporary Easement	1,546	Business
22054006	N/F PATTEE	No	Temporary Easement	864	Residential
22054009	N/F CHABOT FAMILY TRUST	No	Temporary Easement	413	Residential
22054010	N/F LAWTON	No	Temporary Easement	995	Residential
22054011	N/F BRUNELLE	No	Temporary Easement	548	Residential
22054015	N/F CITY OF ST. ALBANS	No	ROW Acquisition	280	Municipal
			Temporary Easement	2,856	
22054016	N/F BAILEY	No	Temporary Easement	564	Residential
22054018	N/F SMITH	No	Temporary Easement	516	Residential
22054020	N/F LASHWAY	No	ROW Acquisition	33	Residential
			Temporary Easement	658	
22054022	N/F BROWN	No	ROW Acquisition	894	Residential
			Temporary Easement	2,362	
22054027	N/F SAXON INDUSTRIES, INC.	No	Temporary Easement	717	Business
22054032	N/F ACTION INDUTRIES LLC	No	ROW Acquisition	798	Residential
			Temporary Easement	1,073	
22063200	N/F DANDURAND	No	ROW Acquisition	47	Residential
			Temporary Easement	787	

Table I-1
City of St. Albans, Vermont
Federal Street Multimodal Connector
Anticipated ROW Impacts by Property Listing

Property ID	Owner[1]	Full Acquisition	ROW Impact Type	Impact Area (SF)	Property Type[2]
23033044	N/F CV PROPERTIES, INC.	No	ROW Acquisition	2,453	Business
			Temporary Easement	2,073	
23033048	N/F PIGNONA	No	ROW Acquisition	133	Residential
			Temporary Easement	396	
23033053	N/F STATE OF VERMONT	No	Temporary Easement	507	State
23033056	N/F HUNGERFORD	No	ROW Acquisition	195	Residential
			Temporary Easement	353	
23033060	N/F MAYNARD AUTO SUPPLY	No	ROW Acquisition	523	Business
			Temporary Easement	1,352	
26004019	N/F BANK AMERICA	No	ROW Acquisition	84	Business
			Temporary Easement	242	
26004021	N/F BERTHIAUME	No	ROW Acquisition	125	Residential
			Temporary Easement	337	
26004023	N/F GODIN	No	ROW Acquisition	229	Residential
			Temporary Easement	551	
26004025	N/F LABRIE	No	ROW Acquisition	129	Residential
			Temporary Easement	375	
26018010	N/F AMERICANADIAN, LLC	No	ROW Acquisition	636	Business
			Temporary Easement	1,423	
26018013	N/F WHITE	No	Temporary Easement	157	Residential

Table I-1
City of St. Albans, Vermont
Federal Street Multimodal Connector
Anticipated ROW Impacts by Property Listing

Property ID	Owner[1]	Full Acquisition	ROW Impact Type	Impact Area (SF)	Property Type[2]
26018017	N/F BLOUIN	No	Temporary Easement	1,692	Residential
26018026	N/F BEVINS PROPERTY #3 LLC	Yes	ROW Acquisition	22,956	Business
26049060	N/F ST. ALBANS HOTEL, INC.	No	Temporary Easement	1,669	Business
26055031	N/F PARAH WAYNE R	No	ROW Acquisition	196	Residential
			Temporary Easement	544	Residential
26055033	N/F SLOAN RODNEY M	No	ROW Acquisition	194	Residential
			Temporary Easement	217	Residential
26055035	N/F CITY OF ST. ALBANS	No	ROW Acquisition	1,370	Municipal
26060010	N/F MASSE	No	Temporary Easement	92	Business
26060012	N/F KRILIVSKI	No	Temporary Easement	538	Residential
26060016	N/F LAWER	No	Temporary Easement	685	Residential
26060020	N/F DESLAURIERS	No	Temporary Easement	617	Residential
26060022	N/F HABITAT FOR HUMANITY	No	Temporary Easement	356	Residential
26060024	N/F DASH NO	No	Temporary Easement	228	Residential
26060025	N/F FISKE REALTY	No	Temporary Easement	34	Commercial
26060028	N/F 28 NASON STREET, LLC CONDOMINIUM	No	Temporary Easement	220	Residential
26060029	N/F MARTELL	No	Temporary Easement	155	Residential
26079180	N/F GRALNICK	No	Temporary Easement	1,000	Residential
26079182,b	N/F LUNEAU FAMILY TRUST	Yes	ROW Acquisition	7,881	Residential
26079184	N/F LUNEAU FAMILY TRUST	No	Temporary Easement	1,623	Residential

Table I-1
City of St. Albans, Vermont
Federal Street Multimodal Connector
Anticipated ROW Impacts by Property Listing

Property ID	Owner[1]	Full Acquisition	ROW Impact Type	Impact Area (SF)	Property Type[2]
26082022	N/F LEWIS	No	Temporary Easement	106	Residential
26084025	N/F WILLARD MILL HOUSING LIMITED	No	Temporary Easement	2,433	Residential
26093000	N/F CHARBONNEAU	No	Temporary Easement	2,096	Residential
26093002	N/F CITY OF ST. ALBANS INDUSTRIAL PARK	No	Temporary Easement	1,027	Commercial
26093003	N/F THREE LEMNAH DRIVE, LLC.	No	Temporary Easement	5,169	Commercial
26093004	N/F WARNER	No	Temporary Easement	5,883	Residential
26130028	N/F 28 NASON STREET, LLC CONDOMINIUM	No	Temporary Easement	513	Commercial
260840269	N/F LEWIS	No	ROW Acquisition	91	Residential
			Temporary Easement	282	Residential
22033142,c	N/F ST. ALBANS COOPERATIVE CREAMERY	No	Temporary Easement	878	Commercial
22033153,a	N/F BETH-EL COURT ASSOCIATES	No	Temporary Easement	675	Commercial
22033160,c	N/F RAYMOND	No	Temporary Easement	138	Residential
22054005e	N/F CORBEIL	No	ROW Acquisition	106	Residential
			Temporary Easement	451	Residential
22054029,o	N/F ST. ALBANS ASSOCIATES	No	Temporary Easement	303	Commercial
22063205a	N/F CORBEIL	No	ROW Acquisition	958	Residential
			Temporary Easement	2,285	Residential
23033002,b	N/F CV PROPERTIES, INC.	No	ROW Acquisition	1,777	Commercial
			Temporary Easement	3,131	

Table I-1
City of St. Albans, Vermont
Federal Street Multimodal Connector
Anticipated ROW Impacts by Property Listing

Property ID	Owner[1]	Full Acquisition	ROW Impact Type	Impact Area (SF)	Property Type[2]
23033002,d	N/F CV PROPERTIES, INC.	No	ROW Acquisition	62,934	Commercial
			Temporary Easement	5,127	
23033002,f	N/F CV PROPERTIES, INC.	No	ROW Acquisition	8,184	Commercial
			Temporary Easement	116	
			Permanent Easement	1,025	
23033002,g	N/F CV PROPERTIES, INC.	No	ROW Acquisition	1,377	Commercial
			Temporary Easement	2,486	
23033002,i	N/F CV PROPERTIES, INC.	No	Permanent Easement	175	Commercial
			ROW Acquisition	4,685	
			Temporary Easement	2,394	
23033083,h	N/F C. BROWN, INC.	No	Temporary Easement	650	Commercial
23033083,m	N/F C. BROWN, INC.	No	Temporary Easement	160	Commercial
23033083,n	N/F C. BROWN, INC.	No	Temporary Easement	372	Commercial
23033083,p	N/F C. BROWN, INC.	No	Temporary Easement	1,854	Commercial
26060026,6	N/F NASON INVESTEMENT 26, LLC	No	Temporary Easement	203	Residential
2606026,a	N/F COUTURE	No	Temporary Easement	725	Residential
26082025,a	N/F B.A. GAGE, LLC	Yes	ROW Acquisition	5,291	Commercial
26093005,a	N/F WARNER	No	Temporary Easement	520	Residential
26093005,b	N/F WARNER	No	Temporary Easement	7,943	Residential
N/A	50' ROW	No	Temporary Easement	468	Other

Table I-1
City of St. Albans, Vermont
Federal Street Multimodal Connector
Anticipated ROW Impacts by Property Listing

Property ID	Owner[1]	Full Acquisition	ROW Impact Type	Impact Area (SF)	Property Type[2]
N/A	EASEMENT RETAINED BY CITY FOR HIGHWAY	No	Temporary Easement	417	Other
N/A	Lot located between 22033175 & 22033173	No	Temporary Easement	592	Residential
N/A	Unknown	No	ROW Acquisition	1,310	Unknown
			Temporary Easement	1,291	Unknown
N/A	N/F AMERICANADIAN, LLC	**Yes**	ROW Acquisition	2,762	Commercial
N/A	N/F MASSEY	No	ROW Acquisition	184	Commercial
			Temporary Easement	355	
N/A	N/F TITAN PROPERTIES, LLC	No	Temporary Easement	812	Commercial
	Grand Total			**225,632**	

Shaded rows denote full acquisitions.

[1] Ownership data based on Assessing records obtained from the City.

[2] Property type was determined from aerial photography.

Appendix J – Hazardous Materials

Table J-1
City of St. Albans, Vermont
Federal Street Multi-Modal Connector
Potential Sources of Contamination - Hazardous Waste Sites

Site Name	Address	Site #	Priority	Contaminant	Status	Closure
UST (LUST): Courthouse	45 Kingman Street	911074	SMAC	Heating Oil	LUST Removal Revealed Contamination. MWs installed and samples were ND from 6/28/2002 sampling. MWs closed as requested.	2/19/2003
UST (LUST): St Albans Co-op Creamery	Deal Street	911110	LOW	Gasoline	Ongoing monitoring. Site in natural attenuation.	OPEN
UST (LUST): S B Collins Bulk Facility	54 Lower Welden Street	911174	NFAP	Gasoline	Petroleum contamination found at bulk plant.	5/13/1992
UST (LUST): S B Collins Bulk Facility	54 Lower Welden Street	951906	MED	Gasoline, Diesel, Heating Oil	Monitoring PCS and MWs biennially - next round fall 2013. Dissolved phase gasoline UST contamination offsite, possibly along utility corridor. No significant GW solvent impact from waste oil UST. Monitoring well network extends to CVPS site.	OPEN
UST: J&L Service Center	171 South Main Street	972257	LOW	Gasoline	Gasoline UST release in 1997. 600 gallons recovered by 1998. Excavated and disposed of approximately 257 gallons of product in 1999. Ongoing biennial groundwater monitoring.	OPEN
UST (LUST): Northwood Realty	56 Federal Street	982438	SMAC	Gasoline	USTs removed and contamination found. Follow up investigation reveals low levels of dissolved phase contamination. No further work needed.	9/30/1999
Unknown: Switchyard Shopping Center	120-129 Lake Street	992578	SMAC	Uknown	Phase II Assessment found soil and groundwater contamination. Corrective Action limits risk with property notice.	12/15/1999
AST (LAST), Batteries, Waste Oil: Clarence Brown Inc.	96 Federal Street	992646	MED	Heating Oil, Waste Oil	Four NOAVs sent due to hazardous waste handling practices. Investigation determined degree and extent of contamination. Groundwater plume towards the west from the UST area. Petroleum contamination also found from site ASTs. Some dissolved metal contamination.	OPEN
UST: St. Albans Exxon	Route 7	20022953	LOW	Diesel, Gasoline	USTs removed and contamination found. Investigation complete but contaminant concentrations still exceed groundwater standards. Ongoing monitoring.	OPEN
AST (LAST): Clarence Brown Aldis Street Bulk Plant	8 Aldis Street	20073739	LOW	Gasoline	Site file split from #992646. Bulk plant overfill and historic contamination. Free product has been cleaned up with residual contamination to soils and groundwater.	OPEN
AST/UST (LAST): St. Albans Cooperative Creamery #4 UST	140 Federal Street	20093894	LOW	Heating Oil	Soil contamination discovered during sewer work. Contamination from #4 fuel oil UST removal in 1989. Investigation or NLR required. 30 yd^3 PCS stockpiled on site.	OPEN

KEY: NA: not available, AST: above ground storage tank, ND: not detected, LUST: leaking UST, MW: monitoring well, PCS: petroleum contaminated soil, GW: groundwater
SMAC: Site Management Activity Completed, UST: underground storage tank, CVPS: Central Vermont Public Service, CAP: Corrective Action Plan,
NOAV: notice of apparent violation, NLR: notice to land record, PAH: polycyclic aromatic hydrocarbons, PCB: polychlorinated biphenyl
VOC: volatile organic compound, NFAP: no further action planned
CAP: Corrective Action Plan
Shaded sites are considered to be a potential concern to construction in the Project Corridor due to the potential presence of residual soil/groundwater contamination in the vicinity of the Study Area

Table J-2
City of St. Albans, Vermont
Federal Street Multi-Modal Connector
Potential Sources of Contamination - Brownfields

Site Name	Address	Site #	Priority	Contaminant	Status	Closure
Central Vermont Railway Inc.	2 Federal Street	770126/ 20124257	LOW	Non-petroleum	Brownfields status listed as active. CAP completed. Remediation system installed and operating. Semi-annual groundwater monitoring is ongoing.	OPEN
Leader Evaporator Co Inc	25 Stowell Street	20053412	SMAC	Lead, Other Petroleum, PAH	Lead, arsenic and petroleum contamination found in top 3 feet of surface soils. Remedial efforts included removing between 0.5 - 2 feet of surface soil and covering remaining soils with indicator fabric and clean fill. Low levels of residual contaminants in groundwater. Brownfield status listed as SMAC. NLR July 9, 2008 Book 226 Pages 249-252.	7/17/2008
Lewis Auto Body	22 Stebbins Street	20053413	SMAC	Lead, Other VOCs	Contaminated surface soils excavated, remaining soils capped with asphalt. Brownfield status listed as SMAC. NLR.	11/27/2006
Former Fonda Container Company	15-21 Lower Newton Street	20083777	MED	Chlorinated Solvents, PCBs	Brownfield status listed as active. Interim CAP to be implemented. Vapor instrusion investigation confims risk should structure be built on footprint of building #2.	OPEN
Brickyard Tavern Building	29-33 Federal Street	20083815	SMAC	Manganese, PAH	Brownfield status listed as SMAC. NLR for PAHs (soil) and metals (gw), Book 247 pgs 224-225.	7/13/2011
St. Albans Municipal Parking Lot No.1	Lake, Federal, and Kingman Streets	20083818	SMAC	Manganese, Metals, PAH	Brownfield status listed as SMAC. NLR for PAHs (soil) and metals (gw).	7/13/2011

KEY: NA: not available, AST: above ground storage tank, ND: not detected, LUST: leaking UST, MW: monitoring well, PCS: petroleum contaminated soil, GW: groundwater
SMAC: Site Management Activity Completed, UST: underground storage tank, CVPS: Central Vermont Public Service, CAP: Corrective Action Plan,
NOAV: notice of apparent violation, NLR: notice to land record, PAH: polycyclic aromatic hydrocarbons, PCB: polychlorinated biphenyl
VOC: volatile organic compound, NFAP: no further action planned
CAP: Corrective Action Plan
Shaded sites are considered to be a potential concern to construction in the Project Corridor

Table J-3
City of St. Albans, Vermont
Federal Street Multi-Modal Connector
Potential Sources of Contamination - Operational Underground Storage Tanks

Site Name	Address	Facility ID	Status	Permit Expires
St. Albans Gulf Station	190 South Main Street	560	4 active USTs, 5 removed USTs. No additional information available online.	9/1/2014
J&L Snack Shop	171 South Main Street	1423	4 active USTs, 11 removed USTs. No additional information available online.	9/1/2013
Clarence Brown Inc.	96 Federal Street	1197	7 active USTs. No additional information available online	7/31/2015
Break Yard	83-97 Federal Street	2701	5 active USTs. No additional information available online	5/31/2013
S B Collins Bulk Facility	54 Lower Welden Street	178	8 active USTs. No additional information available online	9/1/2014

KEY: NA: not available, UST: underground storage tank, LUST: leaking UST

Table J-4
City of St. Albans, Vermont
Federal Street Multi-Modal Connector
Potential Sources of Contamination - Hazardous Waste Generators

Site Name	Address	EPA ID	Status	Operational	Spill Reported/ SMS Designation
Amtrak	2 Federal Street	VTR000518332	FRGSQ	Active	Yes, SMS #770126 and #20124257
Boston Tailoring & Cleaners	46 Federal Street	VTD019128172	CEG	Active	No Violations Found
Clarence Brown Inc.	93 Federal Street	VTD019129147	CEG	Active	Yes, SMS#992646
Leader Evaporator Co Inc	25 Stowell Street	VTR000009936	CEG	Active	Yes, SMS# 20053412
Liberty Propane	43 Lower Newton Street	VTR000509661	CEG	Active	No Violations Found
Northern Vermont Oral Surgery	17 Catherine Street	VTR000505826	CEG	Active	No Violations Found
S B Collins Bulk Facility	54 Lower Welden Street	VTD982194193	FRGSQ	Active	Yes, SMS# 911174 and #951906
St. Albans Cooperative Creamery, #4 UST	140 Federal Street	VTR000004408	CEG	Active	Yes, SMS #911110
Town & Country Autobody	23 Stebbins Street	VTR000009928	CEG	Active	Past violations found, in compliance as of 2/9/12
Central Vermont Railway Inc.	2 Federal Street	VTD004860979	FRG, QNP	Inactive	Yes, SMS #770126 and #20124257
Champlain Monuments Inc.	48 Federal Street	VTR000011908	NG	Inactive	No Violations Found
City Feed and Lumber Company	44 Lower Newton Street	VTR000005207	CEG	Inactive	No Violations Found
Clarence Brown Inc.	Federal Street	VT5000002170; VTD019129147	CEG	Inactive	Yes, SMS#992646
Franklin District Court	45 Kingman Street	VTP000003160	CEG	Inactive	Yes, SMS# 911074
George S Wood Company	170 Federal Street	VTP000003790	CEG	Inactive	Status not reported
Mountain View Printing	1 Catherine Street	VTR000012633	CEG	Inactive	No Violations Found
North Country Linen Services	1 Lemnah Street	NA	NG	Inactive	Status not reported
Vermont Republic Industries	Lemnah Street	NA	NG	Inactive	Status not reported

KEY: NA: not available,
CEG: Conditionally Exempt Generator, CEGSQ: Conditionally Exempt Small Quantity Generator, NG= Non-Generator,
FRGSQ = Fully Regulated Generator Small Quanitity, QNP: Quantity not provided
List includes only RCRA facilities identified within the Study Area

Table J-5
City of St. Albans, Vermont
Federal Street Multi-Modal Connector
Potential Sources of Contamination -VDEC Spills Database

Report #	Year	Facility Name	Address	Responsible Party	Date Reported	Date Closed
WMD123	1984	N/A	Federal St	Clarence Brown Inc	9/10/1984	1/1/2000
WMD72	1985	N/A	Aldis St. Bridge	Central Vt. Rail Road	5/6/1985	5/9/1985
WMD318	1992	Handy Pontiac	Lake Street	Handy Pontiac/cadillac/buick	11/24/1992	9/1/1993
WMD248	1993	N/A	Cor Lower Welden	N/A	8/30/1993	10/1/1993
WMD176	1994	Brown Inc	Federal St	Clarence Brown Inc	5/4/1994	6/1/1994
WMD114	1994	Handy Olds/Dodge	Lake St	N/A	4/9/1994	4/9/1994
WMD239	1995	RL Vallee	Deal St	R L Vallee	8/10/1995	8/10/1995
WMD056	1996	Berno Residence	10 Lake St	N/A	2/28/1996	2/28/1996
WMD047	1996	N/A	Lake St R R Right-of-way	R L Vallee	2/21/1996	3/25/1996
WMD044	1997	Brown Station	Federal St	3-j Fuels	2/11/1997	2/11/1997
WMD365	1998	Clarence Brown Inc	Federal St	Clarence brown	9/21/1998	9/22/1998
WMD311	1998	Robert Lamus Residence	26 Lower Welden St	Robert Lamus	8/14/1998	8/14/1998
WMD468	1998	Lake Street Housing	Lake St	Anita Perry	12/22/1998	12/22/1998
WMD420	1998	Peoples Trust Co	25 Kingman St	N/A	11/16/1998	11/16/1998
WMD086	1999	Candice Billodeau Property	179 Federal St	Candice Billodeau	3/27/1999	3/29/1999
WMD257	1999	Parking Lot	Federal St	Casella Waste Mgmnt	8/4/1999	9/30/1999
WMD058	1999	S B Collins Bulk Plant	54 Welden St	S B Collins	2/23/1999	2/23/1999
WMD101	1999	Sam Brooks Residence	398 Lake St	Brooks	4/5/1999	4/20/1999
WMD385	1999	U S Post Office	Stebbins St	Paul Costello	11/10/1999	11/10/1999
WMD280	2000	Harold Ryan Property	Lake Rd	N/A	7/20/2000	7/20/2000
WMD029	2000	Kevin Bean Residence	Lake Rd	Kevin bean	1/22/2000	1/26/2000
WMD344	2001	Maquam Cove	Lake Champlain	N/A	9/3/2001	9/5/2001
WMD046	2002	N/A	132 Congress St	S B Collins	2/4/2002	2/4/2002
WMD216	2002	Bean Residence	497 Lake Rd	Kevin Bean	6/25/2002	9/27/2002

Table J-5
City of St. Albans, Vermont
Federal Street Multi-Modal Connector
Potential Sources of Contamination -VDEC Spills Database

Report #	Year	Facility Name	Address	Responsible Party	Date Reported	Date Closed
WMD287	2002	Vt Housing Authority	1113 Lake St	John Powell	9/5/2002	10/16/2003
WMD160	2003	Bay Store	585 Lake St	S B Collins	5/24/2003	5/26/2003
WMD278	2003	VT Electric Co-op	8 Lakemount Drive	VT Electric	9/15/2003	9/15/2003
WMD213	2004	Mylan Technologies	110 Lake St - Plant CF	Mylan Tech	6/19/2004	8/25/2004
WMD107	2004	Switchyard Mobil	138 Lake St	R L Vallee	3/26/2004	3/26/2004
WMD231	2005	Clarence Brown AST facility	Aldis & Federal St	S L Dudley Trans	6/23/2005	7/6/2005
WMD050	2006	Kilburn Apartment Building	583 Lake Rd	Ron Kilburn	1/31/2006	2/3/2006
WMD291	2006	Lake St Muffler & Brake	138 Lake St	Dan Gaboury	6/29/2006	7/10/2006
WMD468	2006	roadside	257 Lake St	Casella Waste	10/10/2006	10/10/2006
WMD143	2006	Clarence Brown Heating Oil	Aldis St	Clarence Brown	4/4/2006	4/6/2006
WMD461	2008	Mylan Technologies	110 lake St	Mylan Technologies	9/25/2008	9/26/2008
WMD644	2008	Mylan Technologies	110 Lake St.	Mylan Technologies, Inc.	7/28/2008	9/26/2008
WMD280	2009	Bayside Shell	585 Lake St	S B Collins	6/13/2009	6/15/2009
WMD079	2011	roadside	182 Blake St.	CVPS	2/16/2011	2/16/2011

KEY: N/A = Not Available
Shaded sites are considered to be a potential concern to construction in the Project Corridor

Appendix K – Transcript of Public Hearing

PUBLIC HEARING

FEDERAL STREET MULTIMODAL CONNECTOR PROJECT

BELLOWS FREE ACADEMY LIBRARY

WEDNESDAY, DECEMBER 12, 2012

7:00 P.M.

Reporter: Richard Forney

GREEN MOUNTAIN REPORTERS
P.O. Box 1311
Montpelier, VT 05601
(802) 229-9873 (802) 288-9578
(800) 595-9873

1 Introduction and Welcome - Dominic Cloud,
2 City of St. Albans 3
3 Summary of the Environmental Assessment -
4 Brad Ketterling, VHB 4
5 Presentation of Proposed Action -
6 Dan Peck, Greg Bakos, VHB 29
7 40
8 Public Comment Period 47
9 Summary and Next Steps - Greg Bakos, VHB 55
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P R O C E E D I N G S

MR. CLOUD: My name is Dominic Cloud. I'm the city manager for the City of St. Albans. This is a public hearing on the Federal Street Multimodal
19:06:03 Connector Project. We were discussing as we were getting going how long it's been around and whether our Planning Director, Chip Sawyer was older or the project was older. Both of them were evidently conceived around the same time.

19:06:17 Nonetheless we've come a long way. One of the most difficulties in a project like this is getting your environmental permitting straightened out, and the document we're going to talk about tonight is called an environmental assessment. It's a creature of the
19:06:30 National Environmental Policy Act, the premiere federal environmental regulatory document.

The next step is to get the Federal Government to determine that they issue what's called a finding of no significant impact, and that's your green light to
19:06:49 move to the next phase.

Our primary purpose tonight is to collect public input on this document. Our consulting engineers from VHB are going to walk you through that document in great detail and with that I'm going to turn it over to
19:07:04 the VHB team.

Thanks for coming out.

MR. KETTERLING: Thank you very much, Dominic.

So I'm Brad Ketterling from VHB and my task for the evening is to task two which is a summary of the
19:07:17 environmental assessment, and as you can probably see it's a pretty lofty task here. So I'm going to definitely hit upon the more salient points of the project and where potentially impacts may or may not occur associated with it.

19:07:32 So after I go through that I'm going to hand it over to the other component of our team Greg Bakos and Dan Peck with respect to the presentation of essentially what is the proposed action. And we have some materials over here, some full scale boards that
19:07:44 you guys can have a look at, and also a full roll plan in the back, some of you have already had a look at, to help out.

But really what it comes down to is a public comment period. That's one of the chief goals of
19:07:59 tonight's meeting, and that's to solicit input from everyone here, so that's going to be an open floor to everyone in the audience.

The one wrinkle to that is that because this is a document that's essentially owned by the Federal
19:08:12 Highway Administration who participated, of course, with

the city and with VTrans and with FHWA, they're the owner of it, so it's not a question and answer period per se. What we'll definitely be doing is, and that's why we have this gentleman here recording everything, 19:08:26 taking your comments and any questions you may have, making them part of the administrative record of this project. All of those questions and comments will be addressed and that has to go through FHWA for review. So after we go through that period, public comment period, 19:08:41 and if you have any questions along the way please keep them until that point, we'll go into the next step and we'll bring Greg back to kind of bring everyone up to speed with where the project is going.

So just before I get into this I just want to 19:08:55 make sure everyone has got or anyone who wants it the materials that we brought which is the project summary, has a map, and also we actually have the comment forms here, blank forms, which you can if you so wish make comments tonight, fill it out and leave it behind right 19:09:12 here or alternately just fold it over, tape it, put a stamp on it and send it right in to federal highways. So there's a few different options. You can give that feedback directly to us tonight filling out this form and leaving it here or filling it out and sending it in.

19:09:27 So with that I'll jump right in to the summary

of the environmental assessment, and just a little bit of a background here.

Environmental assessment is actually more than just the document that you see in front of you, it's a
19:09:39 process and as Dominic was saying the National Environmental Policy Act or NEPA requires that any federal agency conduct an environmental assessment of potential impacts when they make a federal action. In this case FHWA is going to be allocating funds to the
19:09:59 Federal Street Multimodal Connector Project. The donation or allocation of funds is the federal action in this case, so that triggers a review under NEPA. VHB was responsible for preparing the document in coordination, of course, with the city and VTrans and FHWA, and as I
19:10:15 was saying they're the owner of the project or of the document I should say.

Parts of the EA include project alternatives. A number of them were evaluated for this project and we won't necessarily go into those tonight because those
19:10:29 have been subject to public meetings in the past and they are well articulated within the EA.

One of the main things we're going to be talking about tonight is actually the proposed action which is an outcome of all of the alternative analysis
19:10:41 that we've done and gone through so far and that

proposed action was informed in great part not only by coordination with different agencies but moreover from coordination with the public, VTrans, the historic preservation officer and so forth.

19:10:56 So highlighted there at the end the public review period and hearing. Public review period is a minimum of 30 days for this EA. It commenced on the 26th of November and it's actually going to be a little bit longer than 30 days. It's going to terminate on January 4th. And through that entire time frame you can submit comments. We're right in the middle of it here. That's kind of purposeful. We put the public hearing right in the middle of it, so hopefully some of you had a chance to look at the EA before you came here and may have some particular comments to give us. So we're going to have a fairly brief discussion of the EA. I would encourage you to seek it out. Hard copies of it are available through the St. Albans Free Library, the City Clerk's Office and we actually have some CD's of it here, probably enough to cover everyone if you really need one. So I would encourage you to have a look at that and, of course, at the end of the presentation we'll have the web link to the EA where you can actually get it on line.

19:11:11 19:11:25 19:11:45

So just a quick overview of the public involvement that's happened today. There's been three

19:12:00

such meetings. Local concerns meeting just over two years ago where the project was introduced. Alternatives presentation meeting, just under or just over a year ago, November 29, 2011. At that meeting
19:12:13 residents and business owners, city officials, VTrans got together and were presented with the alternatives that have been developed to date and worked towards a proposed action. And City Council meeting shortly thereafter where the proposed action was presented and
19:12:28 endorsed by the city.

Now, beyond what we're going to be doing tonight the public hearing is actually other opportunities to comment on this project. If the Act 250 process is triggered by this project hearings can be
19:12:45 attended by those with party status. And also as we get into the presentation a little bit further you'll see that there could be potential wetland impacts associated with it that would trigger a 15 day review period with the wetland section. And similarly storm water permit
19:13:00 process as described in the EA. So there's other opportunities to engage in this process.

So just for the record, and this is articulated well in the EA, the purpose of the project, and that's three fold: To increase economic competitiveness and
19:13:15 livability in downtown St. Albans by providing an

1 efficient and convenient alternate north south route for
2 truck and automobile traffic currently using Main Street
3 U.S. Route 7. To resolve longstanding traffic flow
4 problems that have impacted the competitiveness of
19:13:30 5 commercial industrial properties using complete street
6 design principles where appropriate. And lastly to
7 harness the economic power of the multiple
8 transportation modes located in close proximity to one
9 another in an environment containing commercial,
19:13:42 10 residential, and industrial uses.
11 So armed with that purpose and use statement
12 just a brief overview of the corridor and having
13 discussed this with a few of you here I think you're
14 probably intimately familiar with it, but it runs from
19:14:00 15 the interstate access road down here with what would be
16 the only proposed new road segment, and that's called
17 the Nason Street Connector, swings to the west and joins
18 up with at Nason Street Lemnah Drive. Lemnah Drive would
19 cross over, actually currently does cross over Stevens
19:14:17 20 Brook, the only stream crossing on this project area,
21 proceeds to Lower Welden Street, Allen Street north
22 area around Market Street, Catherine and Lake Street and
23 then roughly half of the project corridor along Federal
24 Street all the way up to Lower Newton where the corridor
19:14:32 25 would rejoin Main Street.

1 So some of the, actually let me just back up
2 here. I'm sure that some of you are familiar with this
3 and especially with our board out there that the key
4 elements of this project and even at this high level you
19:14:52 5 can probably tell there's some interesting geometry
6 associated with Lemnah Drive where it comes in at Allen
7 here and I bet you most of you are familiar with that,
8 so those have been parts of the project obviously that
9 we focused our attention on.
19:15:07 10 The intersection of Lake with Federal,
11 Catherine and Market Street right here where Federal
12 Street comes in. One of the chief issues here is, of
13 course, the offset with Catherine Street that leads to,
14 and I experienced this tonight to a certain degree
19:15:26 15 coming back from having dinner, a little bit of
16 confusion and the amount of pavement too in this area
17 can be something that is confusing to motorists and lead
18 to congestion, potential collisions. This is a high
19 accident rate area. Another thing I noticed tonight is
19:15:43 20 and working in the corridor in the past is the amount of
21 building and utility obstruction for sight lines which
22 can pose problems and then crosswalks with a lot of
23 pavement and relatively little demarcation.
24 Just a few quick photographs of this. This is
19:15:58 25 on Federal Street looking south towards Catherine Street

and the offset which is pretty obvious right there.

This is just a photograph I found interesting of a little bit of the traffic conflict in progress, a truck trying to go south on Federal Street to Catherine Street. And here also the idea of having a lot of pavement and very little traffic management demarcation for vehicles coming through this intersection.

And lastly just an example of a lot of pavement for pedestrians to cross. It can be a little bit of a challenge.

And then the second intersection that we concentrated on, that of Lower Welden Street and Lemnah Drive and Allen Street, again the chief issue here is having, I'll get used to this laser eventually, the oblique intersection here. The example here in this photograph, this is looking north from Lemnah towards Allen. A couple of minutes later there's a challenge for this truck moving through that intersection and again areas of fairly expansive pavement with not a whole lot of demarcation and traffic management and a couple of pedestrians having a bit of a challenge there.

So alternatives and the proposed action and how do we develop alternatives, very briefly. As some of you probably know the Federal Street corridor is really constrained with respect to available space, so that's

1 challenging from a design perspective. The other thing
2 is preservation of historic resources and that is
3 something we understood right up front as something that
4 we had to work around. As I mentioned focused on two
19:17:45 5 key intersections where there are issues that are long
6 standing.
7 However there are certain constants associated
8 with the design of this project. The purpose and need
9 mentioned providing an alternative route. So one of the
19:17:57 10 constants that we kept was the Nason Street connector
11 providing access to the interstate via the interstate
12 access road. Nason Street connector is one of the
13 constants of the project. But of course we go beyond
14 that to corridor-wide improvements, drainage
19:18:12 15 improvements, utility, lighting, access management and
16 so on. And of course the application of a typical
17 section complete streets approach to the design and that
18 was done to satisfy the project purpose and need with
19 respect to realizing multiple transportation modes in
19:18:29 20 close proximity to one another. This is a typical
21 section that would occur along Federal Street south
22 where you have eleven foot travel lanes, a minimum of
23 four foot bicycle lanes, that's going to be five foot
24 where off street parking is provided, a grassy strip
19:18:45 25 that would range from two to four feet and sidewalks,

1 five foot wide.
2 And then this is just a closer overview of the
3 Nason Street connector. We have a print up there you're
4 welcome to have a little closer look at. Of course we
19:18:59 5 have the interstate access road there swinging around
6 connecting onto the corridor.
7 So proposed action. The two intersections I
8 mentioned. Again the EA goes into the history of the
9 alternatives that were developed there. Two alternatives
19:19:14 10 were developed at Lower Welden Street, Lemnah Drive and
11 four alternatives were developed for Lake Street at
12 Federal Street and Catherine Street. And the decision
13 for Lower Welden was a roundabout. Again we have a
14 large scale there. The roundabout is particularly well
19:19:31 15 suited for this oblique approach into Allen Street. Also
16 provides good pedestrian circulation along the outside
17 of the traveled way. And another benefit of this
18 particular arrangement is that the roundabout allows for
19 bypassing when a train is present, something that you
19:19:49 20 can't have right now. It's just a lot of stacking
21 there.
22 With respect to Lake Street at Catherine and
23 Federal this is the proposed action which would have a
24 one way, one way Market going south and one way
19:20:10 25 Catherine going north. Major improvement here is the

signalization that will be present as well as the degree of pedestrian management here. The pedestrian island should help try to diminish the amount of paved area that people have to traverse and resulting in safety
19:20:29 improvements.

So on to the environmental assessment now that we have a background of what the purpose and need of the project is and what our proposed action is at critical areas. NEPA demands that we look at a no action
19:20:43 alternative which is essentially doing nothing versus what your proposed action is. Of course no action doesn't really satisfy the purpose and need of the project so we won't really spend much time on that. We did look at a total of 17 different resource topics in
19:20:58 the EA and I'm going to touch upon six of them in discussion and then mention the other ones at the end. Of course everything is well articulated in the EA. The ones that I mention are either low impact or very minimal impact.

19:21:11 So we'll start with traffic. Obviously improving traffic conditions is one of the fundamental goals of the project so this is a particular study for us and I'll have a fairly brief overview of this, and again the EA has a lot of information that I simply can't cover
19:21:30 because of the volume that we have in there, a lot of

graphics and actually I think complete traffic study is in there. The methodology that we used was to look at 2010 and 2030 no build and build conditions.

You might be asking why 2010 and why 2030? 19:21:51 The EA has been in development for awhile and working the corridor, traffic count information has been going on, commenced in 2010, that's when the most comprehensive traffic count information was collected, September of 2010. 2030 is 20 years hence and that's 19:22:07 something, that's a recommendation of Federal Highways Administration for projects that may have a long lead time to make sure that they are designed to be dependable going forward. So that's what we, why we use those two build scenarios.

19:22:24 The key part of the study, the traffic count study, was to evaluate traffic conditions for peak morning and peak evening hours, and that would be seven to nine and four to six p.m., and one of the things that we looked at, traffic count data of course is volume 19:22:40 data, but one of the other critical issues is actually what's the quality of that flow? So we performed a capacity analysis to determine how well the intersections handle the flow that they are experiencing. The output from this is called level of 19:22:53 service, and level of service depends on roadway,

intersection geometry, travel speed, the delay people
are experiencing, freedom to maneuver, and safety. There
are six different levels of service ranging from A, the
best, to F, the worst, and it's, of course, ideal to
19:23:14 have a level of service closer to A but as we'll see in
this discussion it doesn't necessarily mean the end of
the world if you have something that's closer to E or F.
It depends on the situation. In congested traffic
situations level of service E could be perfectly
19:23:30 acceptable. It depends on the situation. To that end
traffic management signals et cetera can mitigate for
lower levels of service where site conditions are
constrained by buildings, historic structures,
environmental resources. So again the corridor has a
19:23:45 lot of constraints, a lot of built environment, natural
resources and especially historic resources. So the key
to the Federal Street project is not necessarily opting
for a lot of volume augmentation as being part of the
traffic management solution.
19:24:01 So with that, existing conditions. And I was
speaking with some folks earlier about poor level of
service and where that happens. Interstate access road
morning and evening there's a confirmation of that.
Lake, Federal, Catherine Streets intersection in the
19:24:17 evening hours, a level of service F. And Federal Street

at Lower Newton Streets in the evening is also level of service F.

So looking at 2010 conditions, no build existing conditions versus well what if we put our
19:24:31 proposed plan into the current traffic situation? Well for the Main Street downtown area there's actually a decrease in volume to capacity of 30 percent along Main Street for all of the signalized intersections in the downtown area because of the diversion to the Federal
19:24:51 Street corridor. There is one exception to that and that is Main Street at Upper and Lower Newton Streets at the intersection where it changes from upper to lower. What we see there is a level of service drop from D to C in the morning and remains at E in the evening. And
19:25:06 this highlights again why it's important to strike a balance between intersection capacity and overall quality of travel and safety. The reason why there's a slight decrease at that particular location is because the proposed project which implements what are called
19:25:24 pedestrian only phases. There would be pedestrian management at that location where they would be allowed to cross with no conflicting traffic. And also there would be also split phasing where traffic moving one direction would be allowed to move without conflicting
19:25:40 traffic from the other direction and vice versa. So what

that does is while it may diminish the level of service somewhat at this particular intersection our study has determined that being a high crash location this split phasing and pedestrian only phasing could reduce
19:25:58 accidents by as much as 33 percent, so slight obstruction in terms of level of service but major improvement in terms of safety. Again striking the balance between capacity and overall quality of travel.

2010 no build versus build for other
19:26:14 intersections. There reportedly will be three now signalized intersections, South Main Street and interstate access road. That would be a level of service F going to D. Lake Street at Federal and Catherine Street it would go from F to a D in the
19:26:29 morning and an E in the evening, and Lower Newton at Federal pretty significant improvement from F to C. This change from F to E which doesn't seem like a lot is interesting when you think about the actual delay that would happen, current conditions versus proposed. In
19:26:47 this situation the anticipated delay at this intersection would be 69 seconds, and that's substantially lower than the level of service currently which is in the unsignalized setting of 287 seconds on Catherine Street and 433 seconds for Federal Street
19:27:09 which is 7.2 minutes. So the letters sometimes don't

tell the entire story and the background.

Continuing on from there the continued unsignalized intersection of South Main Street and Maple Street. Dramatic improvement there from F to D so it's a lot easier to exit off Nason Street onto Main Street because we're having traffic diverted onto the Nason Street exit.

19:27:24

And then the proposed Lower Welden roundabout would be projected to operate at a level of service of A expected.

19:27:41

So projecting on to 2030. Quite similar results to 2010. North Main Street at the Lower Upper Newton Street intersection, that would remain a level of service E in the morning but it would drop in 2030 from E to an F and again that has to do with pedestrian management and split phasing. And then we have slight decreases for the other three signalized intersections from D to E but the important thing to note is the bottom line here that these proposed signalized intersections even in the forecast 2030 year will be well below their capacity.

19:27:56

19:28:15

So that is traffic kind of in a nutshell.

So summarizing level of service either changes favorably or whether as a decrease there's enhancement of safety issues in the corridor, especially with

19:28:31

1 respect to pedestrians crash locations and so on.
2 So moving on to noise, and a little bit of a
3 background, and the first point is probably fairly
4 obvious to most. Noise is defined essentially as
19:28:47 5 excessive or unwanted sound, anything that interferes
6 with your normal activities, sleep, work, recreation,
7 and so on. How sound is perceived by people depends on
8 a number of different variables. The two variables, the
9 two primary ones are loudness and frequency. Because
19:29:05 10 people perceive different frequencies as not equally
11 loud what we do is we use a weighted scale which is
12 called the A weighted scale, so sound, excuse me, sound
13 is measured in decibels and then it's weighted so that
14 we can evaluate environmental impacts on the A weighted
19:29:28 15 scale.
16 What we have with respect to guidelines when
17 there is a noise impact are established by the FHWA to
18 protect the public health and welfare from excessive
19 noise impacts. So sound levels are measured against not
19:29:45 20 instantaneous noise but they're averaged over a one hour
21 period and that's called equivalent continuous noise,
22 and that's what that LEQ is.
23 So the threshold for an impact as determined
24 by the FHWA is 67 dba. What does that really mean? What
19:30:03 25 can we kind of equate it to? Well I've got a couple of

1 points at the bottom. Normal speech at three feet from
2 the individual is 65 dba, so to exceed that threshold
3 you have to have somebody talking to you continuously
4 three feet away for an hour. Slightly higher. So that
19:30:20 5 gives you some kind of perception as to what that noise
6 level is. Interestingly the threshold for perceptibility
7 for the average person is three decibels and let's just
8 keep that in mind moving forward. So what did we do?
9 We measured sound levels actually with
19:30:35 10 recorders in the corridor and we used our traffic data
11 projection for modeling sound levels at other places
12 where in fact we measured it, we modeled sound issues
13 say at 19 different receptor locations and I'll go
14 through those really quickly. We broke them down into
19:30:52 15 what are called common noise environments and these are
16 determined by land use. So the first one is the northern
17 section north of Hoyt Street all the way up to Lower
18 Newton Street and that's primarily a residential area.
19 The different receptor locations are these white dots
19:31:06 20 here so you can see how they're laid out within that
21 noise environment.
22 The middle section is noise environment two,
23 which runs from Locke Terrace north to Lake Street, and
24 that's a combination of commercial and residential
19:31:18 25 development.

And then lastly we have noise environment three the southern section around the Nason Street connector and you can see there's a variety of different noise receptors clustered here as this is the only new
19:31:33 proposed roadway associated with the project.

So the results. Impacts were determined to occur actually only at one location where the Federal threshold will be exceeded and that's, I'll back up to it, that's actually right up here at Lower Newton and
19:31:59 Main Street. The model predicts that there would be a one decibel increase in sound level there. So as we saw before earlier in the earlier slide that actually won't be perceptible to the human ear at that level here.

Increases in sound level along the middle part
19:32:22 in common noise environment number two would be two decibels or below and none of them approaching being an impact. But not surprisingly the introduction of the new stretch of the roadway along Nason Street would mean the greatest changes and there would be changes to sound
19:32:38 level to those properties backing onto Nason Street and these vary from an increase of about nine decibels in the back yard of one residence to an actual decrease in the front yards of some residences and that's a little bit surprising until we remember that there's going to
19:32:52 be a decrease in traffic along Nason Street because the

connector will be active so there will be actually less traffic along Nason Street.

So the conclusion of the study was that we have one impacted area, it's only one decibel, so it's
19:33:06 not really perceptible. The location of that impact is such that we really can't do anything for it, it's fairly significant build environment. And along the Nason Street connector there's actually no impact regarding federal thresholds.

19:33:24 So historic resources. The national register listed or eligible properties they're described pretty exhaustively in the EA. There are seven within the corridor. We performed some additional studies to characterize some of these eligible properties. The
19:33:41 upshot is most of them are around the Lake, Federal, Catherine Street intersection and those really are a design challenge and especially there's Giroux Furniture Company building right here that from the very early part of the project was recognized as being something
19:34:03 that the VTrans historic preservation officer would like to have seen worked around to the extent possible. So the proposed action actually does avoid that. That building and right of way takings are limited to what is absolutely necessary to make the project work and that's
19:34:24 limited to about 2.4 acres of the Central Vermont

1 Headquarters Historic District and some limited right of
2 way takings around the Giroux Furniture Company building
3 for sidewalk and parking spots.
4 So the upshot of the historic resources is
19:34:44 5 that the project as proposed currently has been
6 evaluated by VTrans historic preservation officer and
7 determined that there is no adverse effect.
8 Acquisitions. We estimated the right of way
9 impacts and they formed three categories essentially.
19:35:00 10 New roadway and associated sidewalks, drainage and
11 utilities and building demolition. Acquisition would be
12 required along the Nason Street connector and the
13 Catherine Street building, demolition of three buildings
14 would be required for the proposed action here.
19:35:20 15 Permanent easement would be required for things like
16 traffic control and storm water infrastructure. Signal
17 pole utility boxes at Federal, Lake and Catherine Street
18 and a storm water pond at Lemnah Drive and Nason Street
19 would occur right here and that would treat storm water
19:35:40 20 runoff from the Nason Street connector as well as a
21 portion of this intersection here. And then temporary
22 easement would be estimated around five feet outside the
23 proposed limits of the right of way.
24 Here is a slide showing the red and black
19:35:55 25 hatching of the three buildings that would be taken as

1 part of the proposed action and there is a break down on
2 the area involved and that rings in at about 7.5 acres
3 total out of all three categories. From the impact
4 mitigation standpoint for those properties from which
19:36:13 5 there would be a full acquisition the demolition of
6 those three buildings they would be entitled to just
7 compensation and eligible for relocation assistance and
8 that's in accordance with the uniform act.
9 So surface water. There's only one stream
19:36:29 10 within the corridor as I mentioned earlier, Stevens
11 Brook. The project proposes to actually span it in much
12 the same way it is now making sure that there is
13 sufficient hydraulic passage there, and the only issue
14 that we want to coordinate with Vermont Fish and
19:36:46 15 Wildlife is when that work is done. There is typically
16 a time of year restriction on activities in water, so
17 that's to avoid spawning times of the year you should
18 perform your work through June 1 and October 1. So that
19 is something that we've definitely worked around.
19:37:03 20 So surface water impacts to designated streams.
21 Very minimal associated with this project.
22 Work in impaired watersheds. The project does
23 occur in two storm water impaired watersheds, that is
24 Stevens Brook and Rugg Brook, and for those that aren't
19:37:24 25 familiar with storm water impaired watersheds it's just

1 those watersheds that have been recognized that the
2 degree of development would result in potential and real
3 impacts to a lot of these streams because of sediment
4 loads, so the requirement for working in such watersheds
19:37:38 5 are pretty stringent actually. There can be no loading
6 above natural background conditions, and what that means
7 is that any redevelopment or new development within a
8 storm water impaired watershed would have to not
9 increase loading over it and that's been interpreted as
19:37:57 10 a forested area, so very very high target and we'll
11 discuss here how we'll be able to get to that.
12 Existing conditions in terms of storm water
13 treatment are pretty minimal. In fact there's a
14 combined water and sewer sanitary sewer network and
19:38:12 15 really there's very very little treatment of storm water
16 before it's discharged. The proposed action will be a
17 significant improvement over the existing conditions.
18 We would be looking to capture storm water and treat it.
19 Conceptual plan is to include in line devices to capture
19:38:33 20 sediment and also have the storm water pond right here.
21 Just doing conceptual analysis of the degree of sediment
22 decrease is a 75 percent drop in load. Just some numbers
23 that are pretty staggering. At present 18,400 pounds per
24 year of sediment are discharged. That would drop to
19:38:56 25 4,500 pounds per year, so that's a 75 percent decrease.

Again the challenge is getting to the actual background conditions is that you have to drop almost another 4,000 pounds per year so that can be accomplished either by pursuing another project within the corridor that
19:39:12 decreases sediment being delivered at Stevens or Rugg Brook or there is actually a Stevens, Rugg diversion channel offset here.

So in summary. Proposed actions should result in significant increases in water quality and major
19:39:30 decrease in loading simply by separating the sanitary sewer and water to be updated.

Okay. Wetlands. Impacts to wetlands are limited to the Nason Street Connector where there is the only new section of roadway and you can come up here and
19:39:46 have a look at this. This is the delineated wetland area and there would be an impact right here. That would be a direct wetland impact that rings in at about 1,891 square feet and then that's both federal, state jurisdiction, and then the State of Vermont puts 50 foot
19:40:08 wetland buffers on what are called class two wetlands and this is a class two wetland feature in terms of the state so there would be 14,613 square feet of buffer impact associated with the roadway there.

And that's just a screen shot.

19:40:26 Permits required. Well, right now 1,800 square

1 feet is below the threshold for reporting activity for
2 the Corps of Engineers. Of course they can use their
3 discretion, get involved in the project especially if
4 they think secondary impact would occur. All indication
19:40:43 5 from the corps is that they wouldn't claim secondary
6 impact however there would be an individual permit
7 required from the DEC wetland section and that would be
8 reviewed as mentioned earlier.
9 So quickly some other impacts. Very minor ones
19:40:58 10 at that. Wildlife. Very minimal impacts over all.
11 There's not much habitat in this area. We did a fairly
12 extensive analysis and there are no vernal pools or rare
13 species habitat here. The time of year restriction
14 we're referring to is at Stevens Brook in case the
19:41:16 15 Vermont Fish and Wildlife Department requires us to do
16 that.
17 With respect to hazardous materials, as some
18 of you are probably aware there is definitely some old
19 activities and, you know, hazardous materials in the
19:41:35 20 corridor. The densest amount seems to be just amounting
21 to a 14 percent of the corridor and that's on Federal
22 Street between Deal and Lake. So what we would do going
23 forward is conduct additional file research site
24 testing, determine responsible parties in advance of
19:41:51 25 construction and then if there's any remedial plans that

need to be developed have those in place before we start construction.

In addition we have asbestos pipe. Some of the storm water pipe apparently does contain asbestos so
19:42:03 a corrective action plan would be needed to be implemented for that.

Again hazardous materials because of the constrained nature of the corridor are something that we're not going to be able to work around entirely so
19:42:15 there are ways we can mitigate for that potential impact.

And then no impacts. There's a whole slew of them here. There are no ground water or surface water protection areas intersected by the corridor.

19:42:29 Flood plains and flood ways. The project because of the enhancement in storm water routing would almost certainly improve conditions with respect to ponded water within that, within the Federal Street corridor.

19:42:42 There are no farm lands. No threatened or endangered species.

We did an air quality analysis and determined that there are no violation of national ambient and air quality standards.

19:42:53 Parks and recreation. None.

1 Archeological resources. There was an
2 extensive study done through the Nason Street connector
3 and there was no sites identified that would be
4 threatened by this project. All the same what will be
19:43:11 5 developed is called an unanticipated finds plan.
6 Essentially if the contractor does find something during
7 the course of construction there's a protocol that goes
8 into place that makes sure the construction ceases, and
9 so there are safeguards there for archeological
19:43:28 10 resources even though this area has been cleared.
11 And then lastly environmental justice. That
12 refers to regulations that forbid any disproportionate
13 and adverse effect on either low income or minority
14 populations, and the analysis that's outlined in the EA
19:43:46 15 they determined that there are no such impacts
16 associated with this project.
17 So that is an overview of the environmental
18 assessment and with that I'm going to hand it off to
19 Greg.
19:44:03 20 MR. BAKOS: Thank you, Brad. If I can find the
21 file. I'm actually going to stay seated here because I'm
22 going to run the slides. Actually I'm going to pan and
23 zoom and do all of that within the drawing. And thank
24 you for all coming tonight. I'm glad to see some
19:44:26 25 familiar faces from previous meetings where we talked

about alternatives. So for a lot of you this isn't new. Just a little bit about my background. I'm a highway engineer, responsible for the ultimate design, final design on this project. Brad is an environmental
19:44:43 scientist, and Dan Peck here is a highway engineer. And we're going to get into a little bit of detail about the proposed action. I'm going to give more of an overview and describe how we are satisfying the purpose and need and before I get into the details I just want to mention
19:44:59 that this plan was developed to a design level sufficient to assess the environmental impacts. This is not a final design product at this point. What that means is after the EA is complete and we have our finding of no significant impacts we'll be developing
19:45:18 more detail in the plan. There will therefore still be room to make minor changes to the plan. But at this point the alignment is fixed, the overall concept has been established.

So some of the comments we hope to receive from
19:45:37 you tonight we're going to record and take forward into the design stage so please don't hold anything back. So let me try zooming in a little bit.

I'm going to start at the south end of the project. Beginning at the interstate access road coming
19:46:12 in from the east to Lower Main Street. Today this is a

three way intersection, and the proposed improvement is to make it a four way intersection. So essentially there will be a new connector to get down to the Federal Street corridor. We're calling it the Nason Street
19:46:32 connector just for no better name at this point. Another piece of that is we would have a traffic signal. There is no traffic signal there today. The traffic signal will basically control traffic movements. By doing so we believe there would be an improvement in the
19:46:52 overall safety because today it's largely uncontrolled. You only have a stop sign for the approach from the interstate and what happens with a stop sign is during congested periods people get frustrated if they've been waiting for a long time and they eventually take
19:47:12 chances. So we believe that the signal by implementing methodical controls will eliminate a lot of that. And with a signal we're able to really control the flow. It's like, consider it pipes in your house. We can kind of control which way the cars have the easiest path. So
19:47:35 if we're finding that there is more delay on Main Street than we would like we can give Main Street a little more green time and vice versa the other way. If we're trying to get people to use the Federal Street corridor as the alternative north south route we can actually make it
19:47:55 more convenient for them by improving the green time to

do that. So traffic signals provide a lot of benefits. And this Nason Street connector -- I can answer your question. Yes.

MR. BEAN: Are we going to ask questions
19:48:11 during this or --

MR. BAKOS: You know, we're supposed to only take comments tonight. However, if I say something that requires clarification that you don't understand I would like you to feel free to ask.

19:48:21 MR. BEAN: Okay. Thank you.

MR. BAKOS: So do you just want to hear clarification or do you have any --

MR. BEAN: Well there's one question. There doesn't appear to be any crosswalk going across Main
19:48:32 Street at that intersection.

MR. BAKOS: Correct.

MR. BEAN: Obviously that must be on purpose.

MR. BAKOS: Correct. There are crosswalks nearby and, you know, Jeff, I don't remember the exact
19:48:47 reason at this location, but it was intentional, and I think it has to do with the fact that there are no, there are no sidewalks on the interstate connector so there's really no reason for somebody to go up there, and we would like to cross them elsewhere, like towards
19:49:06 the school down here, but that can, your question will

be recorded and in case that was an omission we'll make sure it's looked at.

MR. BEAN: Thank you.

19:49:20 MR. BAKOS: So this is a new alignment which means we're going over undeveloped surface work to get down to the corridor. You notice this big striped out widened area here. That's because that's a fairly tight radius and we have trucks coming around the outside the rear wheels actually track off of the normal 12 foot
19:49:41 lane and they would cross that, they would cross the center line if we didn't have enough room for them to track around the corner.

So how are we addressing purpose and need? We've now made it more convenient for vehicles to enter
19:49:55 the corridor. We've taken them off of what is a residential street and which is one of the routes that things like trucks and cars are currently using to get down to this area of the city. So we've made an improvement already. At this intersection the Nason
19:50:17 Street intersection the Federal Street corridor would actually have no stop sign. The side streets would stop and there is no traffic signal warranted at this location. So it's basically free flow around the corner like that.

19:50:37 Heading north I want to point out first the

replacement of the bridge that is currently located where my hand is over Stevens Branch or Stevens Brook. We're going to relocate it off line. It makes it simpler. You can maintain traffic on the existing
19:50:56 roadway while you do it. And it allows us to create a buffer by realigning the roadway to the west. We're now able to create a buffer away from these businesses. What you have today is the roadway is really where my hand is going across and there are frontages which have
19:51:20 a lot of parking, the parking is wide open to the roadway. There's like no separation between the parking fields and the roadway. So by moving the roadway away we can now have or do what we call access management. You have entries into parking lots as opposed to cars parked
19:51:41 right along the street. We also end up with a greater green space and very importantly a continuous sidewalk. Today because of all of that parking field adjacent to the roadway there's very little sidewalk. People end up having to cross wide open paved areas on foot. So by
19:52:07 moving the road we've improved a number of things.

MR. BEAN: The actual proposal for the culvert is to keep it the same size and not make it wider?

MR. BAKOS: Yes. Correct. That's the current proposal. By wider you mean the opening that the river
19:52:23 feeds. The current plan is to keep it roughly the same

as the opening that the existing bridge has, and part of the reason for that is hydraulically in flood situations the railroad opening is actually smaller than the existing or the proposed opening under the roadway. So
19:52:44 the railroad opening is the constriction so water backs up as a result of that. The capacity of the proposed culvert is not in question. Would some day the railroad culvert get replaced? Possibly. And at that time maybe it would be enlarged. So as we get into final design
19:53:06 we'll need to look at should we upsize the roadway culvert as well? We'll think about that.

As we go further north some more access management. Defining entrances to parking lots, continuous sidewalks, continuous bike lanes on both
19:53:23 sides of Federal Street as the typical section shows, and then coming into the Lower Welden roundabout which Dan will explain in a little more detail how the roundabout functions especially in relation to the railroad track which is right there, the active track,
19:53:42 and the fire house which is right there currently.

Heading north some more we made an effort after the last meeting to realign Allen Street further to the west. Previously it was pretty much where the existing roadway is, but this was in response to the residents'
19:54:05 comments saying that they would like a little more

buffer between the roadway and their homes both for aesthetics and for the feeling of safety, reduced noise as well as the ability to enter and exit their driveways. So this will provide them a little bit better
19:54:22 sight distance from their drives and a little more space to wait before they come out into the road. So that's an enhancement.

And now we get to the crux of the matter, the central intersection with Federal and Lake Street and
19:54:40 Catherine Street and Market Street. This is where the biggest bottleneck occurs today. It will also be in the future one of the more congested areas, but I think we've managed to improve that. Dan will get into a little bit more about how we did that by making
19:54:58 Catherine Street one way north. It's currently two way. It's currently one lane in each direction and we found that we actually need two lanes northbound so there was not, not the ability to have it remain two way, so to compensate for that Market Street then would become
19:55:14 southbound in this area.

Now, you'll notice this big parking field in the middle roughly a hundred spaces proposed. We eliminated the buildings in the middle and showed this concept. I want to stress that this is a concept, this
19:55:31 is not necessarily the final concept of what would

1 happen in this infield. This kind of becomes dead space
2 because you have the roadway circulating around it. And
3 we felt that parking in this part of the city would be
4 very valuable to the city and the people using or the
19:55:50 5 people developing and or using existing facilities
6 around here. The parking would be very valuable. With
7 some of the alignments we would be, with some of the
8 roadway changes we would be losing parking for the
9 historic Giroux building, so we had to compensate them
19:56:09 10 to begin with for lost parking and make it up in here.
11 Now this could be reduced, the paved area could be
12 reduced. We could put something else in the way of a
13 public facility, a park, a building, storm water
14 treatment facility, you name it, so that land is still
19:56:26 15 up for grabs, but the current proposal is to focus some
16 new parking here.
17 MR. BEAN: Wouldn't the elimination of most of
18 that parking though help with the no loading above
19 natural background conditions? I mean that seems like a
19:56:40 20 lot of pavement runoff going into the stream.
21 MR. BAKOS: Yes. There's actually more green
22 space here than exists today. There's more green space
23 shown here than exists today. You have building
24 rooftops, you have parking areas all around it. If we
19:56:59 25 reduced it, certainly we would reduce the impact even

more, but this is a, this is a no net gain in runoff design right now. We do have some green space over here that we've already talked about maybe doing some underground storm water treatment and that kind of thing.

19:57:21 Lake Street, Federal Street will become signalized similar to the other signalized intersection I described. It will address the safety issues primarily. You're now going to control the movement. Motorists safety first off. Again as Brad noted it's kind of a free for all. You have offset intersecting roadways and it's a high accident location, so adding a signal, improving the number of approach lanes will improve that.

19:57:38 And I think just as importantly we're now going to formalize where all of the crosswalks are. Some of them are now going to become shorter. They will all be signalized so that you'll now have walk cycles for the pedestrians. So an overall benefit in multimodal safety through the intersection.

19:57:56 Maintaining some on street parking where these businesses are as we head north. And then getting into our typical section again where we have sidewalks both sides, bike lanes both sides, green strips for utilities for trees. The occasional crosswalk, this particular

19:58:17

19:58:35

one was at Alden Road.

MR. BARBER: I can't see.

MR. BAKOS: Sorry. This is a route that we heard at previous meetings goes up to the school so
19:58:53 having a crosswalk here is very important. The project does not include going up that roadway with any other types of improvements. We believe you know in the future the state would probably address the need for sidewalks up there, but it's not under the scope of this project
19:59:09 to go that far afield.

And then heading north to Lower Newton another traffic signal, similar situation. You want to make it safer for both cars and pedestrians by having walk cycles for the pedestrians and regulating the movement
19:59:27 for the cars.

We kind of widened this intersection out a little bit to allow for the heavy truck use that some of these businesses generate so that the right turning trucks can get around that corner. We did not take any
19:59:42 homes though. We were able to maintain the number of homes in that area.

And then heading up to North Main Street. Completely redoing the existing traffic signal. The one that is out there is fairly antiquated and nonresponsive
19:59:56 to the approach roadways, so we can improve operations a

little bit through just modernizing and through improving some of the turning radii there as well.

So I think I've hit on most of the proposed improvements operationally. I want to mention too that
20:00:16 from the quality of life perspective we will be doing some limited landscaping throughout the corridor, addressing some of the aesthetic issues. I think there's a potential anyway to maybe put some of the overhead utilities underground. We'll be looking at
20:00:33 doing all new street lighting. This corridor is very deficient on roadway lighting, especially towards the southern end and that's a safety factor. It's a quality of life factor to now come through with adequate and attractive street lighting.

20:00:51 I've already mentioned bikes and access management. There will be in tandem with this a lot of infrastructure improvements as needed. Dan, you can probably talk about some of the construction methods and things that we're considering to improve sewer, water,
20:01:09 drainage, that kind of thing.

I will turn it over to Dan to get back into a little bit more detail and then after we're done we'll open up to questions. So don't fall asleep entirely. Do you want to run this.

20:01:32 MR. PECK: As Greg mentioned I just wanted to

highlight a couple of the key features of the proposed action for this corridor. Beginning at the Nason Street connector what we tried to do was we have, again we have an 11 foot travel lane and four foot bike lane and we
20:01:48 tried to maintain enough one or two features we tried to account for was concerns with the abutting property owners. We maintained enough grass space to potentially include some sort of aesthetic privacy fencing or potential landscaping to act as an additional buffer to
20:02:13 these property owners along the Nason Street connector once it comes down to the Lemnah Drive intersection.

As Brad had mentioned earlier we also are proposing some sort of storm water treatment facility, not facility but a designated area for storm water
20:02:29 treatment because we are adding a significant amount of new pavement through this corridor and this was designated here as that location, and as Brad mentioned what we're considering is some sort of a pond or a settling basin and that would collect impervious runoff
20:02:50 from Nason Street, also some from Lemnah Drive and also some from South Main Street up here.

We're also through here we have, we've shown proposed landscaping, trees, we've also shown lighting along the corridor. Again this is just to show what is
20:03:11 possible along this corridor. These aren't final

1 locations. Obviously property owners abutting this
2 corridor can make decisions on where they want
3 landscaping if they want any at all.
4 Through the Stevens Brook as Greg mentioned we
20:03:31 5 are significantly shifting the project or the roadway to
6 the west which allows us to work off line. Our current
7 proposed structure spanning Stevens Brook is a concrete
8 box similar to what they have today with also an open
9 channel bottom. Again it is mostly off line so we'll
20:03:55 10 allow for an ease of traffic use through this corridor.
11 We can work mostly off line and traffic delay should be
12 minimized.
13 Coming to the Lower Welden Street roundabout
14 it is a hundred and ten foot what we call an inscribed
20:04:15 15 diameter roundabout which is a single lane roundabout
16 and inscribed is defined from this paint line here to
17 this paint line here. This gray area here is what's
18 called a truck apron and that allows for large tractor
19 trailer vehicles to make the movements but it prevents
20:04:35 20 smaller passenger vehicles from, they're not going, it's
21 a raised apron two inches roughly, so large tractor
22 trailer vehicles can mount that pad but passenger
23 vehicles will avoid it. And it provides active
24 deflection because we want to slow vehicles down coming
20:04:56 25 into the roundabout so they just don't zip through the

intersection because again we are changing it from a stop controlled, it will continue to be a natural flowing circular movement.

We've provided and I'm going to show additional
20:05:13 raised truck apron here and that allows for emergency vehicles exiting here to exit and enter the roundabout. No issues. And again because of the railroad crossing so close to the roundabout if there is a train that is blocking traffic it provides movements for vehicles to
20:05:41 divert elsewhere.

As Greg mentioned through here we are providing green space here. This Allen Street will become one way heading north to Catherine Street and one way south on Market Street to Allen Street. Capacity for
20:06:01 a signal here required that we have a two lane approach here so what it is a two lane section today so we had to make this a two lane section here and to avoid well also avoiding the Giroux building. As you can see we're also with this intersection layout it's also going to require
20:06:24 significant utility relocations and modifications including poles, underground telephone, sewer, water, and drainage as well and we would also separate the storm water and sewer to the extent possible that we could through this intersection.

20:06:46 As we extend northerly through here we get

back to our typical section. Let me get back to here. You can see this white two double white line section here. This is a designated bike lane because we don't want bicyclists coming into the intersection and what it
20:07:06 does is allows them to go straight through the intersection without having to, without having a potential conflict with vehicles turning right, so they go straight through the intersection and vehicles turning right are to the right of them and they would
20:07:21 also run parallel with vehicles continuing down Market Street.

MR. BEAN: How will they continue or how will they turn onto Lake Street if they're westbound?

MR. PECK: Turning left onto Lake Street?

20:07:34 MR. BEAN: Turning right onto Lake.

MR. PECK: They would stay in the right lane.

MR. BEAN: They would go with the cars.

MR. PECK: This just provides them safe passage across without having a conflicting right
20:07:45 turning vehicle.

MR. BEAN: Is there a bike lane that they have on to turn right?

MR. PECK: No. They would --

MR. BEAN: They would have to cross?

20:07:54 MR. PECK: They would be in the right turn

lane. They would share the right turn lane with the vehicle.

Extending north we get back into our typical eleven foot lane four foot bike lane. We identified this
20:08:14 area as a location for a possible another storm water treatment location. Existing conditions show that there is a closed system through here that discharges or exits through here so we acquired a right, a permanent right or we're looking to acquire a permanent right to do some
20:08:35 sort of treatment in this location.

Through this corridor north of Kingman Street we tried to maintain the back sidewalk along the eastern side as much as possible. The existing geometry of this road and the grading are going to be a difficult
20:08:56 challenge because it's so flat and the eastern side is significantly higher than the western side of the road so that's one of the things that we would look at when we continue our design of this corridor.

As Greg mentioned we are maintaining what's
20:09:15 called essentially a mid block crossing. There's an existing one there today so we maintain that crossing through here.

As we extend northerly again this becomes a signalized intersection. Capacity analysis for a new
20:09:31 signal requires a two lane approach, so we had to open

up this intersection significantly for one reason only is to get trucks, large trucks to make this right turn movement without encroaching on any vehicles that may have queued up in the passing lane or getting onto the
20:09:51 Federal Street corridor, and again we were able to do that without any takes. It does require a significant, not a complete take of the property right near the corner, and also a take of this corner as well and that's for right turning trucks.

20:10:12 Along Lower Newton Street we were constrained by vertically at the intersection but also relative closeness of the property along the right of way. We also we had to reduce the typical section to two foot shoulders which is basically what's out there today.
20:10:32 What we, the only basically what we've done here is widened the road to essentially account for a three lane section through here so essentially it's a left turn lane heading west and that turns into a left turn lane getting onto North South Main Street. So from edge of
20:10:52 pavement to edge of pavement is 36, 37 feet.

The only, we continue to maintain the signalized intersection at Lower Newton and Main Street. Really the only thing we did was allow for larger turning vehicles to make this movement, so we've opened
20:11:11 up this throat here and here. We've also maintained

1 crossing here. Originally today it crosses right here.
2 We just pushed it to the side and we've maintained this
3 pedestrian crossing here as well.
4 Again what Greg mentioned before was this
20:11:30 5 project is going to require some significant utility
6 modifications, sewer, water, pole relocations, I'm sure
7 there's some underground telephone as well. So as part
8 of our continuing advances with this project we would
9 address all of those issues and move forward.
20:11:53 10 And with that I will hand it over to Greg who
11 will talk about the next steps.
12 MR. BAKOS: Actually I think Brad is going to
13 open it.
14 I do want to mention that we envisioned the
20:12:06 15 project to be constructed in phases partially due to the
16 economic realities of funding a project this large, and
17 if we do develop it in phases the Lake Street Federal
18 Street intersection is likely to be the first targeted
19 project. It has independent utility, in other words it's
20:12:27 20 a project that would on its own even if the rest didn't
21 get completed would have a lot of benefit and it kind of
22 makes sense to fix that one where it's kind of a show
23 point before you open up the rest. So that's our current
24 thinking now, but that's a couple of years away.
20:12:58 25 MR. KETTERLING: So with that presentation by

Dan and Greg we're going to open the comment period on the floor for you to contribute to the NEPA process as it were. So at this point please feel free to make any comments or questions. In terms of format just state
20:13:18 your name for the record. If it's a question for clarification as Greg was saying we can answer that. Typically though comments aren't addressed at this time. They're taken and recorded and a formal written response is prepared as part of the environmental process.

20:13:38 MR. BARBER: My name is David Barber and I noticed I had reviewed the draft at the library and I also noticed in your presentation you didn't have a traffic count on Stowell Street and yet in the proposal you proposed on Allen Street that there will be when
20:13:57 you're heading south a designated turn queuing up lane to go onto Stowell heading east on Stowell towards South Main and as I live on Sawyer Street and I had requested that traffic counts would be, two years ago I requested and a year ago I requested that both means that traffic
20:14:16 counts be conducted on Stowell and Sawyer and now you're designating a turn lane onto Stowell from Allen and yet you didn't provide any traffic counts on Stowell or Sawyer. Are you just assuming that even though you provided a turning lane, a designated turning lane, that
20:14:36 no one is going to take that option to cut from the

connector down to Stowell maybe Sawyer to get to the signalized intersection on the corner of Lower Welden and Main? I just, that was one major concern that I had.

20:15:04 MR. BAKOS: Thank you

MR. BEAN: I've got a whole barrage of questions so I'll try to go as quick as possible.

MR. BAKOS: Sir, state your name.

MR. BEAN: Jeffrey Bean. Left hand turn onto

20:15:19 Nason Street, is that to be eliminated if you're northbound on Main because presently the connector is the Nason Street bypass or indicated as being and I'm sort of curious how traffic is going to be handled attempting to make that left hand turn onto Nason

20:15:40 Street. Is that to be eliminated as part of this?

MR. BAKOS: I guess I can answer that as a clarification. The current plan does not eliminate the ability to make that turn. There is consideration possibly making Nason one way. I think practically

20:16:01 speaking that turn is still feasible to make, but I'm not sure who would ever do it when they have the ability to take the new connector road more or less free flow. I can see the people that live there absolutely would probably still want to use that. I think what people

20:16:22 will find is that when traffic is queued up across that

entrance that they're going to take the connector instead.

MR. BEAN: The Nason Street section eastbound just west of the railroad tracks you're showing a cross
20:16:39 or the stop bar or the stop sign there. How are you handling any type of back up because of the railroad crossing at that particular intersection? I mean that's being addressed on Lower Welden but obviously due to the access I would imagine that there's going to be an
20:16:59 increase of traffic west of the railroad or of the Federal Street corridor. There may be a reduction of traffic east of it but west of it I would imagine it would increase because it's going to be quicker to get onto the interstate. So I'm sort of curious how that
20:17:16 particular intersection is going to be handled.

MR. BAKOS: Yes. Typical signs do not block traffic.

MR. BEAN: Is there any weight limit that's proposed to be placed on Lake, Kingman, the other
20:17:33 streets, Stebbins because of the fact that this is essentially going to be used as a truck route? That's one of the things that we're trying to do is to eliminate the heavy trucks on Main Street. But is there going to be any type of weight limit placed on those
20:17:48 streets that a truck let's say coming from the co-op

1 won't be able to turn onto Kingman like they presently
2 do? So somewhere along there I would imagine weight
3 classes would be addressed not just there but also on
4 Main Street once this is completed to make certain that
20:18:05 5 the heavy trucks aren't continuing to use Main Street in
6 the same fashion that they currently are. The Alder
7 Street is not showing much improvement in addition to
8 what was previously talked about and considering the
9 volume of children that are coming from the city school
20:18:25 10 for field trips, et cetera and also considering that
11 most of the other intersections are being addressed
12 adequately I'm sort of curious the reluctance of
13 addressing Alder Street as part of this whole project. I
14 know it wasn't scoped out as that but it just seems like
20:18:46 15 it's an appropriate time to address it.
16 MR. CLOUD: Can I give a comment to that?
17 Given the repeated advocacy for that from the community
18 if we tie it up in this project it will get done much
19 much later than if we proceed independently with city
20:19:05 20 funding and there's funding afoot which is designated
21 presently. So folks look at it and say we're not doing
22 that section again and the reality is that it's being
23 treated separately and it will be done much quicker as a
24 free standing project than it would as part of this.
20:19:28 25 MR. BEAN: That's what I was hoping to hear.

The MS-4 requirements that are obviously being placed on both the city and town considering the impaired waterways and obviously I've seen signs of storm water mitigation is part of this project primarily
20:19:43 with the new section of roads and also there's the impact of the wetlands. I'm sort of curious how aggressive we really are at proposing this. I've heard a few instances where it's being considered but I would think that the viability of this project would be almost
20:20:02 totally dependent on our ability to mitigate and not only mitigate but to improve our storm water situation so I would have to make that comment that that should be part of this whole process.

The last item is the, I don't know, there's one
20:20:23 more. The north Upper Newton Street North Main Street intersection. Currently that is one of these intersections that Wal Mart improvements were to be made on. How does that affect this particular design or is this design being incorporated as part of their
20:20:43 improvement process?

MR. BAKOS: Is that clarification?

MR. BEAN: Yes. How does it feed into it?

MR. PECK: They're not redundant. The requirements of the Wal Mart permit have been
20:21:06 incorporated into the design.

1 MR. BEAN: Okay. The last thing is would you
2 consider, and this is more of an opinion or than
3 anything else, would you consider this a required tool
4 to justify our proposed state improvements to make it
20:21:26 5 viable?
6 MR. PECK: No, I would say or I would frame it
7 a little bit differently in that now with the creation
8 of the TIF district we have the real, very real
9 potential to actually build this thing. The TIF is kind
20:21:50 10 of a sea change. It makes this significantly much more
11 likely of actually happening.
12 MR. BEAN: So would you consider this more the
13 egg than the chicken, because obviously this is, the
14 improvements we're looking for this is to make this
20:22:07 15 particular part of the city more viable and for the
16 traffic flow and obviously with the TIF district and the
17 proposed amount of investment going in here TIF is going
18 to be needed to make that realized or viable, and at
19 least in my opinion, and so I would, that's why I'm sort
20:22:28 20 of curious if this gets held up for any reason do you
21 think there may be an adverse effect to improvements
22 that we're proposing for our district for this TIF
23 district? Is one going to affect the other?
24 MR. PECK: There's a tremendous amount of nexus
20:22:46 25 between this public project and the private investment.

I wouldn't say that one hinges entirely on the other, but they're inextricably linked.

MR. BEAN: Thank you. That's it.

MR. BARBER: One last question. Again for the
20:23:16 record what was the proposed width now of the design of the green belt on the east side of Allen Street segment, provides safety, added safety for the residents there? What was that proposed green belt?

MR. PECK: It's currently, I think we expanded
20:23:36 it to the neighborhood of 16 to 18 feet.

MR. BARBER: Thank you.

MR. YOUNG: Jeff Young. I have just a couple of questions. Are we going to mandate truck traffic onto this street?

20:23:54 MR. PECK: We haven't made that decision yet.

MR. YOUNG: And the other thing is on the settling pond there on the Nason Street connector part, is that absolutely necessary? Are there other technologies that can be used to eliminate that?

20:24:14 MR. PECK: There are multiple potential treatment practices we can utilize there. Proprietary products or products. A storm water pond is deemed most feasible at this location.

MR. BAKOS: Again for the sake of understanding
20:24:37 environmental impact I think the pond would have the

1 greatest footprint so we went with that for now and if
2 we want to reduce that or come up with other solutions
3 then we can do that.
4 MR. PECK: There are solutions where we can
20:24:49 5 look to reduce our overall proposed impervious impact to
6 the surrounding area which Vermont usually calls credit.
7 Or just credit. Certain locations of an impervious
8 area. So that area could potentially get a lot smaller.
9 MR. YOUNG: I just think that we've been trying
20:25:14 10 to work out a lot of plans. The ponds are ugly and there
11 are a lot of other things that could be done there, so
12 those are incorporable at some point.
13 MR. BAKOS: Nobody leave. Okay. We do have a
14 couple of more slides.
20:25:32 15 Last chance for comments.
16 Okay.
17 Next step. Can't see it from here.
18 So this concludes, this will conclude phase A
19 with the environmental assessment. Again the comment
20:25:59 20 period ends January 4th. At that point we will address
21 the comments in writing and then it turns over to the
22 gentlemen in the back of the room from FHWA to make a
23 determination, finding of no significant impact
24 hopefully, and then we actually have to wrap up
20:26:22 25 conceptual plans before getting into what we call the

final design. So that's the process. We're not, we're not exactly ready to turn over any earth just yet but this is an important step right here with them as you saw in the plans have a fair amount of right of way
20:26:45 impact along the strips along the way, we have permitting, Act 250, storm water, wetland permits, and of course we have funding to secure before the actual construction, and again the start date is dependent on available funding. I think we're talking that if the
20:27:06 funding was available tomorrow I think we're talking a year to a year and a half before we would be able to get through the entire process, maybe longer. The right of way process can take two years just in itself. So again we're a few, probably two to three years away from a
20:27:26 viable project.

Thank you. Thank you from the beginning.

MR. BAKOS: Would the two people that didn't sign in if you would kindly sign in at the sheet on the front table.

1
2 CERTIFICATE OF REPORTER
3 I, Richard Forney, certify that the foregoing
4 57 pages comprise a full true and correct transcript
5 prepared to the best of my knowledge and belief of the
6 Public Hearing on Federal Street Multimodal Connector
7 Project held on December 12, 2012 at 7:00 p.m. in the
8 Bellows Free Academy Library, St. Albans, Vermont.
9
10
11 _____
12 Richard Forney
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Appendix L – Response to Comments Received During Public Comment Period

Federal Street Multimodal Connector, HPP 8000 (17)
Environmental Assessment – Response to Comments

Response to Comments Made by
Jeffrey Bean
(address not provided)
Public Hearing, December 12, 2012

1. *Mr. Bean inquired as to how northbound traffic turning left onto Nason Street from Main Street is to be handled, or if it will be eliminated.*

   The current design plan does not eliminate the ability to make a left turn onto Nason Street, although there is consideration into making it a one-way street. Most traffic is expected to use the connector road, but people who live on Nason Street will still be able to turn onto it.

2. *Mr. Bean inquired as to how the traffic from the stop sign at the railroad crossing on Nason Street will be handled, as it is being addressed on Lower Welden Street.*

   Typical signs such as "Do Not Block Intersection" and "Do Not Stop on Tracks."

3. *Mr. Bean inquired as to the purpose of not including a crosswalk at South Main Street and the proposed Nason Street Connector.*

   There are no sidewalks along the Interstate Access Road and therefore there is no need to provide connectivity across South Main Street. In addition, the preference is to cross pedestrians at a different location farther north on Main Street, such as at the location of the entrance to the St. Albans Town Educational Center, where there is an existing crosswalk.

4. *Mr. Bean asked if the elimination of the conceptual parking lot just south of the Giroux Building would help diminish sediment loading from stormwater runoff.*

   The conceptual plan for the parking lot actually includes more green space (i.e., less impervious surface) than does the existing conditions. Therefore, the proposed conditions would generate less runoff than the current configuration of parking areas, rooftops, and driveways. As the plan presented in the EA is conceptual, it is subject to change, including the possible implementation of underground stormwater detention.

5. *Mr. Bean inquired as to whether or not any weight limit would be imposed on Lake Street, Kingman Street, Stebbins Street or other streets so as to encourage truck traffic to remain on the Federal Street Corridor. Would a weight limit be imposed on Main Street after full build out of the Project for the same reasons?*

   At present, there are no plans to impose weight restrictions on any streets. This traffic management approach may be considered for certain minor streets as the Project moves towards final design. However, Lake Street (Vermont Route 36) and Main Street (US Route 7) are unlikely candidates for weight restriction.

6. *Mr. Bean asked why the Aldis Street is not showing improvements as part of the scope of this project. He noted that there is a high volume of children due to the close proximity to the school, and since most other streets in the area are being addressed, it is odd to not included Aldis Street.*

   Independent funding has been designated to make improvements to Aldis Street. Treating that section independently will ensure that it gets completed earlier than if it were included in the proposed Federal Street Multimodal Connector Project.

7. *Mr. Bean cited the considerable regulatory requirements with respect to the new Municipal Separate Storm Sewer Systems (MS-4) permit as well as regulations governing stormwater and wetland impacts, and inquired as to how aggressively the City is pursuing the Project given these potential hurdles. Mr. Bean considers the viability of the Project to hinge on the ability to not only mitigate but to improve the current stormwater conditions.*

   The Project would be designed to comply with all necessary state and federal permit requirements. As stated in the EA, in accordance with EPR Chapter 22 (Stormwater Management Rule for Stormwater-Impaired Waters, AKA the Impaired Rule), developments within stormwater impaired watersheds must meet the "no net increase" criterion. This means that projects proposing to create new, expanded, or redeveloped impervious surfaces must reduce the washoff sediment load to natural background conditions. An analysis of the conceptual stormwater treatment approach for the Project determined that it would result in a 75 percent decrease in sediment loading. The remaining necessary reduction in sediment loading would be achieved via the currently permitted offset project (the Stevens/Rugg Diversion Channel offset project) and/or a separate offset project elsewhere in the watershed.

   Through coordination with the Department of Environmental Conservation (DEC) Wetland Section and US Army Corps of Engineers (USACE), there is no reason to believe that the Project would not be eligible for authorization under a Vermont Individual Wetland Permit and Vermont General Permit, respectively.

8. *Mr. Bean noted that at the intersection of Upper Newton Street and North Main Street, improvements are being planned due to the proposed Wal-Mart. He asked if these improvements were being considered with regards to the Federal Street Multimodal Connector Project.*

   The conditions of the Wal-Mart Land Use Permit have been considered in the conceptual design for the Project.

9. *Mr. Bean inquired asked for an opinion as to whether or not tax incremental financing (TIF) is a required tool to justify the proposed improvements to the state. He also inquired that if the improvements that are being made are to make that area of the city more accessible, if the TIF district development becomes delayed, would there be adverse effects to the improvements being proposed.*

   The creation of the TIF district makes the project significantly more likely to happen. They are not entirely dependent on one another, but they are linked.

Federal Street Multimodal Connector, HPP 8000 (17)
Environmental Assessment – Response to Comments

Response to Comments Made by
David Barber
12 Sawyer Street, St. Albans, VT 05478
Public Hearing, December 12, 2012

1. *Mr. Barber noted that traffic counts for Stowell Street and Sawyer Street were not included in the EA, and that he had previously requested such counts be made. Mr. Barber asked if it was assumed that, even though a designated left turn lane is being provided for southbound traffic on Allen Street to access Stowell Street, motorists would not attempt to access the signalized intersection of Lower Welden Street and Main Street via Stowell Street and perhaps Sawyer Street.*

   The design of the roadway and associated traffic controls are intended to provide a convenient and comfortable route of travel that would sufficiently accommodate traffic volume demands, minimizing the need for motorists to seek bypass or cut-through options.

   The left turn lane proposed at the intersection of Allen Street and Stowell Street is intended to provide access to residences on Stowell Street and Sawyer Street. While the use of Stowell Street and Sawyer Street as an alternate route to access the intersection of Lower Welden Street and Main Street is not precluded by the conceptual design, a number of factors make such a diversion unlikely:

   - The capacity analysis for the proposed roundabout at the intersection of Lower Welden Street with Allen Street and Lemnah Drive indicates that this intersection will function at level of service (LOS) A under the 2010 conditions and LOS B or better under the 2030 conditions. The southbound approach (accommodating motorists traveling from Allen Street to Lower Welden Street) and westbound approach (accommodating motorists traveling from Lower Welden Street to Allen Street) to the roundabout are projected to experience average delays of 10 seconds or less during the future 2030 peak hour conditions. Accordingly, it is unlikely that traffic traveling between Allen Street and Lower Welden Street would experience a degree of traffic backup that would prompt a motorist to consider a bypass.

   - With the completion of the project, motorists traveling between Allen Street and Lower Welden Street will only incur intersection delay at one location (the roundabout). To execute a bypass between Allen Street and Lower Welden Street, motorists will be subject to the intersection delay incurred at three stop controlled intersections. During peak hours, the travel time and delay for a bypass route is likely to be longer than proceeding through to the roundabout itself.

2. *Mr. Barber inquired as to the width of the proposed green belt on the east side of Allen Street.*

   As shown on the conceptual plans, the proposed green belt would be expanded to a width of approximately 18 to 20 feet.

Federal Street Multimodal Connector, HPP 8000 (17)
Environmental Assessment – Response to Comments

Response to Comments Made by
Jeff Young
(address not provided)
Public Hearing, December 12, 2012

1. *Mr. Young inquired if truck traffic would be mandated onto the proposed Federal Street Corridor.*

   A decision has not been made at this time as to whether truck traffic will be mandated onto Federal Street Corridor rather than Main Street.

2. *Mr. Young inquired if the stormwater pond at the southwest corner of the intersection of Nason Street and Lemnah Drive was absolutely necessary. He expressed concern about the aesthetics of the pond and asked if there was other technology that could be used instead.*

   Stormwater treatment is most feasible at this position in the landscape because it allows for the collection of runoff from the proposed Nason Street Connector and portions of the new intersection with Main Street. However, there are other potential treatment approaches that can be evaluated as the Project moves forward with more detailed design. For conceptual planning purposes and the purpose of the EA, the option of a stormwater pond was pursued because it results in the largest footprint among the stormwater treatment options and therefore results in a conservative estimate of potential right-of-way impacts. Other options will be considered for stormwater treatment and additional opportunities for public input will occur.

Federal Street Multimodal Connector, HPP 8000 (17)
Environmental Assessment – Response to Comments

Response to Comments Made by
Kayce Massey
192 Federal Street, St. Albans, VT 05478
Letter dated January 2, 2013

1. *While Ms. Massey expressed support for what she feels are necessary changes in City infrastructure, she expressed concern as to how the Proposed Action would affect the subject property specifically. A request was made to describe the improvements at her property. Ms. Massey offered to share survey information for the parcel.*

   The Proposed Action would result in a number of improvements at the intersection of Federal Street and Lower Newton Street. These include:

   - signalization of the intersection;
   - dedicated left and right turning lanes for northbound traffic;
   - bicycles lanes and sidewalks on both sides of Federal Street;
   - demarcated crosswalks across Lower Newton Street and Federal Street;
   - installation of a curb (none are present on the southbound side of Federal Street); and
   - formalization of the driveway into the parking area south of the commercial building on this parcel.

   At present, the distance from the east façade of the building on the subject parcel to the edge of pavement (i.e., point where vehicular traffic can be present) ranges from approximately 13 to 15 feet. Under the Proposed Action, the range would be reduced to approximately 9 to 12 feet between the east façade and the edge of the bicycle lane. The travelled way for vehicular traffic would lie an additional 4 feet beyond (i.e., total of approximately 13 to 16 feet from east façade). Therefore, the distance at which vehicular traffic would pass remains essentially the same under the Proposed Action. The installation of a curb would also serve to constrain motorized and non-motorized traffic.

   The Proposed Action would result in corridor enhancements that would improve pedestrian and bicycle safety and access to the subject parcel. The installation of lighting improvements would enhance the overall visual appeal and feeling of personal security along the corridor.

   The estimated permanent right-of-way (ROW) acquisition required for the Proposed Action with respect to the subject parcel is 184 square feet, corresponding to a strip take ranging from 0 to 6 feet in width by approximately 65 feet in length. This acquisition would be required for the slight widening of the roadway cross section, to provide sufficient paved surface for large trucks to make the necessary turning movements, and for the installation of the sidewalk and bicycle lanes. Temporary ROW use during construction is estimated to be 594 square feet, most of which would occur within the open area north of the existing building.

   The City is committed to working closely with property owners along the Federal Street Corridor as the Project moves towards final design and appreciates Ms. Massey's offer to provide survey information.