



# **Buckland Area Transportation Study**

Draft Technical Memorandum No. 1

## **Existing and Future Conditions Report**

November 2, 2006



**Dewberry**

In Conjunction with:

Earth Tech, Inc.

Fitzgerald & Halliday, Inc.

Keville Enterprises, Inc.



U.S. Department of Transportation  
Federal Highway  
Administration



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## List of Acronyms

ADT	Average Daily Traffic
APA	Aquifer Protection Areas
BRT	Bus Rapid Transit
CERC	Connecticut Economic Resource Center
CERCLIS	Comprehensive Environmental Response, Compensation and Liability Information System
CO	Carbon Monoxide
ConnDOT	Connecticut Department of Transportation
CRCOG	Capitol Region Council of Governments
CTDEP	Connecticut Department of Environmental Protection
CT Transit	Connecticut Transit
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Maps
EJ	Environmental Justice
GIS	Geographic Information Systems
GPS	Global Positioning System
HCM	Highway Capacity Manual
LOS	Level of Service
LWCFA	Land and Water Conservation Funding Act of 1965
MEV	Million Entering Vehicles
mp	Mile Post
NAAQS	National Ambient Air Quality Standards
NAC	Noise Abatement Criteria
NDDDB	Natural Diversity Database
NO <sub>2</sub>	Nitrogen Dioxide
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetland Inventory
PAH	Polyaromatic Hydrocarbons
Pb	Lead
PCB	Polychlorinated Biphenyls
pc/mi/ln	Passenger cars per mile per lane
PM	Particulate Matter



## **List of Acronyms (cont.)**

RTS	Regional Transit Strategy
SCEL	Stream Channel Encroachment Lines
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SO <sub>2</sub>	Sulfur Dioxide
SUBOG	Student Union Board of Governors
UConn	University of Connecticut
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service



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# 1 – Introduction

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## 1.1 Study Background and Goals

The Capitol Region Council of Governments (CRCOG) and the Connecticut Department of Transportation (ConnDOT) have identified the need to evaluate existing and future transportation deficiencies, and identify near and long-term transportation improvements for the roadway network in the Buckland commercial area, which encompasses portions of the Towns of Manchester, South Windsor and East Hartford. A review of existing land use policies and practices in the Buckland area will also be conducted, and compared to best practices used in other parts of the country, where similar conditions exist.

This report presents an assessment of the existing transportation and environmental conditions, and an analysis of future transportation conditions (projected to year 2030), assuming no improvements other than those already planned and programmed take place. Potential improvement options, a plan for implementation of the improvement options most likely to meet project goals, and potential funding mechanisms for build alternatives will be discussed in future Technical Memoranda.

Overarching goals of the study include:

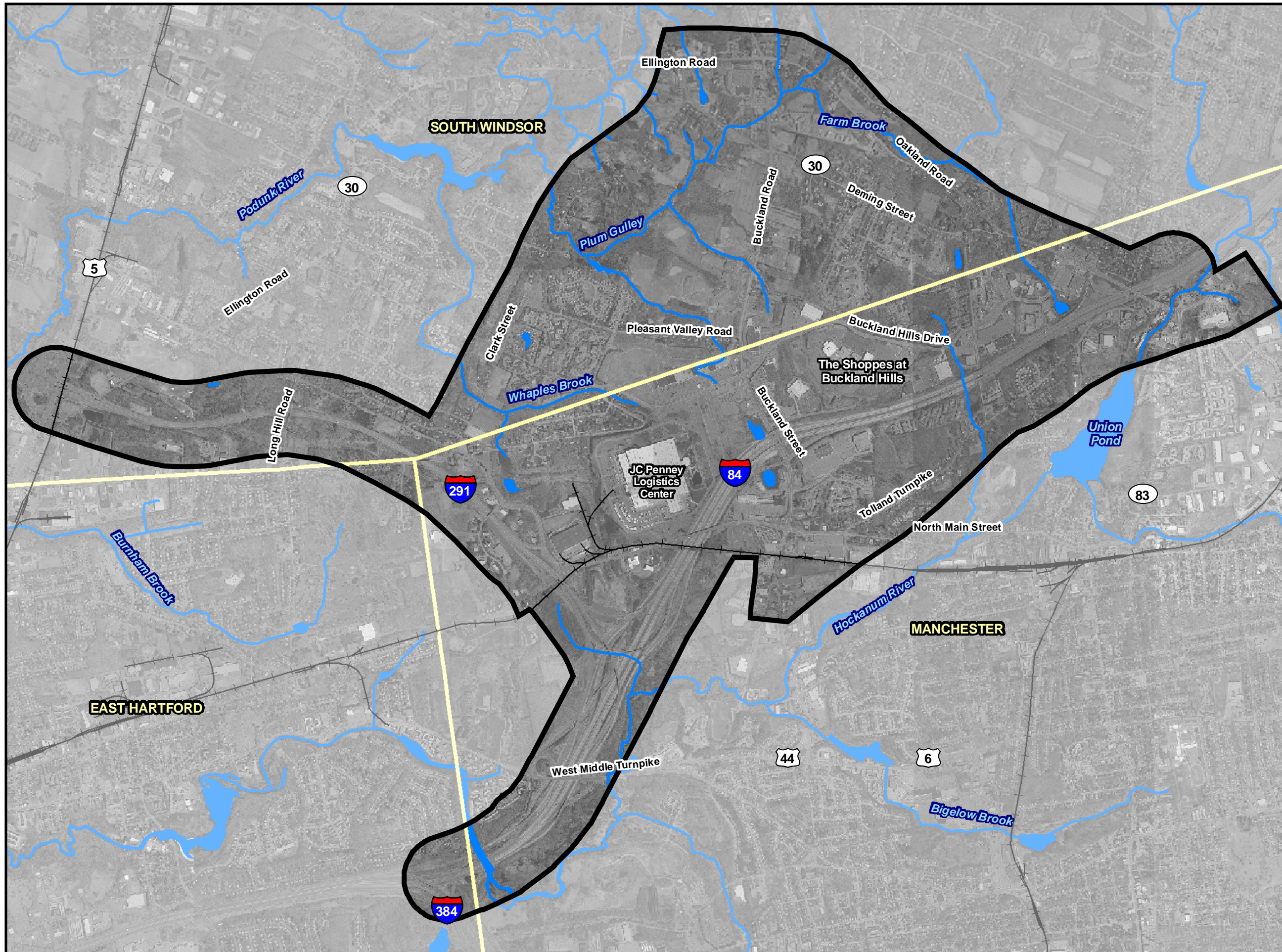
**Formulate plans of improvement** for operations and safety along the major elements that define the transportation system in the study area, including roadways, access drives, transit and bicycle and pedestrian services. Plans that have the greatest potential to improve safety, reduce congestion and improve air quality will be given the greatest consideration for advancement.



**Plan for future growth and development.** It is understood that the Buckland commercial area is of regional stature, with as yet unrealized potential for additional growth. Every effort will be made to identify and incorporate state, local and regional plans of development for use in the identification of improvement alternatives study phase.

**Ensure transportation equity and balance** by identifying transportation improvement alternatives that promote use of all transportation modes.

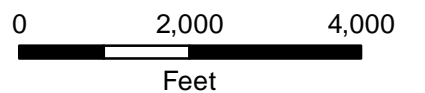
## 1.2 Study Area Definition

The study will be conducted giving attention to two distinct geographic areas. The broader area includes Interstate 84 (I-84) between Interstate 384 (I-384) and interchange 63 (Deming Road), Interstate 291 (I-291) between interchange 4 (Route 5) and I-84, and I-384 between interchange 1 (Spencer Street) and I-84. The more concentrated Buckland area will be the second major focus of this study. The Buckland area is defined as the geographic area along Buckland Street and Buckland Road, from New State Road and Adams Street in the town of Manchester to the intersection of Routes 30 and 194 in the town of South Windsor. Figure 1 presents a map of the study area.



-  Study Area
-  Town Boundaries

**Figure 1-1**  
**Study Area**



**Buckland Area**  
**Transportation Study**



## **1.3 Study Process**

The process developed for this study is typical of most Transportation Planning Corridor Studies. In broad terms, the study consists of the following major tasks:

- Study Management
- Public Involvement
- Data Collection
- Analysis of Existing Conditions
- Analysis of Future, No-Build Conditions
- Identification of System Deficiencies
- Development of Potential System Improvements
- Screening of Potential Improvements
- Identification of High-Performing Alternatives
- Refinement of Alternatives
- Review of Land Use Policies and Practices
- Development of Improvement Implementation Plan
- Development of Financial Plan
- Documentation of Deficiencies, Needs, and Implementation Plan

At the completion of the study, the Towns, ConnDOT, the Federal Highway Administration and CROCOG will have the basis and consensus to develop a program of improvements that will meet the overall goals of improved access and circulation through the Buckland Area. By incorporating a review of Land Use policies as well as transportation issues, the program will be one that supports, and manages, future economic development.

## **1.4 Public Involvement**

The Public has several opportunities to provide input to this study. A brief description of the Public Involvement program is provided in the following paragraphs.

**Website** A project website, [www.bucklandstudy.org](http://www.bucklandstudy.org), has been developed to provide an overview of the study goals, area and schedule. The site is continually updated to include dates and locations of upcoming meetings, status of documents being prepared, and responses to frequently asked questions. For those who wish to share their personal travel experiences in the Buckland area, or provide comments, a brief survey is provided on the site. In order to publicize the site, business-card sized information cards were developed and provided to shop owners, municipal offices and other establishments for the public to take.

**Advisory Committee** State and Federal Resource Agencies and other stakeholders were invited to participate on an Advisory Committee that will meet at specific milestones in the process to provide input to issues and alternatives being considered. The Advisory



Committee meetings will be open to the public, and opportunities to comment will be provided. There will be a total of up to seven scheduled advisory committee meetings.

***Public Information Meetings*** At key milestones in the study, Public Information Meetings will be held. The meetings will be interactive, and held at central locations. Current project status and findings at that point in time will be the subject items of the Public Information meetings. The public will have the opportunity to ask questions and provide comments. Times and locations of meetings will be advertised in local papers, on the website and in high-traffic locations through the region. A total of three Public Information Meetings will be held.

***Targeted Stakeholder Outreach*** In addition to the Public Information Meetings, which will be open to the general public, the Study Team will make every effort to identify stakeholder groups that may have specific issues to discuss. Examples of these groups might be emergency response personnel, senior citizen groups, social service agencies and their public population, “transient” users of the commercial area, etc. For these groups, focused meetings will be held to provide them with the opportunity to voice their concerns and opinions.

***Planning Workshops*** Eight planning workshops will be held at specific points in the study. These workshops will be attended by Study Team members and other designated persons, appropriate for the topic being discussed. The focus of these meetings will be to facilitate the decision making process.

## **1.5 Project Team**

Members of the Project Team include staff from ConnDOT, CRCOG, and the Dewberry-Goodkind, Inc. (Dewberry) consultant team. The Dewberry team included staff from Earth-Tech, Inc. (Earth Tech), Fitzgerald & Halliday, Inc. (FHI) and Keville Enterprises, Inc. (KEI). Key project staff include:

### ***ConnDOT – Lead Agency***

- Edgar Hurle, Director of Policy and Planning
- Carmine Trotta, Assistant Director of Intermodal Project Planning
- James Andrini, Project Manager
- James Morrin, Transportation Planner 2
- Jeff Hunter, Transportation Planner 1

### ***CRCOG – Regional Planning Organization***

- Thomas Maziarz, Director of Transportation



***Dewberry – Project Management, Improvement Concept Development, Land Use Review, Report Preparation***

- George Jacobs, PE, Project Manager
- Mark Witek, PE, Deputy Project Manager
- James Coffey, PE, Senior Engineer
- Steven Shapiro, PE, PTOE, Principal Transportation Engineer
- Philip Yates, AICP, Principal Land Use Planner

***FHI – Environmental Conditions Assessment, Public Involvement***

- Paul Stanton, Senior Environmental Planner
- Leslie Black, Public Outreach Specialist
- Howard Latimer, Website Designer
- David Lauippa, GIS / Graphics Specialist

***Earth Tech, Inc. – Traffic Analysis and Modeling***

- James Ford, PE, Principal Transportation Engineer
- Jeffrey Maxtutis, AICP, Senior Transportation Planner
- Susan Hirl, Traffic Engineer

***KEI – Constructability Analysis and Cost Estimating***

- Thomas F. Brown, Vice President



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## **2 – Existing Transportation System Conditions**

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### **2.1 Project Area Characteristics and Issues**

The Buckland Hills Area is a retail district bounded primarily by I-84 and I-384 on the south, I-291 on the west, and Route 30 on the north and east. It is located in central Connecticut with excellent access to the regional interstate system (I-84) with connections to I-91 in Hartford. The Buckland Hills Area is located within the towns of Manchester and South Windsor, approximately nine miles east of Hartford, 45 miles northeast of New Haven, and 29 miles south of Springfield, MA.

In the mid-1980's the towns of Manchester and South Windsor enacted zoning and financial incentives to spur commercial and residential development in the area north of I-84. The Town of Manchester worked with developers to develop infrastructure and roadway access to I-84, which was improved by the state in 1980's. Over the following two decades the area has grown to include approximately three million square feet of retail representing one of the largest concentrations of retail and restaurant providers in the northeast.

The Buckland Hills Area is comprised of several separate but interrelated retail, commercial, and residential areas. These include:

**The Shoppes at Buckland Hills.** This 1.1 million square-foot super regional mall was opened in 1990 and is located on Buckland Hills Drive. It is anchored by Filene's, Sears, and JC Penny.

**The Plaza at Buckland Hills.** This 480,000 square-foot retail area was developed shortly after the Shoppes at Buckland Hills. It is located on Pleasant Valley Road west of Buckland Street and its anchor stores include Toys R US, Pet Smart, Comp USA, and Office Depot.

**The Plaza at Burr Corners.** This community shopping center has grown to include 240,000 square feet of retail located south of I-84. It provides a mix of clothing stores, retail, and restaurants.

**The Shops at Evergreen Walk.** This area provides some 60 retail shops, 10 restaurants, and a grocery store located on Buckland Road north of Buckland Hills Drive. The shops are anchored by Pottery Barn, Old Navy, Anthropologie, and Highland Park Market.





**Other Development.** In addition to the signature shopping centers and malls located in the Buckland Hills Area, there are numerous other major and minor stores and shops, restaurants, hotels, and housing. Some of these include:

- Target and Lowe’s on Buckland Hills Drive
- Wal-Mart and Best Buy on Buckland Hills Drive
- Bob’s Store, Christmas Tree Shop, and Babies R Us on Hale Road
- Various other stores and restaurants on roadways in the area such as Deming Street
- 1,600 luxury rental apartments
- Hotels and extended stay accommodations
- A 16-screen movie theatre
- Office parks

This concentration of retail and commercial development generates significant traffic volume in the Buckland Hills Area during the peak Friday and weekend afternoon periods. The high level of traffic volume creates congestion on both regional and local roadways, delays for motorists, and safety issues at intersection and interstate ramp locations.

In addition to traffic generated by the retail development, this area experiences significant through-traffic volumes on regional roadways, including I-84 (>100,000 vehicles per day), I-291, and I-384. These volumes are generated by a combination of commuters headed to and from the Hartford area and interstate traffic destined for other parts of Connecticut, Boston, New York, and beyond.

The combination of retail-generated traffic, commuter traffic and regional through-traffic creates significant congestion that negatively impacts area access, circulation, travel times, and safety. Unfortunately, the level of roadway improvements has not kept pace with the accelerated rate of commercial development. Improvements will need to be identified to correct existing transportation deficiencies as well as accommodate future planned development in the area.

This section of this transportation study will summarize existing traffic conditions in the Buckland Hills study area, including a description of network characteristics, traffic volume and speed data, accident history and rates and roadway and intersection capacity analyses. A simulation analysis is also included, and deficiencies that currently exist are identified.



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## 2.2 Roadway Network Characteristics

### 2.2.1 Interstates

The three interstate expressways serving the project study area are described below.

**Interstate I-84** is an east-west expressway that provides access across the entire length of the state connecting with New York to the west and Massachusetts to the east. Within the study area in Manchester, I-84 is six lanes. Average daily traffic (ADT) on I-84 in Manchester was approximately 114,000 vehicles per day in 2005.

**Interstate I-291** is a four-lane east-west expressway connecting I-84 in Manchester and I-91 in Windsor. It generally provides access for regional travelers to South Windsor and East Hartford.

**Interstate I-384** is an eight-lane east-west expressway connecting I-84 in Manchester/East Hartford with Routes 6 and 44 in Bolton. This roadway generally provides access for regional traffic.

### 2.2.2 Arterial Roadways

The roadways described herein are of importance to the Buckland Area.

#### Manchester

**Silver Lane/Spencer Street (Route 502)** is a four-lane east-west roadway between Hartford Road in Manchester and Main Street (Route 5) in East Hartford that provides access to I-384 and I-84. Land use in the area is commercial/retail.

**Buckland Hills Drive** is a four-lane roadway running east-west between Slater Street/Hale Road and Buckland Street/Pleasant Valley Road in Manchester. The posted speed limit is 30 mph, and the topography of Buckland Hills Drive is hilly with several steep sections. There are several signals and commercial driveways along Buckland Hills Drive, including driveways to the Shoppes at Buckland Hills, Wal-Mart, Target, Home Depot and Lowe's stores.

**Buckland Street** is a four-lane roadway running north-south between Adams Street and Buckland Hills Drive/Pleasant Valley Road in Manchester. Posted speed limits are 35 and 40 mph. Buckland Street provides access to I-84, the Shoppes at Buckland Hills, and several other commercial/retail developments. Buckland Street is a major feeder roadway to Buckland commercial/retail development.

**Hale Road** is a four-lane roadway between Deming Street (Route 30) and Slater Street/Buckland Hills Drive in Manchester. The posted speed limit is 30 mph. There are



several signals and commercial driveways along Hale Road. The topography is hilly with steep sections.

**Tolland Turnpike** is a two-lane roadway between Route 30/83 in Manchester and Tolland Street in East Hartford. The posted speed limit is 35 mph, and land use along Tolland Turnpike varies from commercial/retail to residential.

**North Main Street** is a two-lane east-west roadway between Tolland Turnpike and Oakland Street (Route 83) in Manchester. The posted speed limit varies from 35 mph near Tolland Turnpike to 25 mph near Stock Place. Land uses along North Main Street are a mix of commercial/retail and residential.

**Adams Street** is a north-south two-lane roadway between Tolland Turnpike/Buckland Street and Center Street in Manchester. The posted speed limit is 30 mph. Land use along Adams Street is commercial/retail, with many commercial driveways. Adams Street crosses under railroad tracks south of Tolland Turnpike.

**Union Street** is a two-lane north-south residential roadway between North Main Street and Tolland Turnpike in Manchester. The posted speed limit on Union Street is 25 mph.

#### South Windsor

**Sullivan Avenue (Route 194)** is a four-lane north-south roadway that tapers to two lanes north of Route 74. Sullivan Avenue begins at Oakland Road/Ellington Road (Route 30) and continues to Main Street in South Windsor. The posted speed limit is 40 miles per hour (mph). Land use along Sullivan Road is a mix of commercial/retail, office, and residential.

**Ellington Road (Route 30)** is a two-lane east-west roadway between Sullivan Avenue (Route 194) and John Fitch Boulevard (Route 5) in South Windsor. The posted speed limit is 35 mph. Land use along the eastern portion of Ellington Road (near its intersection with Sullivan Avenue) is predominantly commercial/retail, while the western portion is predominantly residential.

**Buckland Road** is a north-south four-lane roadway between Buckland Hills Drive/Pleasant Valley Road in Manchester and Oakland Road/Ellington Road (Route 30) in South Windsor. The posted speed limit is 40 mph. The southern end of Buckland Road is divided by a raised landscaped median. There are several signals and commercial/retail driveways along Buckland Road, including driveways to Evergreen Walk, a major retail development.

**Oakland Road (Route 30)** is a two-lane roadway between Sullivan Avenue/Ellington Road/Buckland Road and Deming Street in South Windsor. Posted speed limits on Oakland Road are 35 and 40 mph, and land uses are commercial/retail.



**Clark Street** is a north south two-lane roadway in South Windsor between Chapel Road and Ellington Road (Route 30) with a posted speed limit of 30 mph. Land use along Clark Street is residential/agricultural, with some commercial uses near Route 30.

### Manchester and South Windsor

**Pleasant Valley Road** is a four-lane east-west roadway between Buckland Street/Buckland Road and Croft Drive in Manchester, which tapers to two lanes as it continues west into South Windsor. There are no posted speed limits along Pleasant Valley Road in Manchester; however the posted speed limit for Pleasant Valley Road in South Windsor is 30 mph. There are several commercial driveways along Pleasant Valley Road in Manchester, where land use is commercial/retail. However, in South Windsor the land use is predominantly residential. Pleasant Valley Road between Wheeler Street and Clark Street in South Windsor was under construction during the summer of 2006.

**Slater Street** is a north-south two-lane roadway which begins at Oakland Road (Route 30) in South Windsor and dead ends at the Manchester town line. Slater Street in Manchester begins at Tolland Turnpike and dead ends north of Hale Road. The posted speed limit is 30 mph in Manchester and 25 mph in South Windsor. Land use along Slater Street varies from predominantly commercial/retail in Manchester to residential in South Windsor.

**Deming Street** is a two-lane roadway connecting Clark Street on the west with I-84 on the east. West of Oakland Road, Deming Street is a residential roadway posted at 25 mph. Southeast of Oakland Road, Deming Street becomes Route 30 with adjacent commercial/retail land use.

### **2.2.3 Study Intersections**

Study intersections are shown in Figures 2-1A and 2-1B, and are listed in the following paragraphs.

#### Signalized Intersections

The signalized intersections in the towns of Manchester and South Windsor evaluated for this study include:

#### **Manchester:**

1. Hale Road at Christmas Tree Shops/Bernie's Driveways
2. Hale Road at Babies R Us
3. Hale Road at Bobs/TGI Fridays/Residence Inn Driveways
4. Buckland Hills Drive/Hale Road at Slater Street
5. Buckland Hills Drive at Pavilions Apartments/Northeast Magazine Drive
6. Buckland Hills Drive at Lowe's/Target/Northwest Magazine Drive
7. Buckland Hills Drive at Home Depot Driveway
8. Buckland Street at Buckland Hills Drive/Pleasant Valley Road



9. Pleasant Valley Road at I-84 Westbound Exit 62 Ramp
10. Pleasant Valley Road at JC Penney Warehouse/Buckland Shopping Plaza Drive
11. Buckland Street at Pavilions Drive
12. Buckland Street at I-84 HOV Ramps
13. Buckland Street at I-84 Eastbound Ramps
14. Buckland Street at Redstone Road
15. Buckland Street at Tolland Turnpike
16. Tolland Turnpike at North Main Street
17. Tolland Turnpike at Burr Corners
18. Tolland Turnpike at JC Penney Main Entrance
19. Tolland Turnpike at Chapel Road
20. Tolland Turnpike at I-291 Eastbound Exit 5 Ramp
21. Adams Street at New State Road
22. Deming Street (Route 30) at Hale Road/Gateway Plaza Drive
23. Deming Street (Route 30) at I-84 Westbound Exit 63 Ramp/Avery Street
24. Deming Street (Route 30) at Tolland Turnpike
25. Deming Street (Route 30/83) at I-84 Eastbound Exit 63 Ramps/Oakland Street
26. Spencer Street (Route 502) at I-384 Westbound Ramps/Cemetery Road
27. Spencer Street (Route 502) at I-384 Eastbound Ramps

***South Windsor:***

28. Oakland Road (Route 30) at Slater Street/Foster Street
29. Oakland Road/Ellington Road (Route 30) at Buckland Road and Sullivan Avenue (Route 194)
30. Buckland Road at Terry Office Park Drive
31. Buckland Road at Deming Street,
32. Buckland Road at Evergreen Walk North Drive
33. Buckland Road at Hemlock Drive
34. Buckland Road at Tamarack Road

***Unsignalized Intersections***

The unsignalized intersections in Manchester and South Windsor listed below were evaluated for this study.

***Manchester:***

35. Pleasant Valley Road at JC Penney Distribution Center Driveway
36. Chapel Road at I-291 Westbound Exit 5 Ramp
37. Chapel Road at Clark Street/Burnham Street West
38. Buckland Hills Drive at Best Buy Drive
39. Buckland Hills Drive at Wal-Mart Drive
40. Buckland Hills Drive at Mall Driveway
41. Tolland Turnpike at Slater Street
42. Tolland Turnpike at Union Street/Jeffrey Alan Drive

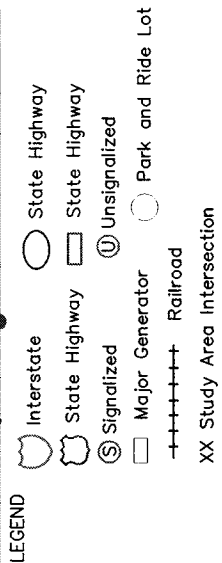
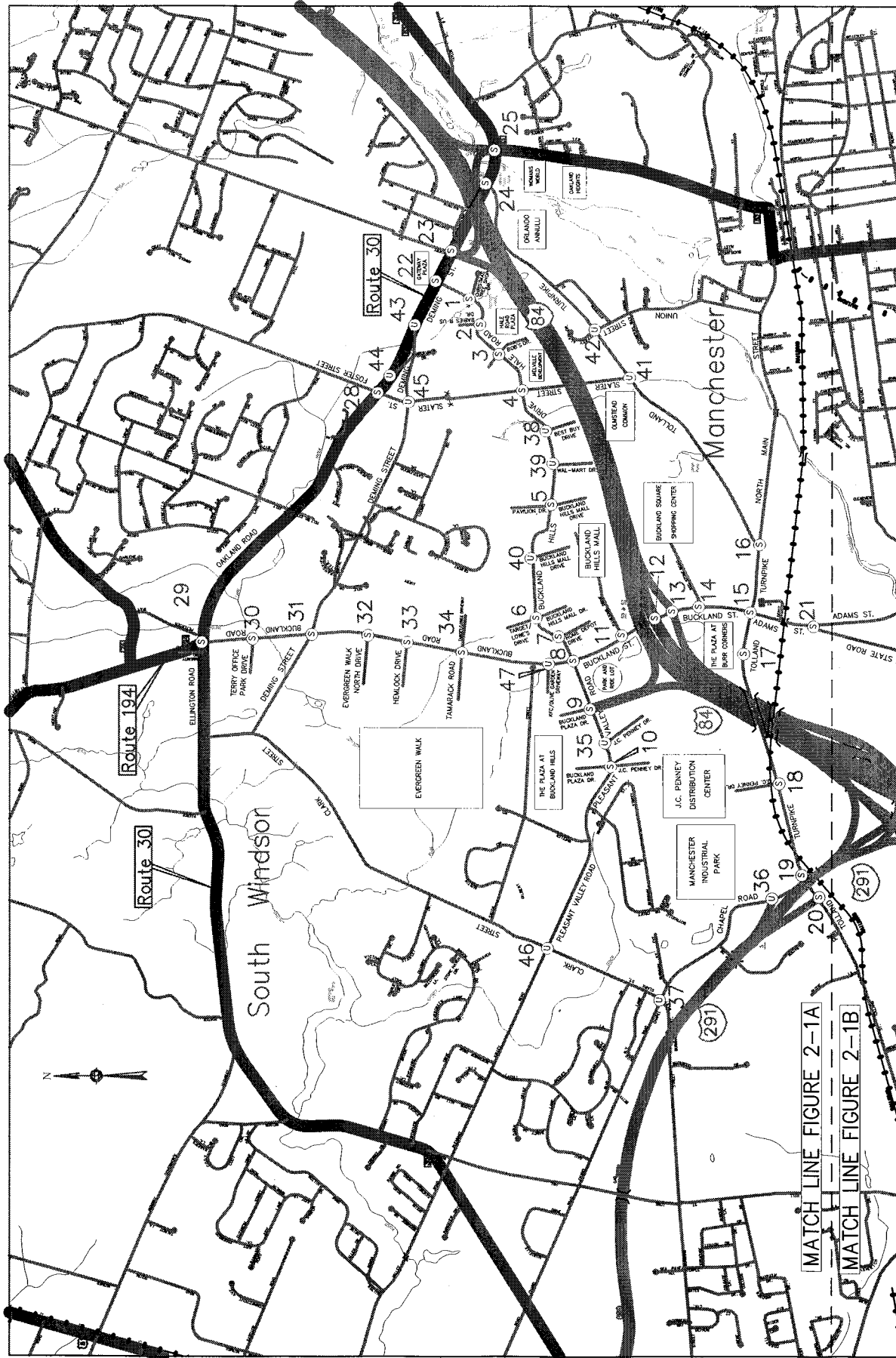
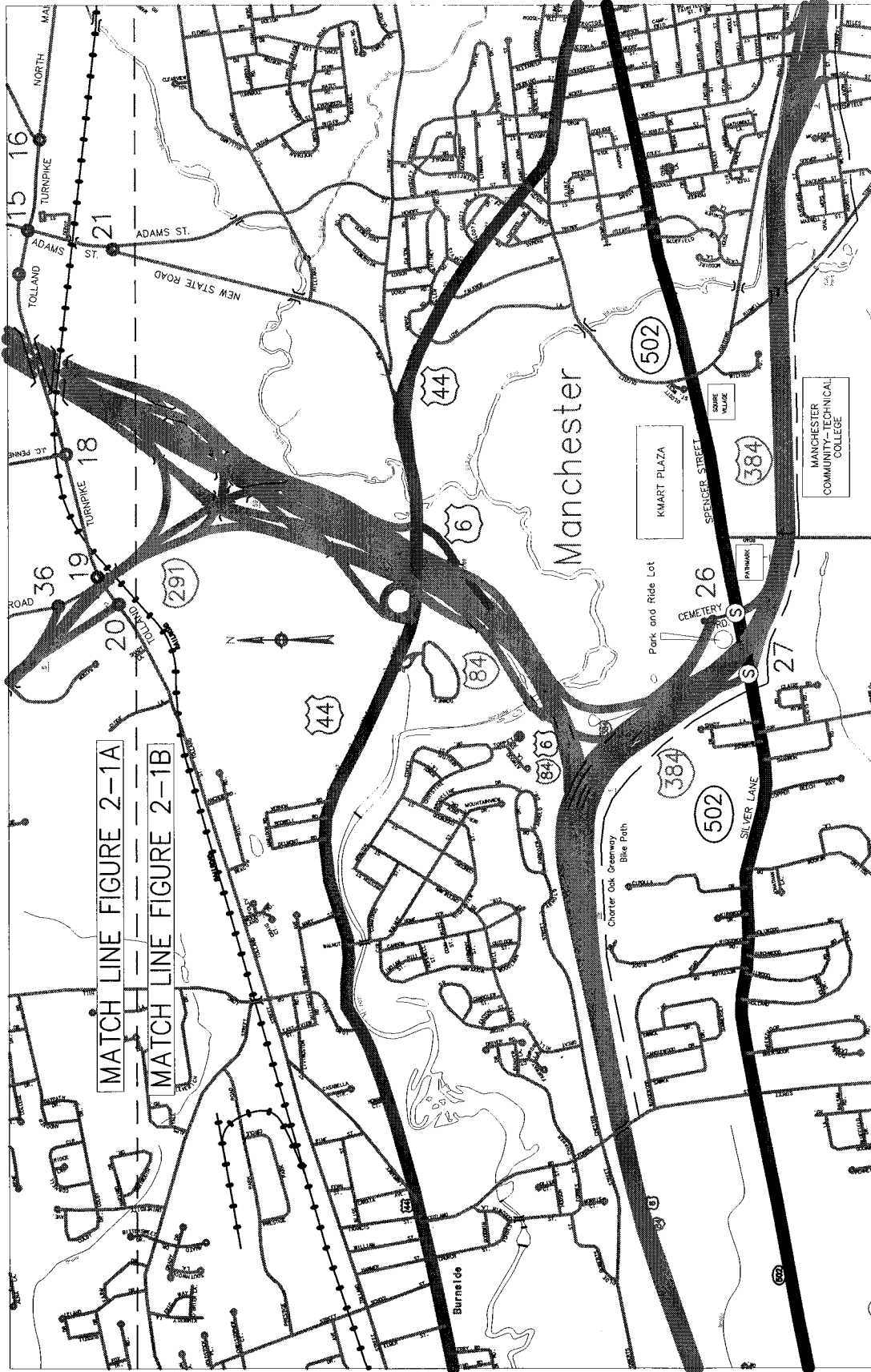


FIGURE NO. 2-1A  
 STUDY AREA INTERSECTION LOCATIONS  
 BUCKLAND AREA TRANSPORTATION STUDY  
 MANCHESTER AND SOUTH WINDSOR, CT



LEGEND

- Interstate
- State Highway
- Signalized
- Major Generator
- XX Study Area Intersection
- State Highway
- State Highway
- Unsignalized
- Park and Ride Lot
- Charter Oak Greenway Bike Path

FIGURE NO. 2-1B  
 STUDY AREA INTERSECTION LOCATIONS  
 BUCKLAND AREA TRANSPORTATION STUDY  
 MANCHESTER AND SOUTH WINDSOR, CT



South Windsor:

43. Oakland Road (Route 30) at Deming Street (East)
44. Oakland Road (Route 30) at Deming Street (West)
45. Deming Street at Slater Street
46. Pleasant Valley Road at Clark Street
47. Buckland Road at Olive Garden/KFC Drive

Locations of these intersections are illustrated in Figures 2-1A and 2-1B.

#### **2.2.4 Driveway Access**

Access to the retail shopping centers, malls, and individual commercial developments is provided by a series of driveways that intersect the main feeder roadways. The main roadways are: Buckland Street, Buckland Road, Buckland Hills Drive, Pleasant Valley Road, and Hale Road. The following is a summary of the main development driveways, and the feeder roadways they intersect.

##### Buckland Hills Drive

- Home Depot Drive (intersection #7)
- The Shoppes at Buckland Hills Drive/Target and Lowes Drive (intersection #6)
- The Shoppes at Buckland Hills Drive (intersection #40)
- The Shoppes at Buckland Hills Drive/Pavilion Drive (intersection #5)
- Wal-Mart Drive (intersection #39)
- Best Buy Drive (intersection #38)

##### Buckland Street

- Pavilions Drive (intersection #11)
- Red Stone Road (intersection #14)

##### Buckland Road

- Tamarack Road (intersection #34)
- Hemlock Drive (intersection #33)
- Evergreen Walk North Drive (intersection #32)
- Terry Office Park Drive (intersection #30)
- KFC/Olive Garden Driveway (intersection #47)

##### Pleasant Valley Road

- JC Penney Drive (intersection #35)
- Buckland Plaza Drive/JC Penny Drive (intersection #10)

##### Hale Road

- Bob's Drive (intersection #3)
- Babies R US Drive (intersection #2)
- Christmas Tree Shops Drive (intersection #1)





### **2.2.5 Park and Ride Lots**

The Connecticut Department of Transportation operates the following Park-and-Ride lots in the Buckland area:

- I-84 at Buckland St (Exit 62) in Manchester: Lot located in southwest corner of Buckland Street at Pleasant Valley Road; 743 parking spaces; express bus service
- I-384 at Spencer Street (Exit 1) in Manchester: Lot located off Cemetery Road; 245 parking spaces; local bus services
- Route 30 at I-291 (Exit 4) in South Windsor (west of study area): 157 parking spaces; no bus or rail service

The locations of the Park-and-Ride facilities are shown in Figures 2-1A and 2-1B.

## **2.3 Traffic Data**

### **2.3.1 Traffic Volumes**

Traffic volume data was obtained from the Connecticut Department of Transportation (ConnDOT). Traffic volume data included year 2005 Average Daily Traffic for study roadways, and 2005 Friday afternoon and Saturday midday peak hour volumes for study area intersections. Year 2005 Friday morning and Friday afternoon peak hour volumes were provided by ConnDOT for I-84 and associated ramps between Exit 59 and Exit 63.

Table 2-1 shows Average Daily Traffic Volumes for year 2005 on study roadways. Figures 2-2A and 2-2B show the Friday afternoon traffic volume network and the Saturday midday traffic volume network.



**TABLE 2-1**  
**AVERAGE DAILY TRAFFIC (2005)**

<b>LOCATION</b>	<b>24-HOUR VOLUME<sup>1</sup></b>
Buckland Hills Drive	<b>23,000</b>
Buckland Street	<b>37,300</b>
Pleasant Valley Rd, Manchester	<b>14,300</b>
Tolland Turnpike	<b>22,000</b>
North Main Street	<b>11,600</b>
Slater Street	<b>9,800</b>
Hale Road	<b>24,300</b>
Adams Street	<b>24,200</b>
Union Street	<b>6,200</b>
Buckland Road	<b>26,000</b>
Sullivan Avenue (Route 194)	<b>27,400</b>
Ellington Road (Route 30)	<b>10,100</b>
Clark Street	<b>4,200</b>
Oakland Road (Route 30)	<b>13,000</b>
<i>Pleasant Valley Rd, S. Windsor</i>	<b>5,800</b>
<i>Silver Lane / Spencer Street</i>	<b>21,900</b>
<i>Interstate 84</i>	<b>114,000</b>

Note:

1. Source of data is ConnDOT traffic counts.

### 2.3.2 Speed Data

A speed study was conducted for 16 arterial roadways in the study area using GPS recording floating car method. This technique uses a GPS-equipped automobile that is driven at prevailing traffic conditions on study roadways. The program software records travel time, stopped delay, and vehicle speeds. The speed study was conducted in July and August 2006 during the Friday afternoon and Saturday midday peak hour periods. Table 2-2 summarizes the average speed and delay\* for each arterial for these critical peak hours.

Total delay reported in Table 2-2 represents the additional time to traverse the subject roadway during peak periods of operation. Total delay includes both stopped vehicle delay and delay encountered when traveling below the posted speed limit.

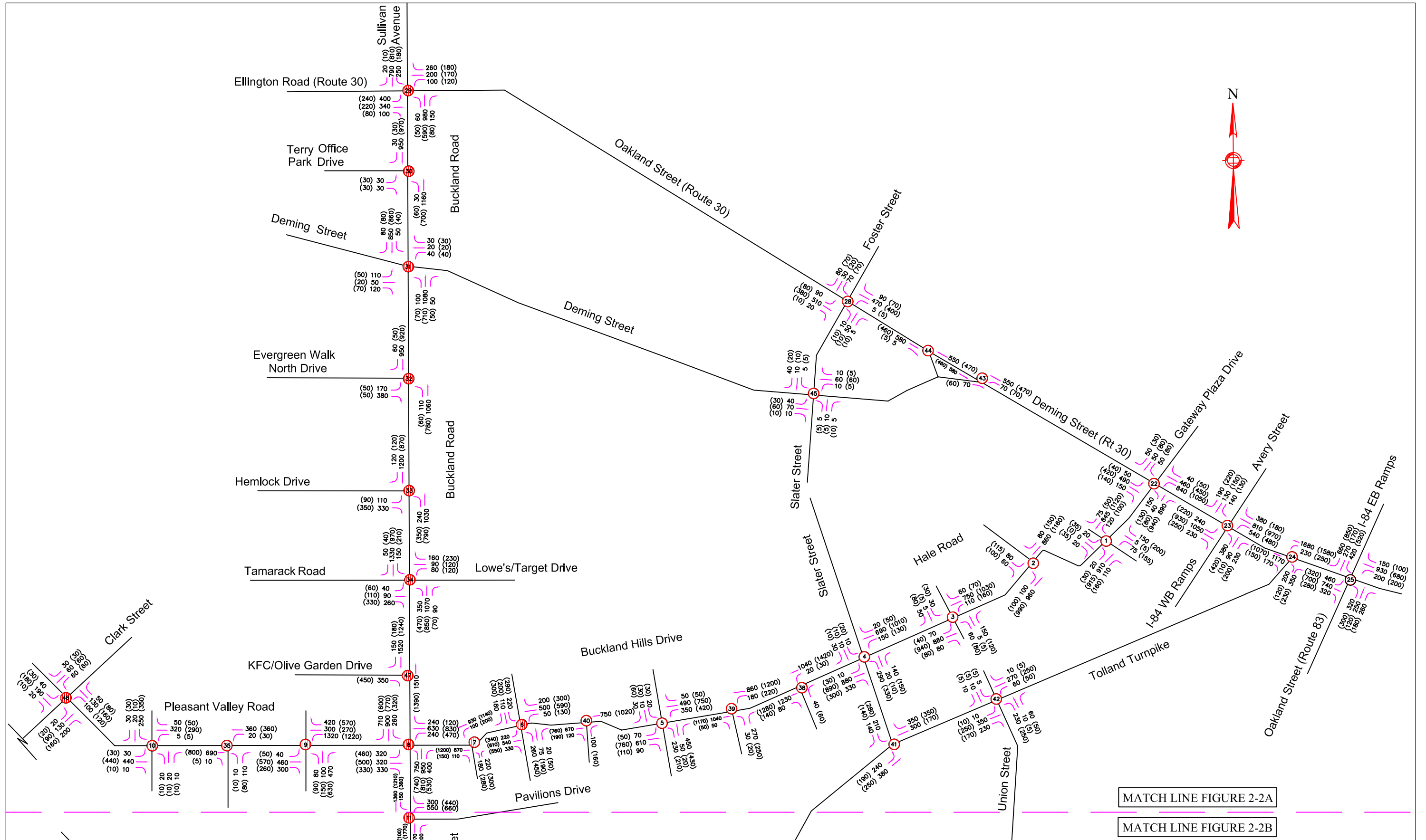


FIGURE NO. 2-2A  
 2005 FRIDAY PM (SATURDAY MIDDAY) PEAK HOUR VOLUMES  
 BUCKLAND AREA TRANSPORTATION STUDY  
 MANCHESTER AND SOUTH WINDSOR, CT

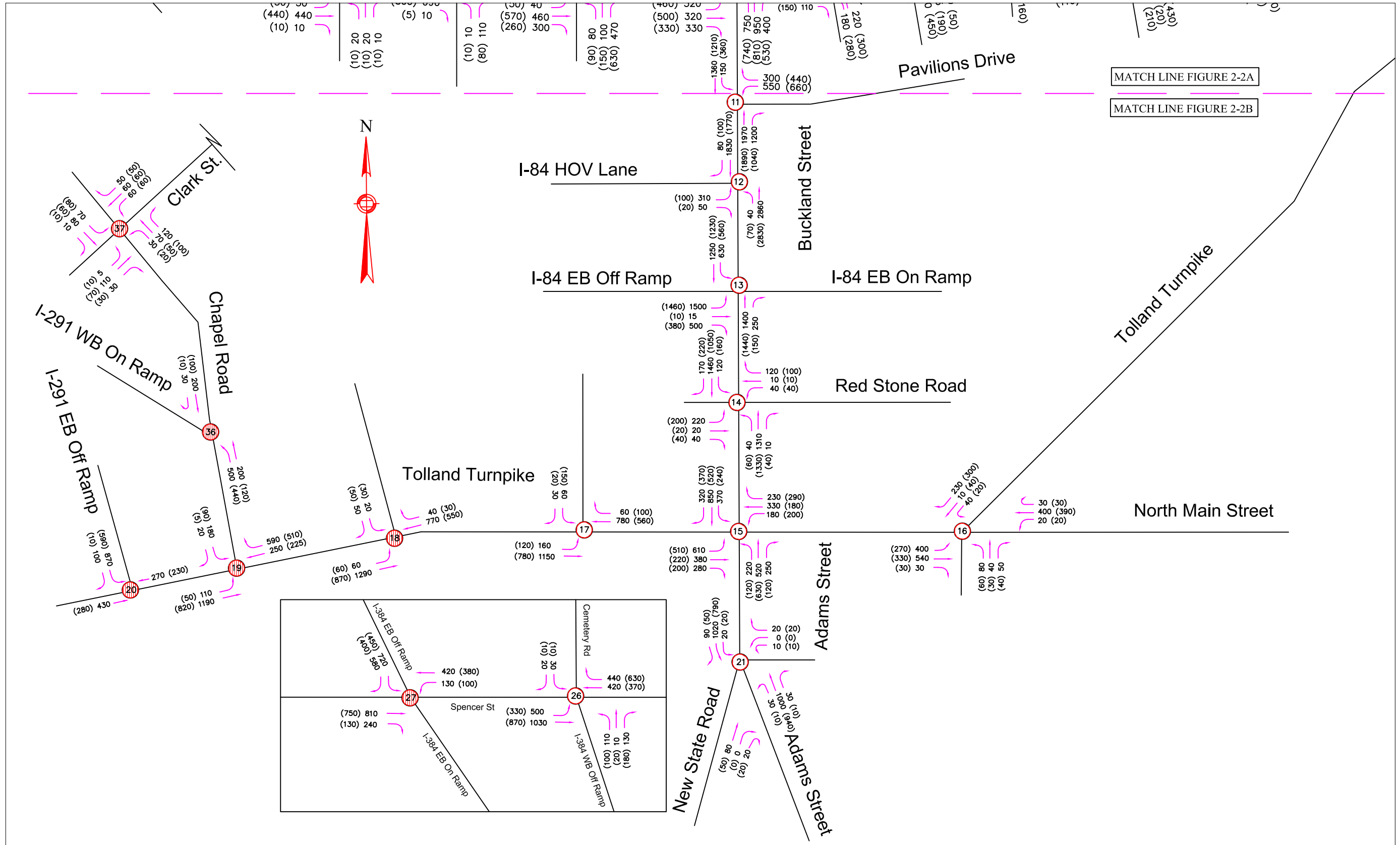


FIGURE NO. 2-2B  
2005 FRIDAY PM (SATURDAY MIDDAY) PEAK HOUR VOLUMES  
BUCKLAND AREA TRANSPORTATION STUDY  
MANCHESTER AND SOUTH WINDSOR, CT



TABLE 2-2

**SUMMARY OF SPEED STUDY RESULTS  
EXISTING CONDITIONS (2005 VOLUMES)**

Arterial	Friday PM Peak Hour		Saturday Midday Peak Hour	
	Average Speed (mph)	Total Delay (seconds) <sup>1</sup>	Average Speed (mph)	Total Delay (seconds) <sup>1</sup>
Buckland Hills Drive EB/WB	27/19	26/88	27/23	55/96
Buckland Street NB/SB	22/23	111/108	22/28	88/65
Pleasant Valley Rd, Manchester EB/WB	18/18	85/74	22/25	63/75
Tolland Turnpike EB/WB	26/29	158/119	29/29	89/97
North Main Street EB/WB	35/35	3/2	27/32	34/14
Slater Street NB/SB	26/20	14/35	25/14	15/78
Hale Road EB/WB	22/23	28/18	26/21	85/51
Adams Street NB/SB	30/22	6/57	25/33	41/1
Union Street NB/SB	17/19	46/28	30/29	3/3
Buckland Road NB/SB	28/28	51/52	32/32	15/13
Sullivan Avenue (Route 194) NB/SB	28/26	18/22	35/28	4/24
Ellington Road (Route 30) EB/WB	28/29	42/32	36/31	11/19
Clark Street NB/SB	31/34	21/7	32/32	4/5
Oakland Road (Route 30) EB/WB	29/33	45/26	34/36	11/15
Pleasant Valley Rd, S. Windsor EB/WB	28/28	8/17	21/25	39/29
Silver Lane / Spencer Street EB/WB	25/29	86/46	30/32	34/31

Notes: EB = eastbound; WB = westbound; NB = northbound; SB = southbound

1 – Total delay includes both stopped vehicle delay and delay encountered when traveling below the posted speed limit.

At the time of the speed study, some roadways were under construction; therefore the average travel speeds recorded for these roadways may be lower than typical conditions. The roadways that were under construction include:

- Pleasant Valley Road from Wheeler Street to Clark Street, South Windsor
- Union Street from North Main Street to Tolland Turnpike, Manchester



At the time of the speed study, Silver Lane/Spencer Street between the I-384 eastbound and westbound ramps was also under construction. However, all lanes were open to traffic and the pavement was in fair condition, so the average travel speed was not impacted by the construction.

### **2.3.3 Accident Data and Analysis**

As part of the traffic engineering assessment of this study area, accident histories were evaluated both on an intersection and roadway basis. A summary of intersection and roadway accident data and analysis is provided below. *It is noted that accident data is still being updated for this analysis. The results should be considered preliminary at this time.*

Accident data was compiled from both State (ConnDOT) and Local (police departments) sources. It should be noted that the two sources use different criteria in their designation of “reportable” accidents. ConnDOT’s accident file includes data only for state road accidents that have personal injuries or property damages greater than \$1,000, and for local road accidents that have personal injuries. ConnDOT’s accident file does not include data for local road accidents with property damage only. Local sources generally report data for any accident involving the police department, no matter how minor the property damage or injuries. Therefore, simply comparing the numbers of accidents at various locations does not always provide an indication of the seriousness of operational issues at that location. The nature of the accidents must be understood prior to making recommendations for improvements.

#### *Intersection Accidents*

Accident information at intersections was based on information collected as part of the Buckland Hills Traffic Signal System Report and is shown in Table 2-3. Traffic accident reports for 2001-2003 were reviewed and accident rates developed for each of the 19 intersections evaluated for that report. Accident rates were then compared to customary levels for similar facilities. While the majority of the intersections showed rates within expected ranges and did not demonstrate alarming patterns or excessive accidents of a type that would not normally occur, the following locations exceed expected accident experience for similar type of roadways.

- Buckland Street at Pleasant Valley Road
- Buckland Hills Drive/Hale Road at Slater Street
- Buckland Street at Pavilions Drive
- Buckland Street at Redstone Road

Examination of the accident data indicates many of the accidents are occurring on weekend afternoons. The majority of these accidents are rear-end type, indicating that congestion may be the main factor in causing these incidents. In particular, the



intersection of Slater Street at Buckland Hills Drive is troublesome. The computed accident rate is 3.11 accidents per million entering vehicles (MEV). In reviewing this location, we have not been able to identify any specific causal factor, although it is noted that the geometry of Buckland Hills Drive is limited and stopping sight distances are minimal.

The Town of Manchester has noted that the intersections of Buckland Hills Drive with the Wal-Mart Driveway and the intersection of Slater Street at Best Buy/Circuit City Driveways are hazardous locations. At Buckland Hills Drive/Wal-Mart Driveway, rear-end collisions are the most common type of collision, particularly in the westbound direction. Crossing traffic and angle accidents are the prevalent type of accident at Slater Street/Best Buy/Circuit City Driveways.

### Roadway Accidents

For study roadways, accident reports were obtained from the Connecticut Department of Transportation for the study area for the years 2003 through 2005. This data is summarized in Tables 2-4 and 2-5.

The state routes and interstates in the study area have experienced between 74 and 798 collisions during the study period. Locations with over 150 total accidents over the three-year period include the three interstates, Route 30, and Route 83. Route 194, Tolland Turnpike, Adams Street, Buckland Street and Buckland Hills Drive experienced more than 50 accidents over the three year period. Similar to the study intersections, the most common type of reported accident on study arterials is the rear-end collision (see Table 2-5). This is indicative of high volumes and congestion throughout the study area.

Traffic accident reports for 2003-2005 were also reviewed and used to develop accident rates for study area roadways (see Table 2-4). Calculated accident rates for study roadways were then compared to customary levels for similar facilities. The following locations stand out as exceeding expected accident experience:

- Adams Street, Manchester
- Pleasant Valley Road, South Windsor
- Route 30 (Ellington Road/Oakland Rd/Deming Street)
- Route 83 (Oakland Street)
- Route 194 (Sullivan Avenue)



**TABLE 2-3**  
**ACCIDENT DATA SUMMARY (2001 – 2003)**  
**FOR STUDY AREA INTERSECTIONS**

<b>Manchester Locations</b>	<b>Total</b>	<b>Leading to Injuries</b>	<b>Involving Pedestrians</b>	<b>Crash Rate<sup>1</sup></b>
1. Hale Road at Christmas Tree Shop /Bernies	10	3	0	0.47
2. Hale Road at Babies R Us	2	0	0	0.10
3. Hale Road at Bob’s Driveway	16	2	0	0.69
4. Hale Road/Buckland Hills Drive at Slater Street	79	22	2	3.11
5. Buckland Hills Drive at NE Magazine Drive./Pavilion Drive	14	4	0	0.63
6. Buckland Hills Drive at Mall/ Lowe’s/Target	6	1	0	0.21
7. Buckland Hills Drive at Home Depot	11	2	0	0.51
8. Buckland Hills Drive at Pleasant Valley	92	18	0	2.08
9. Pleasant Valley Rd at I-84 Westbound Ramps	22	4	0	0.78
10. Pleasant Valley Rd at Buckland Plaza	2	1	0	0.17
11. Buckland Street at Pavilions Drive	62	3	0	1.01
12. Buckland Street at I-84 HOV Lane Ramp	34	2	0	0.83
13. Buckland St at I-84 EB Ramp	31	4	0	0.51
14. Buckland St at Red Stone Road	40	1	0	1.23
15. Tolland Tpk at Buckland Street	80	9	0	0.96
16. Tolland Tpk at N. Main Street	11	1	0	0.60
17. Tolland Tpk at Burr Corners	1	1	0	0.04
18. Tolland Tpk at JC Penney Drive	4	2	0	0.18
19. Tolland Tpk at Chapel Road	1	1	0	0.04

*Notes:*

Source of data is Buckland Hills Signal System Improvements Final Design Report.

1. Crash rates in units of crashes per million entering vehicles (MEV).





**TABLE 2-4  
ACCIDENT DATA SUMMARY (2003 – 2005)  
FOR ROADWAYS**

<b>Location</b>	<b>Total</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>Injury</b>	<b>Crash Rate<sup>1</sup></b>
Adams Street, Manchester	<b>61</b>	11	31	19	61	3.29
Slater Street, Manchester	<b>12</b>	4	4	4	12	1.60
Tolland Turnpike, Manchester	<b>69</b>	25	26	18	69	0.84
Pleasant Valley Road, Manchester	<b>13</b>	2	7	4	13	1.19
Hale Road, Manchester	<b>23</b>	9	4	10	23	1.44
Buckland Hills Drive, Manchester	<b>58</b>	17	19	22	58	1.77
Buckland Street, Manchester	<b>70</b>	22	19	29	70	2.14
North Main Street, Manchester	<b>10</b>	5	3	2	10	0.56
Union Street, Manchester	<b>6</b>	2	2	2	6	1.26
Buckland Road, South Windsor	<b>14</b>	3	4	7	11	0.33
Clark Street, South Windsor	<b>5</b>	1	1	3	5	0.49
Pleasant Valley Road, South Windsor	<b>12</b>	4	3	5	12	2.10
Route 30 (Ellington Rd/Oakland Rd/Deming St) From west of Clark Street (mp 3.25) to Manchester-Vernon Town Line (mp 6.82)	<b>484</b>	152	173	159	113	9.19
Route 83 Oakland Street From Sheldon Street (mp 9.06) to Route 30 (mp 10.14)	<b>151</b>	46	52	53	44	6.58
Route 194 (Sullivan Avenue) From Sand Hill Road (mp 2.97) to Route 30 (mp 3.67)	<b>74</b>	18	33	23	21	3.52
Interstate 84 (I-84) From west of I-384 (mp 66.0) to east of Deming Road (mp 72.6)	<b>798</b>	184	304	310	175	0.97
Interstate 291 (I-291) From west of Route 5 (mp 2.50) to Junction with Interstate 84/I-384 (mp 6.05)	<b>174</b>	31	73	70	42	TBD
Interstate 384 (I-384) From I-84 (mp 0.0) to Spencer Street (mp 1.6)	<b>108</b>	17	41	50	27	TBD

*Notes:*

Source of data is Buckland Hills Signal System Improvements Final Design Report.

1. Crash rates in units of crashes per million vehicle miles.



**TABLE 2-5**  
**ACCIDENT DATA SUMMARY**  
**COLLISION TYPE (2003 – 2005)**

Location	Total	Angle	Rear End	Head-On	Fixed Object	Other
Adams Street, Manchester	61	1	47	2	2	9
Slater Street, Manchester	12	5	1	1	1	4
Tolland Turnpike, Manchester	69	0	37	6	5	21
Pleasant Valley Road, Manchester	13	1	6	2	2	2
Hale Road, Manchester	23	4	9	2	0	8
Buckland Hills Drive, Manchester	58	4	34	7	3	10
Buckland Street, Manchester	70	1	50	6	4	9
North Main Street, Manchester	10	0	3	2	2	3
Union Street, Manchester	6	1	3	0	1	1
Buckland Road, South Windsor	14	1	11	0	1	1
Clark Street, South Windsor	5	0	1	0	3	1
Pleasant Valley Road, South Windsor	12	3	1	2	2	4
Route 30 (Ellington Rd/Oakland Rd/Deming St) From west of Clark Street (mp 3.25) to Manchester-Vernon Town Line (mp 6.82)	484	12	243	64	21	144
Route 83 Oakland Street From Sheldon Street (mp 9.06) to Route 30 (mp 10.14)	151	4	96	7	8	36
Route 194 (Sullivan Avenue) From Sand Hill Road (mp 2.97) to Route 30 (mp 3.67)	74	2	47	5	5	15
Interstate 84 (I-84) From west of I-384 (mp 66.0) to east of Deming Road (mp 72.6)	798	2	334	13	202	247
Interstate 291 (I-291) From west of Route 5 (mp 2.50) to Junction with Interstate 84/I-384 (mp 6.05)	174	0	57	4	70	43
Interstate 384 (I-384) From I-84 (mp 0.0) to Spencer Street (mp 1.6)	108	0	13	0	67	28



## **2.4 Traffic Capacity Analysis**

Traffic capacity analysis was conducted to assess the quality of traffic flow in the study area for intersections (signalized and unsignalized), arterial roadways, interstate segments, and highway ramp junctions. The capacity analysis was conducted using the procedures of the *2000 Highway Capacity Manual* (HCM) using Synchro/SimTraffic software.

Operational conditions on a particular roadway are classified by the Level of Service that is experienced at a given time. Level of Service (LOS) is a qualitative measure that considers speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience and safety. There are six defined levels of service, which are defined below:

**LOS A** represents free flow with low volumes and unimpeded movements.

**LOS B** represents a stable traffic flow with some restriction in a driver's ability to maneuver within the traffic stream.

**LOS C** is the Level used for design purposes. Traffic flow is stable, but movements and ability to select speeds are restricted due to higher volumes. Traffic conditions are generally not considered objectionable.

**LOS D** is generally considered the lower range of acceptable conditions. Traffic flow is stable, but driver comfort is compromised, and small increases in volume can create significant operational issues.

**LOS E** represents the capacity of the roadway or intersection and involves delay due to congestion. Operator comfort, convenience and freedom to maneuver are significantly compromised.

**LOS F** is generally described as forced flow, with the traffic volume exceeding the capacity of the roadway or intersection. Operations are extremely unstable, and are characterized by stop and go waves. This is considered an unacceptable operating condition.

Level of Service is measured in terms of density, using the terms of passenger cars per mile per lane (pc / mi / ln) for freeway, ramp and weaving sections. For intersections, LOS is measured in terms of control delay per vehicle for a 15-minute analysis period. Control delay includes initial deceleration delay, queue move-up time, stopped delay and final acceleration delay.

On freeway segments, LOS ranges from 11 pc / mi / ln for LOS A to greater than 45 pc / mi / ln for LOS F. For ramps and weaving sections, the range limits are 10 pc / mi / ln (LOS A) and greater than 35 pc / mi / ln (LOS E).



At signalized intersections, range limits are 10 or less seconds of delay for LOS A, and greater than 80 seconds delay for LOS F.

At unsignalized intersections, limits are 10 or less seconds of delay for LOS A, and greater than 50 seconds for LOS F.

The methodology and existing condition results for each system component are discussed below.

#### **2.4.1 Signalized Intersections**

The capacity analysis for signalized intersections uses traffic volumes, geometrics, and traffic signal timings to determine an LOS rating from A through F indicating how the intersection is expected to operate. Capacity analysis for intersections was conducted for Friday afternoon peak hour and Saturday midday peak hour periods using 2005 traffic volumes. The capacity analysis results for signalized intersections are shown in Table 2-6.

As shown in Table 2-6, the majority of the signalized intersections currently operate at acceptable Level of Service (LOS D or better) overall during both Friday afternoon and Saturday midday peak hour periods. However, the following intersections operate at either LOS E or LOS F during one or both peak hours:

- Intersection 6: Buckland Hills Mall Driveway/Lowes/Target Driveways at Buckland Hills Drive operates at LOS E during the Saturday midday peak hour. This location experiences high traffic volumes generated by nearby retail developments.
- Intersection 8: Buckland Hills Drive/Pleasant Valley Road/Buckland Street operates at LOS E during the Friday afternoon peak hour and LOS F during the Saturday midday peak hour. This location experiences high traffic volumes from commuter traffic going to and from I-84 and traffic generated by the retail developments.
- Intersection 9: Pleasant Valley Road at I-84 Westbound Ramps operates at LOS F during the Saturday midday peak hour.
- Intersection 13: Buckland Street at I-84 Eastbound Exit 60 & 62 Ramps operates at LOS F during both peak hour periods. This location experiences high traffic volumes going to and from the I-84 ramps.
- Intersection 14: Buckland Street at Red Stone Road operates at LOS F during both peak hour periods. This location experiences high traffic volumes within a congested corridor with closely spaced intersections.



- Intersection 21: Adams Street at New State Road/Club Golf Driveway operates at LOS E during the Friday afternoon peak hour. This location experiences high traffic volumes within a congested corridor.
- Intersection 25: Deming Street at I-84 Eastbound Ramps/Oakland Street operates at LOS F during both peak hour periods. This location experiences high traffic volumes going to and from the I-84 ramps.
- Intersection 26: Spencer Street at Cemetery Road/I-384 Westbound Ramps operated at LOS E during both peak hour periods. This location experiences high traffic volumes going to and from the I-384 ramps
- Intersection 34: Buckland Road at Tamarack Road operates at LOS E during the Saturday peak hour. The large amount of retail development in the area generates high traffic volumes at this location.



**TABLE 2-6**  
**SUMMARY OF CAPACITY ANALYSIS – SIGNALIZED INTERSECTIONS**  
**EXISTING CONDITIONS (2005 VOLUMES)**

Study Location	Friday PM Peak Hour		Saturday Midday Peak Hour	
	Level of Service	Delay (sec per veh)	Level of Service	Delay (sec per veh)
<b>In Manchester:</b>				
1. Hale Rd at Christmas Tree Shop/Bernies Driveways	A	9	B	15
2. Hale Road at Babies R Us	A	9	B	12
3. Hale Road at Bob’s Driveway	A	10	B	15
4. Hale Road/Buckland Hills Drive at Slater Street	C	32	C	24
5. Buckland Hills Dr at NE Magazine Drive/Pavilion Dr	B	16	C	20
6. Buckland Hills Dr at Mall/ Lowe’s/Target	C	30	E	59
7. Buckland Hills Drive at Home Depot Driveway	B	11	C	24
8. Buckland Hills Dr at Pleasant Valley Rd/Buckland	E	71	F	96
9. Pleasant Valley Rd at I-84 Westbound Ramps	D	48	F	>100
10. Pleasant Valley Rd at Buckland Plaza Dr/JC	D	42	D	38
11. Buckland Street at Pavilions Drive	C	25	D	41
12. Buckland Street at I-84 HOV Lane Ramp	D	37	A	4
13. Buckland St at I-84 EB Ramp	F	>100	F	>100
14. Buckland St at Red Stone Road	F	>100	F	>100
15. Tolland Tpk at Buckland Street	D	40	C	23
16. Tolland Tpk at N. Main Street	C	27	C	21
17. Tolland Tpk at Burr Corners	A	5	A	7
18. Tolland Tpk at JC Penney Drive	A	7	A	9
19. Tolland Tpk at Chapel Road	C	21	B	18
20. Tolland Tpk at I-291 Exit 5 Eastbound Ramps	C	34	B	14
21. Adams Street at New State Road/Club Golf Driveway	E	72	B	13



**TABLE 2-6 (CONT.)  
SUMMARY OF CAPACITY ANALYSIS – SIGNALIZED INTERSECTIONS  
EXISTING CONDITIONS (2005 VOLUMES)**

Study Location	Friday PM Peak Hour		Saturday Midday Peak Hour	
	Level of Service	Delay (sec per veh)	Level of Service	Delay (sec per veh)
22. Deming St (Route 30) at Hale Road/ Gateway Plaza Drive	C	32	D	39
23. Deming St (Route 30) at I-84 Exit 63 Westbound Ramps and <i>Avery St</i>	D	47	D	55
24. Deming Street (Route 30) at Tolland Tpk	B	15	B	11
25. Deming St (Route 30/83) at I-84 Eastbound Ramps and Oakland St (Route 194)	F	>100	F	>100
26. Spencer St (Route 502) at Cemetery Rd and I-384 Westbound Ramps	E	72	E	71
27. Spencer St (Route 502) at I-384 Eastbound Ramps	C	22	B	10
<b>In South Windsor:</b>				
28. Oakland Rd (Route 30) at Slater St/ Foster St	A	9	A	7
29. Oakland Rd/Ellington Rd (Route 30) at Buckland Rd and Sullivan Ave (Route 194)	D	45	C	21
30. Buckland Road at Terry Office Park	A	5	A	6
31. Buckland Road at Deming Street	B	12	A	10
32. Buckland Road at Evergreen Walk	C	26	A	6
33. Buckland Road at Hemlock Drive	C	21	B	15
34. Buckland Road at Tamarack Road	D	40	E	63



## **2.4.2 Unsignalized Intersections**

As with signalized locations, unsignalized intersection analysis uses traffic volumes, geometrics, and traffic controls to determine a Level of Service rating from A through F indicating how the intersection is expected to operate. Unsignalized intersection capacity analysis was conducted for Friday afternoon peak hour and Saturday midday peak hour periods using 2005 volumes. For unsignalized intersections, an overall Level of Service (LOS) rating is not used. Instead, the operation of the critical movement, which is usually the left-turn from the minor street, is reported. LOS E and LOS F are common for unsignalized intersections and do not necessarily indicate a need for improvements. The capacity analysis results for unsignalized intersections are shown in Table 2-7.

Table 2-7 shows that the majority of the unsignalized intersections currently operate at acceptable levels of service (LOS D or better). However, the following intersections have minor movements that operate at LOS E or LOS F during one or both peak hours:

- Intersection 39: Buckland Hills Drive at Wal-Mart Driveway – The northbound left-turn movement (the Wal-Mart driveway) operates at LOS F during both Friday afternoon and Saturday midday periods.
- Intersection 41: Tolland Turnpike at Slater Street – The Tolland Turnpike eastbound and westbound movements operate at LOS F during the Friday afternoon period, and the Tolland Turnpike westbound movement operates at LOS E during the Saturday midday period.
- Intersection 42: Tolland Turnpike at Union Street/Jeffrey Alan Drive – The Tolland Turnpike eastbound movement operates at LOS F during the Friday afternoon peak hour.
- Intersection 47: Buckland Road at Olive Garden/KFC Driveway – The Olive Garden/KFC Driveway eastbound movement operates at LOS E during the Friday afternoon and Saturday midday peak hours.





**TABLE 2-7**  
**SUMMARY OF CAPACITY ANALYSIS – UNSIGNALIZED INTERSECTIONS**  
**EXISTING CONDITIONS (2005 VOLUMES)**

Study Location	Friday PM Peak Hour		Saturday Midday Peak Hour	
	Level of Service <sup>1</sup>	Delay <sup>1</sup> (sec per veh)	Level of Service	Delay (sec per veh)
<b>In Manchester:</b>				
<i>35. Pleasant Valley Road at JC Penney Driveway</i>				
JC Penney Driveway, NB Left	C	21	D	25
<i>36. Chapel Road at I-291 Exit 5 On Ramp</i>				
Chapel Road, NB	A	10	A	9
<i>37. Chapel Road at Clark Street/Burnham Street West</i>				
Chapel Road, WB	B	10	A	9
<i>38. Buckland Hills Drive at Best Buy Driveway</i>				
Best Buy Driveway, NB Right	C	16	C	18
<i>39. Buckland Hills Drive at Wal-Mart Driveway</i>				
Wal-Mart Driveway, NB Left	F	>300	F	>300
<i>40. Buckland Hills Drive at Mall Driveway</i>				
Mall Driveway, NB Right	B	12	B	14
<i>41. Slater Street at Tolland Turnpike</i>				
Tolland Turnpike, WB	F	111	E	47
<i>42. Union Street/Jeffrey Alan Drive at Tolland Turnpike</i>				
Tolland Turnpike, EB	F	66	C	21



**TABLE 2-7 (CONT.)**  
**SUMMARY OF CAPACITY ANALYSIS – UNSIGNALIZED INTERSECTIONS**  
**EXISTING CONDITIONS (2005 VOLUMES)**

Study Location	Friday PM Peak Hour		Saturday Midday Peak Hour	
	Level of Service <sup>1</sup>	Delay <sup>1</sup> (sec per veh)	Level of Service	Delay (sec per veh)
<b>In South Windsor:</b>				
<i>43. Oakland Road at Deming Street (East)</i>				
Deming Street, NB Right	B	14	B	12
<i>44. Oakland Road at Deming Street (West)</i>				
Deming Street, NB Left	D	29	C	21
<i>45. Deming Street at Slater Street</i>				
Deming Street, EB	A	8	A	8
<i>46. Pleasant Valley Road at Clark Street</i>				
Pleasant Valley Road, WB	C	15	C	18
<i>47. Buckland Road at Olive Garden / KFC Drive</i>				
Olive Garden/KFC Driveway, EB	E	44	E	42

*Notes:*

1. Level of Service and Delay reported for the worst (critical) movement, typically from the minor street.

**2.4.3 Arterial Roadways**

Traffic capacity analysis was conducted to assess the quality of traffic flow for 16 study area arterial roadways. The capacity analysis was conducted using the procedures of the *2000 Highway Capacity Manual (HCM)* using Synchro/SimTraffic software. The capacity analysis uses traffic volumes, geometrics, and traffic controls along the arterial roadway to determine a Level of Service (LOS) rating from A through F indicating how the arterial roadway is expected to operate. Capacity analysis for arterial roadways was conducted for Friday afternoon peak hour and Saturday midday peak hour periods using 2005 volumes. The capacity analysis results for the study area arterial roadways are shown in Table 2-8. Figure 2-3 shows the capacity analysis results for the study area arterial roadways for the Friday afternoon peak hour, and Figure 2-4 shows the capacity analysis results for the study area arterial roadways for the Saturday midday peak hour.



As shown in Table 2-8, one-half of the arterial roadways operate at acceptable Level of Service (LOS D or better) during both Friday afternoon and Saturday midday peak hour periods. However, the following arterial roadways operate at LOS E or LOS F during one or both peak hours:

- Buckland Hills Drive operates at LOS F during the Saturday midday peak hour in the westbound direction. This arterial serves the Shoppes at Buckland Hills, Wal-Mart, and other retail developments and experiences high traffic volumes on Saturdays.
- Buckland Street operates at LOS F during both the Friday afternoon and Saturday midday peak hours in both northbound and southbound directions. This arterial serves the ramps to I-84 Eastbound, the Shoppes at Buckland Hills, and several commercial/retail developments.
- Pleasant Valley Road in Manchester operates at LOS E during the Friday afternoon peak hour in the eastbound direction. During the Saturday peak hour, this arterial operates at LOS E in the eastbound direction and LOS F in the westbound direction. This arterial serves the Buckland Plaza shopping center and I-84 westbound ramps.
- Slater Street operates at LOS F during the Friday afternoon peak hour in the northbound direction and LOS E during the Saturday peak hour in the northbound direction. Slater Street most likely is used as a northbound cut-through as it connects Tolland Turnpike from the south to the retail areas along Buckland Hills Drive and Hale Road to the north.



**TABLE 2-8  
SUMMARY OF CAPACITY ANALYSIS  
ARTERIAL LEVEL OF SERVICE  
EXISTING CONDITIONS (2005 VOLUMES)**

Study Location	Friday PM Peak Hour		Saturday Midday Peak Hour	
	Arterial Speed (MPH)	Arterial Level of Service	Arterial Speed (MPH)	Arterial Level of Service
Buckland Hills Drive EB/WB	27/18	D/D	22/15	D/F
Buckland Street NB/SB	14/9	F/F	6/8	F/F
Pleasant Valley Road, Manchester EB/WB	16/14	E/D	14/15	E/F
Tolland Turnpike EB/WB	22/24	D/B	24/24	C/B
North Main Street EB/WB	31/30	A/B	27/27	B/C
Slater Street NB/SB	16/17	F/D	18/15	E/D
Hale Road EB/WB	22/19	D/C	16/17	E/D
Adams Street NB/SB	4/19	F/E	17/25	E/D
Union Street NB/SB	17/18	C/C	25/25	B/B
Buckland Road NB/SB	20/15	E/F	26/18	D/E
Sullivan Avenue (Route 194) NB/SB	27/19	C/E	33/26	C/D
Ellington Road (Route 30) EB/WB	24/23	C/D	23/29	D/B
Clark Street NB/SB	30/29	A/A	28/29	A/A
Oakland Road (Route 30) EB/WB	28/28	B/C	33/30	A/B
Pleasant Valley Rd, S. Windsor EB/WB	25/26	A/A	23/27	B/A
Silver Lane / Spencer Street EB/WB	11/11	F/F	18/8	D/F

- Hale Road operates at LOS E during the Saturday peak hour in the eastbound direction. Hale Road serves many retail developments and has several retail/commercial driveways. Hale Road eastbound connects with Route 30 (Deming Street) which is a heavily developed commercial that also serves the ramps to I-84.



- Adams Street operates at LOS F in the northbound direction and at LOS E in the southbound direction during the Friday afternoon peak hour. During the Saturday peak hour, Adams Street operates at LOS E in the northbound direction. Adams Street has several retail/commercial driveways and connects residential areas to the south with retail/commercial developments to the north.
- Buckland Road operates at LOS E in the northbound direction and LOS F in the southbound direction during the Friday afternoon peak hour. During the Saturday peak hour, Buckland Road operates at LOS E in the southbound direction. This arterial roadway serves many retail/commercial developments, including Evergreen Walk, and in the southbound direction, it connects to Buckland Street, which serves the I-84 ramps.
- Sullivan Avenue operates at LOS E during the Friday afternoon peak hour in the southbound direction. Sullivan Avenue southbound connects Route 30 and Buckland Road.

Silver Lane/Spencer Street operates at LOS F in both directions during the Friday afternoon peak hour and LOS F in the westbound direction during the Saturday midday peak hour. This roadway experiences high peak hour traffic volumes as it serves the ramps to I-384 eastbound and westbound.

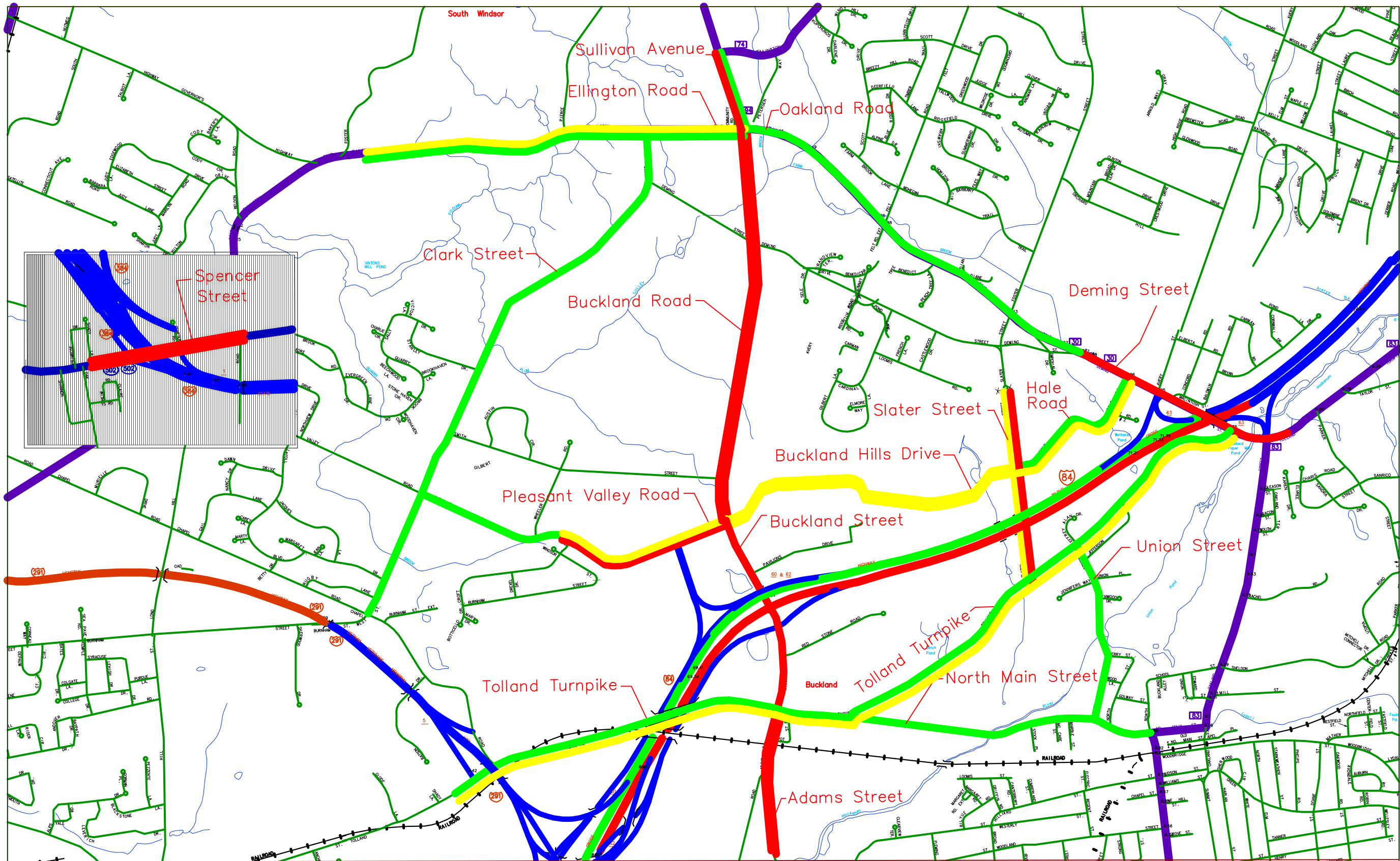


FIGURE NO. 2-3  
ARTERIAL LEVEL OF SERVICE - 2005 FRIDAYPM PEAK HOUR  
BUCKLAND AREA TRANSPORTATION STUDY  
MANCHESTER AND SOUTH WINDSOR, CT

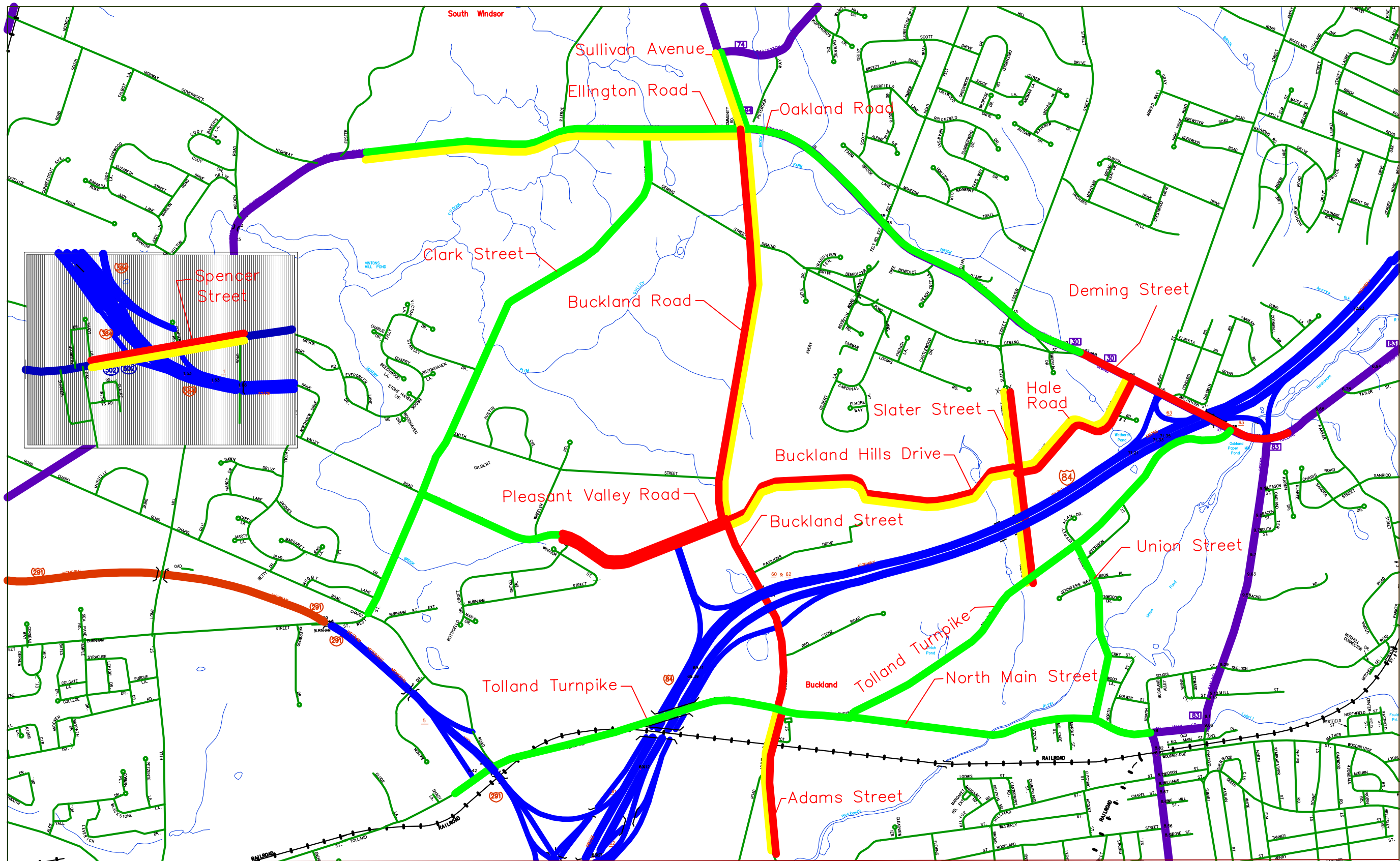


FIGURE NO. 2-4  
ARTERIAL LEVEL OF SERVICE - 2005 SATURDAY MIDDAY PEAK HOUR  
BUCKLAND AREA TRANSPORTATION STUDY  
MANCHESTER AND SOUTH WINDSOR, CT



## Comparison of Synchro Results Versus Speed Study Results

The data collected from the speed study was used to calibrate the Synchro model to more accurately reflect existing conditions in the study area. Table 2-9 compares the collected average speed data to the Synchro results for arterial average speeds during the Friday afternoon peak hour. Table 2-10 compares the collected average speed data to the Synchro results for arterial average speeds during the Saturday midday peak hour.

**TABLE 2-9  
COMPARISON OF SPEED STUDY RESULTS  
VS. SYNCHRO ARTERIAL ANALYSIS RESULTS  
EXISTING CONDITIONS - FRIDAY AFTERNOON PEAK HOUR**

Arterial	Speed Study Results		Synchro Arterial Analysis Results	
	Average Speed (mph)	Average Speed (mph)	Average Speed (mph)	Average Speed (mph)
Buckland Hills Drive EB/WB	27 EB	19 WB	27 EB	18 WB
Buckland Street NB/SB	22 NB	23 SB	14 NB	9 SB
Pleasant Valley Rd, Manchester EB/WB	18 EB	18 WB	16 EB	14 WB
Tolland Turnpike EB/WB	26 EB	29 WB	22 EB	24 WB
North Main Street EB/WB	35 EB	35 WB	31 EB	30 WB
Slater Street NB/SB	26 NB	20 SB	16 NB	17 SB
Hale Road EB/WB	22 EB	23 WB	22 EB	19 WB
Adams Street NB/SB	30 NB	22 SB	4 NB	19 SB
Union Street NB/SB	17 NB	19 SB	17 NB	18 SB
Buckland Road NB/SB	28 NB	28 SB	20 NB	15 SB
Sullivan Avenue (Route 194) NB/SB	28 NB	26 SB	27 NB	19 SB
Ellington Road (Route 30) EB/WB	28 EB	29 WB	24 EB	23 WB
Clark Street NB/SB	31 NB	34 SB	30 NB	29 SB
Oakland Road (Route 30) EB/WB	29 EB	33 WB	28 EB	28 WB
Pleasant Valley Rd, S. Windsor EB/WB	28 EB	28 WB	25 EB	26 WB
Silver Lane / Spencer Street EB/WB	25 EB	29 WB	11 EB	11 WB

Notes: EB = eastbound; WB = westbound; NB = northbound; SB = southbound





**TABLE 2-10  
COMPARISON OF SPEED STUDY RESULTS  
VS. SYNCHRO ARTERIAL ANALYSIS RESULTS  
EXISTING CONDITIONS  
SATURDAY MIDDAY PEAK HOUR**

Arterial	Speed Study Results		Synchro Arterial Analysis Results	
	Average Speed (mph)	Average Speed (mph)	Average Speed (mph)	Average Speed (mph)
Buckland Hills Drive EB/WB	27 EB	23 WB	22 EB	15 WB
Buckland Street NB/SB	22 NB	28 SB	6 NB	8 SB
Pleasant Valley Rd, Manchester EB/WB	22 EB	25 WB	14 EB	15 WB
Tolland Turnpike EB/WB	29 EB	29 WB	24 EB	24 WB
North Main Street EB/WB	27 EB	32 WB	27 EB	27 WB
Slater Street NB/SB	25 NB	14 SB	18 NB	15 SB
Hale Road EB/WB	26 EB	21 WB	16 EB	17 WB
Adams Street NB/SB	25 NB	33 SB	17 NB	25 SB
Union Street NB/SB	30 NB	29 SB	25 NB	25 SB
Buckland Road NB/SB	32 NB	32 SB	26 NB	18 SB
Sullivan Avenue (Route 194) NB/SB	35 NB	28 SB	33 NB	26 SB
Ellington Road (Route 30) EB/WB	36 EB	31 WB	23 EB	29 WB
Clark Street NB/SB	32 NB	32 SB	28 NB	29 SB
Oakland Road (Route 30) EB/WB	34 EB	36 WB	33 EB	30 WB
Pleasant Valley Rd, S. Windsor EB/WB	21 EB	25 WB	23 EB	27 WB
Silver Lane / Spencer Street EB/WB	30 EB	32 WB	18 EB	8 WB

Notes: EB = eastbound; WB = westbound; NB = northbound; SB = southbound

As shown in Tables 2-9 and 2-10, the average speed results from the Synchro model are within 5 mph of the speed study results for most arterials. For a few arterials, the difference is 10 mph or greater. A likely reason for this is that the 2005 traffic volumes



used in the Synchro model are higher than the traffic volumes occurring on the arterials when the speed study was conducted.

#### 2.4.4 I-84 Interstate Expressway Segment Analysis

Traffic capacity analysis was conducted to assess the quality of traffic flow on the interstate segments of I-84 between Exit 59 and Exit 63. The interstate segment capacity analysis was conducted using the procedures of the *2000 Highway Capacity Manual* (HCM) using HCS+ Version 5.1 software. The interstate segment capacity analysis uses traffic volumes, geometrics, and speeds on the interstate mainline to determine a Level of Service (LOS) rating from A through F indicating how the interstate segments are expected to operate. Capacity analysis for interstates and ramps was conducted for the Friday morning and Friday afternoon peak hour periods using 2005 volumes. The interstate segment capacity analysis results are shown in Table 11.

**TABLE 2-11**  
**INTERSTATE EXPRESSWAY SEGMENT CAPACITY ANALYSIS RESULTS**  
**I-84 BETWEEN EXIT 59 AND EXIT 63**  
**EXISTING CONDITIONS (2005 VOLUMES)**

Location	Level of Service	
	Friday AM Peak Hour	Friday PM Peak Hour
I-84 EB Between Exit 59 and Exit 60	C	F
I-84 EB Between Exit 60 and Exit 61	B	D
I-84 EB Between Exit 61 and Exit 60/62	B	E
I-84 EB Between Exit 60/62 and Exit 63	C	F
I-84 WB Between Exit 60 and Exit 59	F	C
I-84 WB Between Exit 61 and Exit 60	E	C
I-84 WB Between Exit 60/62 and Exit 61	E	C
I-84 WB Between Exit 63 and Exit 60/62	F	D

Notes: EB = eastbound; WB = westbound

The results of the analysis are consistent with the directional traffic flow on I-84 in the study area, i.e., predominantly westbound (toward Hartford) in the morning peak hour, and predominantly eastbound in the afternoon peak hour. Based on the results shown in Table 2-11, nine of the 16 interstate segments on I-84 operate at acceptable Level of Service (LOS D or better). However, the following seven interstate segments operate at LOS E or LOS F during either the morning or the afternoon peak hour, due to high mainline traffic volumes:



- I-84 Eastbound between Exit 59 and Exit 60 operates at LOS F during the Friday afternoon peak hour.
- I-84 Eastbound between Exit 61 and Exit 60/62 operates at LOS E during the Friday afternoon peak hour.
- I-84 Eastbound between Exit 60/62 and Exit 63 operates at LOS F during the Friday afternoon peak hour.
- I-84 Westbound between Exit 60 and Exit 59 operates at LOS F during the Friday morning peak hour.
- I-84 Westbound between Exit 61 and Exit 60 operates at LOS E during the Friday morning peak hour.
- I-84 Westbound between Exit 60/62 and Exit 61 operates at LOS E during the Friday morning peak hour.
- I-84 Westbound between Exit 63 and Exit 60/62 operates at LOS F during the Friday morning peak hour.

#### **2.4.5 Ramp Capacity Analysis**

Traffic capacity analysis was conducted to assess the quality of traffic flow on the I-84 ramp-interstate junction influence area for entrance and exit ramps within the study area. The ramp capacity analysis was conducted using the procedures of the *2000 Highway Capacity Manual* (HCM) using HCS+ Version 5.1 software. The ramp capacity analysis uses traffic volumes, geometrics, and speeds on the interstate mainline and on the ramps to determine a Level of Service (LOS) rating from A through F indicating how the ramp-interstate junction influence area is expected to operate. Capacity analysis for interstates and ramps was conducted for the Friday morning and Friday afternoon peak hour periods using 2005 volumes. The ramp capacity analysis results are shown in Table 2-12.



**TABLE 2-12**  
**RAMP CAPACITY ANALYSIS RESULTS**  
**EXISTING CONDITIONS (2005 VOLUMES)**

Location	Ramp Type	Level of Service	
		Friday AM Peak Hour	Friday PM Peak Hour
I-84 EB Exit 60/62 (Buckland Street)	Merge	C	F
I-84 EB Exit 61 (I-291)	Merge	B	F
I-84 EB Exit 63 (Route 83)	Merge	B	E
I-84 EB Exit 59 (I-384)	Diverge	B	C
I-84 EB Exit 60 (Route 44)	Diverge	B	D
I-84 EB Exit 61 (I-291)	Diverge	B	D
I-84 EB Exit 61 (Buckland St. Ramp)	Diverge	B	D
I-84 EB Exit 63 (Route 83)	Diverge	B	F
I-84 WB Exit 59 (I-384)	Merge	F	B
I-84 WB Exit 60 (I-291)	Merge	F	C
I-84 WB Exit 61 (Pleasant Valley Rd. Ramp)	Merge	D	C
I-84 WB Exit 63 (Route 30)	Merge	F	D
I-84 WB Exit 61 (I-291)	Diverge	D	B
I-84 WB Exit 61 (I-384)	Diverge	C	B
I-84 WB Exit 63 (Route 30)	Diverge	D	C

Notes: EB = eastbound; WB = westbound

As shown in Table 2-12, the majority of the ramp-interstate junction influence areas on I-84 currently operate at acceptable Level of Service (LOS D or better). However, the following ramp-interstate junction influence areas operate at LOS E or LOS F during either the morning or the afternoon peak hours due to high ramp and/or mainline traffic volumes:

- I-84 Eastbound Exit 60/62 On-Ramp from Buckland Street operates at LOS F during the Friday afternoon peak hour.
- I-84 Eastbound Exit 61 On-Ramp from I-291 operates at LOS F during the Friday afternoon peak hour.
- I-84 Eastbound Exit 63 On Ramp from Route 83 operates at LOS E during the Friday afternoon peak hour.



- I-84 Eastbound Exit 63 Off-Ramp to Route 83 operates at LOS F during the Friday afternoon peak hour.
- I-84 Westbound Exit 59 On-Ramp from I-384 operates at LOS F during the Friday morning peak hour.
- I-84 Westbound Exit 60 On-Ramp from I-291 operates at LOS F during the Friday morning peak hour.
- I-84 Westbound Exit 63 On-Ramp from Route 30 operates at LOS F during the Friday morning peak hour.

The results of the analysis are consistent with the directional traffic flow on I-84 in the study area, i.e., predominantly westbound (toward Hartford) in the morning peak hour, and predominantly eastbound in the afternoon peak hour.

#### **2.4.6 Weave Analysis**

According to the *2000 Highway Capacity Manual (HCM)*, “Weaving is defined as the crossing of two or more traffic streams traveling in the same general direction along a significant length of highway without the aid of traffic control devices (with the exception of guide signs). Weaving segments are formed when a merge area is closely followed by a diverge area, or when an on-ramp is closely followed by an off-ramp and the two are joined by an auxiliary lane. Note that if a one-lane on-ramp is closely followed by a one-lane off-ramp and the two are not connected by an auxiliary lane, the merge and diverge movements are considered separately using procedures for the analysis of ramp terminals.” The maximum freeway segment length for which weaving analysis is conducted is 2,500 feet for all weave configuration types. Beyond these lengths, merge and diverge areas are considered separately and are analyzed as isolated merge and diverge areas.

A review of I-84 in the study area between Exit 59 and Exit 63 was conducted to determine if any weaving segments existed. It was found that where an on-ramp was followed immediately by an off-ramp, the distance between the ramps was greater than 2,500 feet. Therefore, no weaving analysis was conducted. Instead, on-ramps and off-ramps were analyzed as isolated merge and diverge areas, as discussed above.

#### **2.4.7 Traffic Simulation Results**

The roadways and capacity analysis results presented above are useful to identify issues and concerns at individual locations. However, in areas with heavy traffic volume, traffic congestion often extends beyond a single location impacting a series of intersections or an entire corridor. In these cases, vehicle queues will extend back through one or more intersections affecting traffic flow and operations at upstream areas. Queuing can at times back up to impact highway ramp locations. While traditional analysis results may show a



location to operate at acceptable conditions, it may in fact be operating far worse at peak times as a result of queue spillback. Queue spillback is caused when a queue from a downstream intersection is so long that it blocks vehicles from entering the upstream intersection on green.

The SimTraffic component of the study area Synchro model was employed to evaluate the impacts of corridor queuing and congestion in the study area. SimTraffic provides simulations of traffic operations on study roadways and intersections at peak periods and is used to identify system deficiencies. The SimTraffic model was also used to calibrate analysis results to current operating conditions. Figure 2-5 shows a screen shot of the Synchro model developed for this project.

Figures 2-6 through 2-10 show SimTraffic screen shots of vehicle queuing at selected locations.

The key operational traffic issues were identified based on the SimTraffic analysis results and are discussed below.

### ***1. Buckland Street and Buckland Road***

Traffic congestion and queuing occurs along the Buckland Street and Buckland Road (Figures 2-6 and 2-7) corridor focusing on the large intersection of Buckland Street/Buckland Road/Buckland Hills Drive/Pleasant Valley Road. This intersection serves as the gateway to the Buckland Hills retail district. Motorists arriving from I-84 Exit 60/62 must pass through this intersection to reach the Shoppes at Buckland Hill, Buckland Plaza and Evergreen Walk shopping areas. As a result, congestion, delay and slow travel speeds are experienced in and around this location.

Significant queuing occurs at the Buckland Street / Buckland Road / Buckland Hills Drive / Pleasant Valley Road intersection in both the northbound direction (on Buckland Street), and in the southbound direction (on Buckland Road). Vehicle queuing also occurs on Buckland Road at the intersection with the Target/Lowes and Tamarack Road Driveways.

Vehicles queues on Buckland Street in both the northbound and southbound directions extend between the I-84 eastbound ramps and Redstone Road. Long vehicle queues on the I-84 eastbound off ramp at Buckland Street extend back to near the I-84 mainline.

### ***2. Pleasant Valley Road***

Stemming from the intersection at Buckland Street/Buckland Road, significant vehicle queuing of eastbound traffic on Pleasant Valley Road can extend beyond the I-84 westbound ramps to the west (Figure 2-7).

### ***3. Buckland Hills Drive***



Due to the many driveways, heavy traffic volumes, and topography of the road, traffic congestion and queuing is experienced at several location along Buckland Hills Drive (Figure 2-7). Long westbound vehicle queues are generated at the intersection with Buckland Road/Buckland Street/Pleasant Valley Drive. The queues extend upstream beyond the Home Depot Driveway. Long queues are also experienced by motorists making an eastbound left turn into Target/Lowes Driveway and out of the many driveways along Buckland Hills Drive.



Figure 2-5 Overall Synchro Model Network

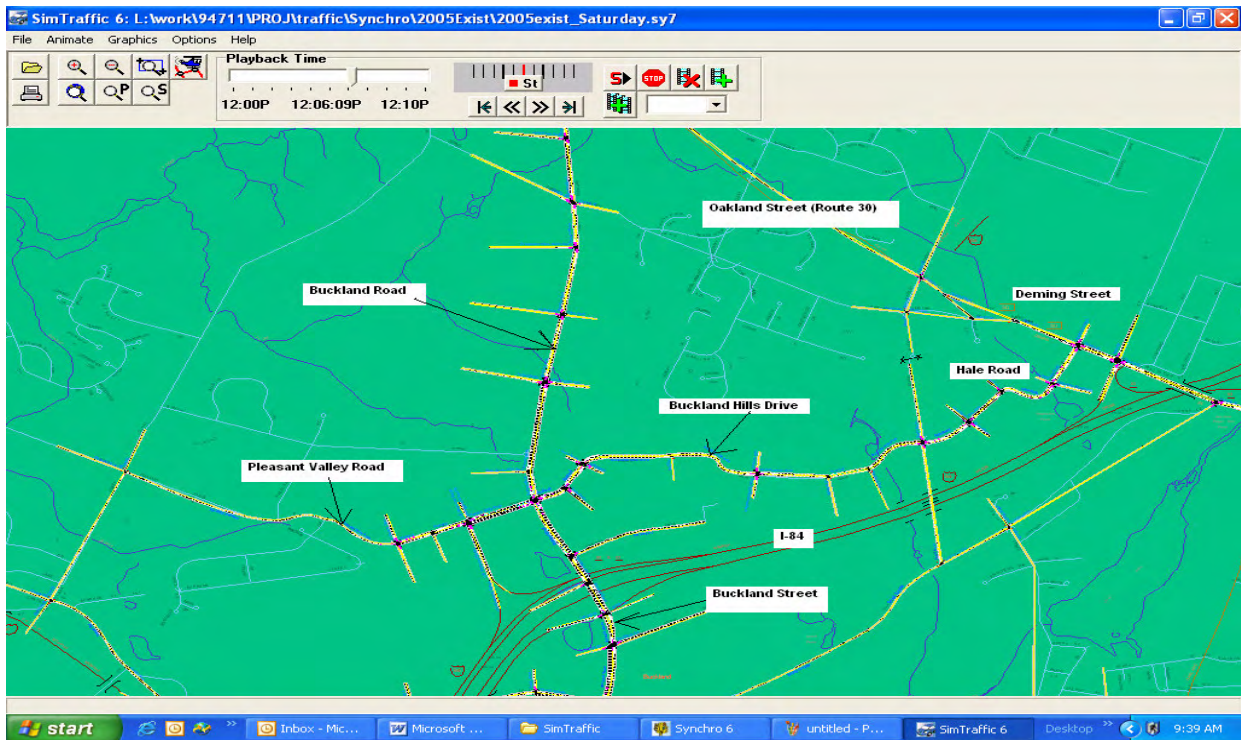


Figure 2-6 Buckland Street Corridor – Saturday Peak Hour

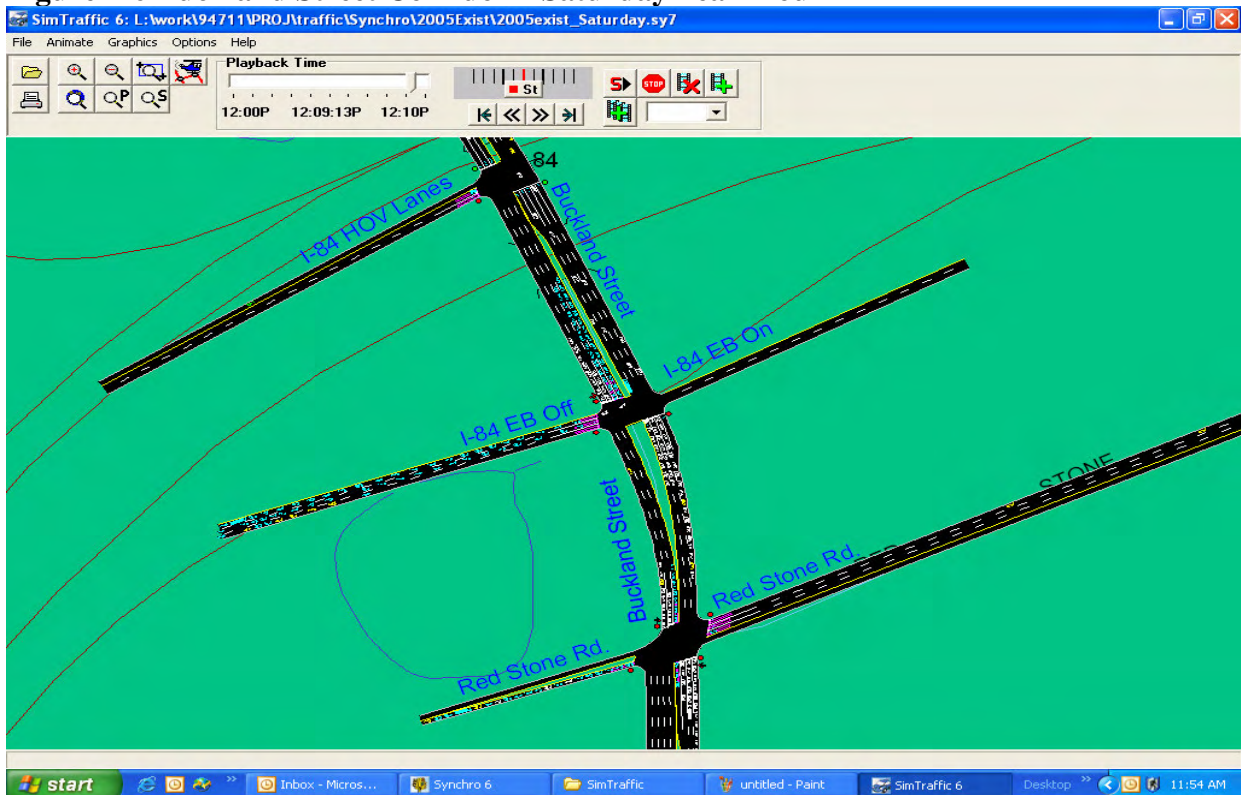






Figure 2-7 Buckland Hills Dr at Pleasant Valley Rd/Buckland St/Buckland Rd – Saturday Peak Hr

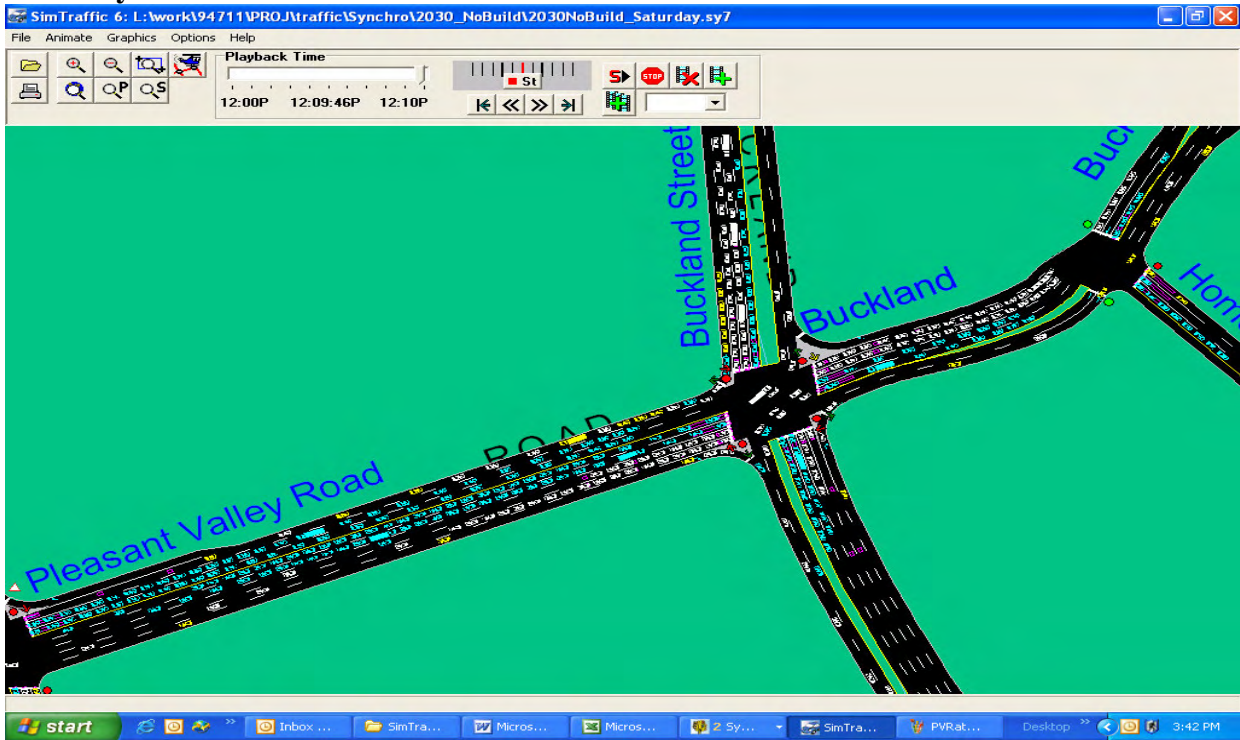


Figure 2-8 Buckland Hills Dr at Lowe's/Target Driveway and Mall Driveway – Saturday Peak Hour

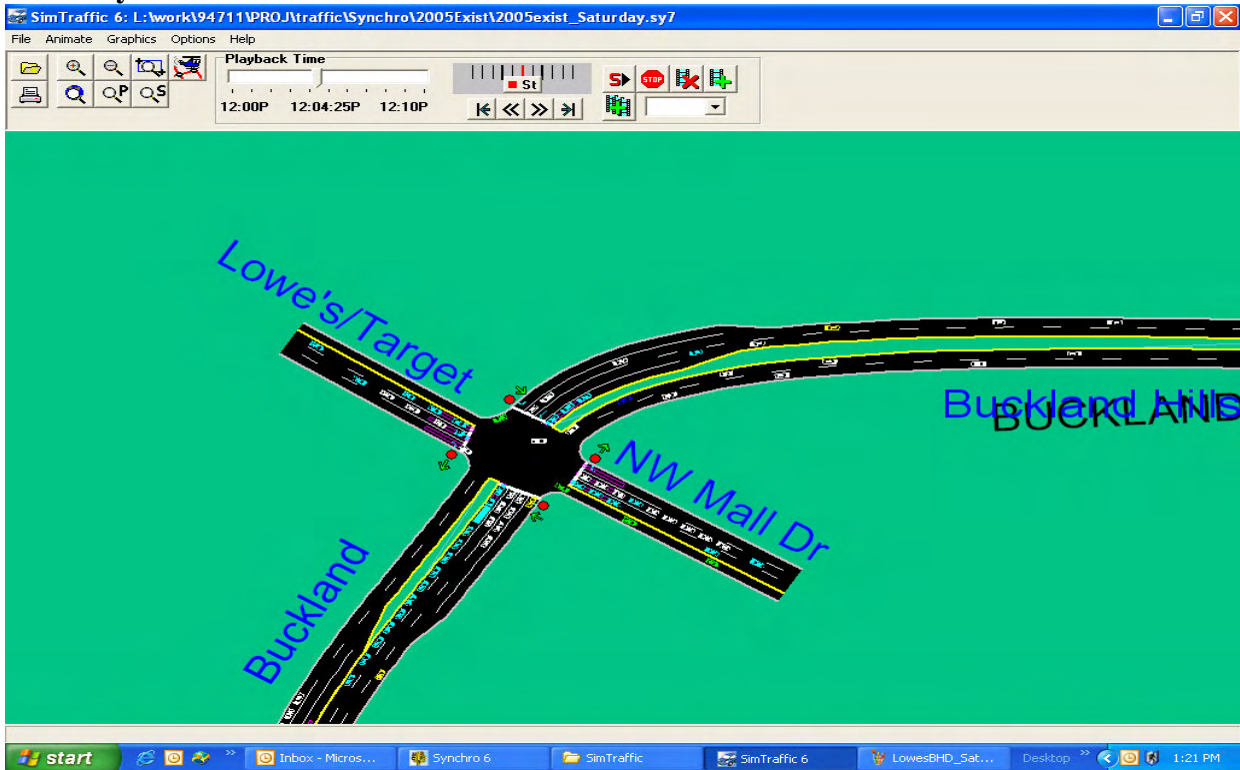




Figure 2-9 Hale Road at Christmas Tree Shop Driveway and Bernie’s Driveway

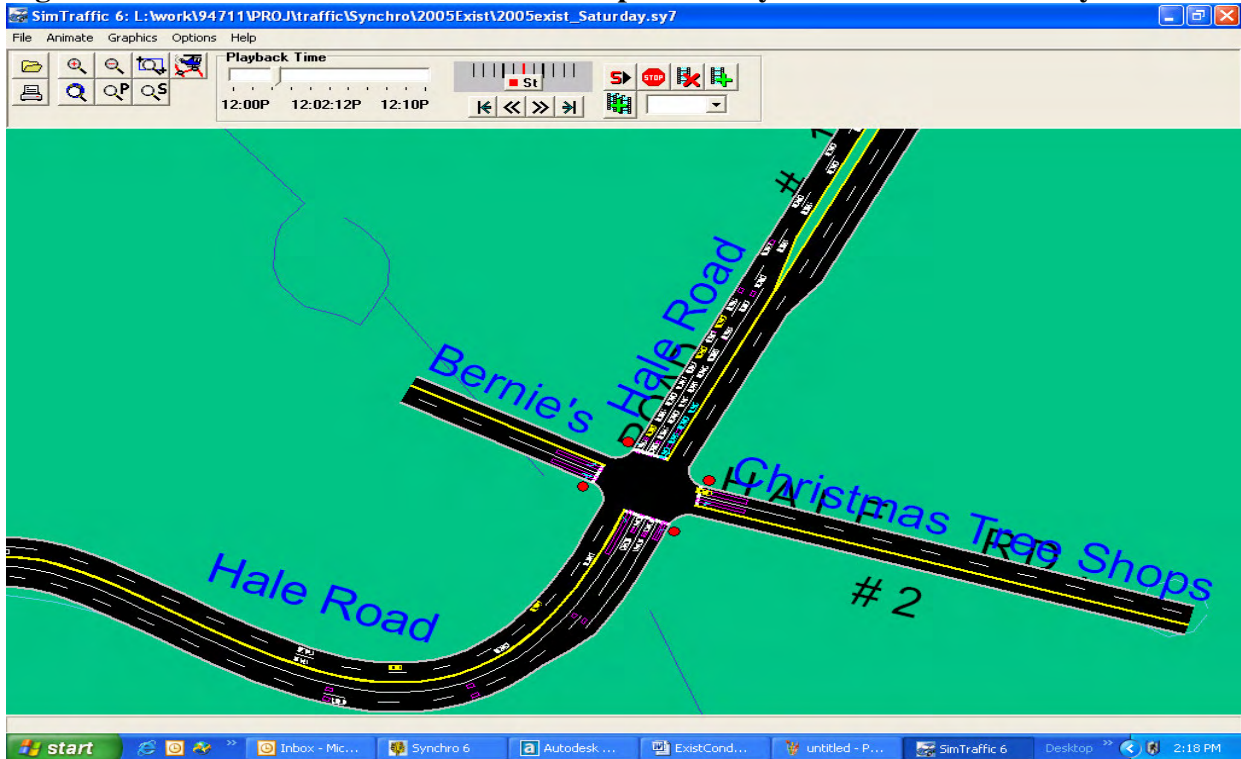
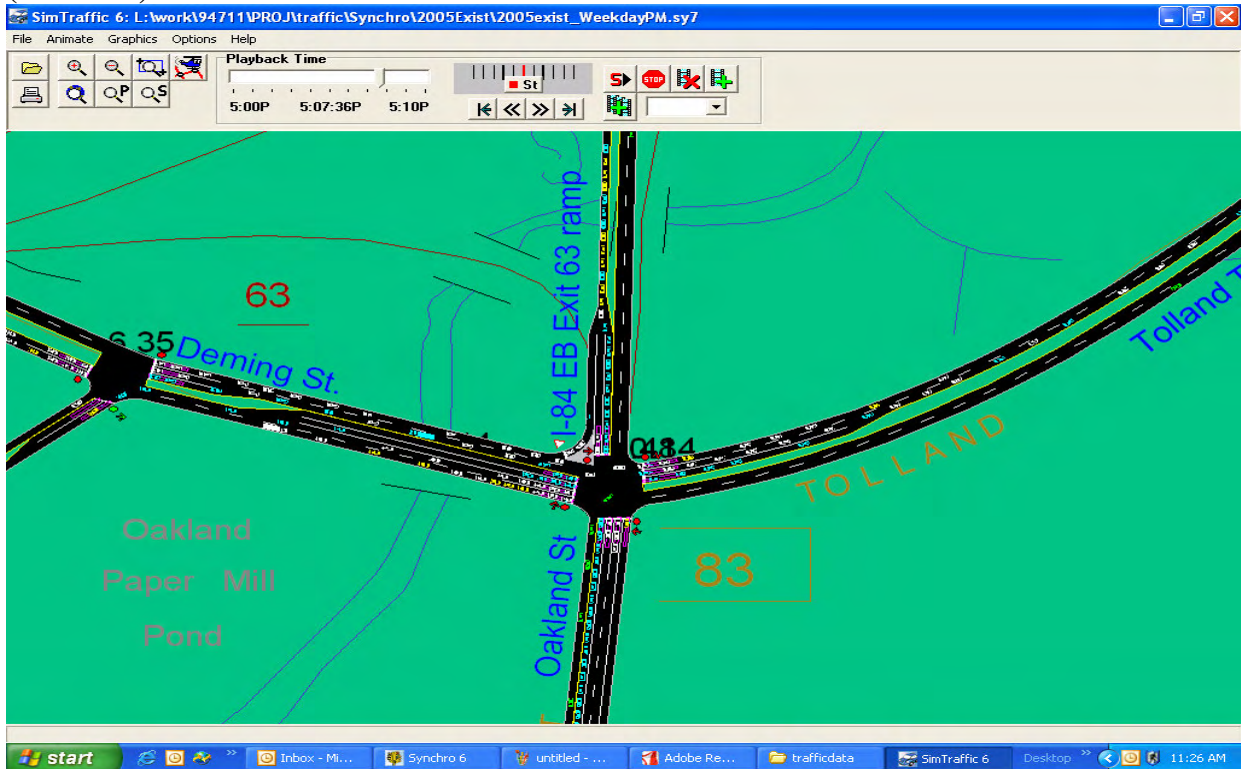


Figure 2-10 Deming Street (Route 30) at I-84 Eastbound Ramps/ Oakland Street (Route 83)





#### ***4. Hale Road***

As with Buckland Hills Drive, congestion and queuing is experienced on Hale Road as a result of the heavy volumes, multiple access points, and topography (Figure 2-9).

#### ***5. Deming Street at I-84 Ramps***

Vehicle queues on the I-84 eastbound off-ramp (exit 63) at Deming Street extend back to near the I-84 mainline (Figure 2-10). Vehicle queues also occur on the eastbound Deming Street and westbound Tolland Turnpike approach at this intersection.

## **2.5 Multi-Modal Transportation Services**

### **2.5.1 Existing Transit Services**

Existing transit service within the Buckland study area consists of a network of local and express bus routes operated by Connecticut Transit (CT Transit), plus paratransit<sup>1</sup> and shuttle buses serving specific market areas. CT Transit is the Connecticut Department of Transportation owned bus service with over 30 local and 12 express bus routes serving the overall Hartford market, with four local and one express route serving the Buckland study area. With the exception of the Buckland Express, the CT Transit routes in the study area currently operate seven days per week with some of the routes providing level of service frequency on weekends comparable to weekday service.

The service corridor is generally east-west with local and express routes with suburban stop locations in the towns of Manchester, South Windsor, Vernon, and East Hartford. Weekday service generally serves a commuter market between each of these suburbs and employment centers in Hartford, with weekend and evening service for other work and non-work related trips such as those serving the retail destinations in the Buckland area. Provided below is a summary of the existing transit services, recent notable changes in service, and an overview of other transit plans and studies completed or underway relevant to the Buckland area.

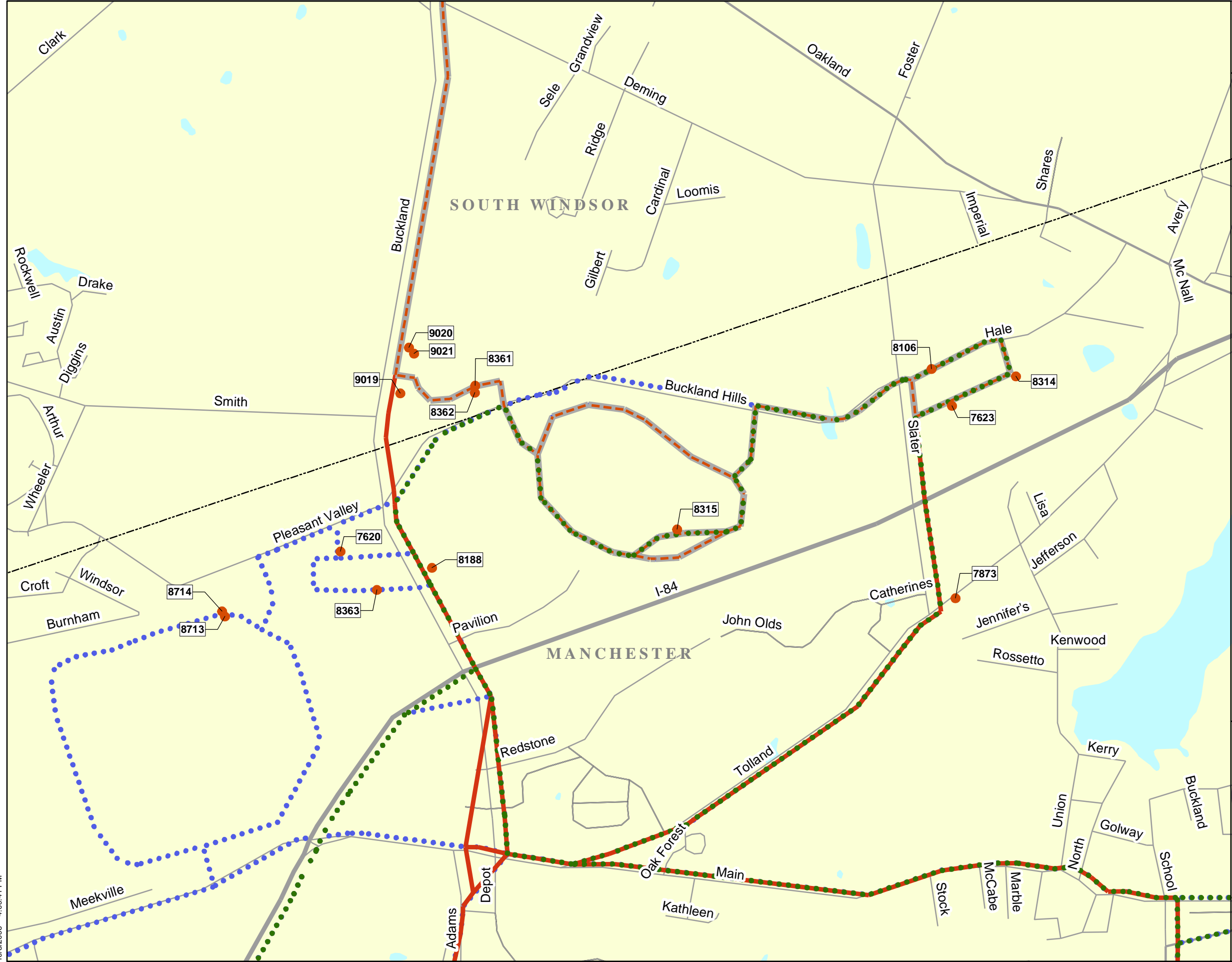
#### **Local Bus Service**

CT Transit is the provider of local bus service in the study area. Route descriptions are provided, followed by span of service, route length and scheduled running times, and level of service (frequency). Figure 2-11 depicts Hartford and the eastern suburban travel corridors highlighting the local bus routes serving the study area. Figure 2-12 depicts the Buckland Hills retail area highlighting the local bus routes and bus stop locations. Figure 2-13 shows a diagram from the Z Route with further detail of the local stop locations in and around the Buckland Hills, which is representative of the stops made by other routes serving the area.

<sup>1</sup>Paratransit: an alternative mode of flexible passenger transportation that does not follow fixed routes or schedules. Typically, vans or mini-buses are used to provide paratransit services, but also share taxis and jitneys are important providers.







- Legend**
- Buckland Area Stops
  - B - Silver Lane
  - - - L - Tower Ave. Crosstown
  - X - Manchester/Weathersfield
  - Z - Tolland Turnpike
  - 7623 Stop ID #

**Figure 2-13**

**Buckland Area Transit Stops (Mapped Version)**

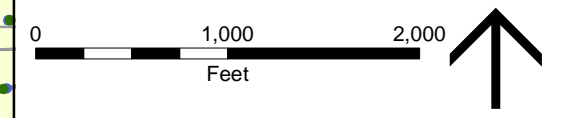
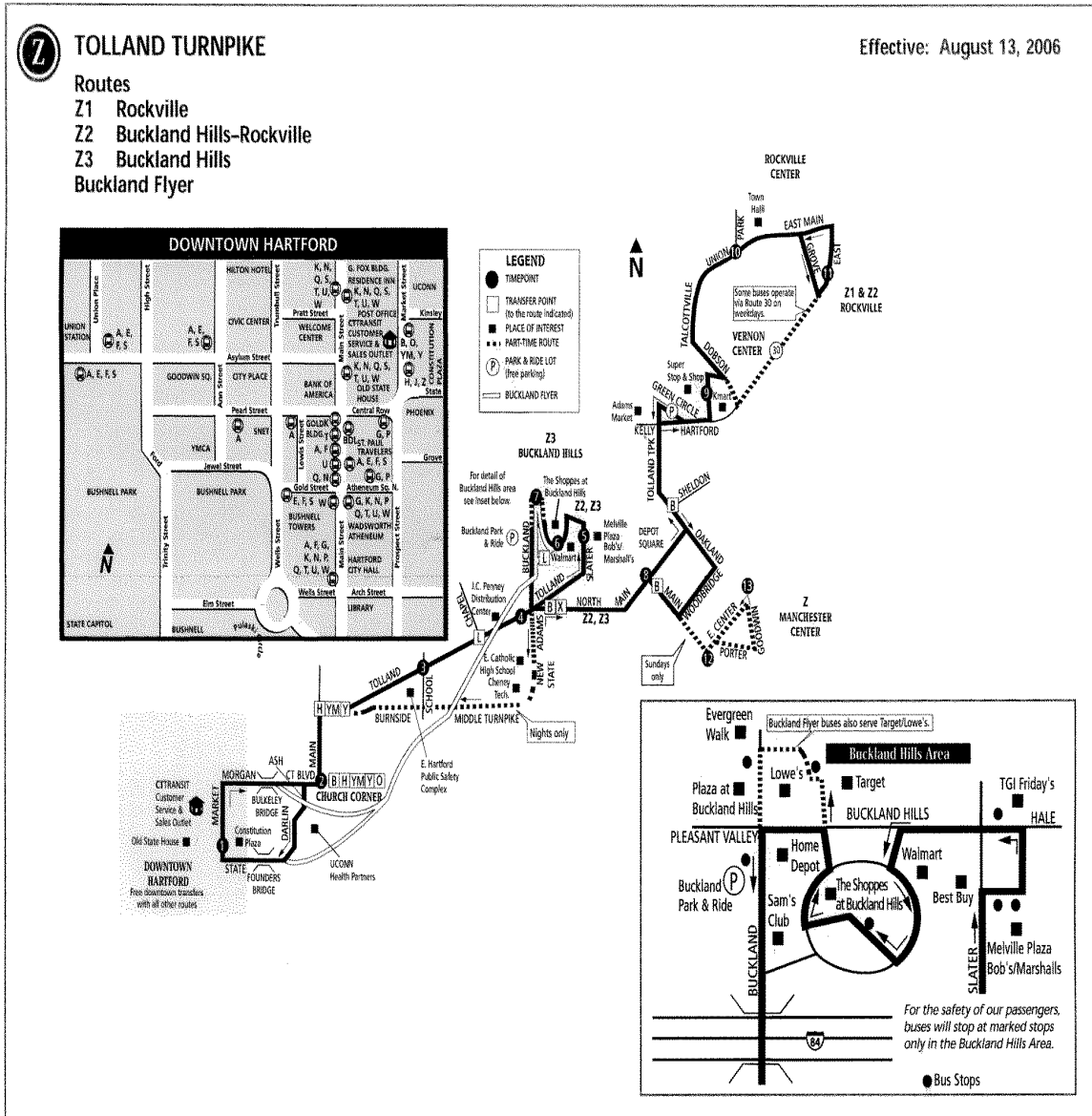




Figure 2-13 Buckland Area Z-Route and Local Transit Stops





### Route Descriptions

#### *B Route Group – Silver Lane*

The B Route group operates between downtown Hartford and Manchester primarily via Main Street and Silver Lane with a total of five routes (B1, B2, B3, B4, and Bx). The route connects the Buckland study area with the central business district of Hartford as well as points in East Hartford. The following two of the five B routes currently serve the Buckland study area as listed below:

- B3 Route – Buckland Hills via MCC
- B4 Route – Buckland Hills via McKee Street

Major stops along the B3 and B4 routes include the Buckland Hills retail area, Manchester Center, Manchester Community College, Silver Lane Plaza, and Church Corner. Transfer points are available in downtown Hartford with virtually all CT Transit bus routes and other modes, as well as at various points outside of downtown with Routes B1, B2, Bx, H, L, X, YM, Y, and Z.

#### *L Route Group – Tower Avenue Crosstown*

The L Route group operates between Bloomfield, Hartford (north), South Windsor, and Manchester primarily via Tower Avenue, I-291, and State Route (SR) 30 with a total of three routes (L1, L2, L3). The route connects the Buckland study area with Bloomfield and Windsor, which are two major suburban population and employment areas north of Hartford. The L1 and L2 routes operate weekdays and weekends (L1 eastbound and L2 westbound) as far west as Copaco. On weekends, the L1 route originates at Bloomfield Center rather than Copaco, with the L3 route providing a Bloomfield Center destination. All three of the L routes serve the Buckland study area as listed below:

- Route L1 – Buckland Hills (Bloomfield to Buckland Hills)
- Route L2 – Copaco (Buckland Hills to Bloomfield)
- Route L3 – Bloomfield Center (Buckland Hills to Bloomfield Center – weekends only)

Major stops along the L routes include Copaco, North Hartford, and the Windsor, South Windsor, and Buckland Park-and-Ride lots. Transfer points are located along Tower Avenue with numerous north-south bus routes serving downtown Hartford. Transfer points in South Windsor and Manchester are along the B, H, X, and Z routes.

#### *Route X – Forbes Street Crosstown*

The X Route group operates in a southwest to northeast direction between Wethersfield and Buckland Hills primarily via Silas Dean Highway, Main Street, Forbes, and Burnside with a pair of unidirectional routes (X1 northbound and X2 southbound). The route





connects the Buckland study area with Wethersfield and Glastonbury, which are two major suburban population and employment areas south of Hartford. These routes serve the Buckland study area as listed below:

- Route X1 – Buckland Hills
- Route X2 – Wethersfield Shopping Center

Major stops along the X routes include Somerset Square in Glastonbury, Main and Brewer near Pratt & Whitney Aircraft, East Hartford, and a number of stops in Manchester. Transfer points are provided with routes B, J, O, P, T, U, YM, and Z.

#### *Route Z – Tolland Turnpike and Buckland Flyer*

The Z Route group operates between downtown Hartford, the Buckland study area, and Vernon on weekdays and weekends using a shorter route via the Tolland Turnpike with fewer intermediate stops compared with the B Route group which also connects downtown Hartford with the Buckland study area. There are five routes in the Z Route group (Z, Z1, Z2, Z3, and the Buckland Flyer.) The Z route provides all westbound service, with the Z1, Z2, and Z3 routes providing the eastbound service. The Z1 route bypasses the Buckland study area to provide faster service between Hartford and Rockville and therefore is not listed below as a route currently serving the study area. The Buckland Flyer serves the study area primarily on Saturdays. The following routes currently serve the study area.

- Route Z2 – Buckland Hills-Rockville
- Route Z3 – Buckland Hills

Major stops along the Z2 and Z3 routes between Hartford and Buckland Hills include Church Corner and Tolland and School. The Z2 route continues eastward beyond Buckland Hills to serve Rockville and several other stops. Transfer points are provided with multiple bus routes in downtown Hartford, and with the B, H, L, O, YM, Y, and X routes between downtown Hartford and Buckland Hills.

While listed in the CT Transit schedules as a local route related to the Z Route group, the Buckland Flyer route functions as a Saturday express bus route between downtown Hartford and the retail complex at Buckland Hills, with the schedule focused on the hours of operation at the retail stores. For approximately one month during the peak holiday shopping season, the frequency of service on the Buckland Flyer increases and includes Sunday service.

#### *Express Bus Service*

CT Transit operates a total of 12 Commuter Express routes in the Hartford area. One of these express routes, the Route 3 Buckland Express, currently serves the study area. The



CT Transit Commuter Express routes operate weekdays during peak hours, mostly between suburban Park-and-Ride lots and downtown Hartford.

*Route 3 – Buckland Express*

This express bus route originates at the Buckland Park-and-Ride facility (P&R #4) located west of the retail district off of Buckland Street in Manchester. This route uses Exit 62 to access I-84 westbound to downtown Hartford where it serves Central Row North. Figure 2-14 is a photo of the Park & Ride facility served by the Buckland Express. The photo was taken on a Saturday when utilization is relatively low compared to weekdays, when the facility is used by commuters.

**Figure 2-14 Buckland Express Park-and-Ride Facility**



Other downtown Hartford locations are served by this route at various times in the schedule. The following Buckland Express routes serve the study area:

- Route 3 – Buckland Express
- Route 3/50 Buckland-Vernon Express

The only other existing Commuter express bus near the study area is the Route 50, which connects Vernon to downtown Hartford via I-84. This route is operated by Collins Bus Service and already serves three Park-and-Ride facilities in Vernon (P&R #40, 41, and 42) located at I-84 Exits 64/65 and 67 in Vernon. This route passes nearby Buckland Hills as it travels along I-84, but does not serve the study area.



### Days and Hours of Operation

CT Transit local and express commuter services are provided by CT Transit year-round, with one service, the Buckland Flyer, providing significantly increased level of service to the study area on weekends during the peak shopping season (late November to late December) each year. The local routes operate seven days per week (except the Buckland Flyer) with the earliest weekday service in the study area starting around 5:30 AM.<sup>1</sup> The local weekday service generally ends around 11 PM. The express commuter Route 3 departs the Buckland Hills Park-and-Ride facility weekdays only at 6:15 AM, with the last inbound bus leaving the Park-and-Ride at 8:37 AM. Outbound Route 3 has one mid-day bus, followed by outbound peak service starting at 3:22 PM, and the last bus leaving downtown Hartford around 6:30 PM (depending upon downtown location).

On the local routes, a Sunday service schedule is operated on New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving, and Christmas holidays. Regularly scheduled service operates on all other holidays. The exception is the Buckland Flyer, which *increases* its service frequency and adds Sunday service for the holiday shopping season between Thanksgiving and Christmas.

The express commuter Route 3 does not operate on New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving, and Christmas. A reduced express bus service operates on the day after Thanksgiving, Martin Luther King Day, President's Day, and the Day before Independence Day.

In summary, with the exception of the Buckland Flyer, the existing local and express bus services in the study area operate at reduced levels on national holidays and holiday weekends which, given the high concentration of retail land use, are when the greatest levels of trip making occurs in the study area. Local buses serving Buckland Hills add one additional late night bus during one month per year to coincide with later closing times for some retail stores. Table 2-13 provides a summary of the CT Transit hours of operation for local and express routes in the study area based on the regular (non-holiday) schedules.

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<sup>1</sup> Some start earlier or later depending on the route.



**TABLE 2-13  
CT TRANSIT HOURS OF OPERATION  
(NON-HOLIDAYS)**

Route	Dir	Weekdays		Saturdays		Sundays	
		Begin	End	Begin	End	Begin	End
B – Silver Lane (B3, B4)	EB	8:10 AM	7:15 PM	8:40 AM	6:00 PM	-	-
	WB	7:38 AM	8:15 PM	9:40 AM	6:57 PM	-	-
L – Tower Avenue Crosstown (L1,L2,L3)	EB	6:00 AM	8:50 PM	8:30 AM	8:50 PM	8:17 AM	5:50 PM
	WB	6:53 AM	10:07 PM	7:32 AM	10:07 PM	8:20 AM	7:05 PM
X – Forbes Street Crosstown (X1, X2)	EB	6:19 AM	8:47 PM	7:27 AM	8:47 PM	8:21 AM	5:41 PM
	WB	7:21 AM	10:07 PM	8:31 AM	10:07 PM	8:25 AM	6:40 PM
Z – Tolland Turnpike (Z2, Z3)	EB	6:20 AM	9:15 PM	7:15 AM	9:15 PM	8:00 AM	5:15 PM
	WB	8:50 AM	10:07 PM	7:35 AM	10:07 PM	8:16 AM	6:42 PM
Z – Buckland Flyer*	EB	-	-	1:00 PM	8:15 PM	-	-
	WB	9:53 AM	10:20 AM	1:30 PM	10:00 PM	-	-
3 – Buckland Express	EB	6:30 AM	6:27PM	-	-	-	-
	WB	6:15 AM	5:36 PM	-	-	-	-

Source: CT Transit published schedules 11/25/05; except L Route 3/20/05; and B Route 4/23/06.

Notes: For local routes, EB service “begin and end” is for western terminus outbound to Buckland Hills.  
WB service “begin and end” is for scheduled departure from Buckland Hills.

\*Buckland Flyer hours of operation shown are for Jan-Nov and do not reflect increased hours of operation on Saturdays and addition of Sunday service for the holiday season between November 25 and December 23.

Route Length, Scheduled Running Times, and Level of Service Frequency

The route length shown in Table 2-14 and scheduled running time information for the routes serving the study area provide a general idea of the average speed of the service. Not surprisingly, the local bus routes have the most intermediate stops and therefore have end to end running times which average approximately 15-20 miles per hour. By comparison, the Buckland Flyer and Buckland Express make few or no intermediate stops between the Buckland study area and downtown Hartford, which is reflected in their higher average speeds.



**TABLE 2-14**  
**ROUTE LENGTH, SCHEDULED RUNNING TIMES, AND**  
**LEVEL OF SERVICE FREQUENCY**

Route	Route Length (Miles)	Scheduled Running Time (minutes)	Frequency Weekdays	Frequency Saturdays	Frequency Sundays
<i>B-Silver Lane</i>					
B3 Buckland Mall via MCTC	16	44-59	Hourly	Hourly	-
B4 Buckland Mall via McKee	14	46-55	Once/day	Hourly	-
<i>L – Tower Avenue Crosstown</i>					
L1 Buckland Hills	16	49-51	Hourly	Hourly	Hourly
L2 Copaco	16	49-51	Hourly	Hourly	Hourly
L3 Bloomfield Center	N/A	N/A	-	Hourly	Hourly
<i>X – Forbes Street Crosstown</i>					
X1 Buckland Hills	16	42	Hourly	Hourly	Hourly
X2 Wethersfield Shop Ctr.	15	42	Hourly	Hourly	Hourly
<i>Z – Tolland Turnpike</i>					
Z2 Buckland Hills Rockville	19	55-73	Twice/day	Hourly	Hourly
Z3 Buckland Hills	9	24-33	30-60 min.	Hourly	Hourly
Z - Buckland Flyer	N/A	15-20	Once/day	Hourly	-
3 Route – Buckland Express	N/A	13-20	15 min.	-	-

Source: CT Transit published schedules. Route length and running time sources are approximate from Hartford East BRT Feasibility Study. Frequency shown is for peak period during regular non-holiday service. L2/L3 weekend service is not concurrent.

The level of transit service is measured by the frequency of bus service. The local bus routes in the study area generally provide bus service hourly in each direction on weekdays and weekends. The span of service is somewhat shorter on weekends with service generally starting later as shown in Table 2-14. Notable exceptions are the Buckland Flyer, which significantly increases level of service for the period of November 25 to December 23 during peak holiday shopping season from hourly to every 30 minutes and adds Sunday service.

The Route 3 Express bus from Buckland Park-and-Ride to Hartford provides the most frequent service with a bus departing every 15 minutes during the peak morning and afternoon periods. However, there is only one mid-day express bus, no late evening service, and no weekend service.



## Ridership

Ridership at the Buckland Hills area bus stops for the routes summarized above is provided in Table 2-15. Ridership is provided for each of the bus stop locations shown in Figures 2-12 and 2-13.

The bus stops with the highest ridership in the Buckland study include the Buckland Park-and-Ride lots, Buckland Commuter lot, Buckland Filenes, and Bob’s/Marshalls.

**TABLE 2-15  
RIDERSHIP AT BUCKLAND HILLS AREA BUS STOPS**

<b>Town</b>	<b>Location</b>	<b>Stop ID</b>	<b>Boardings</b>	<b>Alightings</b>
Manchester	JC Penny East	8713	0	14
Manchester	JC Penny West	8714	19	0
Manchester	Buckland P&R Lot	7620	326	289
Manchester	Buckland P&R Lot 2	8363	56	0
Manchester	Buckland Street/Commuter	8188	40	36
South Windsor	Buckland Road/Evergreen1	9019	1	1
South Windsor	Buckland Rd/Evergreen2	9020	1	7
South Windsor	Buckland Rd/Target-Lowes	9021	4	0
Manchester	Target and Lowes	8362	1	10
Manchester	Target and Lowes	8361	4	10
Manchester	Buckland and Filenes	8315	359	417
Manchester	Slater St. and Tolland	7873	6	9
Manchester	Hale Rd. and Slater	8106	11	17
Manchester	Bob’s and Marshall’s	7623	1	13
Manchester	Bob’s and Marshall’s	8314	58	77

### **2.5.2 Paratransit and Other Alternative Services**

In addition to the local and express bus services provided by CT Transit and its contract operators, there are other services available within the study area providing mobility options. These are described below.



### *The Rideshare Company*

The Rideshare Company is a non-profit organization providing vanpool, carpool, and related ridesharing information to assist commuters in finding an alternative to single occupancy vehicle travel to work. One of its commuter matching services is EasyStreet vanpool. A search of their current database of origins and destinations demonstrates that the service does not include Buckland Hills.

### *The Greater Hartford Transit District*

The Greater Hartford Transit District provides transportation and transit related support services, as well as securing the attainment of capital items within the Greater Hartford region and statewide. Their services include:

- Provision of ADA Paratransit Service
- Dial-A-Ride Municipal Grant Collaboration
- Drug and Alcohol Testing Consortium Administration
- Hartford Dial-A-Ride Service Operator
- Insurance Consortium Administration
- Member Town Dial-A-Ride Vehicle Procurement Coordination
- Spruce Street Parking Lot – Owner
- Training – National Safety Council Defensive Driver and OSHA
- Union Station Transportation Center – Owner

The Greater Hartford Transit District (the “District”) is a quasi-municipal corporation operating under the authority of Chapter 103a of the Connecticut General Statutes. There are currently sixteen member towns: Bloomfield, East Hartford, East Windsor, Enfield, Farmington, Granby, Hartford, Manchester, Newington, Rocky Hill, Simsbury, South Windsor, Vernon, West Hartford, Wethersfield and Windsor. Each member town appoints one to four Directors according to population, who collectively form the Board of Directors, which is the policy making body of the District. The day to day affairs are managed by the District staff. The District has broad powers to acquire, operate, finance, plan, develop, maintain and otherwise provide all forms of land transportation and related services including the development or renewal of transportation centers and parking facilities.

The ADA paratransit service provides service for a ¾ mile radius around all CT Transit bus routes, including those serving the Buckland study area.

### *Shoppes at Buckland Hills Shuttle*

Until recently, ConnDOT had operated a shuttle bus from the University of Connecticut (UConn) to the Shoppes at Buckland Hills one Saturday per month during the Fall and Spring semesters. That service was discontinued and the UConn transportation website indicates that a similar service is currently being operated by the Student Union Board of



Governors (SUBOG). However, the web link to that service description was not available at the time of this writing.

### **2.5.3 Bicycle / Pedestrian Facilities**

#### *Bicycle Facilities*

The Town of Manchester has several hiking and bicycle trails. The following is a list of the bicycle-accessible trails in Manchester:

- Case Mountain Hiking Trails – several hiking/mountain biking trails are located within the Case Mountain Recreation Area in the southeastern corner of Manchester, outside the Buckland study area.
- Charter Oak Greenway – this trail runs parallel to I-384 from the I-84/I-384 interchange to Exit 2, and is shown on Figure 2-1B.
- Center Springs Park Trail – this trail is located within Center Springs Park, outside the Buckland study area.
- Hop River Linear State Park this trail starts at Colonial Road in Manchester and continues through the towns of Vernon and Bolton, outside the Buckland study area.

These trails provide recreational opportunities to bicyclists but do not directly connect to the transportation network in the Buckland area.

In South Windsor, Chapel Road is signed as a bicycle route for shared use by vehicles and bicycles. Chapel Road connects to the Bissel Bridge Trail, a bike path that crosses from South Windsor into Windsor over the Connecticut River.

#### *Pedestrian Facilities*

##### Sidewalks

Most of the study area arterials and intersections have sidewalks on one or both sides of the roadways. The study area arterials that have sidewalks include:

In Manchester:

- Buckland Hills Drive (sidewalk on both sides)
- Buckland Street (sidewalk on both sides)
- Pleasant Valley Road (sidewalk on both sides)
- Tolland Turnpike (sidewalk varies; on one or both sides, no sidewalk west of Slater Street to North Main Street)
- North Main Street (sidewalk on south side)
- Slater Street (sidewalk on both sides)
- Hale Road (sidewalk on both sides)
- Adams Street (sidewalk on east side)





- Union Street (sidewalk on east side)
- Spencer Street (sidewalk on both sides)

In South Windsor:

- Buckland Road (sidewalk varies, on one or both sides)
- Ellington Road (sidewalk on south side in the area of the Stop & Shop plaza)

Substantial portions of Sullivan Avenue, Clark Street, Oakland Road, and Pleasant Valley Road in South Windsor are lacking sidewalks on one or both sides of the roadways in the study area.

### Crosswalks

Many of the study area intersections have crosswalks; however, several do not have crosswalks. Below is a summary of the study area intersections without crosswalks.

In Manchester, no crosswalks exist for:

- Hale Road at Christmas Tree Shops/Bernie's Driveways
- Hale Road at Bobs/TGI weekdays/Residence Inn Driveways
- Buckland Street at I-84 Eastbound Ramps
- Adams Street at New State Road
- Deming Street (Route 30/83) at I-84 Eastbound Exit 63 Ramps/Oakland Street
- Spencer Street (Route 502) at I-384 Westbound Ramps/Cemetery Road
- Pleasant Valley Road at JC Penney Distribution Center Driveway
- Chapel Road at I-291 Westbound Exit 5 Ramp
- Chapel Road at Clark Street/Burnham Street West
- Buckland Hills Drive at Wal-Mart Drive
- Buckland Hills Drive at Mall Driveway
- Tolland Turnpike at Slater Street

In South Windsor, no crosswalks exist for:

- Oakland Road (Route 30) at Slater Street/Foster Street
- Oakland Road/Ellington Road (Route 30) at Buckland Road and Sullivan Avenue (Route 194)
- Buckland Road at Terry Office Park Drive
- Buckland Road at Deming Street
- Buckland Road at Evergreen Walk North Drive
- Buckland Road at Hemlock Drive
- Buckland Road at Tamarack Road
- Oakland Road (Route 30) at Deming Street (East)
- Oakland Road (Route 30) at Deming Street (West)
- Deming Street at Slater Street
- Pleasant Valley Road at Clark Street
- Buckland Road at Olive Garden/KFC Drive



## Signals

Of the 34 signalized study intersections, most have either concurrent or exclusive pedestrian phases and are equipped with pedestrian-activated push buttons. However, in many cases, neither pedestrian signal heads nor marked crosswalks exist. This is the case for the three signalized intersections along Buckland Road that access the Evergreen Walk retail area (at Hemlock Drive, Tamarack Road, and North Site Drive).

## Pedestrian Accidents – Arterial Roadways

Table 2-16 lists the arterial roadways where accidents involving pedestrians occurred between 2003 and 2005.

**TABLE 2-16**  
**PEDESTRIAN ACCIDENT DATA SUMMARY**  
**2003 – 2005**

<b>Location</b>	<b>Total</b>	<b>Involving Pedestrians</b>	<b>Percent Involving Pedestrians</b>
Tolland Turnpike, Manchester	<b>69</b>	3	4%
Buckland Hills Drive, Manchester	<b>58</b>	2	3%
North Main Street, Manchester	<b>10</b>	1	10%
Pleasant Valley Road, South Windsor	<b>12</b>	1	8%

Source: Connecticut Department of Transportation

Of the 16 study area arterials and 3 interstate freeway segments in the Buckland Study area, only these four had accidents involving pedestrians. On Tolland Turnpike, 3 out of 69 accidents (4%) involved pedestrians. On Buckland Hills Drive, 2 out of 58 accidents (3%) involved pedestrians. On North Main Street, 1 out of 10 accidents (10%) involved pedestrians, and on Pleasant Valley Road, 1 out of 12 accidents (8%) involved pedestrians.

### **2.5.4 Related Studies and Surveys**

Other studies recently performed by ConnDOT and others in the study corridor principally include the Hartford East BRT Feasibility Study. Other studies may have been performed by private developers, the Shoppes at Buckland Hills, and major employers and are being researched further.



### Hartford East BRT Feasibility Study

As summarized in the East BRT Feasibility study, “...in March 2001 the Capitol Region Council of Governments (CRCOG) adopted its Long Range Transportation Plan. The Plan recommended that the Hartford East Corridor be retained as a high priority corridor and that transportation improvement options be assessed in greater detail to determine the most appropriate improvements. In addition, the Regional Transit Strategy (RTS) identified the Hartford East Corridor as a location with high potential for successful implementation of Bus Rapid Transit.” Information from the Project Survey undertaken as part of that study will be reviewed and utilized in the analysis for this study as appropriate. The Project Survey data is not contained in the hard copy of the December 2004 Feasibility Study Final Report.

### Surveys and studies by retail developments and major employers (as available)

Information, if available, will be obtained from major generators in the study area. No data is available at this time.

### Other Data

Input from public processes related to existing transit service includes customer complaints/suggestions on record with CT Transit relative to Buckland area service. CT Transit will be contacted to identify any relevant customer comment records.

## **2.6 Issues Identification**

### **2.6.1 Roadway System**

Critical operational and safety traffic issues were identified based on the 1) analysis results, 2) observations, and 3) information of existing conditions in the Buckland Hills Area provided by the towns. The purpose of this section is to identify areas and locations that are operating deficiently at this point in time so that improvement alternatives can be developed and operations can be compared against future conditions to see if operations worsen in the future. It should be noted that these issues are being experienced under current development and traffic volumes. It is logical to expect that these issues will worsen, and other issues may be added once projected 2030 traffic volumes are considered.

Overall, the Buckland Hills Area experiences high traffic volumes from a variety of sources:

- Local and regional traffic attracted to the major regional shopping area and additional development
- Commuter traffic traveling through the area on interstate highways and local residents traveling to and from work



- Local traffic not associated with retail activity that needs to travel through the area

The study area roadway system has not kept pace with the level of development that has been constructed in this area. The combination of high traffic volumes, competing roadway users, and capacity limitations has resulted in significant congestion and travel delay, long queues at study intersections, safety issues, and impacts to access and circulation.

The critical traffic deficiencies in the study area can be summarized into three categories:

- Traffic operations
- Safety
- Access

Specific problem locations and trends are highlighted in the matrix presented in Table 2-13 and described below.

#### *Traffic Operations Issues*

Many roadways and intersections in the Buckland Hills Area currently experience capacity and delay issues during peak commuter hours. Interstates 84, 291, and 384 have poor levels of service, particularly on ramps and at ramp intersections. Reflecting local and regional commute patterns, highway through and ramp volumes generally experience delays in the westbound direction (towards Hartford) during the morning peak period and in the eastbound direction (away from Hartford) during the afternoon peak period.

Most of the arterial roadways providing access to the shopping areas experience poor traffic operations as the result of high traffic volumes and multiple intersections/driveways. These include Buckland Road, Buckland Street, Buckland Hills Drive, Pleasant Valley Road, Slater Street, Spencer Street, Hale Road, Deming Street, Adams Street, and Sullivan Avenue (Route 194). Tolland Turnpike, the arterial that connects I-84 Exit 63 with the center of Buckland, also experiences peak hour congestion in the vicinity of Slater Street and Jeffrey Alan Drive–Union Street. The signalized intersection central to the retail area, Buckland Hills Drive/Buckland Street/Pleasant Valley Road, is troublesome during the Friday afternoon and Saturday midday peak hour due primarily to retail traffic. Spencer Street, which serves the I-384 ramps, also experiences peak hour congestion.



**TABLE 2-17**  
**TRANSPORTATION DEFICIENCIES SUMMARY**

<b>Signalized Intersections</b>	<b>Capacity/Delay Issues</b>	<b>Safety Issues</b>	<b>Access Issues</b>
4. Buckland Hills Dr/Hale Road/Slater Street		X	
6. Buckland Hills Dr/Mall Drive/Lowe's, Target	X		X
8. Buckland Hills Dr/Pleasant Valley	X	X	
9. Pleasant Valley Rd/I-84 WB Ramps	X		
11. Buckland Street at Pavilions Drive		X	
13. Buckland St/I-84 EB Ramps	X		
14. Buckland St/Redstone Rd	X	X	
21. Adams Street at New State Rd.	X		
25. Deming St/Oakland St/I-84 EB Ramps	X		
26. Spencer St. (Route 502) at I-384 WB	X		
34. Buckland Rd/Tamarack Rd	X		X
<b>Unsignalized Intersections</b>			
39. Buckland Hills Dr/Wal-Mart Drive	X	X	X
41. Tolland Turnpike/Slater Street	X		
42. Tolland Turnpike/Jeffrey Alan Dr/Union St	X		
47. Buckland Rd/Olive Garden, KFC Dr	X		X
<b>Highway Ramps</b>			
I-84 EB On-Ramp from Buckland St	X	X	X
I-84 EB On-Ramp from I-291	X		X
I-84 EB On-Ramp from Route 83	X		X
I-84 EB Off-Ramp to Route 83	X		X
I-84 EB Off-Ramp (#59) to I-384	X		X
I-84 WB On-Ramp from I-384	X		X
I-84 WB On-Ramps from I-291	X		X
I-84 WB On-Ramps from Route 30	X		X
<b>Roadways</b>			
Buckland Hills Dr	X		
Buckland St	X	X	
Buckland Road	X		
Pleasant Valley Rd	X	X	
Slater Street	X		
Hale Rd	X		
Deming St	X		
Adams St	X	X	
Sullivan Ave	X	X	
I-84 between Exits 59-60	X		
I-84 between Exits 60/62 - 61	X		
I-84 between Exits 60/62 - 63	X		
Rt. 83 (Oakland Street/Tolland Turnpike)	X	X	



**TABLE 2-17**  
**TRANSPORTATION DEFICIENCIES SUMMARY (Cont'd)**

<b>Roadways</b>			
Rt. 30 (Deming Street)	X	X	
Tolland Turnpike	X		
Spencer Street	X		

Likewise, heavy retail and commuter traffic accounts for peak hour congestion in the vicinity of the two I-84 exits (Exits 60/62 and 63) used to access the Buckland area. Tolland Turnpike–Oakland Street and Buckland Road–Buckland Street experience peak hour congestion during both Friday afternoon and Saturday midday peak hours. Figure 2-15 shows peak hour queuing at Buckland Street’s intersection with the Pavilion Drive, which connects to the Shoppes at Buckland Hills (Buckland Hills Mall).

**Figure 2-15 Buckland Street northbound at Pavilion Drive, with I-84 overpass**



Buckland Hills Drive–Pleasant Valley Road, the roadway that runs north of and parallel to I-84 adjacent to the Shoppes at Buckland Hills, experiences severe congestion, particularly in the vicinity of its signalized intersection with Buckland Street. In addition to high traffic volumes and multiple access driveways, traffic is constrained along Buckland Hills Drive due to topography. Critical areas along Buckland Hills Drive include intersections at the Mall Drive/Lowe’s/Target Drive (signalized) and the Wal-Mart Driveway (unsignalized).



### Safety

The following intersections and roadways in the study area have experienced high crash rates:

- Buckland Hills Drive/Hale Road/Slater Street
- Buckland Hills Drive/Pleasant Valley Road/Buckland Street
- Buckland Hills Drive/Wal-Mart Drive
- Buckland Street/Redstone Road
- Pleasant Valley Road–Buckland Hills Drive
- Adams Street
- Sullivan Avenue
- Route 83 (Oakland Road/Tolland Turnpike)
- Route 30 (Deming Street/Oakland Road/Ellington Road)
- I-84 Eastbound Exit 61 (Buckland Street On Ramp)

Deficiencies along these roadways include high traffic volumes, multiple access points, and way-finding (signage). The extensive width of the roads (multiple through and turning lanes) and pedestrian crossings at intersections along these roadways may also be a problem for pedestrians traveling from one portion of the retail area/mall to another. These roadways experience large peak hour traffic volumes because they provide highway access as well as access to major shopping areas.

In addition, the physical geometry of Buckland Hills Drive is challenging. The layout of this road is hilly and windy, including many slope changes and horizontal curves. Its multiple curves and grade changes add to the potential safety hazards that already exist along this roadway.

The accident analysis demonstrated that considerable safety concerns exist at the centrally located Buckland Hills Drive's intersection with Pleasant Valley Road/Buckland Street. Figure 2-16 illustrates the expansiveness of this signalized intersection. The intersection's large size contributes to potential conflicts for both cars and pedestrians. Safety is a concern at this location primarily because of high peak hour traffic volumes made up of multiple users, including shoppers, commuters, local town traffic, and pedestrians/bicyclists. The size of this intersection and the fact that it is surrounded by large retail developments and highway ramps may result in drivers experiencing difficulty making decisions and finding the correct lane to be in to access their desired destination. The double left turn lanes on all approaches may add to driver discomfort. I-84 westbound Exit 60/62 ramps, the Home Depot Driveway, and the KFC/Olive Garden Driveway are also within close proximity to this intersection, creating additional opportunities for conflicts.



**Figure 2-16 Intersection of Pleasant Valley Rd, Buckland St, Buckland Rd, and Buckland Hills Dr**



Access

Access problems are particularly evident along Buckland Road and Buckland Hills Drive in the vicinity of the mall and other large stores. Specific locations include Buckland Road intersections with Tamarak Road and the Olive Garden/KFC Driveway, and Buckland Hills Road unsignalized intersections with the Mall Drive/Lowe's/Target Drive and the Wal-Mart Drive. Buckland Road and Buckland Hills Drive have multiple driveways within close proximity, which results in additional delay and potential safety concerns. Queue spillbacks from downstream intersections can extend back to and beyond driveways, blocking access. Signage is prevalent but can be confusing for drivers accessing desired shopping areas or highway ramps. Excessive peak hour traffic volumes and multiple users of these roadways further exacerbate access problems.

Due to high traffic volumes and congestion, access to I-84 from the study area is difficult. In some cases, vehicle queues can extend beyond ramps, interfering with through traffic movements along arterial roadways. This level of congestion exacerbates delay and reduces travel time already experienced on study roadways. In addition, congestion hinders emergency vehicles access.





## **2.6.2 Transit and Alternative Modes**

Existing transit service within the study area consists of several local bus routes operated by CT Transit that provide daily service between the Buckland Hills retail area and points west, including downtown Hartford, as well as suburban locations north and south of Hartford. One express commuter bus route connects the study area with downtown Hartford. Additionally, during the peak holiday retail period from November 25 to December 23, the Buckland Flyer provides increased level of service to the study area from downtown Hartford on weekends. Service frequency for the express commuter route is every 15 minutes weekdays during the peak morning and afternoon periods. The express bus route services the Buckland Park-and-Ride lot, and not the retail area. The local routes serving the retail area operate every hour with start and end of service generally coinciding with the hours of operation of the retail stores.

Figure 2-17 is a photo showing part of the pedestrian walk route necessary to reach the Shoppes at Buckland Hills from the Park & Ride facility. The walk route involves the long signalized pedestrian crossing shown. The local routes serving the retail area operate every hour with start and end of service generally coinciding with the hours of operation of the retail stores.

**Figure 2-17 Pedestrian Route to the Shoppes at Buckland Hills**





Potential deficiencies identified in the existing transit service within the study area include the following:

- Low frequency of service on local routes year round – hourly at peak
- Low frequency of service on Buckland Flyer outside of December holiday season
- Level of service drops on national holidays which often coincide with high retail activity and increased demand for service.
- Bus stop locations and amenities

Hourly service at peak period is not attractive to users because it results in long waiting times for the next bus should a patron miss their intended bus. More frequent service provides users with the flexibility and security of knowing another bus will be along within a reasonable time should they miss the intended bus.

The Buckland Flyer provides service hourly except for approximately one month during the holiday shopping season when the span of service is increased, Sunday service is added, and frequency goes up to every 30 minutes. However, during the remainder of the year the Buckland Flyer schedule is very limited.

Level of service on national holidays outside of December actually drops back to Sunday frequencies which makes it even more difficult for employees and shoppers to use the service during what is often some of the busiest retail days of the year.

Bus stop locations are not always well marked and readily accessible. One of the more convenient stops is the one located at Macy's, where the stop is close to a main entrance that provides shelter and visibility. Figure 2-18 is a photo showing the bus stop at Macy's. Other stops, such as at TGI Friday's, are nothing more than a small sign next to the curb, without any bus pullout, bench, or canopy.



**Figure 2-18 Bus Stop at Macy's**



Paratransit services available in the study area are typical for what is available within the CT Transit service area around greater Hartford. Other alternative services are limited.



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## **3 – Future No Build Conditions**

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### **3.1 Introduction**

This section summarizes future year 2030 transportation operating conditions in the Buckland study area for the No Build condition. The No Build condition is used to compare with Existing transportation conditions and is the basis from which to develop and test improvement measures. The No Build scenario represents a condition with traffic volumes projected to year 2030, but without specific improvements in the study area beyond those that are currently planned and / or programmed.

### **3.2 Future No Build Network**

Future year 2030 traffic volume projections were developed by ConnDOT for study roadways and intersections. The traffic volume projections were developed assuming the projects and improvements that are included in the regional transportation plan for the area. It should be noted that future development for Rentschler Field site (East Hartford) was not assumed for year 2030 traffic projections. However, a Draft EIE for Rentschler Field development was published that addresses potential transportation impacts in that study area, west of the Buckland study area.

The study area intersections Numbers 1 through 19 have been previously evaluated as part of the Buckland Hills Signal System Improvements Final Design Report. Signal timing and coordination improvements recommended in that study have been assumed for the No-Build conditions analysis in this study. Some of the intersections also include pedestrian signal improvements.

In addition, based on improvements planned in the area, the following three currently unsignalized intersections were assumed to be signalized for the No Build condition:

- #39 - Buckland Hills Drive/Wal-Mart Driveway
- #40 - Buckland Hills Drive/Mall Driveway/La-Z-Boy Driveway
- #42 - Union Street/Jeffrey Alan Drive/Tolland Turnpike

The 2030 No Build results are summarized in this section and are compared with 2005 Existing conditions results. Analysis comparisons include the following:

- Intersection capacity analysis results
- Arterial roadway capacity analysis results
- Expressway segment and ramp capacity analysis results



### 3.3 Future No Build Traffic Volumes

ConnDOT developed Friday and Saturday peak hour year 2030 volume projections for study roadways and intersections. The 2030 peak hour volumes were input into the Synchro traffic model that was developed for this study and previously used to evaluate the 2005 Existing conditions. This resulted in the creation of the future No Build traffic volume networks. Figures 3-1A and 3-1B show the 2030 Friday PM and Saturday midday traffic volume networks. Table 3-1 compares 2005 volumes with 2030 volumes for the study area arterials.

**TABLE 3-1  
SUMMARY OF PEAK HOUR VOLUMES  
EXISTING CONDITIONS VS 2030 NO BUILD**

Arterial	Friday PM Peak Hour			Saturday Midday Peak Hour		
	2005 Existing	2030 No Build	Percent Increase	2005 Existing	2030 No Build	Percent Increase
Buckland Hills Drive	2330	2850	22%	2790	3400	22%
Buckland Street	5080	5940	17%	4800	5820	21%
Pleasant Valley Road,	3060	3650	19%	3460	4290	24%
Tolland Turnpike	2140	2630	23%	1600	2040	28%
North Main Street	1080	1360	26%	830	1040	25%
Slater Street	940	1180	26%	960	1210	26%
Hale Road	1980	2570	30%	2415	2985	24%
Adams Street	2300	2740	19%	1790	2270	27%
Union Street	600	780	30%	530	690	30%
Buckland Road	3380	4080	21%	3080	3850	25%
Sullivan Avenue (Route 194)	2700	3460	28%	2010	2580	28%
Ellington Road (Route 30)	1120	1410	26%	770	970	26%
Clark Street	370	490	32%	350	460	31%
Oakland Road (Route 30)	1300	1650	27%	950	1180	24%
Pleasant Valley Rd, S. Windsor	730	930	27%	760	960	26%
Silver Lane / Spencer Street	2080	2680	29%	1680	2160	29%
<b>Totals:</b>	<b>31,190</b>	<b>38,400</b>	<b>23%</b>	<b>28,775</b>	<b>35,905</b>	<b>25%</b>

Source: ConnDOT



As shown in Table 3-1, 2030 volumes on the study area arterials are expected to increase between 19 percent and 32 percent, compared to 2005 volumes. The average increase on study roadways is approximately 24 percent. Buckland Street is projected to have peak hour volume increases of approximately 1,000 vehicles.

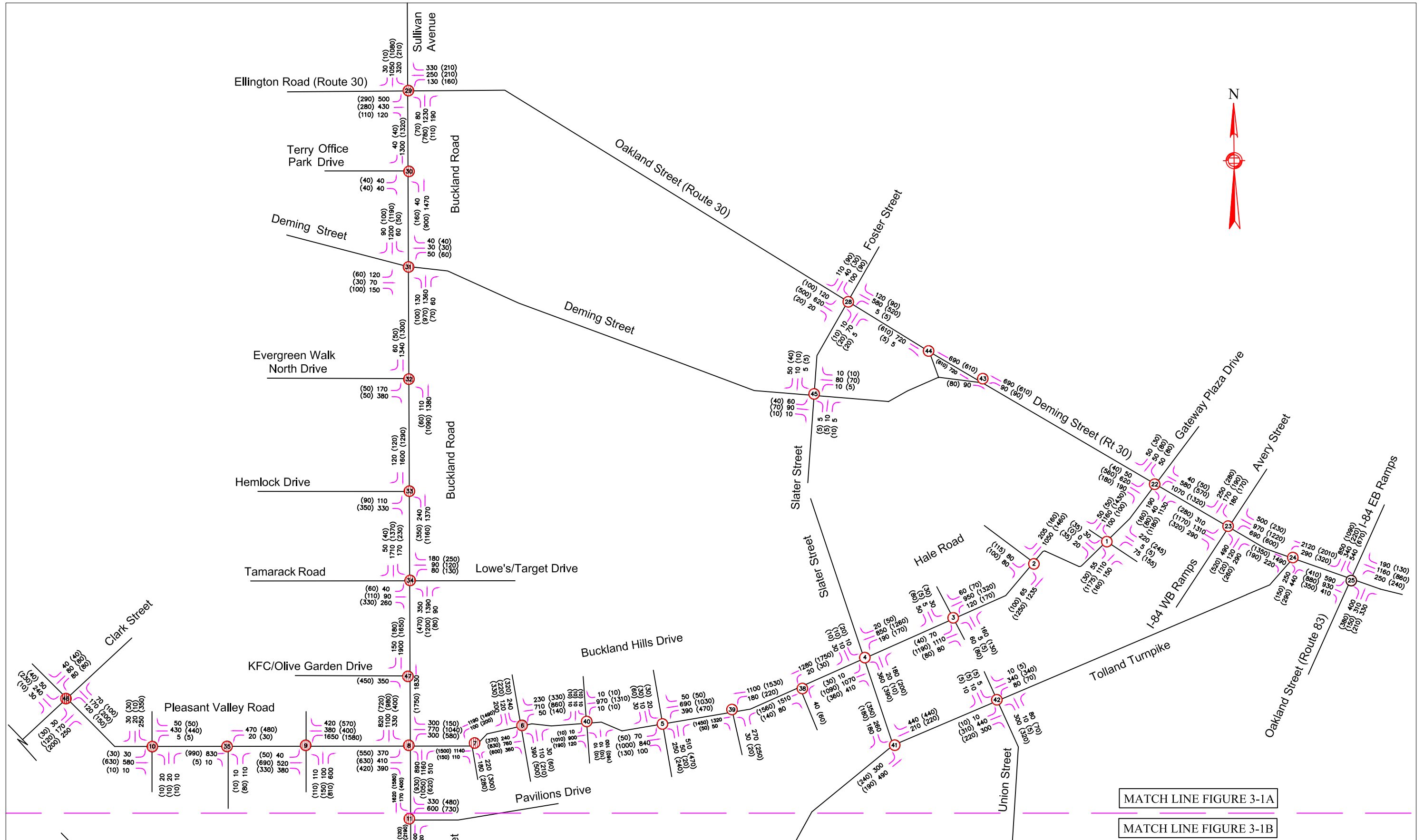


FIGURE NO. 3-1A  
 2030 NO BUILD FRIDAY PM (SATURDAY MIDDAY) PEAK HOUR VOLUMES  
 BUCKLAND AREA TRANSPORTATION STUDY  
 MANCHESTER AND SOUTH WINDSOR, CT

MATCH LINE FIGURE 3-1A  
 MATCH LINE FIGURE 3-1B

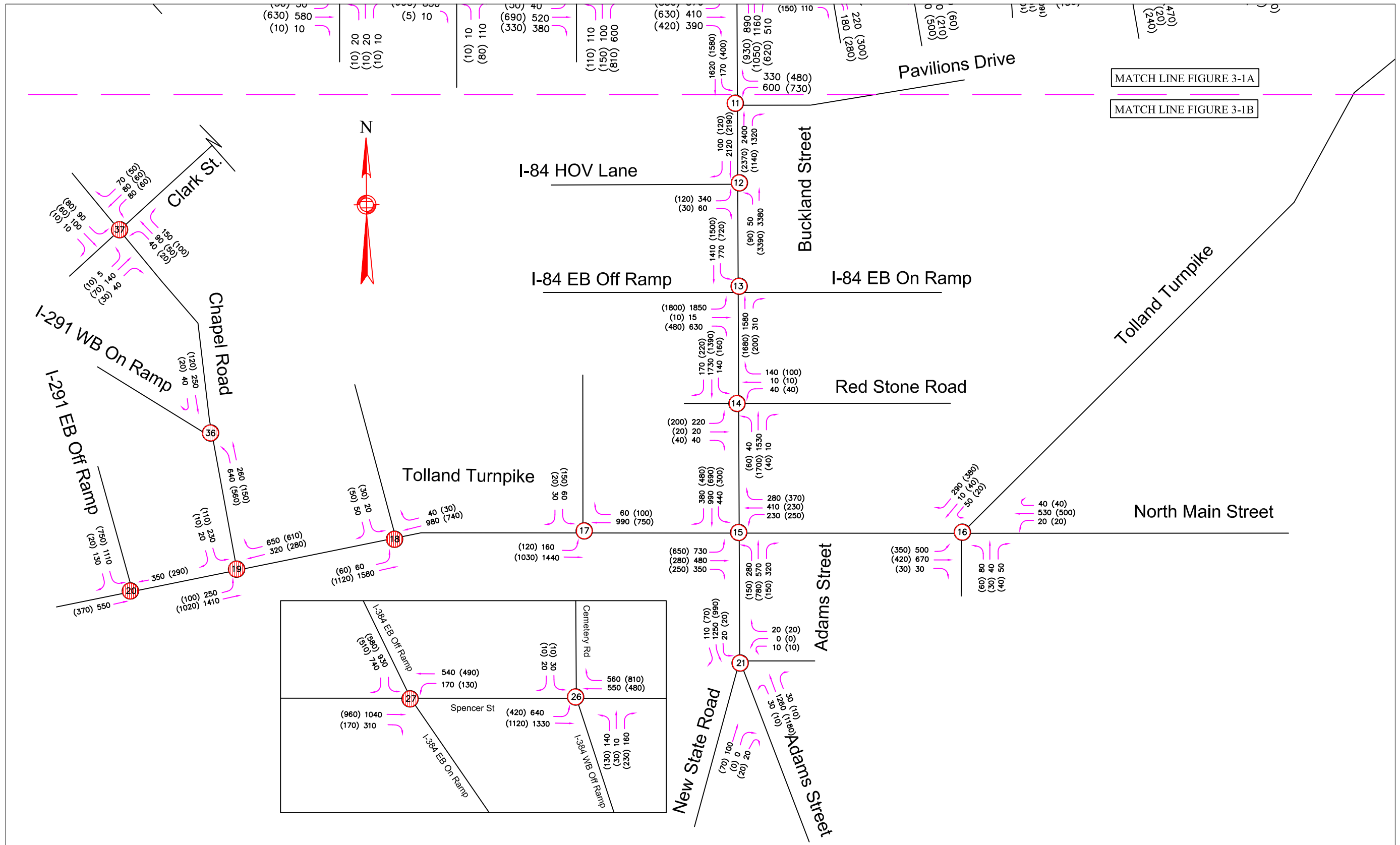


FIGURE NO. 3-1B

2030 NO BUILD FRIDAY PM (SATURDAY MIDDAY) PEAK HOUR VOLUMES  
 BUCKLAND AREA TRANSPORTATION STUDY  
 MANCHESTER AND SOUTH WINDSOR, CT





### 3.4 No Build Capacity Analysis

#### 3.4.1 Signalized Intersection Capacity Analysis

Tables 3-2 and 3-3 summarize the signalized intersection capacity analysis results for the Existing and No Build conditions for the Friday PM and Saturday midday peak hours, respectively. Under Future 2030 No Build conditions, the majority of the signalized intersections operate at acceptable Levels of Service (LOS D or better) during both Friday PM and Saturday midday peak hour periods.

**TABLE 3-2  
SUMMARY OF EXISTING AND NO BUILD CAPACITY ANALYSIS  
SIGNALIZED INTERSECTIONS – FRIDAY PM PEAK HOUR**

Study Location	2005 Existing Conditions		2030 No Build Condition	
	Level of Service	Delay (sec per veh)	Level of Service	Delay (sec per veh)
<b>In Manchester:</b>				
1. Hale Rd at Christmas Tree Shop/Bernies Driveways	A	9	B	17
2. Hale Road at Babies R Us	A	9	A	7
3. Hale Road at Bob's Driveway	A	10	B	15
4. Hale Road/Buckland Hills Drive at Slater Street	C	32	E	61
5. Buckland Hills Dr at NE Magazine Drive/Pavilion Dr	B	16	C	34
6. Buckland Hills Dr at Mall/ Lowe's/Target Driveways	C	30	D	51
7. Buckland Hills Drive at Home Depot Driveway	B	11	B	11
8. Buckland Hills Dr at Pleasant Valley Rd/Buckland St	E	71	F	86
9. Pleasant Valley Rd at I-84 Westbound Ramps	D	48	F	>100
10. Pleasant Valley Rd at Buckland Plaza Dr/JC Penney Drive	D	42	C	28
11. Buckland Street at Pavilions Drive	C	25	C	26
12. Buckland Street at I-84 HOV Lane Ramp	D	37	C	27
13. Buckland St at I-84 EB Ramp	F	>100	F	>100
14. Buckland St at Red Stone Road	F	>100	D	51
15. Tolland Tpk at Buckland Street	D	40	D	54
16. Tolland Tpk at N. Main Street	C	27	C	25
17. Tolland Tpk at Burr Corners	A	5	A	8
18. Tolland Tpk at JC Penney Drive	A	7	C	34
19. Tolland Tpk at Chapel Road	C	21	B	17
20. Tolland Tpk at I-291 Exit 5 Eastbound Ramps	C	34	F	>100
21. Adams Street at New State Road/Club Golf Driveway	E	72	F	>100
22. Deming St (Route 30) at Hale Road/ Gateway Plaza Drive	C	32	D	46
23. Deming St (Route 30) at I-84 Exit 63 Westbound Ramps and Avery St	D	47	F	>100



**TABLE 3-2 (cont.)**  
**SUMMARY OF EXISTING AND NO BUILD CAPACITY ANALYSIS**  
**SIGNALIZED INTERSECTIONS – FRIDAY PM PEAK HOUR**

Study Location	2005 Existing Conditions		2030 No Build Condition	
	Level of Service	Delay (sec per veh)	Level of Service	Delay (sec per veh)
<b>In Manchester:</b>				
24. Deming Street (Route 30) at Tolland Tpk	B	15	C	31
25. Deming St (Route 30/83) at I-84 Eastbound Ramps and Oakland St (Route 83)	F	>100	F	>100
26. Spencer St (Route 502) at Cemetery Rd and I-384 Westbound Ramps	E	72	F	>100
27. Spencer St (Route 502) at I-384 Eastbound Ramps	C	22	D	52
<b>In South Windsor:</b>				
28. Oakland Rd (Route 30) at Slater St/ Foster St	A	9	B	18
29. Oakland Rd/Ellington Rd (Route 30) at Buckland Rd and Sullivan Ave (Route 194)	D	45	F	>100
30. Buckland Road at Terry Office Park	A	5	B	11
31. Buckland Road at Deming Street	B	12	B	18
32. Buckland Road at Evergreen Walk	C	26	F	95
33. Buckland Road at Hemlock Drive	C	21	E	75
34. Buckland Road at Tamarack Road	D	40	E	77
39. Buckland Hills Drive at Wal-Mart Driveway <sup>1</sup>	F	>300	B	15
40. Buckland Hills Drive at Mall Driveway/ La-Z-Boy Driveway <sup>1</sup>	B	12	A	7
42. Union Street/Jeffrey Alan Drive at Tolland Turnpike <sup>1</sup>	F	66	C	21

Source: Town of Manchester, CT

Notes:

1. Intersection is unsignalized under 2005 Existing Conditions but presumed to be signalized under 2030 No Build Conditions.



**TABLE 3-3**  
**SUMMARY OF EXISTING AND NO BUILD CAPACITY ANALYSIS**  
**SIGNALIZED INTERSECTIONS – SATURDAY MIDDAY PEAK HOUR**

Study Location	2005 Existing Conditions		2030 No Build Condition	
	Level of Service	Delay (sec per veh)	Level of Service	Delay (sec per veh)
<b>In Manchester:</b>				
1. Hale Rd at Christmas Tree Shop/Bernies Driveways	B	15	B	17
2. Hale Road at Babies R Us	B	12	B	18
3. Hale Road at Bob's Driveway	B	15	B	16
4. Hale Road/Buckland Hills Drive at Slater Street	C	24	E	55
5. Buckland Hills Dr at NE Magazine Drive/Pavilion Dr	C	20	E	56
6. Buckland Hills Dr at Mall/ Lowe's/Target Driveways	E	59	F	>100
7. Buckland Hills Drive at Home Depot Driveway	C	24	C	21
8. Buckland Hills Dr at Pleasant Valley Rd/Buckland St	F	96	F	>100
9. Pleasant Valley Rd at I-84 Westbound Ramps	F	>100	F	>100
10. Pleasant Valley Rd at Buckland Plaza Dr/JC Penney Drive	D	38	D	47
11. Buckland Street at Pavilions Drive	D	41	E	79
12. Buckland Street at I-84 HOV Lane Ramp	A	4	B	16
13. Buckland St at I-84 EB Ramp	F	>100	F	>100
14. Buckland St at Red Stone Road	F	>100	F	>100
15. Tolland Tpk at Buckland Street	C	23	D	43
16. Tolland Tpk at N. Main Street	C	21	C	21
17. Tolland Tpk at Burr Corners	A	7	A	9
18. Tolland Tpk at JC Penney Drive	A	9	C	26
19. Tolland Tpk at Chapel Road	B	18	A	10
20. Tolland Tpk at I-291 Exit 5 Eastbound Ramps	B	14	C	21
21. Adams Street at New State Road/Club Golf Driveway	B	13	D	41
22. Deming St (Route 30) at Hale Road/ Gateway Plaza Drive	D	39	E	59
23. Deming St (Route 30) at I-84 Exit 63 Westbound Ramps and Avery St	D	55	F	>100
24. Deming Street (Route 30) at Tolland Tpk	B	11	C	23
25. Deming St (Route 30/83) at I-84 Exit 63 Eastbound Ramps and Oakland St (Route 83)	F	>100	F	>100
26. Spencer St (Route 502) at Cemetery Rd and I-384 Westbound Ramps	E	71	F	>100
27. Spencer St (Route 502) at I-384 Eastbound Ramps	B	10	B	13



**TABLE 3-3 (cont.)  
SUMMARY OF EXISTING AND NO BUILD CAPACITY ANALYSIS  
SIGNALIZED INTERSECTIONS – SATURDAY MIDDAY PEAK HOUR**

Study Location	2005 Existing Conditions		2030 No Build Condition	
	Level of Service	Delay (sec per veh)	Level of Service	Delay (sec per veh)
<b>In South Windsor:</b>				
28. Oakland Rd (Route 30) at Slater St/ Foster St	A	7	B	12
29. Oakland Rd/Ellington Rd (Route 30) at Buckland Rd and Sullivan Ave (Route 194)	C	21	C	33
30. Buckland Road at Terry Office Park	A	6	A	9
31. Buckland Road at Deming Street	A	10	B	14
32. Buckland Road at Evergreen Walk	A	6	A	8
33. Buckland Road at Hemlock Drive	B	15	C	26
34. Buckland Road at Tamarack Road	E	63	F	83
39. Buckland Hills Drive at Wal-Mart Driveway <sup>1</sup>	F	>300	B	15
40. Buckland Hills Drive at Mall Driveway/ La-Z-Boy Driveway <sup>1</sup>	B	12	A	9
42. Union Street/Jeffrey Alan Drive at Tolland Turnpike <sup>1</sup>	F	66	B	15

Source: Town of Manchester, CT

Notes:

1. Intersection is unsignalized under 2005 Existing Conditions but presumed to be signalized under 2030 No Build Conditions.

The following 18 signalized study intersections are expected to operate at LOS E or F conditions under the No Build condition:

- #4 – Hale Road/Buckland Hills Drive/Slater Street (Friday PM and Saturday)
- #5 – Buckland Hills Drive at NE Magazine Drive/Pavilion Drive (Saturday)
- #6 – Buckland Hills Drive at Mall/Lowe's/Target Driveways (Saturday)
- #8 – Buckland Hills Drive at Pleasant Valley Road/Buckland Street (Friday PM and Saturday)
- #9 – Pleasant Valley Road/I-84 Westbound Ramps (Friday PM and Saturday)
- #11 – Buckland Street at Pavilions Drive (Saturday)
- #13 – Buckland Street at I-84 Eastbound Ramps (Friday PM and Saturday)
- #14 – Buckland Street at Red Stone Road (Saturday)
- #20 – Tolland Turnpike/I-291 Exit 5 Eastbound ramps (Friday PM)



- #21 – Adams Street at New State Road/Club Golf Driveway (Friday PM)
- #22 – Deming Street/Hale Road/Gateway Plaza Driveway (Saturday)
- #23 – Deming Street/I-84 Exit 63 Westbound Ramps/Avery Street (Friday PM and Saturday)
- 25 – Deming Street / Tolland Turnpike (Route 30/83) at I-84 Eastbound Ramps/Oakland Street (Route 83) (Friday PM and Saturday)
- 26 – Spencer Street (Route 502) at Cemetery Road and I-384 Westbound Ramps (Friday PM and Saturday)
- #29 – Oakland Road/Ellington Road/Buckland Road/Sullivan Avenue (Friday PM)
- #32 – Buckland Road/Evergreen Walk (Friday PM)
- #33 – Buckland Road/Hemlock Drive (Friday PM)
- #34 – Buckland Road at Tamarack (Friday PM and Saturday)

Of the 18 intersections above, eight are projected to degrade from acceptable Levels of Service (LOS D or better) under existing conditions to LOS E or F during the Friday PM peak hour, while five would degrade during the Saturday peak hour.

Due to signal timing improvements planned in the area, the intersection of Buckland Street and Red Stone Road is projected to improve to LOS D conditions during the Friday PM peak hour. Some intersections experience minor improvements in delay and/or Level of Service as a result of planned signal timing and coordination upgrades.

It is noted that the following three unsignalized study intersections are currently unsignalized, but are assumed to be signalized in the 2030 No Build condition:

- #39 - Buckland Hills Drive/Wal-Mart Driveway
- #40 - Buckland Hills Drive/Mall Driveway/La-Z-Boy Driveway
- #42 - Union Street/Jeffrey Alan Drive/Tolland Turnpike

Analysis shows that these intersections would improve to LOS C or better for both study periods.

### **3.4.2 Unsignalized Intersection Capacity Analysis**

Tables 3-4 and 3-5 summarize the unsignalized intersection capacity analysis results for the Existing and No Build conditions for the Friday PM and Saturday midday peak hours, respectively. Under Future No Build 2030 conditions, the majority of the unsignalized intersections operate at acceptable Levels of Service (LOS D or better).



**TABLE 3-4**  
**SUMMARY OF EXISTING AND NO BUILD CAPACITY ANALYSIS**  
**UNSIGNALIZED INTERSECTIONS – FRIDAY PM PEAK HOUR**

Study Location	2005 Existing Conditions		2030 No Build Condition	
	Level of Service <sup>1</sup>	Delay <sup>1</sup> (sec per	Level of Service <sup>1</sup>	Delay <sup>1</sup> (sec per
<b>In Manchester:</b>				
<i>35. Pleasant Valley Road at JC Penney Driveway</i>				
JC Penney Driveway, NB Left	C	21	D	28
<i>36. Chapel Road at I-291 Exit 5 On Ramp</i>				
Chapel Road, NB	A	10	B	12
<i>37. Chapel Road at Clark Street/Burnham Street West</i>				
Chapel Road, WB	B	10	B	13
<i>38. Buckland Hills Drive at Best Buy Driveway</i>				
Buckland Hills, WB Left	C	16	C	21
<i>41. Slater Street at Tolland Turnpike</i>				
Tolland Turnpike, WB	F	111	F	282
<b>In South Windsor:</b>				
<i>43. Oakland Road at Deming Street (East)</i>				
Deming Street, NB Right	B	14	C	17
<i>44. Oakland Road at Deming Street (West)</i>				
Deming Street, NB Left	D	29	F	65
<i>45. Deming Street at Slater Street</i>				
Deming Street, EB	A	8	A	8
<i>46. Pleasant Valley Road at Clark Street</i>				
Pleasant Valley Road, WB	C	15	D	32
<i>47. Buckland Road at Olive Garden / KFC Drive</i>				
Olive Garden/KFC Driveway, EB	E	44	F	90

*Notes:*

1. Level of Service and Delay reported for the worst (critical) movement, typically from the minor street.

The following two unsignalized study intersections have movements that currently operate at Level of Service E or F and will continue to do so under the Future No Build condition:

- #41- Slater Street/Tolland Turnpike (Friday PM and Saturday)
- #47 - Buckland Road/Olive Garden/KFC Driveway (Friday PM and Saturday)

The following three unsignalized study intersections are expected to have movements that deteriorate to LOS E or F conditions under the No Build condition as a result of year 2030 traffic volumes:



- #35 – Pleasant Valley Road /JC Penney Driveway (Saturday)
- #44 - Oakland Road/Deming Street (West) (Friday PM and Saturday)
- #46 - Pleasant Valley Road/ Clark Street (Saturday)

**TABLE 3-5**  
**SUMMARY OF EXISTING AND NO BUILD CAPACITY ANALYSIS**  
**UNSIGNALIZED INTERSECTIONS – SATURDAY MIDDAY PEAK HOUR**

Study Location	2005 Existing Conditions		2030 No-Build Condition	
	Level of Service <sup>1</sup>	Delay <sup>1</sup> (sec per	Level of Service <sup>1</sup>	Delay <sup>1</sup> (sec per
<b>In Manchester:</b>				
<i>35. Pleasant Valley Road at JC Penney Driveway</i>				
JC Penney Driveway, NB Left	D	25	E	37
<i>36. Chapel Road at I-291 Exit 5 On Ramp</i>				
Chapel Road, NB	A	9	A	10
<i>37. Chapel Road at Clark Street/Burnham Street West</i>				
Chapel Road, WB	A	10	A	10
<i>38. Buckland Hills Drive at Best Buy Driveway</i>				
Buckland Hills Drive WB Left	C	18	D	26
<i>41. Slater Street at Tolland Turnpike</i>				
Tolland Turnpike, WB	E	47	F	166
<b>In South Windsor:</b>				
<i>43. Oakland Road at Deming Street (East)</i>				
Deming Street, NB Right	B	12	B	15
<i>44. Oakland Road at Deming Street (West)</i>				
Deming Street, NB Left	C	21	E	37
<i>45. Deming Street at Slater Street</i>				
Deming Street, EB	A	8	A	8
<i>46. Pleasant Valley Road at Clark Street</i>				
Pleasant Valley Road, WB	C	18	E	49
<i>47. Buckland Road at Olive Garden / KFC Drive</i>				
Olive Garden/KFC Driveway, EB	E	42	F	102

*Notes:*

1. Level of Service and Delay reported for the worst (critical) movement, typically from the minor street.

### 3.4.3 Arterial Roadway Capacity Analysis

Figure 3-2 and Table 3-6 show arterial Level of Service during the 2030 No Build Friday PM peak hour, and Table 3-7 and Figure 3-3 show arterial Level of Service during the



2030 No Build Saturday midday peak hour. Under 2030 No Build conditions, about one-half of the arterial roadways are expected to operate at acceptable Levels of Service (LOS D or better) during both Friday PM and Saturday midday peak hour periods.

**TABLE 3-6  
SUMMARY OF EXISTING AND NO BUILD CAPACITY ANALYSIS  
ARTERIAL LEVEL OF SERVICE – FRIDAY PM PEAK HOUR**

Study Location	2005 Existing Conditions		2030 No Build Condition	
	Arterial Speed (MPH)	Arterial Level of Service	Arterial Speed (MPH)	Arterial Level of Service
Buckland Hills Drive EB/WB	27/18	D/D	16/16	E/D
Buckland Street NB/SB	14/9	F/F	7/9	F/F
Pleasant Valley Road, Manchester EB/WB	16/14	E/D	11/12	E/D
Tolland Turnpike EB/WB	22/24	D/B	17/23	D/C
North Main Street EB/WB	31/30	A/B	27/31	B/B
Slater Street NB/SB	16/17	F/D	15/16	F/D
Hale Road EB/WB	22/19	D/C	17/16	E/D
Adams Street NB/SB	4/19	F/E	2/6	F/F
Union Street NB/SB	17/18	C/C	16/18	C/C
Buckland Road NB/SB	20/15	E/F	12/6	F/F
Sullivan Avenue (Route 194) NB/SB	27/19	C/E	3/12	F/F
Ellington Road (Route 30) EB/WB	24/23	C/D	19/5	D/F
Clark Street NB/SB	30/29	A/A	28/26	A/A
Oakland Road (Route 30) EB/WB	28/28	B/C	25/27	B/C
Pleasant Valley Rd, S. Windsor EB/WB	25/26	A/A	18/22	C/B
Silver Lane / Spencer Street EB/WB	11/11	F/F	4/5	F/F

Notes: EB=eastbound; WB=westbound; NB=northbound; SB=southbound



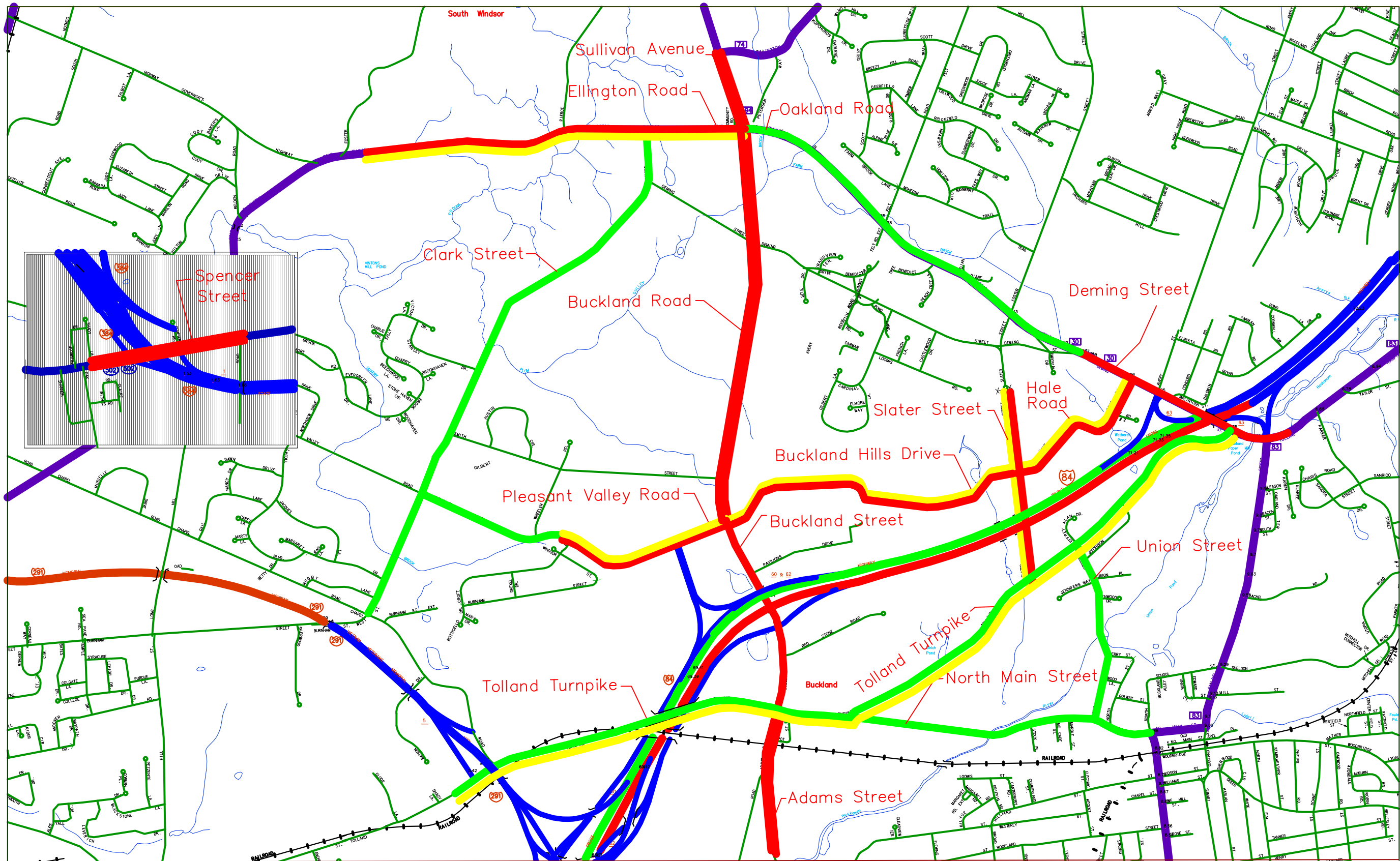


FIGURE NO. 3-2  
ARTERIAL LEVEL OF SERVICE - 2030 NO BUILD FRIDAY PM PEAK HOUR  
BUCKLAND AREA TRANSPORTATION STUDY  
MANCHESTER AND SOUTH WINDSOR, CT



The following arterial roadways currently operate at Level of Service E or F and will continue to do so under the No Build condition:

- Buckland Hills Drive in westbound (Saturday)
- Buckland Street in both directions (Friday PM and Saturday)
- Pleasant Valley Road in Manchester eastbound (Friday PM) and both directions (Saturday)
- Slater Street in the northbound direction (Friday PM and Saturday)
- Hale Road in the eastbound direction (Saturday)
- Adams Street in both directions (Friday PM) and northbound (Saturday)
- Buckland Road in both directions (Friday PM); in the southbound direction (Saturday)
- Sullivan Avenue southbound (Friday PM)
- Silver Lane/Spencer Street in both directions (Friday PM) and westbound (Saturday)



**TABLE 3-7**  
**SUMMARY OF EXISTING AND NO BUILD CAPACITY ANALYSIS**  
**ARTERIAL LEVE OF SERVICE – SATURDAY MIDDAY PEAK HOUR**

Study Location	2005 Existing Conditions		2030 No Build Condition	
	Arterial Speed (MPH)	Arterial Level of Service	Arterial Speed (MPH)	Arterial Level of Service
Buckland Hills Drive EB/WB	22/15	D/F	18/13	E/F
Buckland Street NB/SB	6/8	F/F	4/7	F/F
Pleasant Valley Road, Manchester EB/WB	14/15	E/F	10/13	F/F
Tolland Turnpike EB/WB	24/24	C/B	24/23	C/C
North Main Street EB/WB	27/27	B/C	25/26	B/C
Slater Street NB/SB	18/15	E/D	10/15	F/D
Hale Road EB/WB	16/17	E/D	14/14	F/D
Adams Street NB/SB	17/25	E/D	4/19	F/E
Union Street NB/SB	25/25	B/B	24/27	C/B
Buckland Road NB/SB	26/18	D/E	22/10	D/F
Sullivan Avenue (Route 194) NB/SB	33/26	C/D	22/20	D/E
Ellington Road (Route 30) EB/WB	23/29	D/B	22/28	D/B
Clark Street NB/SB	28/29	A/A	30/26	A/A
Oakland Road (Route 30) EB/WB	33/30	A/B	31/29	A/B
Pleasant Valley Rd, S. Windsor EB/WB	23/27	B/A	18/21	C/B
Silver Lane / Spencer Street EB/WB	18/8	D/F	7/4	F/F

Notes: EB = eastbound; WB = westbound; NB = northbound; SB = southbound

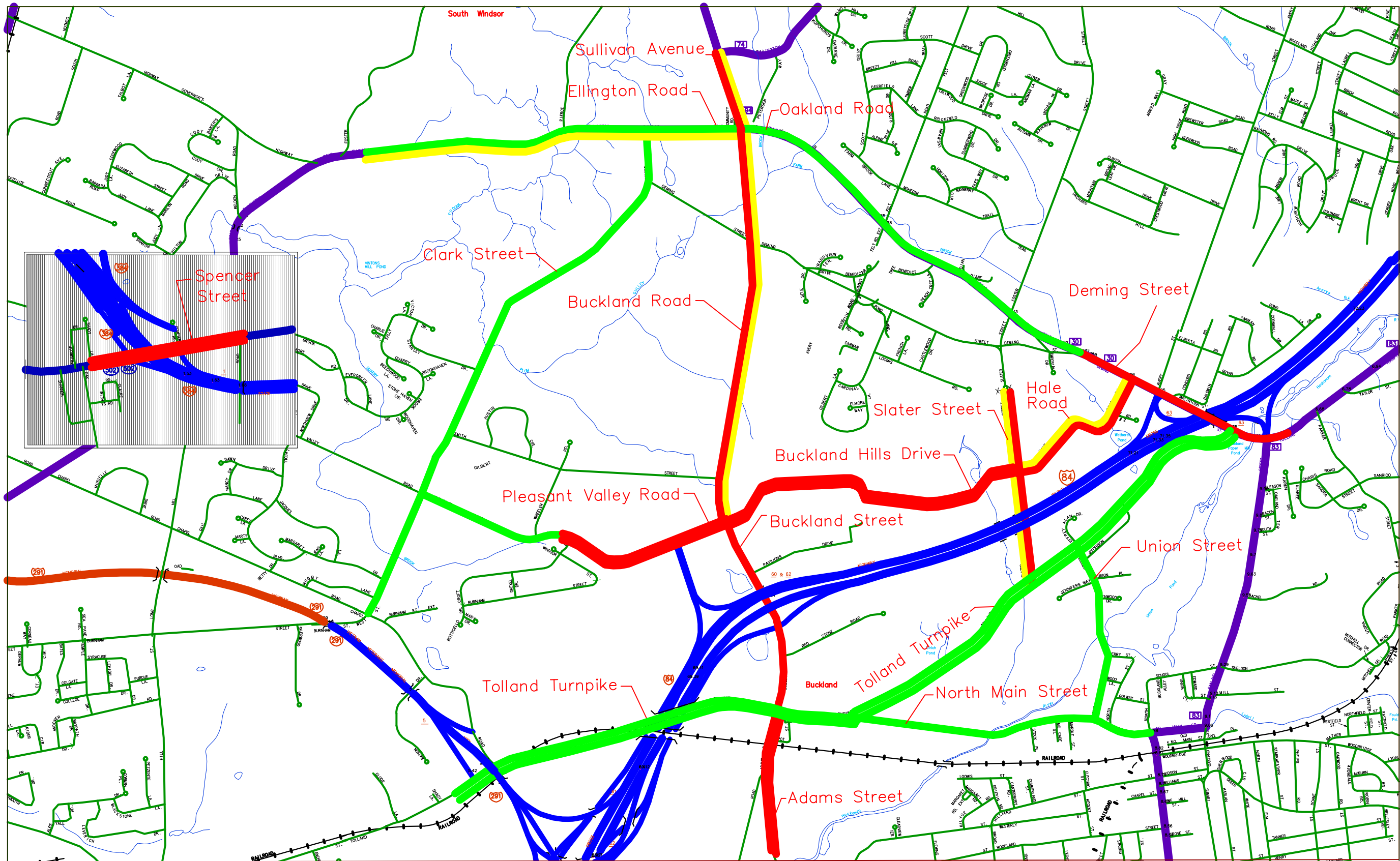


FIGURE NO. 3-3  
ARTERIAL LEVEL OF SERVICE – 2030 NO BUILD SATURDAY MIDDAY PEAK HOUR  
BUCKLAND AREA TRANSPORTATION STUDY  
MANCHESTER AND SOUTH WINDSOR, CT



The following six arterial roadways are expected to deteriorate to LOS E or F conditions under the No Build condition as a result of year 2030 traffic volumes:

- Buckland Hills Drive eastbound (Friday PM and Saturday)
- Hale Road eastbound (Friday PM)
- Adams Street southbound (Saturday)
- Sullivan Avenue northbound (Friday PM) and southbound (Saturday)
- Ellington Road westbound (Friday PM)
- Silver Lane / Spencer Street eastbound (Saturday)

Average speeds on the arterials will either remain the same or decrease under the No Build condition because of higher volumes. However, the following three arterials are expected to have slightly higher average speeds:

- North Main Street westbound (Friday PM)
- Union Street southbound (Saturday)
- Clark Street northbound (Saturday)

The higher speeds on North Main Street and Union Street are likely due to the proposed signal at Tolland Turnpike and Union Street, which is currently under four-way stop control.

#### **3.4.4 Interstate Segment Capacity Analysis**

Based on the results shown in Tables 3-8 and 3-9, the seven interstate segments that operate at LOS E or LOS F under existing conditions (for at least one peak hour) will continue to do so in the future. In addition, the following two interstate segments will degrade to LOS E or F under the No Build condition:

- I-84 EB Between Exit 60 and Exit 61 (Friday PM)
- I-84 WB Between Exit 63 and Exit 60/62 (Friday PM)



**TABLE 3-8**  
**INTERSTATE SEGMENT CAPACITY ANALYSIS**  
**I-84 BETWEEN EXIT 59 AND EXIT 63**  
**FRIDAY AM PEAK HOUR**

Location	Level of Service			
	2005 Existing Conditions		2030 No Build Conditions	
	Volume	LOS	Volume	LOS
I-84 EB Between Exit 59 and Exit 60	3080	C	3840	C
I-84 EB Between Exit 60 and Exit 61	2630	B	3250	C
I-84 EB Between Exit 61 and Exit 60/62	2880	B	3580	C
I-84 EB Between Exit 60/62 and Exit 63	3160	C	3930	C
I-84 WB Between Exit 60 and Exit 59	6500	F	7920	F
I-84 WB Between Exit 61 and Exit 60	5450	E	6490	F
I-84 WB Between Exit 60/62 and Exit 61	5920	E	7370	F
I-84 WB Between Exit 63 and Exit 60/62	6970	F	8680	F

Notes: EB = eastbound; WB = westbound



**TABLE 3-9  
 INTERSTATE SEGMENT CAPACITY ANALYSIS  
 I-84 BETWEEN EXIT 59 AND EXIT 63  
 FRIDAY PM PEAK HOUR**

Location	Level of Service			
	2005 Existing Conditions		2030 No Build Condition	
	Volume	LOS	Volume	LOS
I-84 EB Between Exit 59 and Exit 60	6040	F	7540	F
I-84 EB Between Exit 60 and Exit 61	5140	D	6370	F
I-84 EB Between Exit 61 and Exit 60/62	5550	E	6920	F
I-84 EB Between Exit 60/62 and Exit 63	6430	F	8000	F
I-84 WB Between Exit 60 and Exit 59	4100	C	4980	C
I-84 WB Between Exit 61 and Exit 60	3550	C	4230	D
I-84 WB Between Exit 60/62 and Exit 61	3670	C	4590	D
I-84 WB Between Exit 63 and Exit 60/62	4470	D	5590	E

Notes: EB = eastbound; WB = westbound

### 3.4.5 Ramp Capacity Analysis

Tables 3-10 and 3-11 summarize the I-84 ramp capacity analysis results the Friday AM and Friday PM peak hours, respectively. The seven ramps that operate at LOS E or LOS F under existing conditions will continue to do so in the future. In addition, the following seven ramps will degrade to LOS F under the No Build condition:

- I-84 Westbound Exit 61/Pleasant Valley Road On Ramp (Friday AM)
- I-84 Westbound Exit 61/I-291 Off Ramp (Friday AM)
- I-84 Westbound Exit 63 Off Ramp (Friday AM)
- I-84 Eastbound Exit 60 Off Ramp (Friday PM)
- I-84 Eastbound Exit 61/I-291 Off Ramp (Friday PM)
- I-84 Eastbound Exit 61/Buckland Street Off Ramp (Friday PM)
- I-84 Westbound Exit 63 On Ramp (Friday PM)



**TABLE 3-10**  
**RAMP CAPACITY ANALYSIS**  
**FRIDAY AM PEAK HOUR**

Location	Ramp Type	Level of Service	
		2005 Existing Conditions	2030 No Build Condition
I-84 EB Exit 60/62 (Buckland Street)	Merge	C	C
I-84 EB Exit 61 (I-291)	Merge	B	C
I-84 EB Exit 63 (Route 83)	Merge	B	C
I-84 EB Exit 59 (I-384)	Diverge	A	B
I-84 EB Exit 60 (Route 44)	Diverge	B	C
I-84 EB Exit 61 (I-291)	Diverge	B	C
I-84 EB Exit 61 (Buckland St. Ramp)	Diverge	B	C
I-84 EB Exit 63 (Route 83)	Diverge	B	B
I-84 WB Exit 59 (I-384)	Merge	F	F
I-84 WB Exit 60 (I-291)	Merge	F	F
I-84 WB Exit 61 (Pleasant Valley Rd. Ramp)	Merge	D	F
I-84 WB Exit 63 (Route 30)	Merge	F	F
I-84 WB Exit 61 (I-291)	Diverge	D	F
I-84 WB Exit 61 (I-384)	Diverge	C	C
I-84 WB Exit 63 (Route 30)	Diverge	D	F

Notes: EB = eastbound; WB = westbound





**TABLE 3-11  
RAMP CAPACITY ANALYSIS  
FRIDAY PM PEAK HOUR**

Location	Ramp Type	Level of Service	
		2005 Existing Conditions	2030 No Build Condition
I-84 EB Exit 60/62 (Buckland Street)	Merge	F	F
I-84 EB Exit 61 (I-291)	Merge	F	F
I-84 EB Exit 63 (Route 83)	Merge	E	F
I-84 EB Exit 59 (I-384)	Diverge	C	C
I-84 EB Exit 60 (Route 44)	Diverge	D	F
I-84 EB Exit 61 (I-291)	Diverge	D	F
I-84 EB Exit 61 (Buckland St. Ramp)	Diverge	D	F
I-84 EB Exit 63 (Route 83)	Diverge	F	F
I-84 WB Exit 59 (I-384)	Merge	B	C
I-84 WB Exit 60 (I-291)	Merge	C	C
I-84 WB Exit 61 (Pleasant Valley Rd. Ramp)	Merge	C	C
I-84 WB Exit 63 (Route 30)	Merge	D	F
I-84 WB Exit 61 (I-291)	Diverge	B	C
I-84 WB Exit 61 (I-384)	Diverge	B	B
I-84 WB Exit 63 (Route 30)	Diverge	C	D

Notes: EB = eastbound; WB = westbound

### 3.5 Traffic Simulation Results

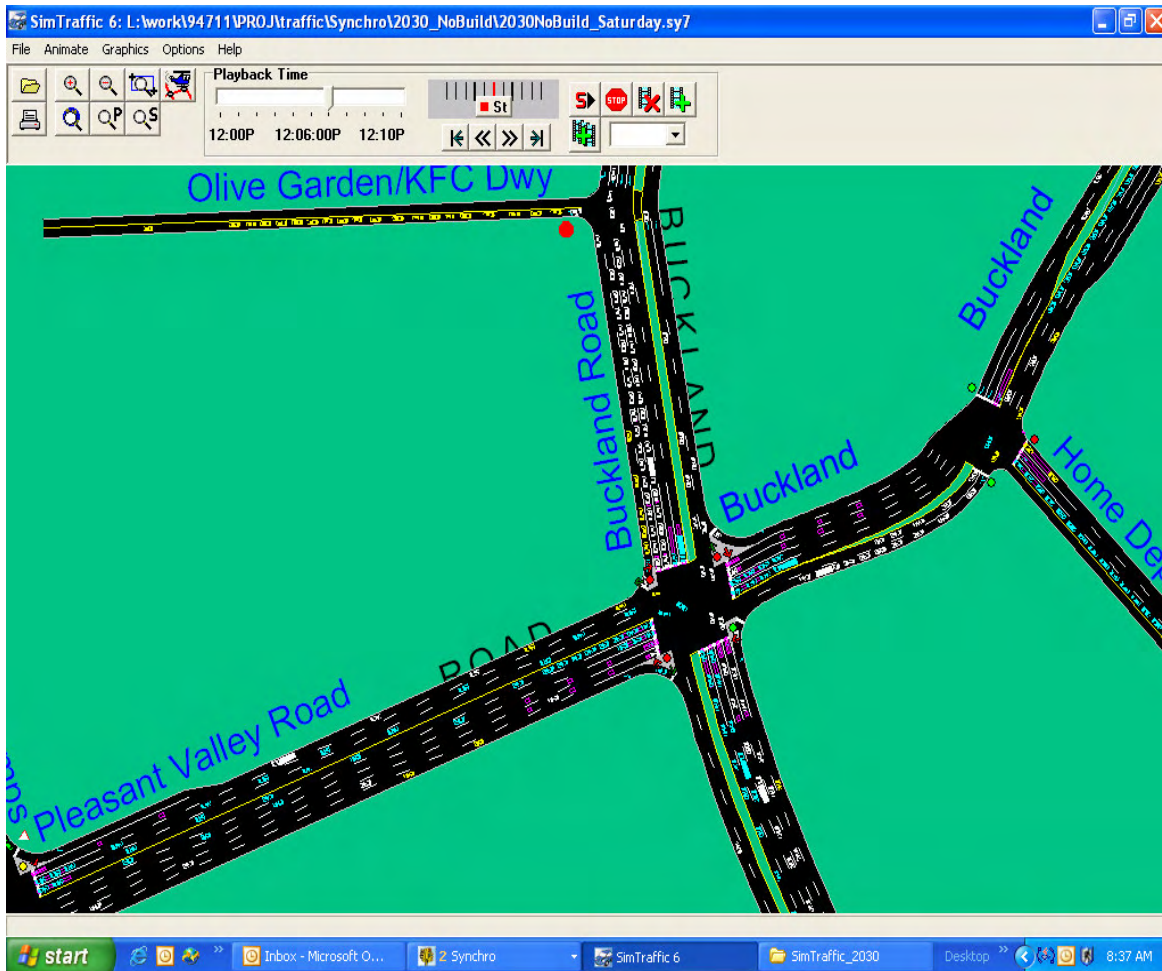
The SimTraffic component of the study area Synchro model was used to evaluate the impacts of corridor queuing and congestion in the study area under the 2030 No Build condition. SimTraffic provides simulations of traffic operations and is used to identify system deficiencies. Figures 3-4 to 3-7 show SimTraffic screen shots of vehicle queuing at selected locations. Key traffic operational issues were identified based on the SimTraffic analysis results and are discussed below.

#### 1. Buckland Hills Drive at Pleasant Valley Road/Buckland Street/Buckland Road

This intersection is expected to experience an increase of almost 1,600 vehicles during the Saturday midday peak hour 2030 No Build condition. As a result, the significant vehicle queuing and delay that currently exists will increase and operations will degrade (Figure 3-4). The poor operation of this intersection will negatively impact the surrounding intersections.



**Figure 3-4 Buckland Hills Dr at Pleasant Valley Rd/Buckland St/Buckland Rd – 2030 No Build Saturday Middy Peak Hour**



## **2. Buckland Street Corridor**

As traffic volumes increase, travel speeds will be reduced and congestion will worsen. Queue spillbacks are expected to block upstream driveways and intersections. Figure 3-5 shows Saturday midday congestion along the Buckland Street corridor in the northbound direction at Red Stone Road and in the southbound direction at the I-84 Eastbound Exit 60/62 Ramps. Figure 3-6 shows queuing on the I-84 Eastbound Exit 60/62 Buckland Street off ramp during the Friday PM peak hour.

## **3. Deming Street/Tolland Turnpike (Route 30) at I-84 Eastbound Ramps/Oakland Street (Route 83)**

The significant westbound queues that occur at this location today will continue to increase as traffic volumes increase (see Figure 3-7). Overall delay for this intersection is expected to increase from 150 seconds to over 300 seconds during the Friday PM peak hour.



Figure 3-5 Buckland Street Corridor – 2030 No Build Saturday Midday Peak Hour

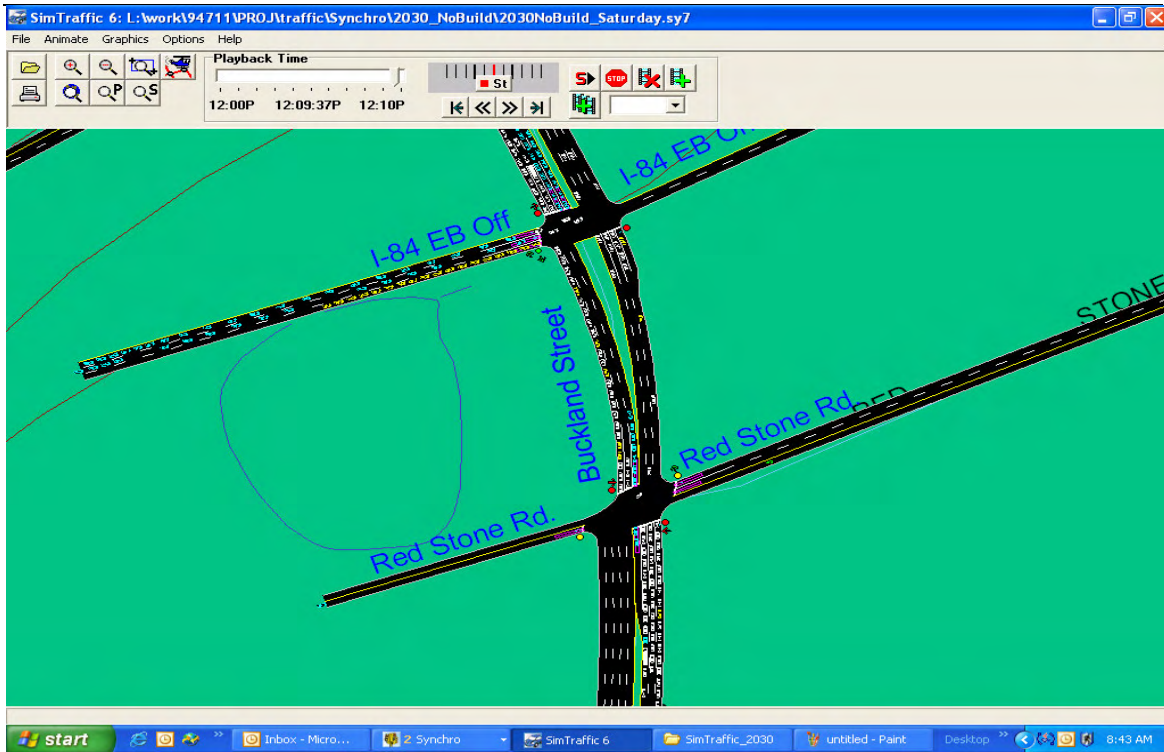


Figure 3-6 I-84 Exit 60/62 Buckland Street Ramp – 2030 No Build Friday PM Peak Hour

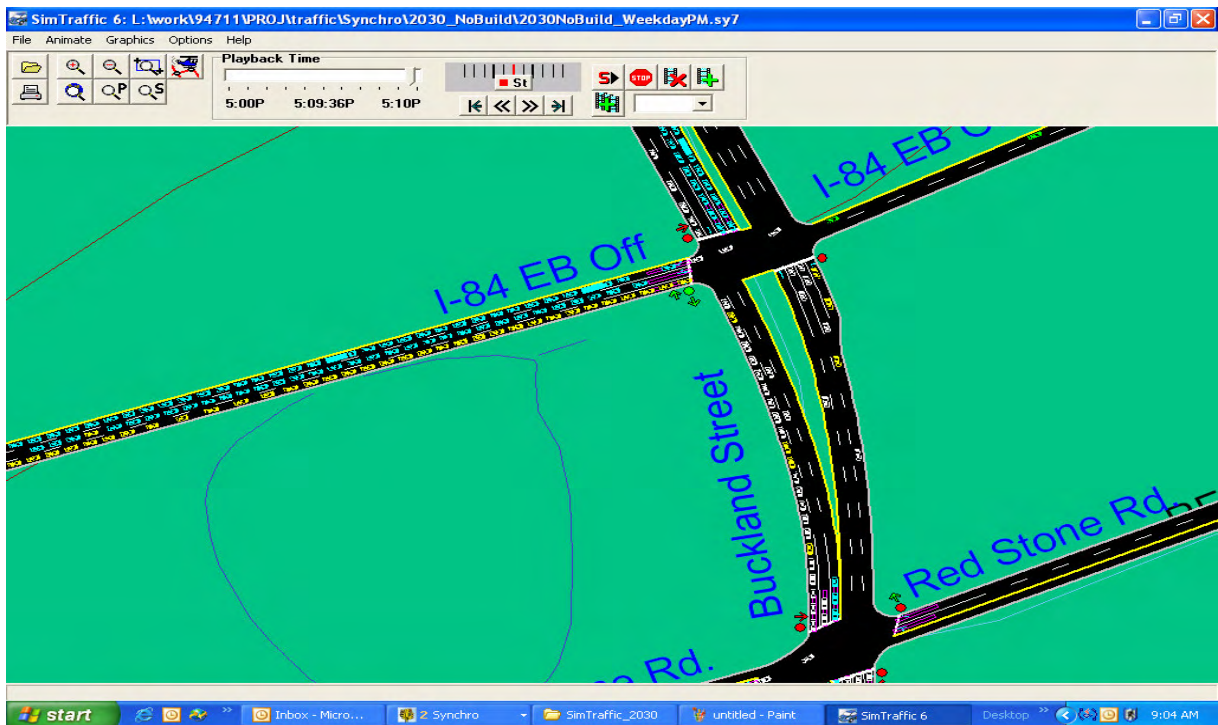
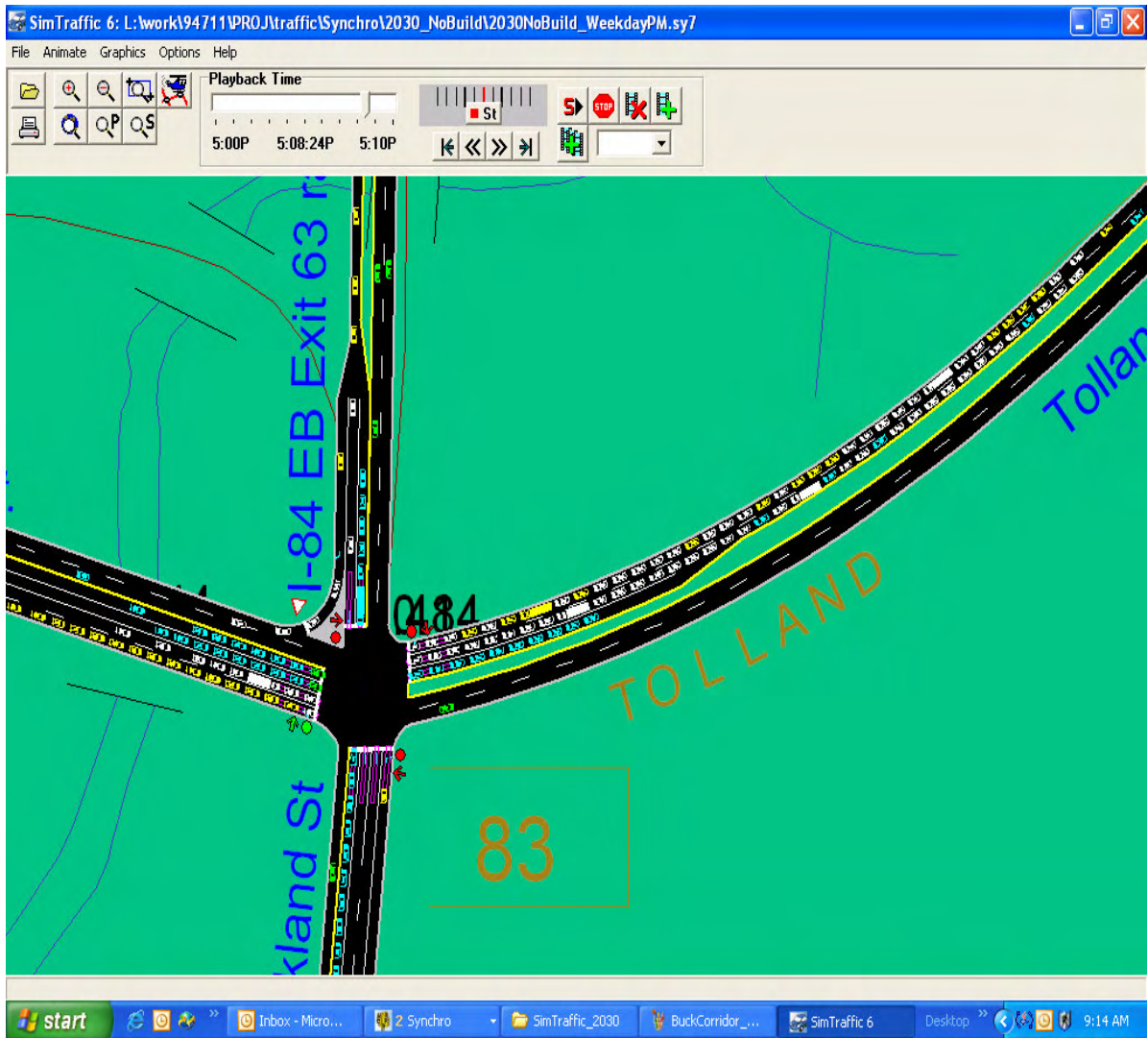




Figure 3-7 Deming St / Tolland Turnpike (Route 30) at I-84 Eastbound Ramps/Oakland St (Route 83) – 2030 No Build Friday PM Peak Hour



### 3.6 Pedestrian Related Improvements

The signalized intersection improvements recommended in the Buckland Hills Signal System Improvements Final Design Report for study area intersections Numbers 1 through 19 include pedestrian-related improvements. For intersections Numbers 1 through 7, 9, 10, and 16 through 19, the pedestrian-related improvements consist of replacing and/or installing new pedestrian signal heads, installing new crosswalks, and providing exclusive pedestrian phasing. For intersections Numbers 8, 11, and 15, pedestrian signal heads, crosswalks, and concurrent pedestrian phasing are recommended.



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## 4 – Existing Natural, Cultural and Socioeconomic Conditions

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### 4.1 Constraint Mapping Process

This section of the report documents the existing environmental, cultural, and socio-economic conditions within the limits of the Buckland Transportation Study. Data is primarily based on the most recent GIS and mapped information obtained from the Connecticut Department of Environmental Protection (CTDEP), the Capital Region Council of Governments (CRCOG), and the study area Towns of South Windsor and Manchester. In addition to GIS and mapped data, U.S. Census 2000 data, and various land use, conservation, and development plans were consulted. Windshield surveys were also conducted to field-verify resources as necessary.

Portions of this report that describe socio-economic conditions and/or the “built” environment include subheadings that correspond to the geographic regions or “units” of the study area described in Section 1.2 – Study Area Definition. These units, however, were not used for describing environmental resources such as wetlands and watercourses because these resources do not fit neatly into these boundaries.

### 4.2 Resources

#### 4.2.1 Land Use and Zoning

##### Land Use

The Capitol Region Council of Government’s (CRCOG) *Achieving the Balance: A Plan of Conservation and Development for the Capitol Region* (2003), the Town of Manchester’s *Zoning Regulations*, the Town of Manchester’s *1998 Plan of Conservation and Development*, and the Town of South Windsor’s *Plan of Conservation and Development* (2002), were consulted for this evaluation.

Land use in the study area is characterized by increasing residential and commercial development within a backdrop of former agricultural and forest land. With close proximity to Hartford and transportation access provided by I-84, I-291, and I-384, the location has been very popular for both people and businesses (such as the Shops at Buckland Hills).

Buckland Area: Land use in the area north of I-84 from Buckland Road to Deming Street is dominated by a large concentration of retail uses, including the Shops at Buckland Hills, Evergreen Walk, and numerous other commercial plazas and individual big box stores. Vestiges of single family residential land uses remain north of I-84. Farmland,



fields, and woodlands, as well as bank and office space, cemeteries, and places of worship, comprise the other land uses in the area.

South Windsor's traditional town center is located in the northern part of the study area. At the intersection of Buckland Road, Ellington Road, Oakland Road and Sullivan Avenue are mixed uses including residential and commercial, as well as governmental and church uses. There is adaptive re-use of historic buildings in this area, such as the former Sadd Memorial Library, now used for accounting and real estate offices.

I-84 Corridor between I-384 and Deming Street (Exit 63): Along Tolland Turnpike, which runs south of and parallel to I-84, land uses are primarily commercial and industrial. There is a high concentration of residential uses east of Buckland Street on Tolland Turnpike.

I-291 Corridor between Route 5 and I-84: North of I-84, in the vicinity of Pleasant Valley Road, there is a concentration of industrial and warehousing uses, such as the JC Penney Logistics Center and Filene's distribution center.

North of I-291, land uses are primarily residential with clusters of open space. Where I-291 crosses Ellington Road and at the interchange with U.S. Route 5, there are also concentrations of commercial and industrial uses.

I-384 Corridor between Spencer Street and I-84: Land uses are predominantly residential, commercial, and industrial in this area. There are preserved open space and parks and recreation land in this area, including a bicycle/pedestrian trail system that enters the area in the vicinity of Wickham Park, an approximately 300 acre municipal park located on the Manchester/East Hartford town line. The trail system runs northwest, parallel to I-291, through the study area. The Connecticut Southern rail line also runs east-west through the study area, generally between I-291 and I-384 and south of I-84 in Manchester.

### Zoning

The Capitol Region Council of Government's *Achieving the Balance: A Plan of Conservation and Development for the Capitol Region* (2003), the Town of Manchester's *Zoning Regulations*, the Town of Manchester's *1998 Plan of Conservation and Development*, and the Town of South Windsor's *Plan of Conservation and Development* (2002), were consulted for this evaluation.

Buckland Area: In Manchester, in the vicinity of the Shops at Buckland Hills, land is primarily zoned for retail and mixed uses. In South Windsor, on Buckland Road south of Deming Street, land is zoned "Buckland Gateway Development," for commercial uses. To the east of the Buckland Gateway Development zone, land is primarily zoned for low density residential uses. To the west of the Buckland Gateway Development Zone, land is primarily zoned for low- and medium-density residential uses.



I-84 Corridor between I-384 and Deming Street (Exit 63): Land is primarily zoned for commercial and industrial uses from I-384 to West Middle Turnpike, industrial and low-density residential from West Middle Turnpike to Tolland Turnpike, and medium-density residential and commercial from Tolland Turnpike to Deming Street. Closer to I-84, zoning allows for mixed uses and clusters of high density residential development.

I-291 Corridor between Route 5 and I-84: Land is primarily zoned for commercial and industrial uses, as well as low and medium density residential uses.

I-384 Corridor between Spencer Street and I-84: Land is primarily zoned for public/semi-public uses and commercial and industrial development. There are also clusters zoned for low and medium density residential uses.

#### **4.2.2 Surface Water Resources**

There are four named watercourses within the study area, which are the Hockanum River, Plum Gulley, Farm Brook and Whaples Brook. Each of these watercourses is described below and depicted on Figure 2 (A, B, and C).

Hockanum River: The Hockanum River originates well to the north and east of the study area and flows predominantly in a westerly direction until it ultimately discharges into the Connecticut River at Great River Park in East Hartford. The river enters the study area from the east, flowing behind several car dealerships located north of Route 83 before passing under the I-84 Exit 63 on- and off-ramps. From this point, the river flows under Route 30 and into the northeastern end of Union Pond in Manchester. The river outlets Union Pond at the southwestern end of the pond, beyond the limits of the study area. It then flows in a southwesterly direction, essentially paralleling the southeastern edge of the study area, eventually flowing under Adams Street and New State Road before re-entering the study area at a point just north of East Catholic High School. The river then curves to the south and flows under West Middle Turnpike (Route 44) and into Laurel Lake. Laurel Lake is a former impoundment of the river that is now known locally as Laurel Marsh. Just east of the I-84/I-384 interchange, the river curves sharply to the north and flows under I-84. It then exits the study area near Wickham Park and Mayberry Village on the Manchester/East Hartford town line.

As the Hockanum River flows through the study area, it is fed by several unnamed tributaries, three of which originate within the study limits. The first originates just east of Parker Street in Manchester, near the easternmost corner of the study area and drains into the Hockanum River from the south near the Big Y Supermarket along Route 83. A second unnamed tributary originates near the intersection of Slater Street and Buckland Hills Road and flows south, paralleling Slater Street on the west. This tributary flows under I-84 and Tolland Turnpike and drains into the Hockanum River at a point just south of the study area and southwest of Union Pond. The third tributary that originates within the study area is located west of the I-84/I-291 interchange and east of Wickham Park. Its



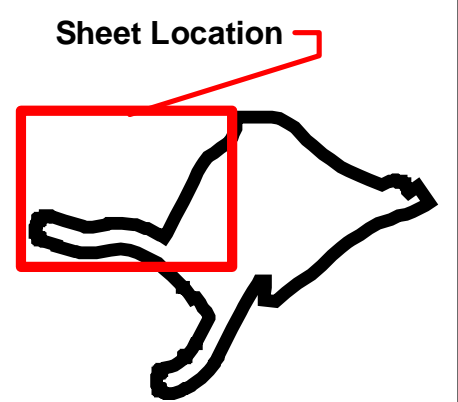
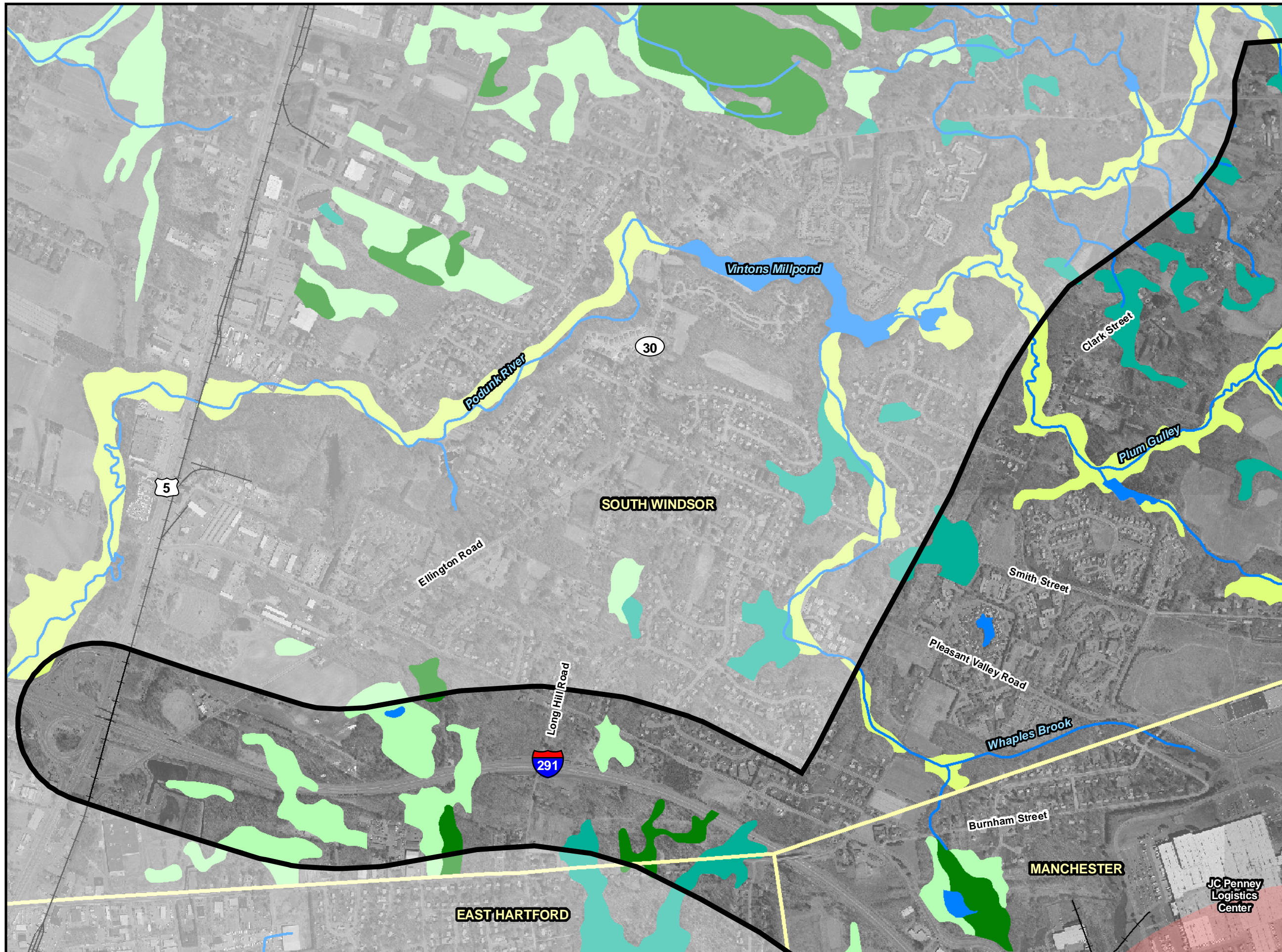
headwater wetland is located just south of Tolland Turnpike. The stream flows to the south under the I-84/I-291 interchange and discharges into the Hockanum River at a point just north of East Catholic High School.

According to the Connecticut Department of Environmental Protection (CTDEP) Surface Water Quality Standards (December 17, 2002), the Hockanum River within the study area is designated as a Class C/B surface water resource. All of the unnamed tributary streams to the Hockanum River that were briefly described above are designated by the CTDEP as Class A surface waters. Table 4-1 provides a description of CTDEP surface water quality classifications and also identifies the designated uses associated with each classification.

In terms of recreation uses, the CTDEP Fisheries Division has documented several species of trout in the Hockanum River and has designated a section (approximately six miles) of the river from Golf Land, a commercial business just south of I-84 and west of Route 83 in Vernon, to the Manchester/East Hartford town line near Wickham Park as a Trout Management Area. This designation is due to the success of brown trout (*Salmo trutta*) within the reach. Unlike many Connecticut streams where stocked trout do not survive for extended periods of time, this section of the Hockanum River is regulated as a catch and release area to provide year-round recreational fishing. This same stretch of river is also frequented by canoe and kayak enthusiasts, as there are several drop-in/take-out locations and a good mix of Class 1 and Class 2 rapids and relatively flat/placid areas for them to enjoy.

Plum Gulley and Farm Brook: Plum Gulley is a major tributary to the Podunk River and is located entirely within the Town of South Windsor in the northern portion of the study area. Plum Gulley is formed by several smaller tributary streams that merge just southeast of the Buckland Road/Ellington Road/Oakland Road/Sullivan Avenue intersection at Wapping Center. One of the tributaries is Farm Brook, which itself is formed by two branches which join just west of the Foster Street/Oakland Road intersection and then flow to the northwest, passing under Felt Street and Oakland Road before merging with Plum Gulley near Wapping Center. The other two tributary streams flow into the study area from the north.



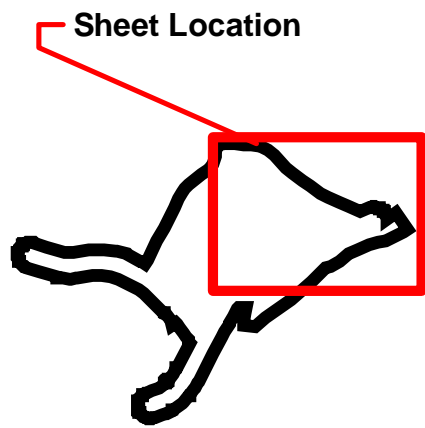
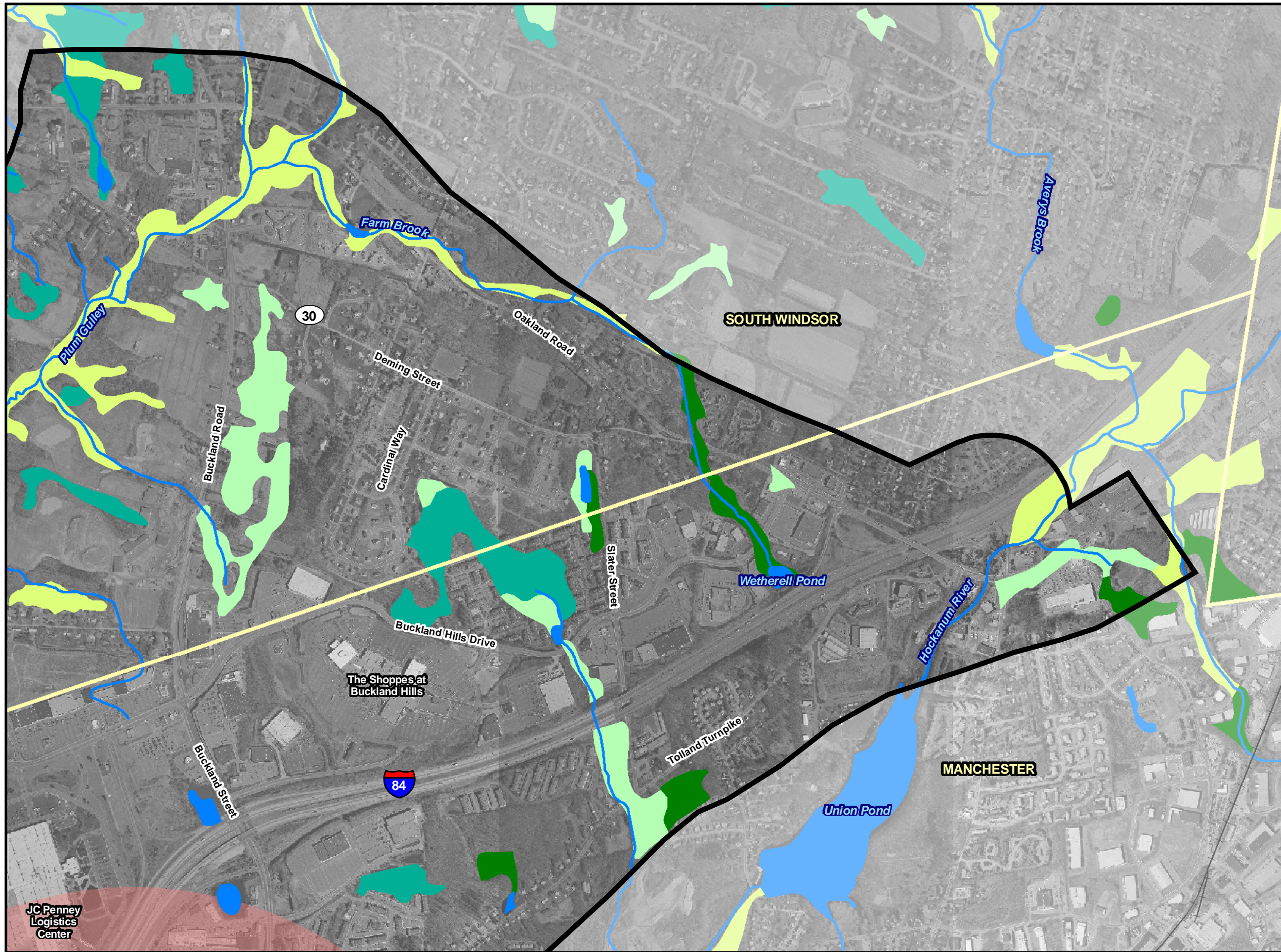


- Open Water
- Wetland Soils**
- Alluvial and Floodplain
- Poorly Drained
- Poorly Drained and Very Poorly Drained
- Very Poorly Drained
- Aquifer Protection Area Wells
- Aquifer Protection Areas
- Study Area
- Town Boundaries

**Figure 4-1A**  
**Wetlands & Water Resources**  
 Sheet 1 of 3

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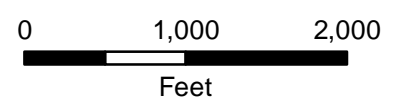
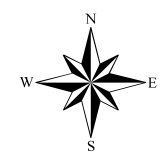
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- Open Water
- Wetland Soils**
- Alluvial and Floodplain
- Poorly Drained
- Poorly Drained and Very Poorly Drained
- Very Poorly Drained
- Aquifer Protection Area Wells
- Aquifer Protection Areas
- Study Area
- Town Boundaries

**Figure 4-1B  
Wetlands &  
Water Resources**

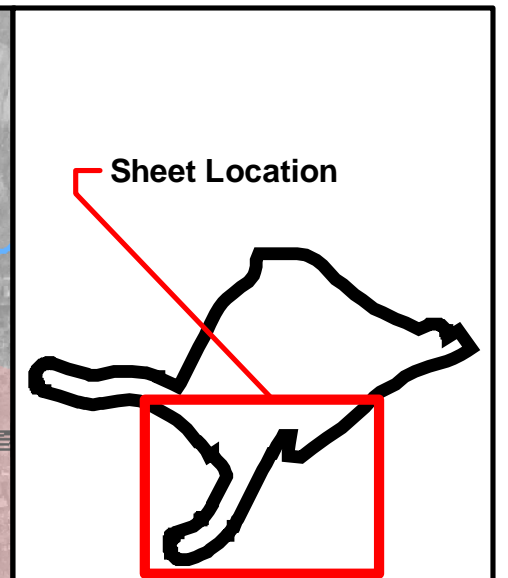
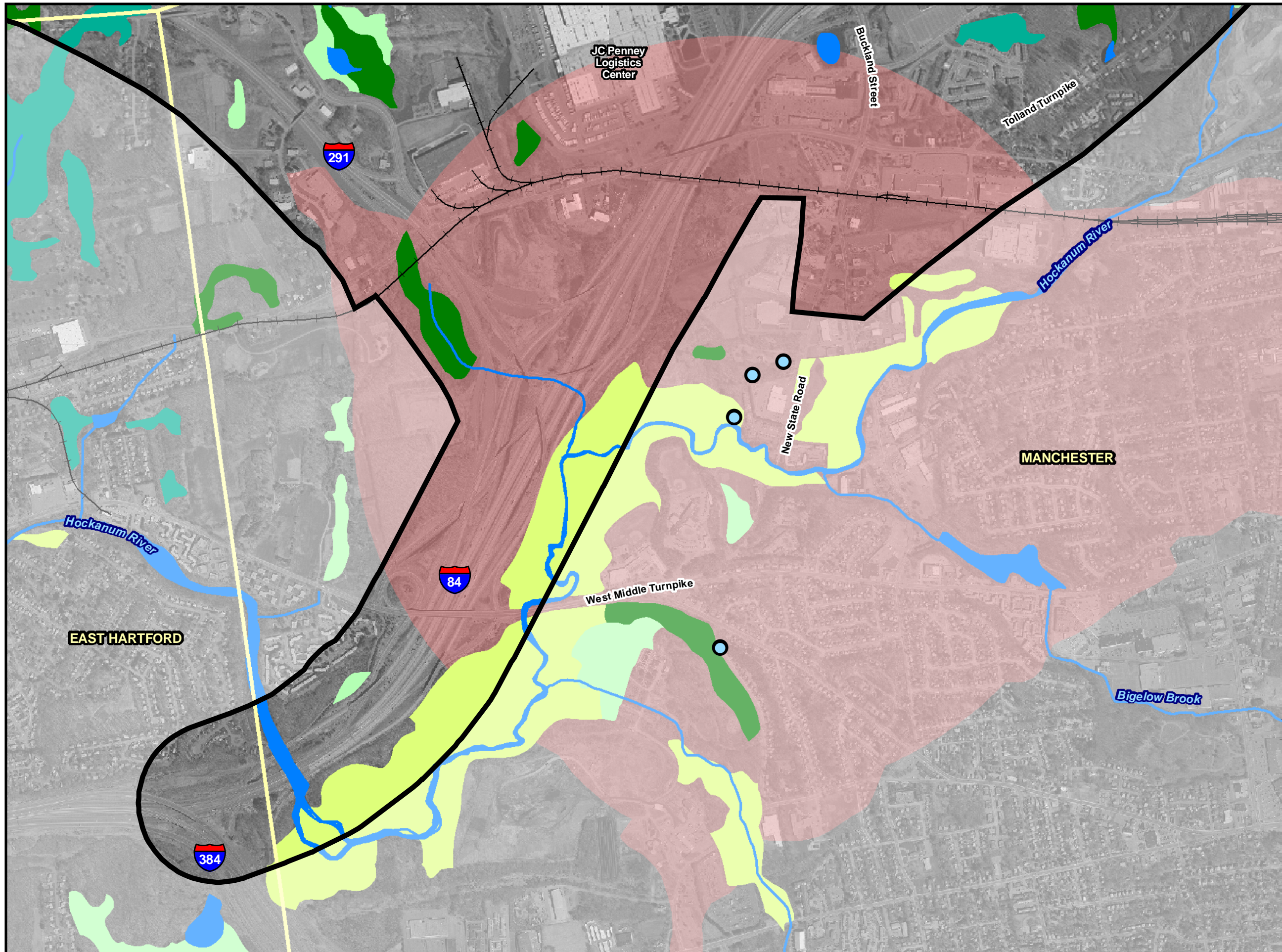
Sheet 2 of 3



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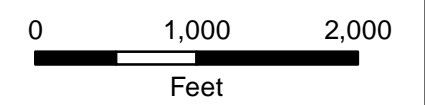
JC Penney  
Logistics  
Center



- Open Water
- Wetland Soils**
- Alluvial and Floodplain
- Poorly Drained
- Poorly Drained and Very Poorly Drained
- Very Poorly Drained
- Aquifer Protection Areas
- Aquifer Protection Area Wells
- Study Area
- Town Boundaries

**Figure 4-1C  
Wetlands &  
Water Resources**

Sheet 3 of 3



**Buckland Area  
Transportation Study**

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**TABLE 4-1**  
**CTDEP SURFACE WATER QUALITY CLASSIFICATIONS**

Class	Designated Uses	Classification	
		Type	Description
A	Potential drinking water supply; fish and wildlife habitat; recreational use; agricultural, industrial supply and other legitimate uses, including navigation.	A	Known or presumed to meet water quality criteria which support designated uses.
		B/A or C/A	May not be meeting water quality criteria or one or more designated uses. The goal is Class A.
B	Recreational use; fish and wildlife habitat; agricultural and industrial supply and other legitimate uses including navigation.	B	Known or presumed to meet water quality criteria which support designated uses.
		C/B or D/B	Presently does not meet the water quality criteria or one or more designated uses. The goal is Class B.
C	Certain fish and wildlife habitat, certain recreational activities, agricultural, industrial or other legitimate uses, including navigation; swimming may be precluded; one or more Class B criteria or designated uses may be impaired; goal is Class B unless a CTDEP and EPA approved use attainability analysis determines certain uses are non-attainable.	C/B, C/A or C/AA	Presently not meeting water quality criteria or one or more designated uses due to pollution. The goal for such waters may be Class AA, A or Class B depending upon the specific uses designated for a watercourse. In those cases where an approved use attainability Analysis has been conducted, certain designated uses may not be sought
D	Present conditions severely inhibit or preclude one or more designated uses for extended time periods or totally preclude attainment of one or more designated uses. May be suitable for bathing or other recreational purposes, certain fish and wildlife habitat, industrial or other legitimate uses, including navigation, may have good aesthetic value.	D/B, D/A	Presently not meeting water quality criteria or one or more designated uses due to severe pollution. The goal for such waters may be Class A or Class B depending upon the specific uses designated for a watercourse. In those cases where an approved Attainability analysis has been conducted, certain designated uses may not be sought.

Source: CTDEP Surface Water Quality Standards (December 17, 2002)

From Wapping Center, Plum Gulley flows in a southwesterly direction passing first under Buckland Road and then under Deming Street. After passing under Deming Street, Plum Gulley flows through a large undeveloped section of South Windsor that is characterized



by open fields and meadows, as well as scrub-shrub and wooded areas. This undeveloped land is bounded by Clark Street on the west, Smith Street on the south, Evergreen Walk on the east and Deming Street on the north. It is within this undeveloped region that Plum Gulley receives additional drainage from two unnamed streams to the east. The first of these tributaries forms just east of Buckland Road, opposite Evergreen Walk, and flows under Buckland Road and the northern access road to Evergreen Walk before draining into Plum Gulley.

The second tributary originates just north of the existing retail plaza located off of Pleasant Valley Road (Toys-R-Us plaza) and flows to the north under the eastern end of Smith Street. It then curves to the west and parallels Smith Street until it eventually merges with Plum Gulley. From this confluence, Plum Gulley curves to the northwest and flows under Clark Street and then ultimately discharges into the Podunk River east of Vinton's Millpond beyond the study area. Much of Plum Gulley from Deming Street to Clark Street is bordered by wetlands and vegetated riparian habitat. Plum Gulley, Farm Brook, and the tributaries identified above are all designated by the CTDEP as Class A surface water resources (refer to Table 1). According to the Connecticut Angler Guide (2006), Plum Gulley is lightly to moderately stocked with trout at Clark Street.

Whaples Brook: Whaples Brook is another major tributary to the Podunk River. The brook discharges into the Podunk River at Vinton's Millpond located just beyond the northwestern limits of the study area. Although much of Whaples Brook is located beyond the study area, it does originate within the study area just over the South Windsor/Manchester Town Line where a large wetland and pond exists just south of Burnham Road. From its point of origin, Whaples Brook flows in a northerly direction under Burnham Road and merges with an unnamed tributary draining from the east. The unnamed tributary originates near the JC Penney Logistics Center off of Pleasant Valley Road and parallels Pleasant Valley Road on the north. After the confluence, Whaples Brook continues north and passes under Clark Street as it flows towards Vinton's Millpond. Whaples Brook and its tributaries are designated by the CTDEP as Class A surface water resources.

Lakes and Ponds: Open water bodies within the study area include Union Pond, Wetherell Pond, and several other smaller unnamed ponds. There is also one lake located partially within the study area along the Hockanum River near the I-84/I-384 interchange. Although it is technically identified as a lake on the United States Geologic Service (USGS) 7.5 minute topographic quadrangle map of Manchester, Connecticut, the lake is no longer an impoundment of the Hockanum River. It is a large wetland system that covers 115 acres and is now known locally as Laurel Marsh (refer to the Wetlands section of this report for more information on Laurel Lake).

Union Pond is an impoundment of the Hockanum River that is located between Route 83 and Tolland Turnpike in Manchester. The pond is approximately 4,000 feet long and 1,000 feet wide and there is a dam on the southwestern end. Access to the pond is primarily gained from Northwest Park on the north. Only the northeastern tip of the pond is located



within the study area. Like the Hockanum River, the water quality of Union Pond is designated as Class C/B, or “impaired”, by the CTDEP. The CTDEP Division of Fisheries has issued a public statement warning people not to eat fish caught in Union Pond due to high levels of potentially dangerous chemicals found in pond water samples. Recreational activities include canoeing and kayaking and there are trails associated with Northwest Park that encircle much of the pond.

Wetherell Pond is a small pond about one (1) acre in size that is located just north of the I-84 and west of the Raymour Flanigan furniture store on the south side of Hale Road in Manchester. The pond serves as a water source for the Farm Brook and is designated a Class A surface water resource by the CTDEP.

The most notable unnamed ponds in Manchester are described below. Two are the man-made detention ponds located to the east of Buckland Street near I-84. One of these is located to the north of I-84 behind the existing Friendly’s restaurant and adjacent to the park-n-ride lot. The second is located south of I-84 and south of the Buckland Street off-ramp from I-84 (Exit 62). It is located just west of the Ground Round restaurant fronting Buckland Street. These detention ponds were constructed by the Connecticut Department of Transportation (ConnDOT) more than a decade ago to collect and treat stormwater runoff from the I-84 roadway and ramps.

The third unnamed pond in Manchester within the study area is located approximately 3,000 feet west of the JC Penney Logistics Center and due south of the residential neighborhood associated with Burnham Road. This pond is about 3 acres in size and is surrounded by a large wetland system. Together, the complex serves as the headwaters of Whaples Brook (previously described).

In South Windsor, there are several small ponds associated with Plum Gulley that are located within the large tract of undeveloped land between Deming Street and Clark Street. There is also one small pond located along Plum Gulley just north of where it flows under Deming Street near several medical office buildings. To the east of Clark Street and south of Ellington Road near South Windsor’s town center are two ponds that are associated with small tributaries that drain to the Podunk River to the north. Other notable ponds in South Windsor within the study area include one near the intersection of Slater Street and Deming Street, one just to the east of Cardinal Way, one south of Oakland Street near the Felt Street intersection, one associated with the Cinnamon Springs condominium complex north of Pleasant Valley Road, and two small ponds located north of I-291 and west of Long Hill Road within the western “tail” of the study area.

Based on the CTDEP Surface Water Quality Standards, all of the ponds within the study area, regardless of whether they are natural or man-made, are designated as Class A surface water resources. This is the default classification assigned by the CTDEP when actual water quality monitoring data is unavailable for a particular resource. A more accurate assessment can only be achieved through a detailed water quality sampling and analysis program which is not part of this study.



### 4.2.3 Wild and Scenic Rivers

There are no rivers designated by the National Park Service as Wild and Scenic Rivers in the study area.

### 4.2.4 Groundwater Resources

Two Aquifer Protection Areas (APA) exist within the study area, which are regulated by the CTDEP. Groundwater within each aquifer protection area is classified by the CTDEP as GAA, although in some locations the CTDEP notes that the groundwater is impaired. Designated uses for GAA groundwater include: existing or potential public supply of water suitable for drinking without treatment, and baseflow for hydraulically connected surface water bodies. Table 4-2 lists designated uses and discharge restrictions associated with CTDEP Groundwater Quality Classifications.

**TABLE 4-2  
CTDEP GROUNDWATER QUALITY CLASSIFICATIONS**

<b>Class</b>	<b>Designated Uses</b>	<b>Discharge Restricted to:</b>
GAA	Existing or public water supply or water suitable for drinking without treatment; baseflow for hydraulically connected surface water bodies	Treated domestic sewage, certain agricultural wastes, certain water treatment discharges
GA	Existing private and potential public or private supplies of water suitable for drinking without treatment; baseflow for hydraulically connected surface water bodies.	As for GAA and discharge from septage treatment facilities subject to stringent treatment and discharge requirements, and other wastes of natural origin that easily biodegrade and present no threat to groundwater.
GB	Industrial process water and cooling waters; baseflow for hydraulically connected surface water bodies; presumed not suitable for human consumption without treatment.	Same as for GA (Note; same treatment standards apply), certain other biodegradable wastewaters subject to soil attenuation.
GC	Assimilation of discharge authorized by the Commissioner pursuant to Section 22a-430 of the General Statutes. As an example, a lined landfill for disposal of ash residue from a resource recovery facility. The GC hydrogeology and setting provides the safest back up in case of technological failure.	Potential discharges from certain waste facilities subject to extraordinary permitting requirements.

Source: CTDEP Groundwater Quality Standards (2002)

Both APAs are located in Manchester. One is located just northeast of Laurel Lake in the vicinity of Exit 60 (West Middle Turnpike). Known as the Love Lane Wellfield, it is owned and operated by the Manchester Water Department. Immediately north of the Love Lane Wellfield is a more extensive wellfield known as the New State Road Wellfield, also owned and operated by the Manchester Water Department. These APA (wellfield) locations are depicted on Figure 2B. There are no APAs in South Windsor



within the study area. Drinking water in the South Windsor portion of the study area is primarily supplied by the Connecticut Water Company or by individual groundwater wells.

Beyond regulated APAs, groundwater underlying much of the study area is classified as GA by the CTDEP. Designated uses of Class GA groundwater resources include: existing private and potential public or private supplies of water suitable for drinking without treatment, and baseflow for hydraulically connected surface water bodies.

#### **4.2.5 Wetlands**

Wetlands within the study area were identified using a combination of Natural Resource Conservation Service (NRCS) soils data (1996) and National Wetland Inventory (NWI) mapping. Wetland locations and sizes were mapped based on the NRCS soils mapping (GIS coverage) for poorly drained, very poorly drained, alluvial and floodplain soil types within the study area. These soil types correspond to the Connecticut state wetland definition. Hence, this data was subsequently mapped to show the study area wetlands, depicted in Figure 2 (A, B, and C). NWI mapping was consulted to identify the wetland vegetation types shown for these areas. A windshield survey was then conducted to verify wetland locations in the field. No delineation, function and value assessments, or vegetation mapping were conducted for this planning level study. The purpose of this study is strictly to identify the general locations and types of wetlands within the study area with the information to be use as a tool to facilitate land use and transportation planning efforts. It should be noted that this narrative does not attempt to describe every wetland within the study area, just those considered to be significant with respect to this planning study.

Overall, wetlands in the study area are primarily associated with the major watercourses and their tributaries (previously described). In Manchester, the most notable wetland systems are associated with Laurel Lake, a tributary to the Hockanum River located just west of Slater Street, Wetherell Pond, the Hockanum River near I-84 Exit 63, and an unnamed pond south of Burnham Road. In South Windsor, the most notable wetlands within the study area are located along Plum Gulley and its tributaries, along several unnamed tributaries to the Podunk River, along the I-291 corridor, and along the eastern side of Buckland Road. These wetland systems are described in more detail below.

Laurel Lake (Laurel Marsh): Laurel Lake, referred to locally as Laurel Marsh, consists of 115 acres of alluvial and floodplain soils. It was once an impoundment of the Hockanum River. Located just southeast of the I-84/I-384 interchange, this large wetland system extends to the northeast to West Middle Turnpike and is a healthy mix of palustrine emergent, scrub-shrub and forested wetland types. Approximately one-half of the 115 acre wetland system is located within the study area. The southern half of the system abuts the Manchester landfill to the south. A small parking area off of West Middle Turnpike provides access to trails within Laurel Marsh, thus enabling the public to enjoy this vast wetland system and the Hockanum River.





Hockanum River north of West Middle Turnpike: To the north of West Middle Turnpike, a broad area of forested and emergent wetland extends along the Hockanum River to a point north of East Catholic High School. This wetland complex continues beyond the study area to New State Road. Like Laurel Marsh, this wetland complex is underlain by alluvial and floodplain soils. The I-84 eastbound on-ramp from West Middle Turnpike abuts the northern edge of this wetland.

Slater Street Tributary to the Hockanum River: Just north of Buckland Hills Drive and west of Slater Street is a large area of poorly and very poorly drained wetland soils that essentially surrounds the Pavilions Apartment Homes complex. This wetland is the headwaters of a tributary stream that flows to the south under Buckland Hills Drive, I-84, Tolland Turnpike and ultimately into the Hockanum River. This large wetland is a mix of palustrine emergent, scrub-shrub and forested cover types and is completely surrounded by residential and commercial development. To the south of I-84, the tributary stream flows through a smaller wetland comprised of emergent, scrub-shrub, forested, and open water areas. Still further to the south, after crossing under Tolland Turnpike, the stream broadens out in an emergent and scrub-shrub wetland abutting the north side of Jennifer's Way, a residential neighborhood.

Wetherell Pond: Another notable wetland system in the study area in Manchester is associated with Wetherell Pond. A linear band of very poorly drained wetland soils extends to the north of Wetherell Pond towards Hale Road, Oakland Road and beyond that is associated with Farm Brook. The wetland is dominated by emergent vegetation that covers an area approximately 250 feet wide by 1,500 feet long. Like the expansive wetland system along Slater Street previously described, the land surrounding this wetland corridor is completely developed.

Hockanum River Near I-84 Exit 63: In the easternmost corner of the study area, the Hockanum River enters from the northeast. In this location, the river flows through a broad, flat area of alluvial and floodplain soils between I-84 and commercial establishments along the north side of Route 83. Emergent and scrub-shrub vegetation is found throughout this floodplain wetland. The unnamed tributary stream that discharges into the Hockanum River at the western end of this wetland is bordered by forested, scrub-shrub and emergent vegetation.

Unnamed Pond South of Burnham Road: Just to the south of a residential neighborhood along Burnham Road, and northeast of Chapel Road, is a pond that is approximately three acres in size. This pond is the central feature of a large complex (approximately 15 to 18 acres) of poorly and very poorly drained soils that support lush emergent and scrub shrub wetland vegetation. This wetland complex drains to the north under Burnham Road, forming Whaples Brook.

Other Wetlands in the Study Area in Manchester: In Manchester, there are a few smaller, less-distinct wetlands in the study area described below. These do not include the two



man-made detention ponds (previously described in the Surface Water Resources section) that are integral components of the highway drainage system.

One wetland is located immediately east of Wickham Park, south of Tolland Turnpike, and west of I-291, comprised by a 10-acre pocket of very poorly drained soils. A small tributary stream originates within this wetland and drains to the south, under the I-84/I-291 interchange and ultimately into the Hockanum River at a location just north of East Catholic High School. Although this wetland is not recognized by NWI mapping, field observations noted that the wetland appears to be primarily forested.

Two other wetlands are located to the east of Buckland Street and south of the movie cinemas along Redstone Road. These wetlands, roughly five to seven acres each in size, are characterized by small areas of open water surrounded by emergent and forested vegetation. From the available mapping, it does not appear that these wetlands have hydrologic connections to nearby streams.

A final pocket of very poorly drained soils supporting emergent vegetation is located just southwest of the JC Penney Logistics Center and north of the railroad corridor. From the available mapping, this wetland also does not appear to have any hydrologic connections to nearby streams.

Plum Gulley and Associated Tributaries: A continuous band of alluvial and floodplain soils exists along the Farm Brook/Plum Gulley system from the Foster Street/Oakland Road intersection all the way to the Podunk River near Vinton's Millpond. This extensive riparian wetland corridor varies in width throughout its length. From the Foster Street/Oakland Road intersection west to the confluence of Farm Brook and Plum Gulley near Wapping Center, the wetland corridor averages between 50 and 200 feet in width. This reach passes through residential and commercial areas and is lightly wooded. At the confluence of Farm Brook and Plum Gulley near Wapping Center, the wetland corridor broadens significantly to approximately 800 to 1,000 feet in width. At this location, virtually the entire southeastern quadrant of the Buckland Road/Ellington Road/Oakland Road/Sullivan Avenue intersection is occupied by wetlands with the exception of the land fronting Buckland Road and Oakland Road. This large wetland is primarily forested with a smaller pocket of emergent vegetation located just before Plum Gulley flows under Buckland Road. Further to the southwest, and just prior to crossing Deming Street, Plum Gulley flows into an open water and scrub-shrub wetland that is approximately five acres in size.

Between Deming Road and Clark Street, the wetland corridor associated with Plum Gulley extends to the southeast along several tributary streams to points just west of Evergreen Walk, the Old Navy/Highland Park Market plaza, and the LA Fitness plaza. These finger-like wetland extensions project out into adjacent low-lying open fields and meadows. Closer to Plum Gulley, the wetlands are primarily forested with patches of emergent and scrub-shrub vegetation. Emergent and scrub-shrub vegetation becomes



more prevalent closer to Evergreen Walk and the other developments west of Buckland Road.

The riparian wetland corridor associated with Plum Gulley transitions to a predominantly forested corridor as the watercourse curves to the west and then north in the vicinity of the residential neighborhood defined by Smith Street, Diggins Court, and Austin Circle. In this location, a tributary stream that originates north of the Toys-R-Us plaza along Pleasant Valley Road flows into Plum Gulley from the southeast. This tributary is buffered by emergent and scrub-shrub vegetation along its length and includes a broader area of alluvial and floodplain soils just north of Smith Street. As Plum Gulley exits the northwestern limits of the study area, the wetland corridor transitions from forested to scrub-shrub vegetation and then back to forested vegetation at its confluence with the Podunk River.

Unnamed Tributaries to the Podunk River: South of Ellington Road and east of Clark Street are several small unnamed tributaries that flow in a northwesterly direction into the Podunk River beyond the study area. Pockets of poorly drained and very poorly drained wetland soils are abundant here and emergent and scrub-shrub vegetation can be found interspersed with several small open water areas.

I-291 Corridor Wetlands: Where I-291 enters the study area from the west, there are numerous pockets of poorly drained wetland soils. Many of these wetland pockets were fragmented during the construction of I-291, resulting in isolated remnant wetlands to the north and south of I-291, particularly west of Long Hill Road and east of Route 5. These wetlands contain a mix of forested, scrub-shrub and emergent cover types and for the most part are segmented from other wetland systems by residential development to the north and south of I-291.

East Side of Buckland Road: A very large and convoluted area of poorly drained wetland soil exists to the east of Buckland Road from Deming Street south to Evergreen Run (a new [2006] commercial/retail plaza located just north of Lowe's). This wetland is characterized by open and maintained fields and meadows that appear to have once supported agricultural uses. Vegetation is primarily emergent, with smaller pockets of scrub-shrub vegetation. A tributary to Plum Gulley originates in the extreme southern end of this large wetland and flows to the west under Buckland Road near the northern entrance to Evergreen Walk and the Old Navy/Highland Park Market plaza. Limitations on development in wetlands is likely the main reason why commercial and retail development has not proliferated along this area.

Other Wetlands in the Study Area in South Windsor: One final wetland of note in the South Windsor portion of the study area is a pocket wetland located just west of Slater Street and south of Deming Street. This wetland is characterized by an elongated open water area buffered by emergent vegetation on the north and a mix of scrub-shrub and forested vegetation on the south. The southern end of this wetland abuts commercial/retail plazas located on the north side of Buckland Hills Drive in Manchester.



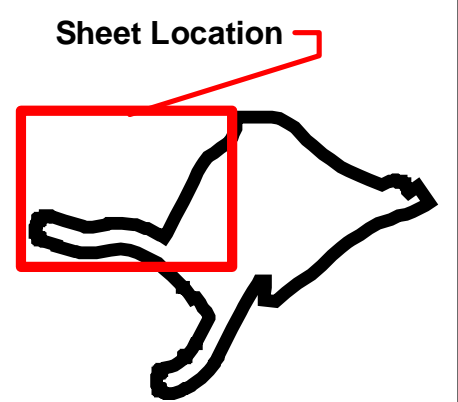
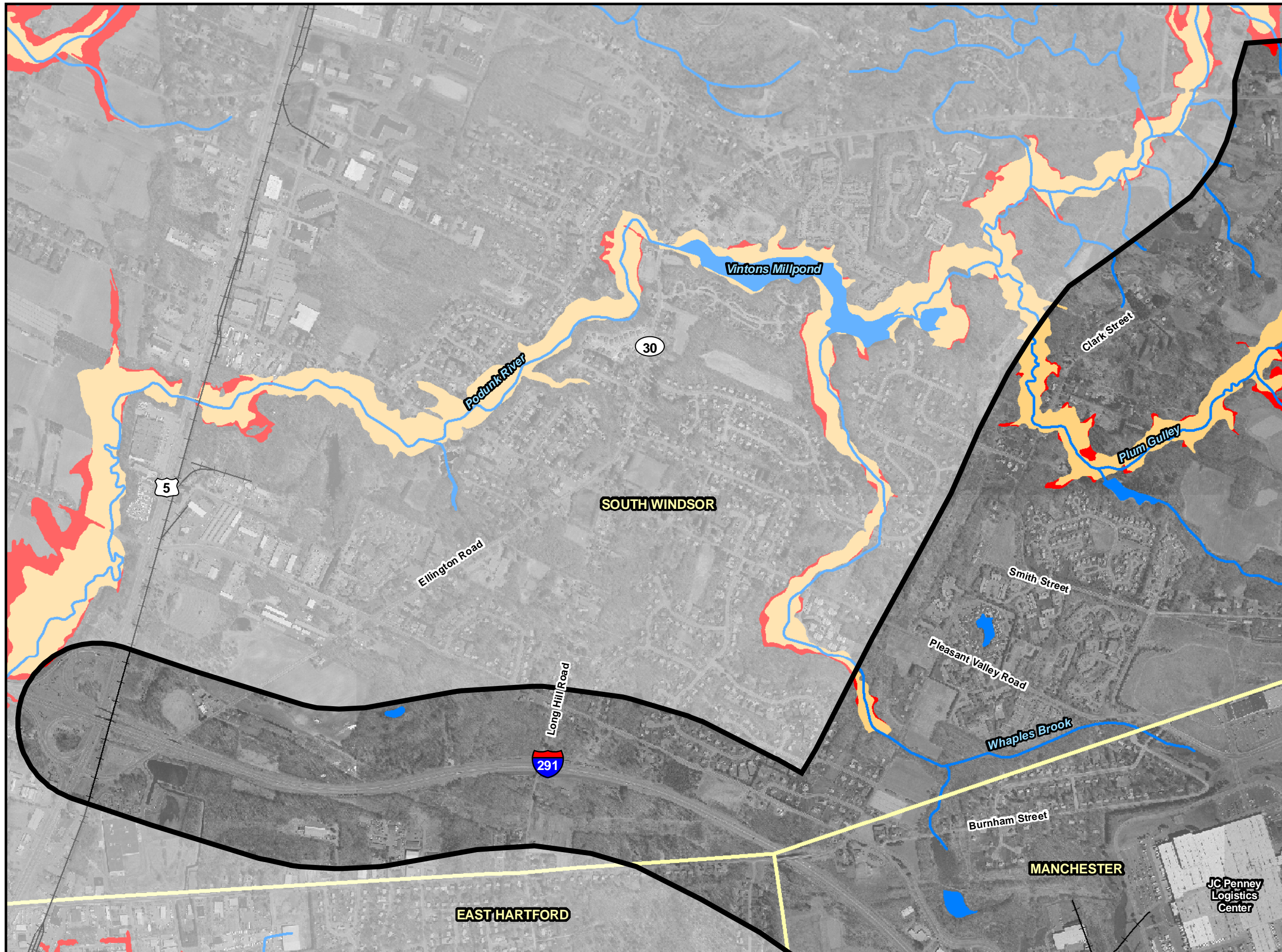
#### **4.2.6 Floodplains and Stream Channel Encroachment Lines**

The Federal Emergency Management Agency (FEMA) produces Flood Insurance Rate Maps (FIRM) that show designated floodplains. A 100-year floodplain is an area that has a one percent chance of being inundated in a given year. A 500-year floodplain is an area that has a one five-hundredth chance (0.02%) of being inundated in a given year. Available FEMA data from CTDEP GIS mapping was used to identify and map floodplain resources in the study area, as shown on Figure 3 (A, B, and C). The location of each of these floodplain resources is generally described in this section. Floodplain locations were not visited in the field for this planning level study, and no research into historic flood events within the study area was conducted. More detailed investigation of floodplain resources may become warranted in the future to address potential environmental impacts associated with proposed transportation improvement alternatives.

Floodplain resources are predominantly associated with the Hockanum River and Plum Gulley. Along the Hockanum River, the 100-year floodplain is most expansive just south of I-84 from Laurel Lake northeast to a point just north of East Catholic High School. Along this reach of the river, the width of the 100-year floodplain is approximately 1,500 feet, with its widest point at Laurel Lake (former impoundment now known as Laurel Marsh). The width of the 100-year floodplain gradually tapers in the upstream direction to about 1,200 feet north of Laurel Lake. North of East Catholic High School the 100-year floodplain abuts the I-84 eastbound on-ramp from West Middle Turnpike. The only other 100-year floodplain along the Hockanum River in the study area is just east of I-84 Exit 63. In this location the floodplain is approximately 300 feet wide and occupies an area south of the eastbound lanes of I-84 and north of Route 83, behind several car dealerships.

Plum Gulley, a tributary of the Podunk River, enters the study area from the northeast at a point just southeast of Wapping Center, where Buckland Road, Ellington Road, Oakland Road, and Sullivan Avenue intersect. Plum Gulley then flows to the southwest under Buckland Road, Deming Street, and eventually Clark Street as it curves to the west and then north before exiting the study area. Along this entire reach of Plum Gulley, the 100-year floodplain is on the order of 200 feet to 400 feet wide and is characterized by a mix of open meadow, scrub-shrub and forested vegetative cover types.

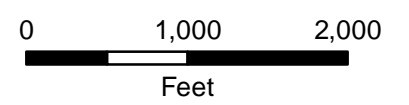
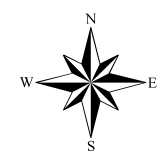
Stream channel encroachments are regulated by the CTDEP Inland Water Resources Division, independent of floodplains. Stream Channel Encroachment Lines (SCELs) have been established for approximately 270 linear miles of riverine floodplain statewide. Different streams have different defined SCEL setbacks from ordinary high water levels. GIS mapping obtained from CTDEP depicts a SCEL along the Hockanum River in the southern part of the study area. The SCEL extends from Laurel Lake northeast to a point north of East Catholic High School, and to the northeast of Union Pond near I-84 Exit 63.



- FEMA Floodplains**
- 100 Year Floodplains
  - 500 Year Floodplains
  - Stream Channel Encroachment Lines
  - Study Area
  - Town Boundaries

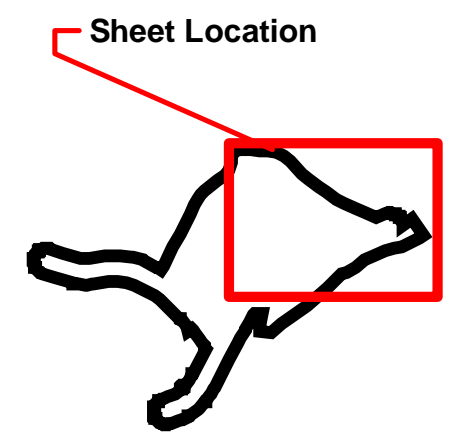
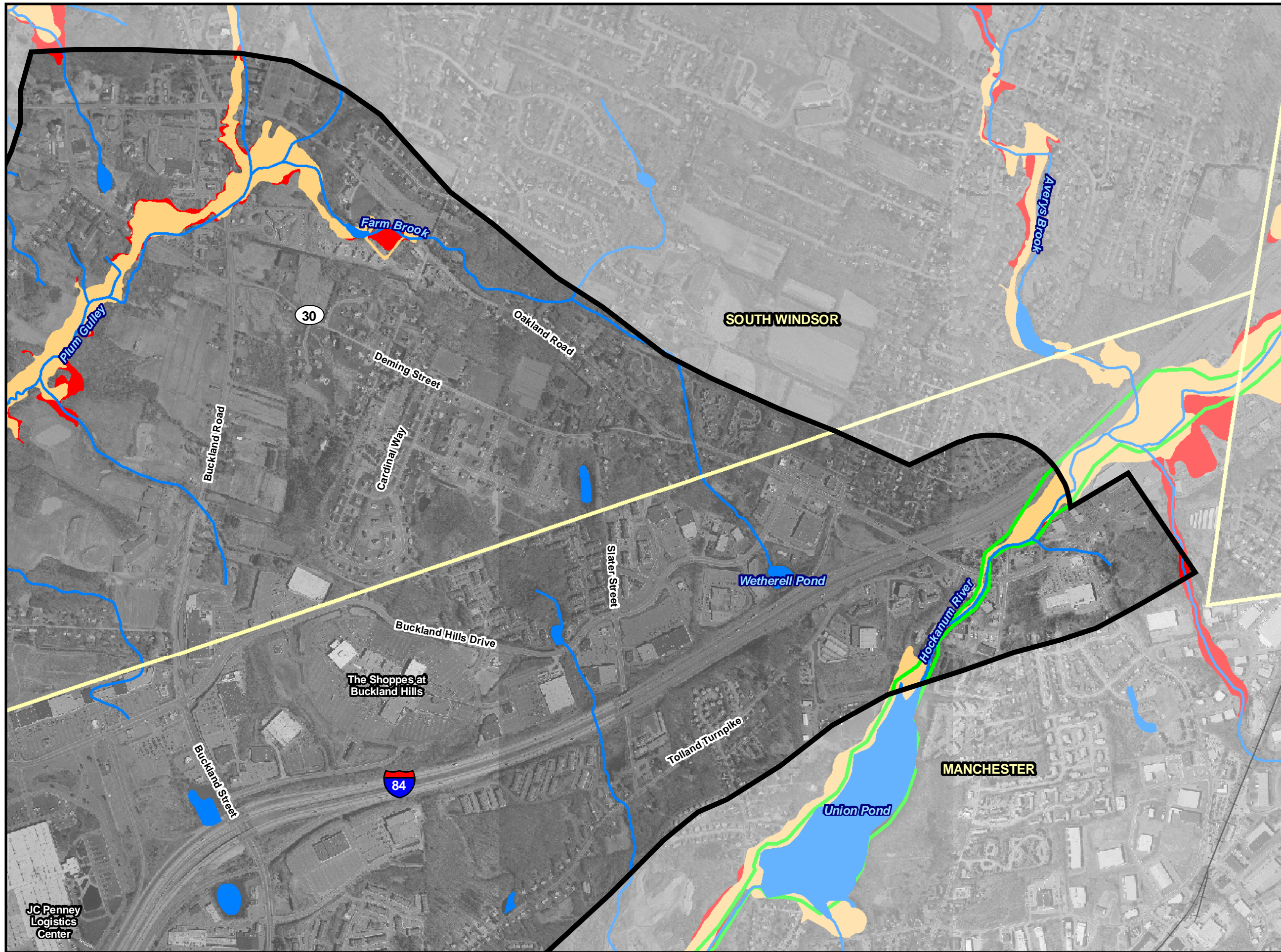
**Figure 4-2A**  
**FEMA & Stream Channel Encroachment**

Sheet 1 of 3



**Buckland Area**  
**Transportation Study**

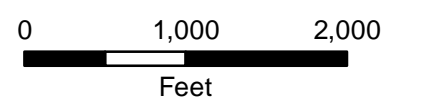
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- FEMA Floodplains**
- 100 Year Floodplains
  - 500 Year Floodplains
  - Stream Channel Encroachment Lines
  - Study Area
  - Town Boundaries

**Figure 4-2B**  
**FEMA & Stream**  
**Channel Encroachment**

Sheet 2 of 3



**Buckland Area**  
**Transportation Study**

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JC Penney  
 Logistics  
 Center

The Shoppes at  
 Buckland Hills

**SOUTH WINDSOR**

**MANCHESTER**

30

84

Farm Brook

Averys Brook

Hockanum River

Union Pond

Wetherell Pond

Oakland Road

Deming Street

Cardinal Way

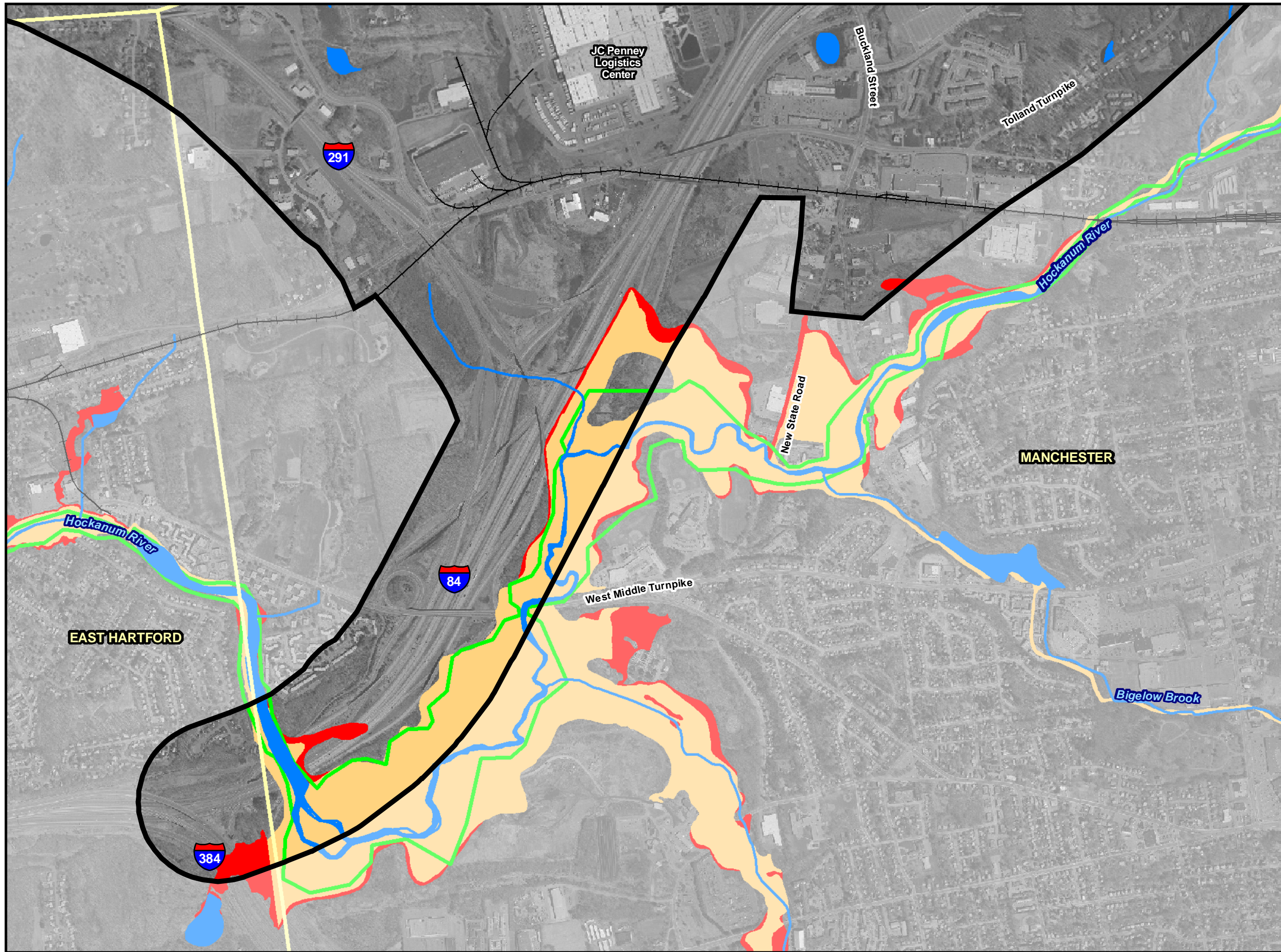
Slater Street

Buckland Hills Drive

Tolland Turnpike

Buckland Road

Buckland Street



**Sheet Location**

**FEMA Floodplains**

- 100 Year Floodplains
- 500 Year Floodplains
- Stream Channel Encroachment Lines

**Study Area**

- Study Area
- Town Boundaries

**Figure 4-2C**  
**FEMA & Stream Channel Encroachment**

Sheet 3 of 3

0 1,000 2,000  
 Feet

**Buckland Area**  
**Transportation Study**

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Any construction within the Hockanum River SCEL will need to be fully coordinated through the CTDEP Inland Water Resources Division permit process.

#### **4.2.7 Threatened and Endangered Species / Critical Wildlife Habitat**

A review of the 2006 CTDEP GIS Natural Diversity Database (NDDDB) of State and Federal Listed Species and Significant Natural Communities identified a total of nine areas within the study area where state threatened and endangered species and/or significant natural communities potentially exist. A Significant Natural Community is generally defined as a natural area or habitat that includes the resources and/or characteristics (such as food, water, shelter, vegetation, soils, etc.) capable of supporting and / or sustaining rare, threatened and / or endangered plant and animal species. These same characteristics are used to define Critical Wildlife Habitats as well.

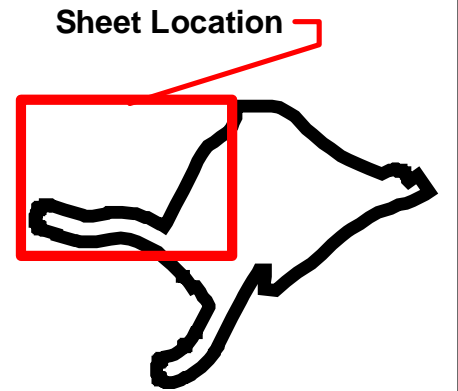
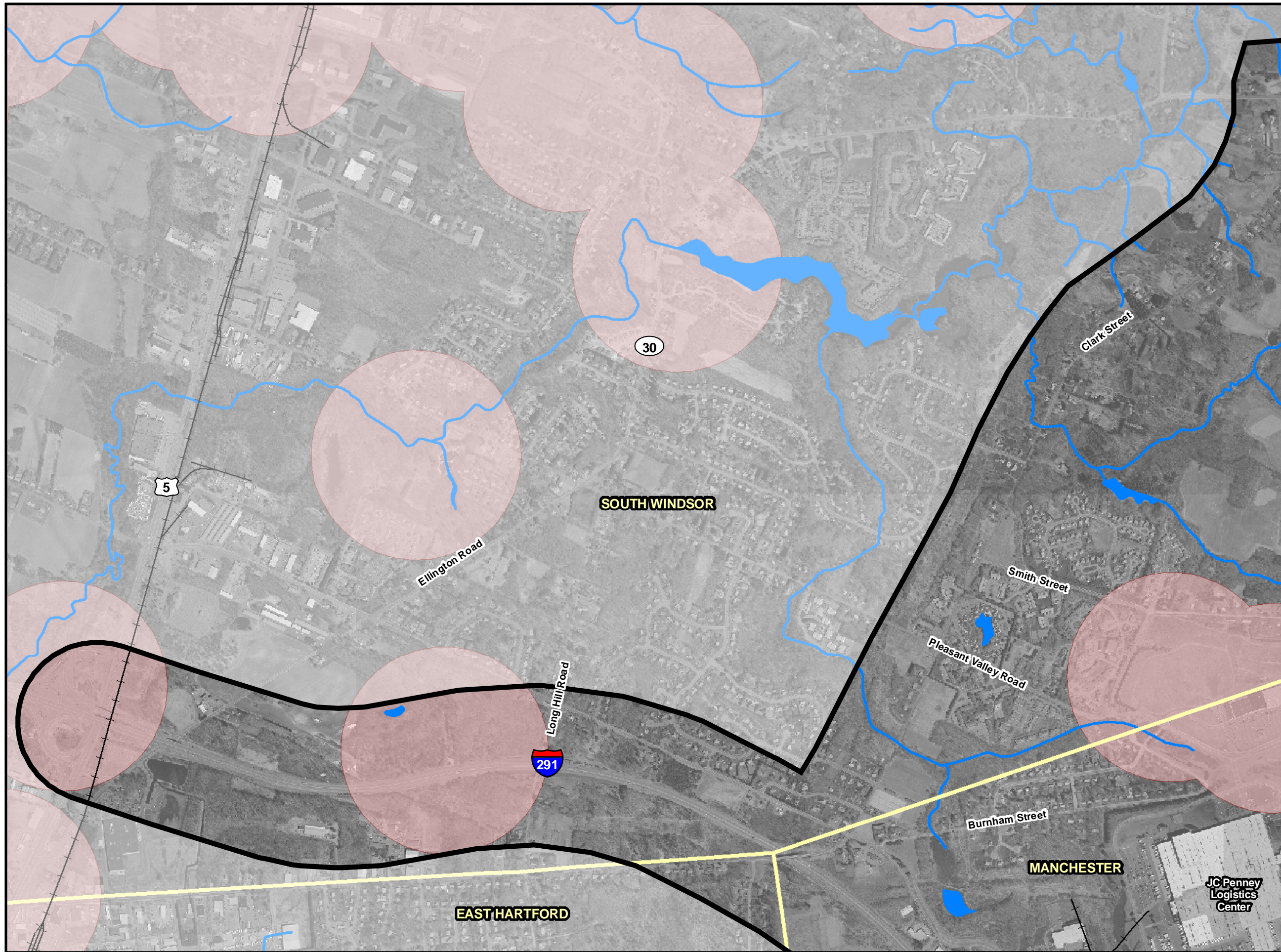
The nine sites discovered during the data search are depicted on Figure 4 (A, B, and C). The sites include two along the I-291 corridor in the western part of the study area, two to the north of the JC Penney Logistics Center near the Manchester/South Windsor town line, one near the Shoppes at Buckland Hills, two sites in the vicinity of the Buckland Street/Tolland Turnpike intersection in Manchester, one along the East Hartford/Manchester town line in the vicinity of Wickham Park, and one site located to the north of Union Pond.

A database information request was completed and submitted to the CTDEP NDDDB for this study on July 31, 2006. According to the CTDEP NDDDB response letter dated August 17, 2006, there are state-listed wildlife species that occur within the study area. Further consultation with the NDDDB program wildlife specialist will be required as improvement alternatives are developed and advanced into design. The NDDDB program botanist has determined that there are no state-listed plants in the study area.

A database information request was also completed and submitted to the United States Fish and Wildlife Service (USFWS) for this study on July 31, 2006. A response from the USFWS regarding the potential for federal threatened and endangered species and/or critical habitats within the study area is forthcoming.

All correspondence relative to threatened and endangered species and significant natural communities and/or critical habitat is included in Appendix A of this report. No field surveys were conducted for this study.



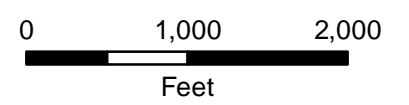
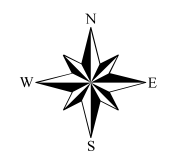


- CTDEP Natural Diversity Database 2006
- Study Area
- Town Boundaries

**Figure 4-3A**

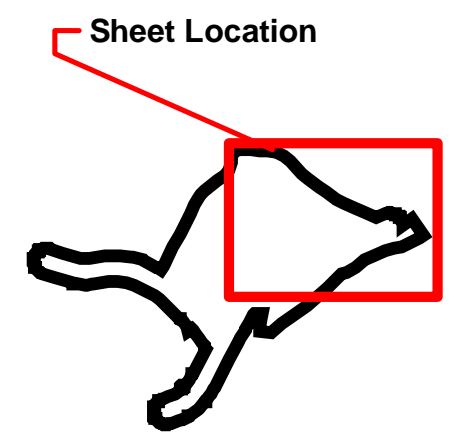
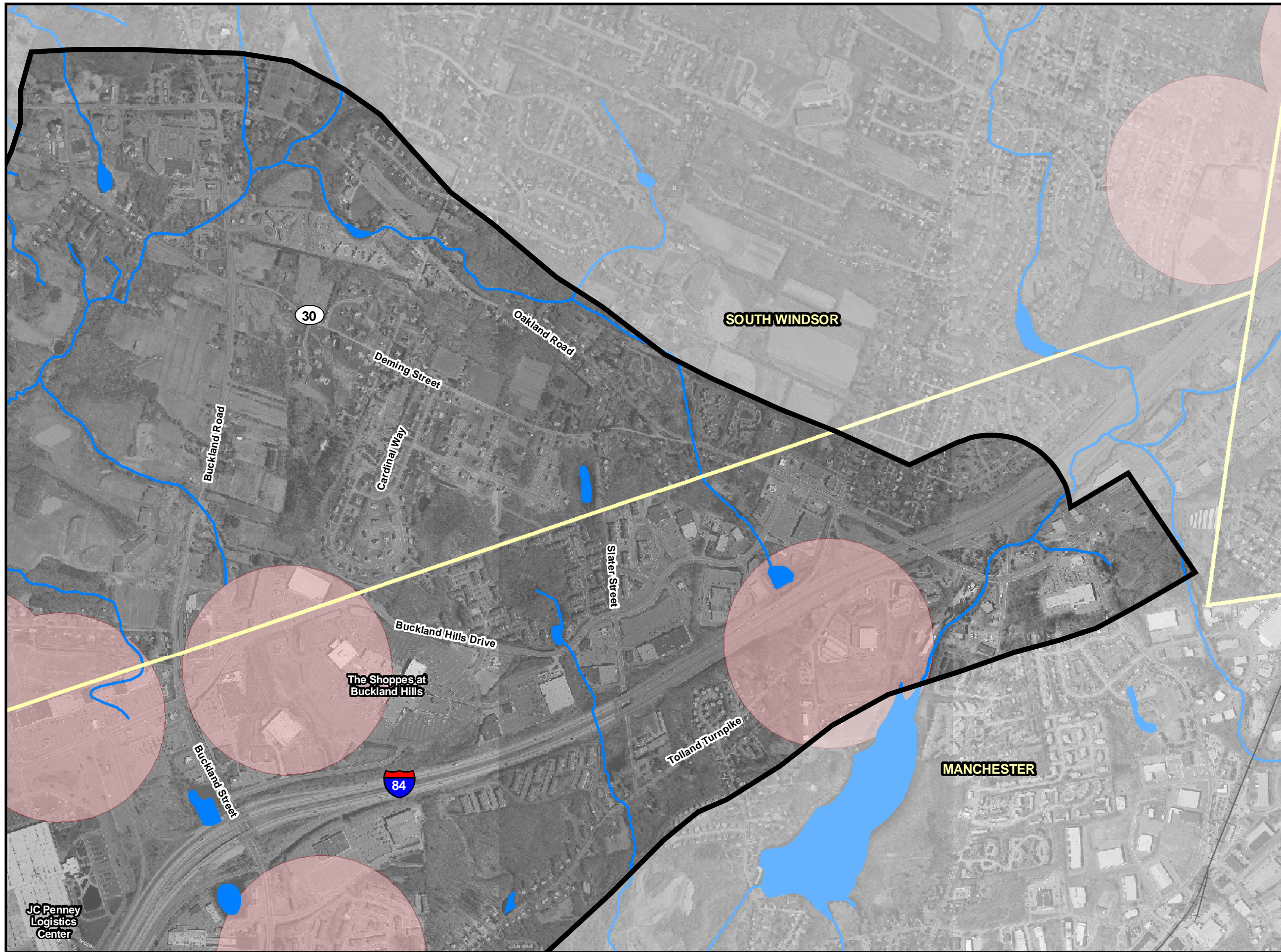
**Critical Habitats**

Sheet 1 of 3



**Buckland Area  
Transportation Study**

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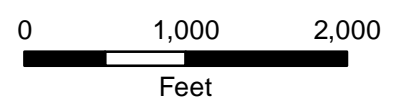


- CTDEP Natural Diversity Database 2006
- Study Area
- Town Boundaries

**Figure 4-3B**

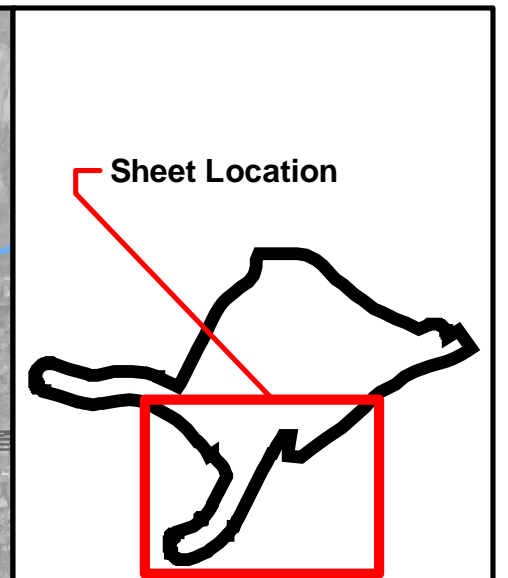
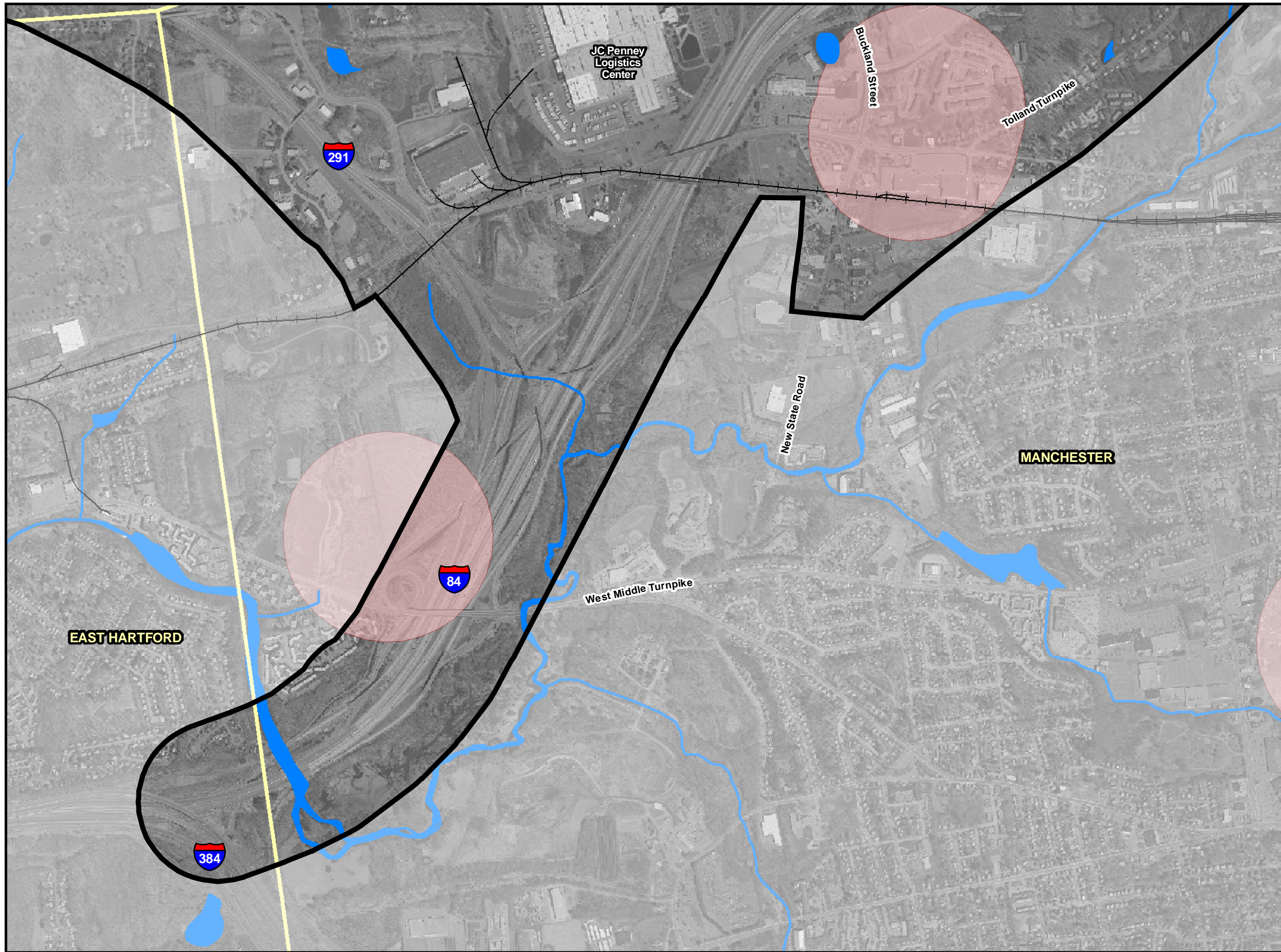
**Critical Habitats**

Sheet 2 of 3



**Buckland Area  
Transportation Study**

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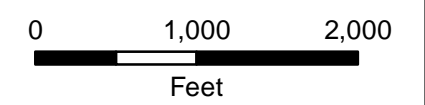


- CTDEP Natural Diversity Database 2006
- Study Area
- Town Boundaries

**Figure 4-3C**

**Critical Habitats**

Sheet 3 of 3



**Buckland Area  
Transportation Study**

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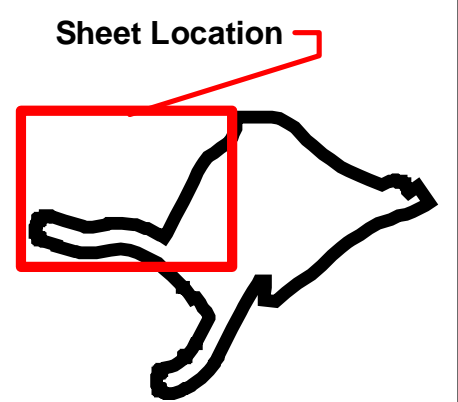
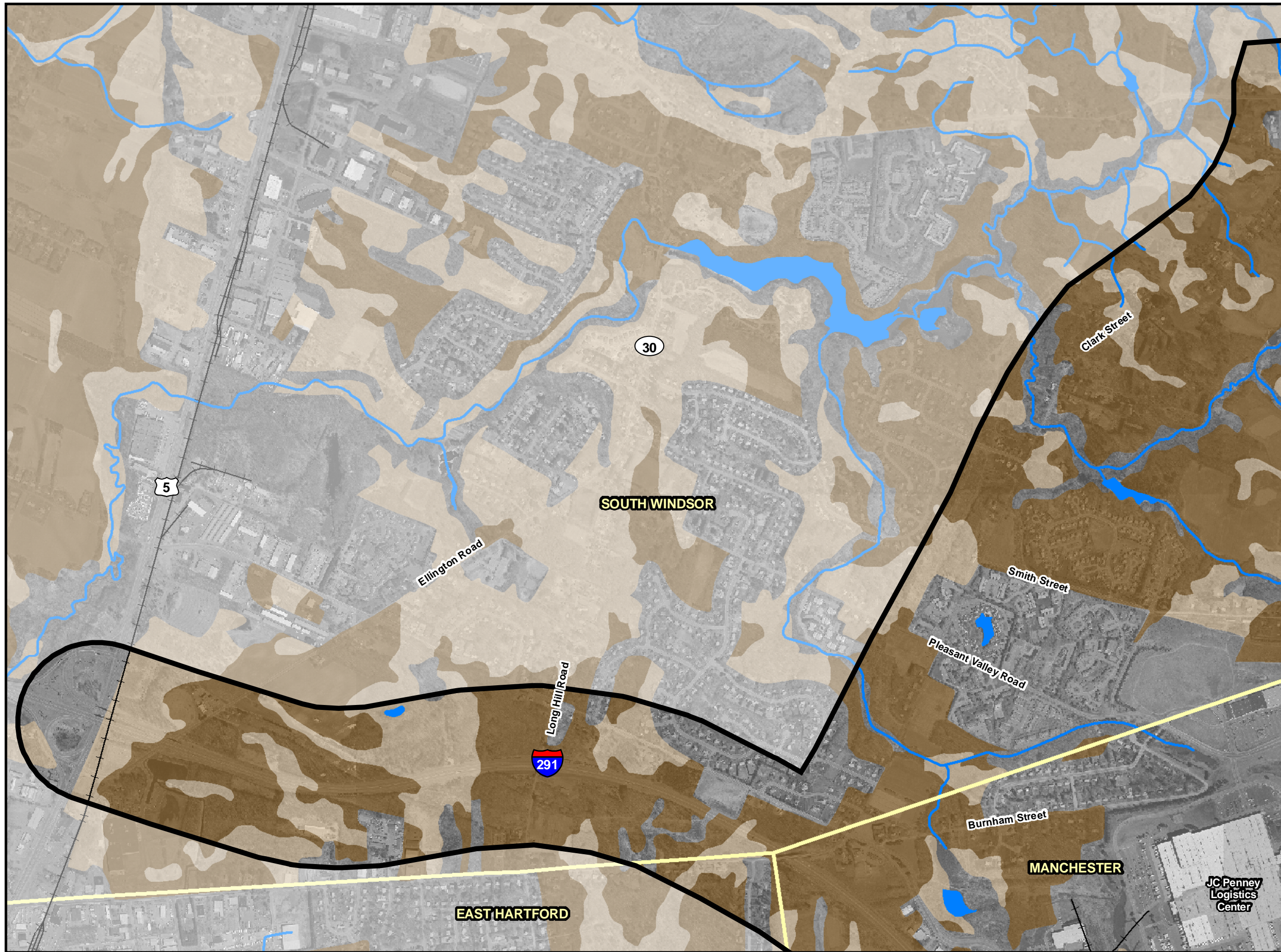
#### **4.2.8 Farmlands**

NRCS soils mapping (CTDEP GIS 1996) shows that prime and additional statewide important farmland soils are abundant within the study area, especially in the Town of South Windsor. Figure 5 (A, B, and C) shows that prime and statewide important farmland soils essentially extend from Oakland Street on the northeastern edge of the study area westward to the Podunk River, and in a southerly direction to the South Windsor/Manchester town line east of Buckland Road and to Smith Street west of Buckland Road. Also, prime and statewide important farmland soils are found north and south of the I-291 corridor that forms the western “tail” of the study area. Indeed, the only land in South Windsor within the study area not underlain by farmland soils are two residential areas northwest of the JC Penney Logistics Center, a developed area associated with Wapping Center, and land located just west of Oakland Road approximately half way between the Oakland Road/Deming Street intersection and Wapping Center. For the most part, prime farmland soils are much more abundant than statewide important farmland soils, especially south of Deming Street to the South Windsor/Manchester town line and west of Buckland Road to Plum Gulley.

The 1996 mapping is not entirely accurate for this 2006 study. There has been significant development in South Windsor since 1996 that has replaced farmland soils within the study area. Of particular note is a large residential development located south of Deming Street to the South Windsor/Manchester town line that is comprised of Ridge Road, Loomis Road, and Cardinal Way among other streets. Also, south of Oakland Road near the Felt Street intersection, the Dzen Strawberry Farm has since been developed into a senior housing complex known as the Berry Patch. To the west of Buckland Road; Evergreen Walk, the Old Navy/Highland Park Market plaza, the LA Fitness plaza, and the ECHN medical plaza have all been constructed in areas formerly abundant in prime farmland soils. A residential neighborhood to the north of Smith Street, made up of Austin Circle and Diggins Court, and development along the eastern side of Clark Street northward to Ellington Road (Route 30) have altered former areas of prime and statewide important farmland soils as well.

There are only three active farms within the study area, and all are located in South Windsor. Two are located along the east side of Clark Street. The third is located north of the Deming Street / Cardinal Way intersection. All other farms in the study area have either been developed or have ceased operations.

In Manchester, farmland soils within the study area are much less abundant and are primarily scattered along the I-291 corridor, south of I-84 and east of Buckland Street along Tolland Turnpike, and in the general vicinity of Slater Street and Buckland Hills Drive. Most of the farmland soils identified in the latter two areas have been developed since the 1996 mapping and now support residential, commercial and retail uses. There are no active farms within the study area in Manchester.

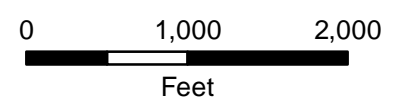
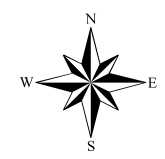


- Prime Farmland Soils
- Statewide Important Farmland Soils
- Study Area
- Town Boundaries

**Figure 4-4A**

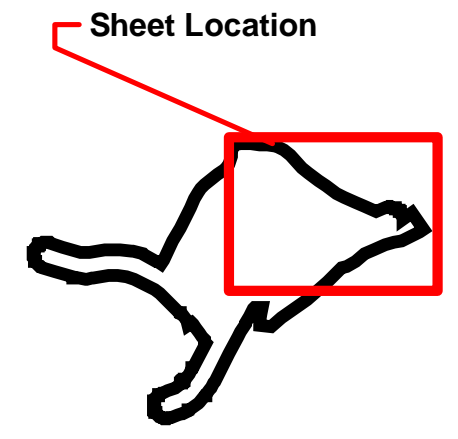
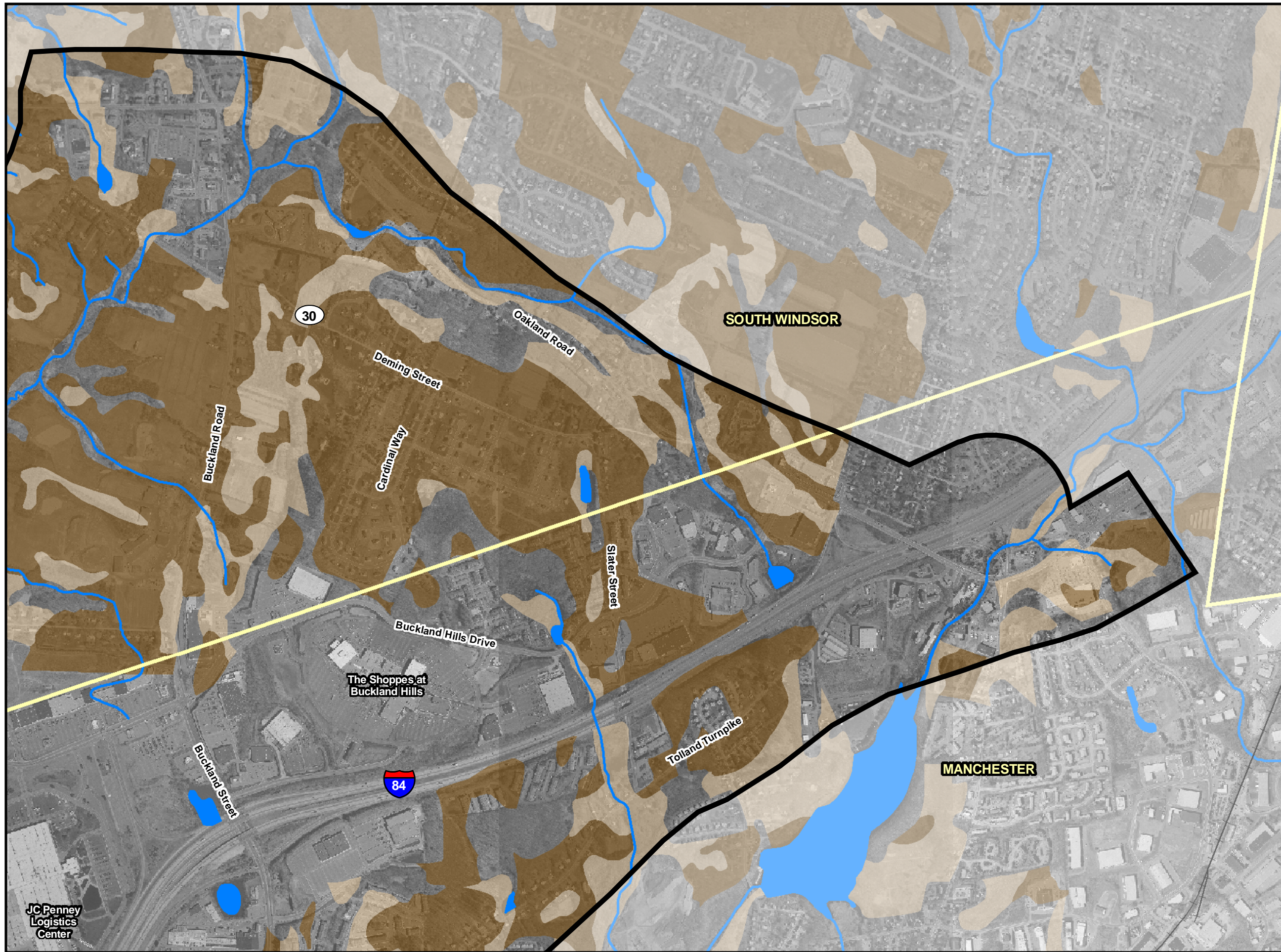
**Farmland Soils**

Sheet 1 of 3



**Buckland Area  
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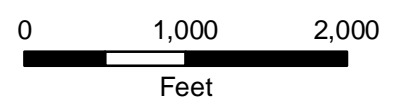


- Prime Farmland Soils
- Statewide Important Farmland Soils
- Study Area
- Town Boundaries

**Figure 4-4B**

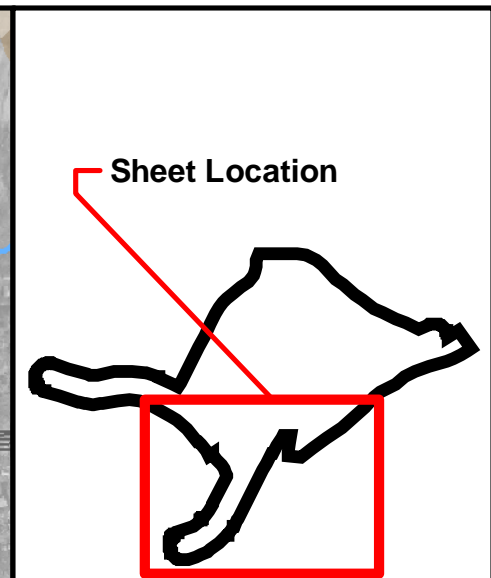
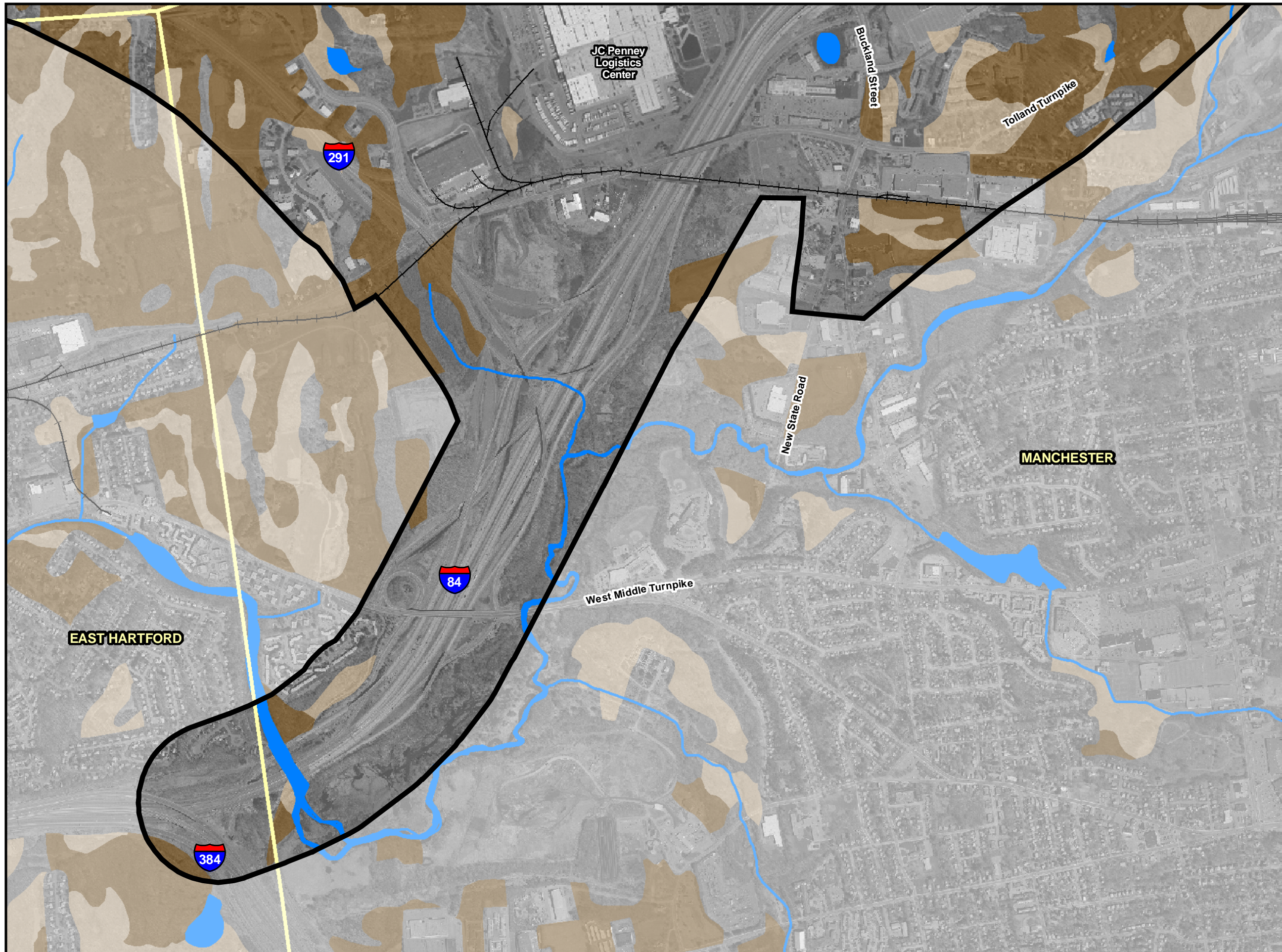
**Farmland Soils**

Sheet 2 of 3



**Buckland Area  
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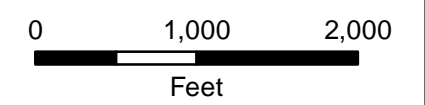


- Prime Farmland Soils
- Statewide Important Farmland Soils
- Study Area
- Town Boundaries

**Figure 4-4C**

**Farmland Soils**

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**Buckland Area  
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#### 4.2.9 Air Quality

The Clean Air Act of 1970 and subsequent Clean Air Act Amendments established National Ambient Air Quality Standards (NAAQS) for six criteria pollutants to ensure the protection of human health and public welfare. NAAQS were established for carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), sulfur dioxide (SO<sub>2</sub>), lead (Pb), ozone, and particulate matter (PM). The Clean Air Act also required states to monitor air quality to determine if regions meet the NAAQS. If a region shows exceedances of any of the NAAQS, that part of the state is classified as non-attainment to that pollutant and the state must develop an air quality plan, called a State Implementation Plan (SIP) that will bring that area into compliance.

Monitored air quality data are documented and reported in the *2005 Annual Report on Air Quality in New England* (EPA Region 1, August, 2006). Data collected at the monitoring sites help establish background air quality levels.

The Buckland Transportation Study falls within Hartford County. The current air quality attainment designations for the six criteria pollutants in Hartford County are:

**CO:** Hartford County, and entire state of Connecticut, is currently designated as attainment for CO.

**Ozone:** The entire state of Connecticut is designated as non-attainment for the 1-hour ozone standard. Hartford County is classified as "moderate non-attainment" for the 1-hour standard. In April of 2004 the EPA determined the entire state of Connecticut to be in moderate non-attainment for the eight-hour ozone NAAQS. The maximum attainment date is projected to be June 2010.

**PM:** EPA has established NAAQS for two size ranges of PM. Hartford County, and the entire state of Connecticut is currently in attainment of PM<sub>10</sub> (particulate matter with a diameter of 10 microns or less) as well as PM<sub>2.5</sub> (particulate matter with a diameter of 2.5 microns or less).

**NO<sub>2</sub>:** Hartford County, and the entire state of Connecticut, is in attainment for NO<sub>2</sub>.

**Pb:** Hartford County, and the entire state of Connecticut, is in attainment for Pb.

**SO<sub>2</sub>:** Hartford County, and the entire state of Connecticut, is in attainment for SO<sub>2</sub>.

#### 4.2.10 Hazardous Waste Sites

Potential hazardous waste sites in the study area were identified using the United States Environmental Protection Agency (EPA) Envirofacts Data Warehouse. In addition, the





CTDEP GIS data called *Landfill Leachate and Wastewater Discharges* was consulted to characterize the potential for hazardous materials or contamination in the study area. No field verification or visual inspection of these locations has been conducted at this time.

Hazardous materials or risk of contamination are sometimes associated with particular land uses, documented spills, and wastewater discharges. Historic land uses, particularly along Tolland Turnpike and the Burr Corners area in Manchester, suggest unregulated past discharges of contaminated materials. The Buckland Industrial Park, south and west of the JC Penney Warehouse, contains four Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) sites that have been remediated. Former wastewater discharges have been documented along Adams Street and New State Road. Discharges have also been reported along Route 83 near the Vernon/Manchester town line. Other potential discharges associated with underground storage tanks are located throughout the study area. In particular, several current and former gasoline stations along Tolland Turnpike and Deming Road have reported spills. The Manchester Landfill is located in the southern portion of the study area, along the Hockanum River, to the east of I-84.

Along the existing railroad right-of-way, there is a high risk for encountering significant contamination. Contaminants potentially associated with railroad corridors include railroad ties (wood treating chemicals), spilled or leaked fluids (oil, cleaning solvents), herbicides, transformer fluids (PCBs), fossil fuel combustion products (PAHs), asbestos, and metals such as arsenic and mercury. Also, the existing steel bridge overpasses along the corridor were probably painted with lead-based paint prior to 1970. Any construction near these structures would likely encounter lead-containing soils and dust. Older building structures requiring demolition would necessitate lead and asbestos testing.

Overall, potential hazardous material sites could be encountered anywhere within the project study area due to the intensive historic land use that has occurred in the area. Former agricultural lands may potentially contain residual pesticides in the soil, cemeteries may be potential sources of contamination due to the chemicals used in mortuary processes, and former industrial sites may contain potential contaminated soils or groundwater that has yet to be uncovered. As project alternatives are developed and advanced, more detailed and intrusive investigations will be conducted to identify, characterize, and if necessary remediate any hazardous conditions that may exist.

#### **4.2.11 Noise Sensitive Areas**

The Federal Highway Administration's Noise Abatement Criteria (NAC) documented in 23 CFR 772, *Procedures for Abatement of Highway Traffic Noise and Construction Noise* is based on Land Use Activity Categories. Land uses considered most sensitive to highway noise are designated as either Land Use Activity Category A or B. Land Use Activity Category A includes 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 purpose. Such uses



include outdoor amphitheatres, outdoor concert pavilions, and National Historic Landmarks with significant outdoor use. Land Use Activity Category B includes picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.

For this feasibility study, Category A and B land uses were identified using existing land use maps and GIS data. These noise sensitive land uses are listed below in Table 4-3 and are depicted in Figure 6 (A, B, and C). Each resource has assigned a unique label that corresponds to a location on Figure 6 (A, B, and C).

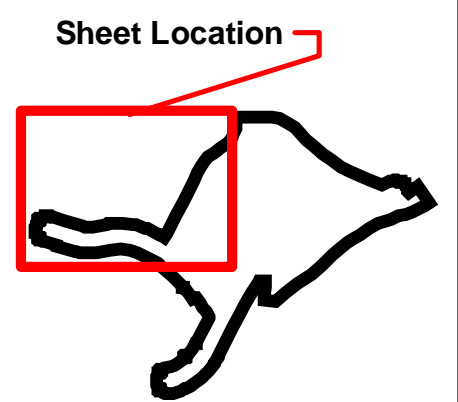
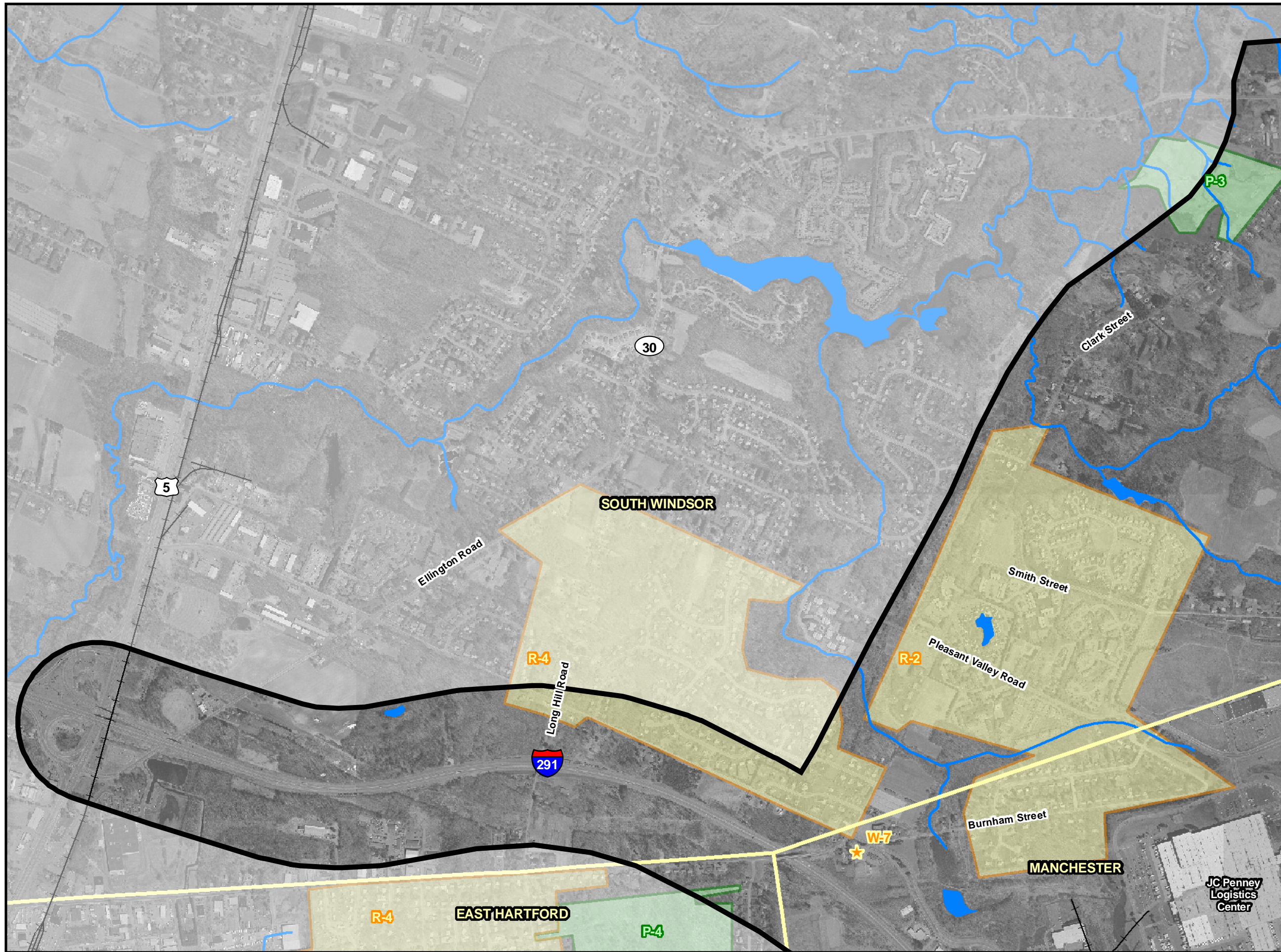
Land Use Activity Category A: There are no Category A land uses within the study area

Land Use Activity Category B: Places of worship, retirement homes for the elderly, parks, and residences are shown by study area segment in Table 4-3.



**TABLE 4-3  
STUDY AREA NOISE SENSITIVE RECEPTORS, LAND USE CATEGORY B**

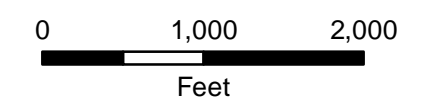
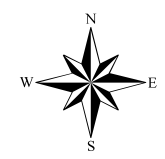
Land Use	Buckland Area	I-84 Corridor between I-384 and Deming Street (Exit 63)	I-291 Corridor between Route 5 and I-84	I-384 Corridor between Spencer Street and I-84
Schools				<ul style="list-style-type: none"> <li>• East Catholic High School (S1)</li> <li>• Howell Cheney Regional Technical School (S2)</li> </ul>
Places of Worship	<ul style="list-style-type: none"> <li>• Messiah Lutheran Church (W1)</li> <li>• Cavalry Church (W2)</li> <li>• Wapping Community Church (W3)</li> <li>• Church of the Living God (W4)</li> </ul>	<ul style="list-style-type: none"> <li>• Church of Christ (W6)</li> </ul>	<ul style="list-style-type: none"> <li>• First Korean Presbyterian Church (W7)</li> </ul>	
Elderly / Retirement Housing	<ul style="list-style-type: none"> <li>• Village at Buckland Court (SH1)</li> <li>• Berry Patch (SH2)</li> <li>• White Oaks (SH3)</li> </ul>			
Parks	<ul style="list-style-type: none"> <li>• Wapping Park (P3)</li> </ul>	<ul style="list-style-type: none"> <li>• Northwest Park (P1)</li> <li>• Bernie Daley Memorial Field (P2)</li> <li>• Nature Park (P4)</li> </ul>		<ul style="list-style-type: none"> <li>• Wickham Park (P5)</li> <li>• Veterans Memorial Park (P6)</li> </ul>
Residences	<ul style="list-style-type: none"> <li>• Deming Street/Cardinal Way Neighborhood Area (R1)</li> <li>• Buckland Hills Road Condos/Apartments (R7)</li> <li>• Clark Street/Smith Street Neighborhood Area (R2)</li> </ul>	<ul style="list-style-type: none"> <li>• Robertson Neighborhood Area (R3)</li> </ul>	<ul style="list-style-type: none"> <li>• Long Hill Road Neighborhood Area (R4)</li> </ul>	<ul style="list-style-type: none"> <li>• Spencer Street Neighborhood Area (R5, R6)</li> </ul>



- Schools
- Places of Worship
- Elderly/Retirement Housing
- Parks
- Residential Neighborhoods
- Study Area
- Town Boundaries

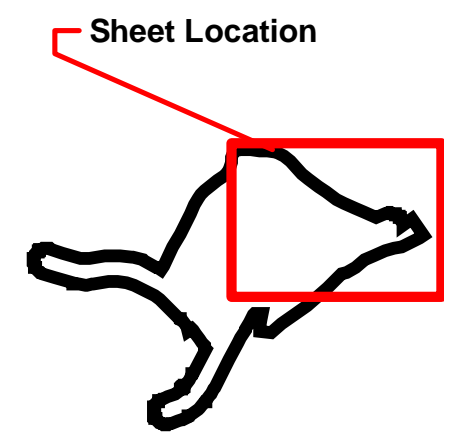
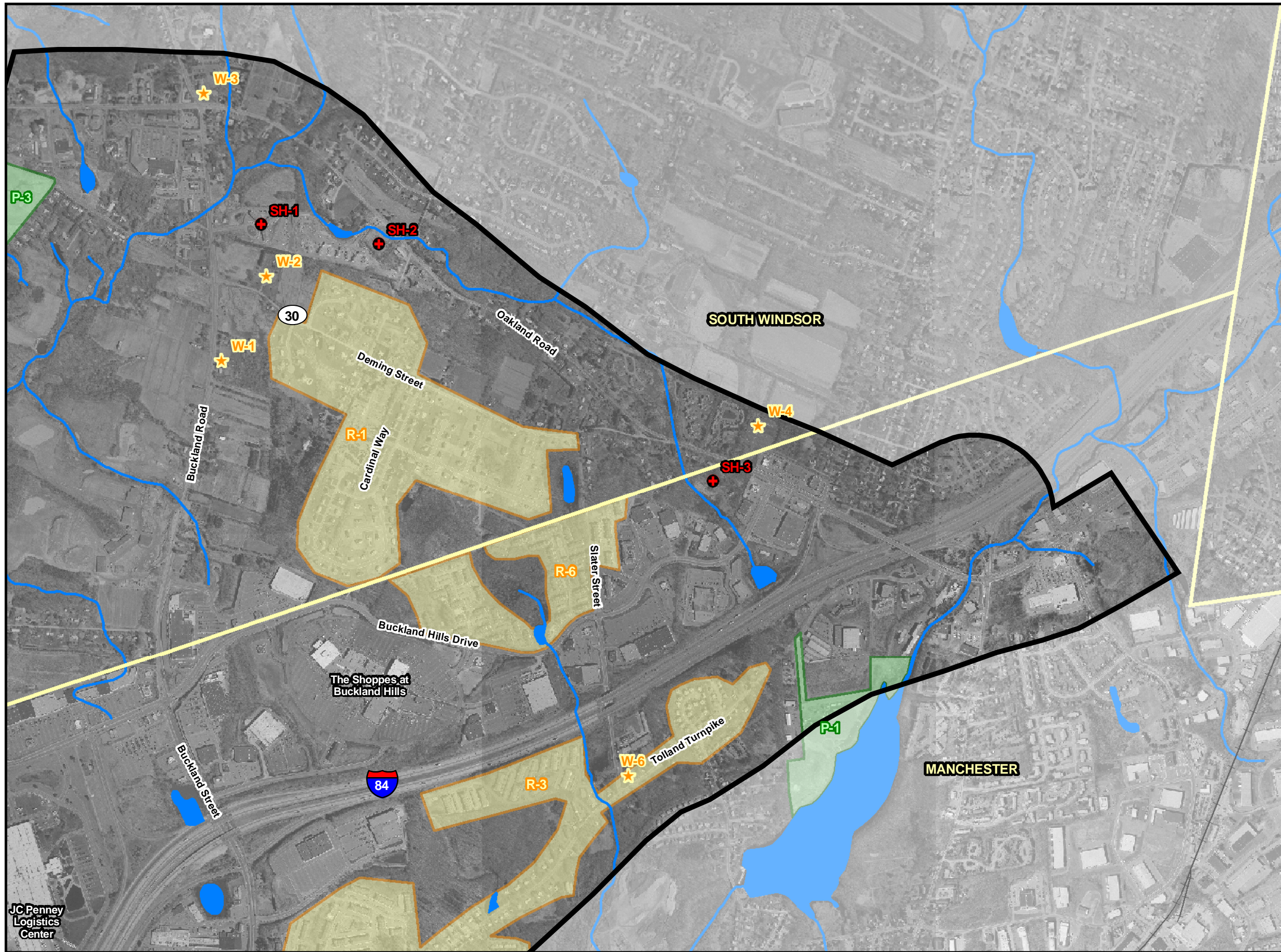
**Figure 4-5A**  
**Noise Sensitive**  
**Receptors**

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**Buckland Area**  
**Transportation Study**

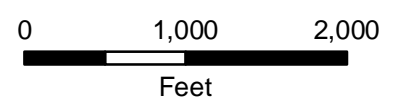
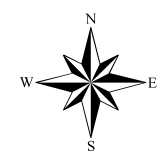
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- Schools
- Places of Worship
- Elderly/Retirement Housing
- Parks
- Residential Neighborhoods
- Study Area
- Town Boundaries

**Figure 4-5B**  
**Noise Sensitive**  
**Receptors**

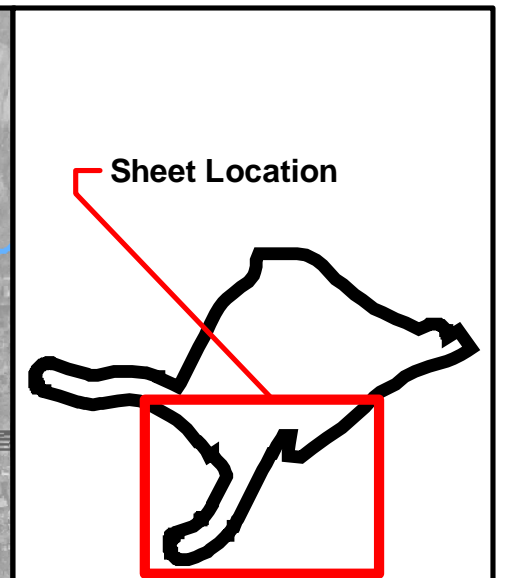
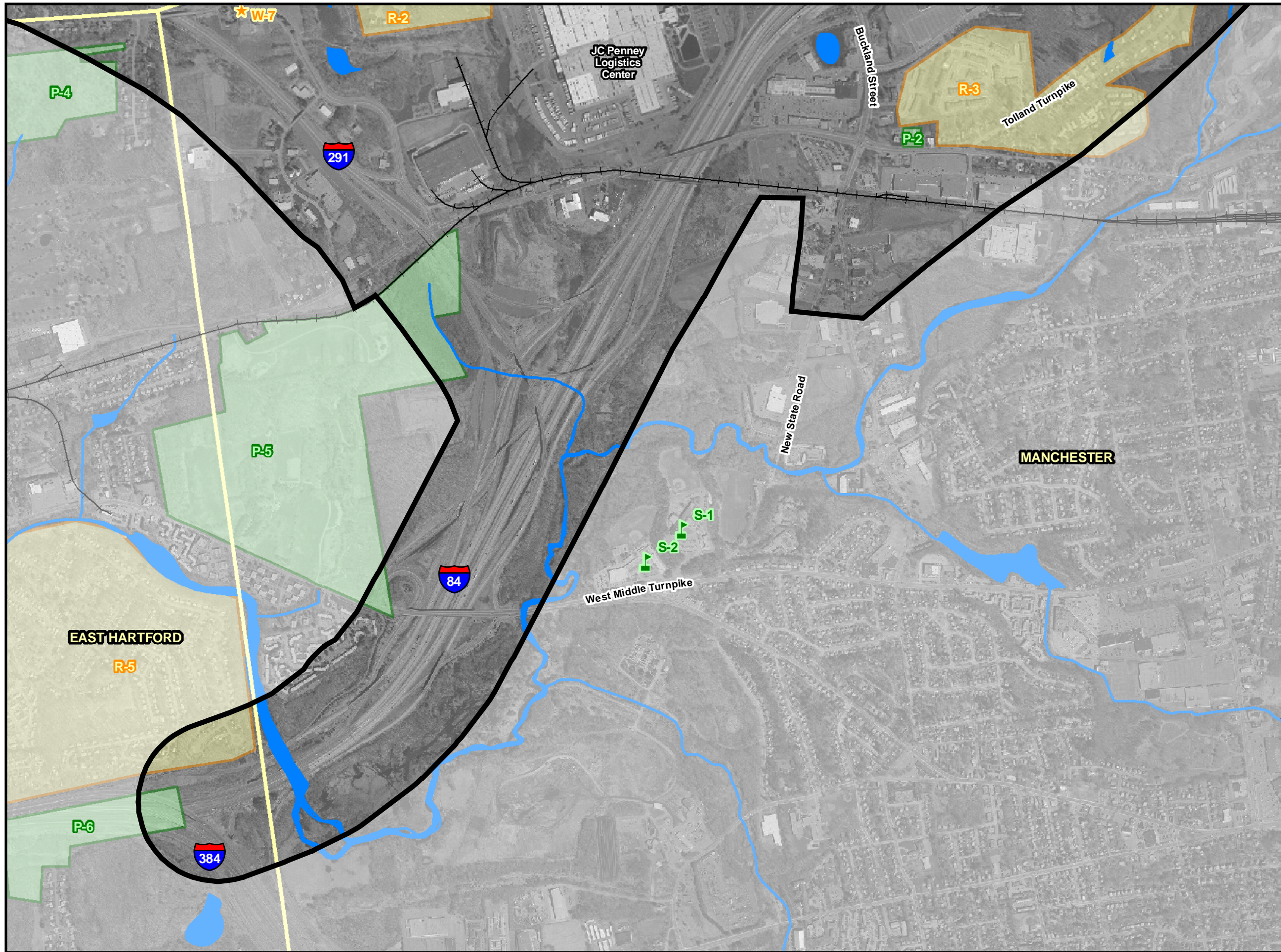
Sheet 2 of 3



**Buckland Area**  
**Transportation Study**

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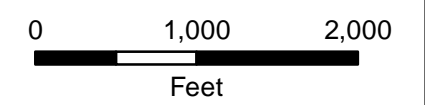
JC Penney  
 Logistics  
 Center



- Schools
- Places of Worship
- Elderly/Retirement Housing
- Parks
- Residential Neighborhoods
- Study Area
- Town Boundaries

**Figure 4-5C**  
**Noise Sensitive**  
**Receptors**

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Buckland Area: There are residential developments both east of Buckland Road (on both sides of Deming Street) and west of Buckland Road (on both sides of Clark Street) in South Windsor. There are also condominium and apartment complexes along Buckland Hills Drive, including The Pavilions and Arbor Commons.

I-84 Corridor between I-384 and Deming Street (Exit 63): In Manchester, south of I-84 on Tolland Turnpike (north of North Main Street), there is a cluster of residential neighborhoods, condominium, and apartment complexes.

I-291 Corridor between Route 5 and I-84: Along the I-291 corridor in the vicinity of Long Hill Road, there are several residential developments both north and south of I-291.

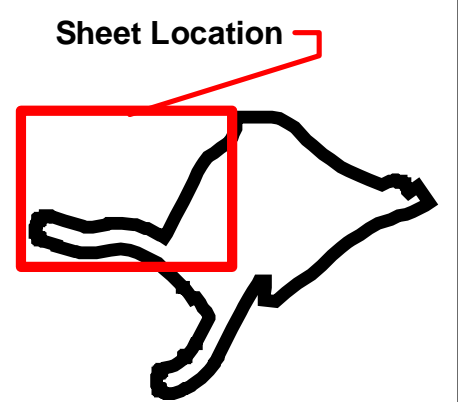
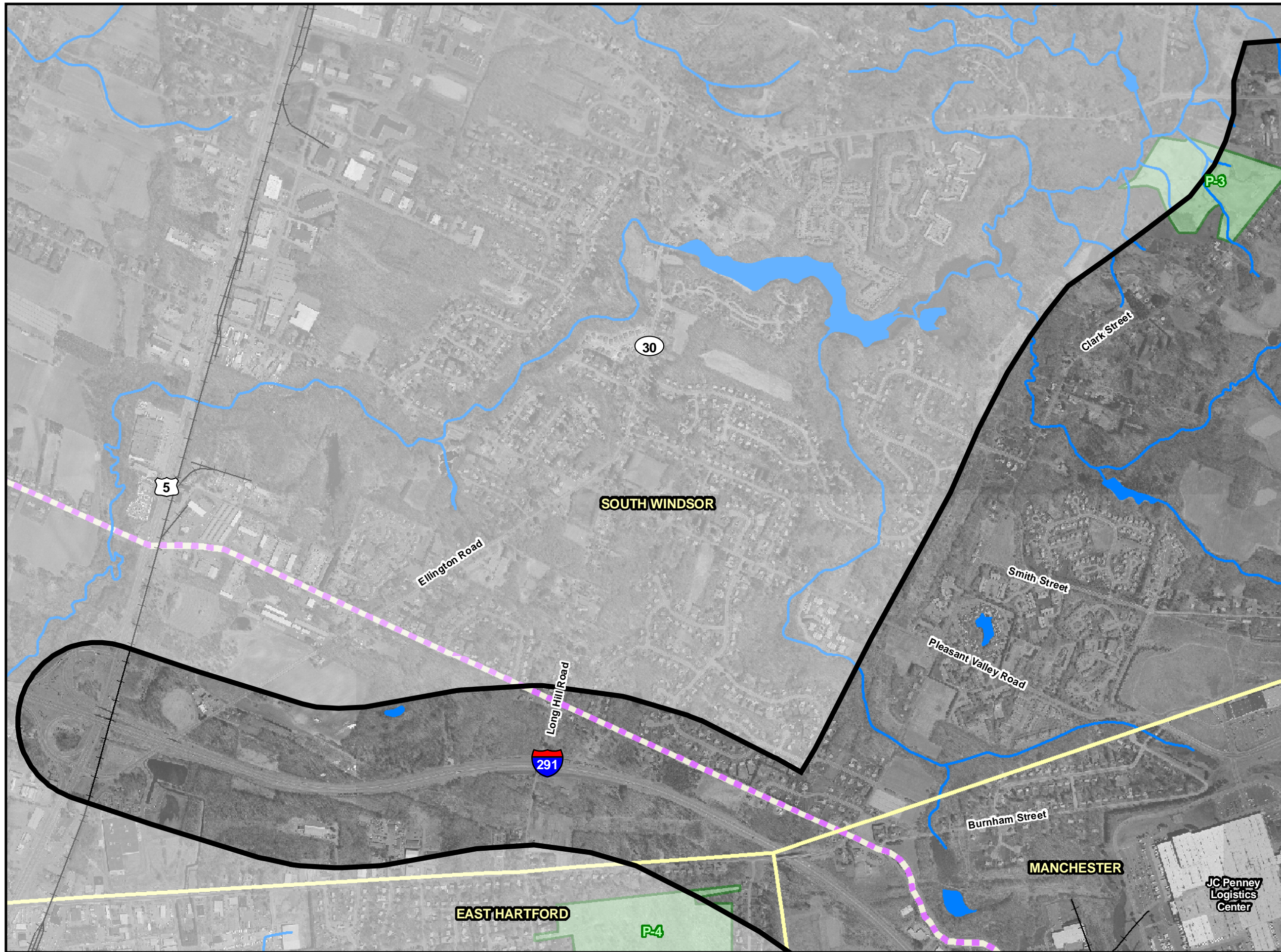
I-384 Corridor between Spencer Street and I-84: In East Hartford, north and south of I-84 in the vicinity of I-384, there are residential uses.

As potential alternatives become more developed and the study progresses, noise sensitive resources and potential impacts to them will be assessed in greater detail.

#### **4.2.12 Community Resources**

The Town of Manchester's *1998 Plan of Conservation and Development* and the Town of South Windsor's *Plan of Conservation and Development* (2002) were consulted for this evaluation.

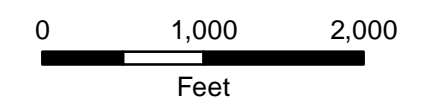
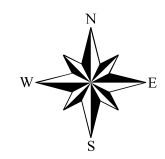
There are many community resources, including schools, parks, libraries, and emergency services, that add to the quality of life and public health and safety in the towns of Manchester and South Windsor. These resources are depicted on Figure 7 (A, B, and C) and are listed in Table 4-4. Each resource has been assigned a unique label that corresponds to a location on Figure 6 (A, B, and C).



- Schools
- Sewage Treatment Plant
- Manchester Landfill
- Emergency Services
- Historic Resources
- Trails
- Parks
- Cemeteries
- Study Area
- Town Boundaries

**Figure 4-6A**  
**Cultural & Community Resources**

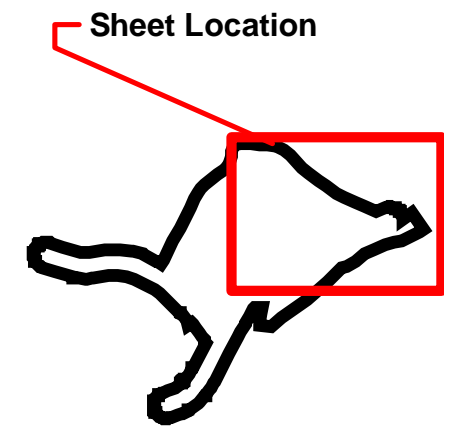
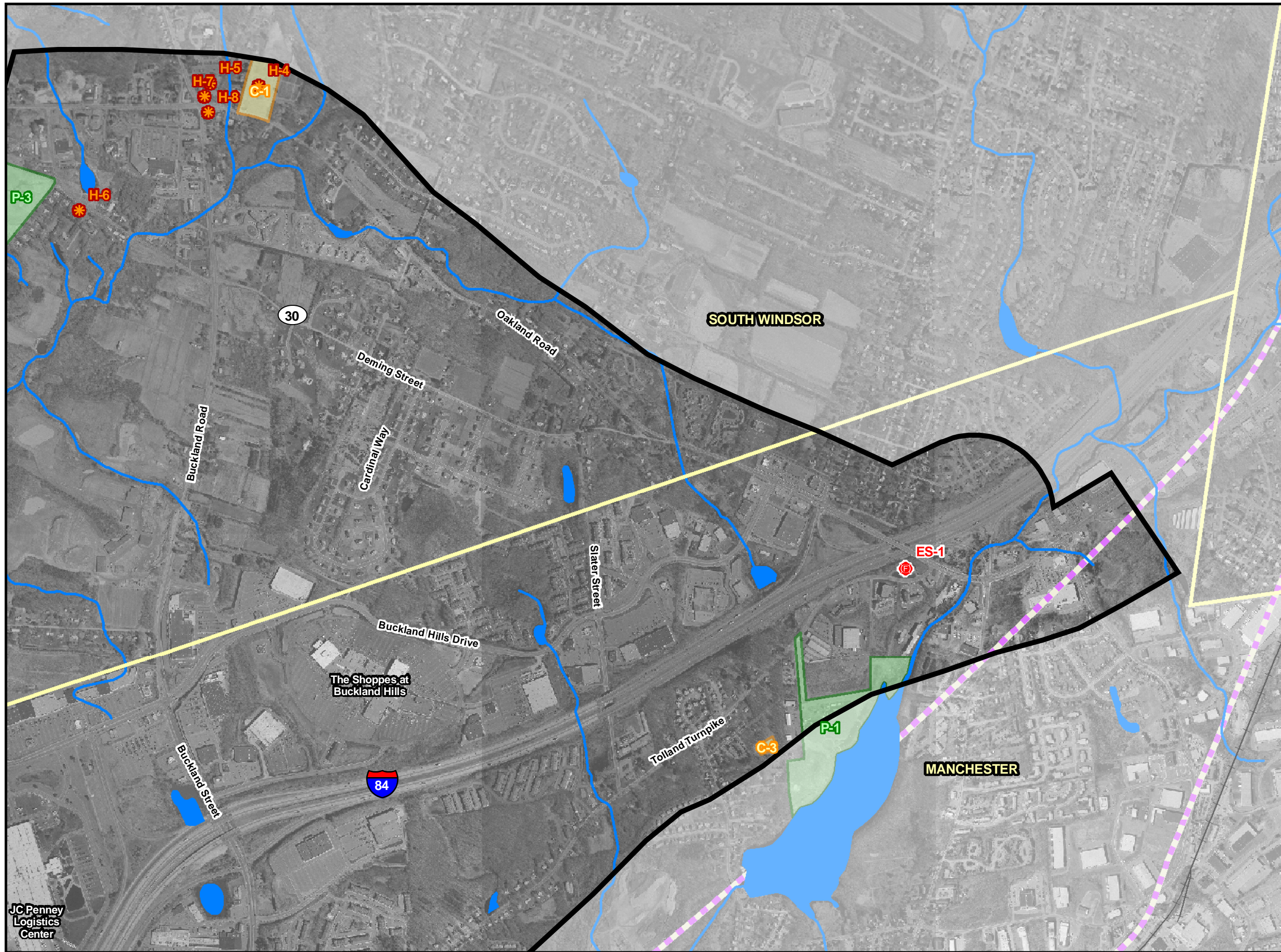
Sheet 1 of 3



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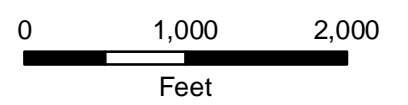
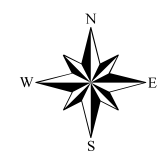




- Schools
- Sewage Treatment Plant
- Manchester Landfill
- Emergency Services
- Historic Resources
- Trails
- Parks
- Cemeteries
- Study Area
- Town Boundaries

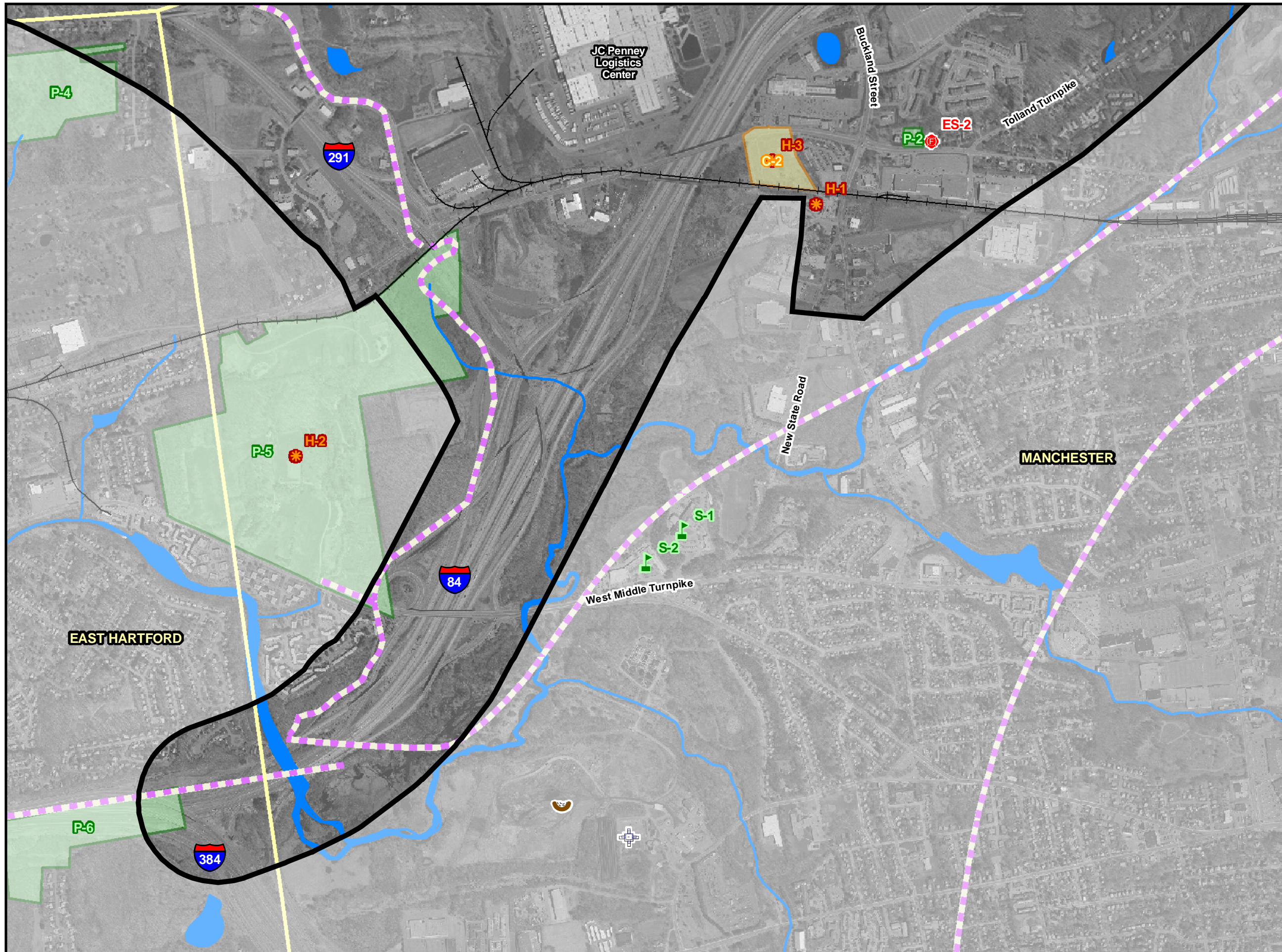
**Figure 4-6B**  
**Cultural & Community Resources**

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**Sheet Location**

- Schools
- Sewage Treatment Plant
- Manchester Landfill
- Emergency Services
- Historic Resources
- Trails
- Parks
- Cemeteries
- Study Area
- Town Boundaries

**Figure 4-6C**  
**Cultural & Community Resources**

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**Buckland Area**  
**Transportation Study**

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**TABLE 4-4  
 STUDY AREA COMMUNITY RESOURCES**

<b>Community Resources</b>	<b>Buckland Area</b>	<b>I-84 Corridor between I-384 and Deming Street (Exit 63)</b>	<b>I-291 Corridor between Route 5 and I-84</b>	<b>I-384 Corridor between Spencer Street and I-84</b>
<b>Schools</b>				<ul style="list-style-type: none"> <li>• East Catholic High School (S1)</li> <li>• Howell Cheney Regional Technical School (S2)</li> </ul>
<b>Parks and Recreation Areas</b>	<ul style="list-style-type: none"> <li>• Wapping Park (P3)</li> </ul>	<ul style="list-style-type: none"> <li>• Northwest Park (P1)</li> <li>• Bernie Daley Memorial Field (P2)</li> <li>• Nature Park (P4)</li> </ul>		<ul style="list-style-type: none"> <li>• Wickham Park (P5)</li> <li>• Veterans Memorial Park (P6)</li> </ul>
<b>Emergency Services</b>		<ul style="list-style-type: none"> <li>• Manchester Fire Station #5 (ES1)</li> <li>• Manchester Fire Station (ES2)</li> </ul>		
<b>Public Health Services</b>				<ul style="list-style-type: none"> <li>• Manchester landfill (PH1)</li> <li>• Manchester water and sewer treatment facility (PH2)</li> </ul>
<b>Cemeteries</b>	<ul style="list-style-type: none"> <li>• Wapping Cemetery (C1)</li> </ul>	<ul style="list-style-type: none"> <li>• Buckland Cemetery (C2)</li> <li>• St. John’s Cemetery (C3)</li> </ul>		<ul style="list-style-type: none"> <li>• West Cemetery (C4)</li> </ul>

South Windsor’s town center, including its town hall and public library are located just north of the study area along Sullivan Avenue. Police stations, senior centers, Manchester Memorial Hospital, and Manchester Community Technical College are also located outside the study area.

#### **4.2.13 Scenic Roads**

There are no designated Scenic Roads in the study area.

#### **4.2.14 Cultural Resources**

Documentary research at the Connecticut Historical Commission and a review of the National Register of Historic Places (NRHP) Database revealed that numerous historic resources are located within the study area. It is also important to note that there are



tobacco barns located throughout the study area. These structures are a vital part of this area’s past and cherished by the local citizenry. All future transportation and safety improvements should seek to retain these structures if possible. All known historic resources in the study area are depicted on Figure 7 (A, B, and C) and are listed in Table 4-5. Each resource has been assigned a unique label that corresponds to a location on Figure 6 (A, B, and C).

**TABLE 4-5  
SECTION 106 RESOURCES IN THE AREA OF POTENTIAL EFFECT**

<b>Resource</b>	<b>Location</b>	<b>Description</b>	<b>National Register</b>
Depot Complex (H1)	Adams Street, Manchester	Single-story wood frame building and accompanying brick building. Both date from ca. 1875.	Potentially eligible
Wickham Park (H2)	Manchester and East Hartford	A 290-acre park designed by Olmstead Associates of Boston.	Potentially eligible
Buckland Cemetery (H3)	Tolland Rd, east of I-84, Manchester	Became public in 1811	Potentially eligible
New Wapping Cemetery (H4)	Oakland Road, South Windsor	Oldest grave dates from 1841	Potentially eligible
Old Wapping Cemetery (H5)	Oakland and Ellington Roads, South Windsor	Oldest grave dates from 1766	Potentially eligible
William C. Grant House (H6)	47 Deming Road, South Windsor	Colonial house dating from late 1700s.	Potentially eligible
Wapping Community Church (H7)	1790 Ellington Road, South Windsor	Colonial Revival-style church built in 1801.	Potentially eligible
Sadd Memorial Library (H8)	Corner of Ellington and Buckland Roads, South Windsor	Beaux-Arts-style masonry former library built in 1905	Potentially eligible

Source: Fitzgerald & Halliday, Inc., September 2006

Due to the presence of the former community of Wapping within the northern part of the study area as well as numerous documented Native American settlements throughout, it is likely that there are concentrations of moderate to high archaeological sensitivity found within the study area. As safety and improvement alternatives are defined and advanced to the design stage, SHPO will require additional project details in order to provide further technical assistance and guidance to ensure the protection of significant cultural resources. A determination of effect on historic and archaeological issues would be issued, and mitigation measures would be necessary if any adverse effects were expected.



#### **4.2.15 Section 4(f) Resources**

Section 4(f) of the Department of Transportation Act of 1966 protects historic resources eligible for listing or listed on the National Register of Historic Places, as well as public parks, recreation areas, and wildlife/waterfowl refuges from adverse impacts. All of the historic resources identified in Table 4-5 are potentially eligible for listing on the National Register, and as such do not currently qualify as Section 4(f) resources. If, upon further review, the SHPO determines that some of these individual historic resources are eligible for listing on the National Register, only then will those National Register eligible resources qualify for protection under Section 4(f) of the Department of Transportation Act of 1966.

Table 4-6 lists known Section 4(f) resources that exist within the study area. These resources are also identified on the Figure 7 (A, B, and C).

**TABLE 4-6  
KNOWN SECTION 4(F) RESOURCES WITHIN THE STUDY AREA**

<b>Resource</b>	<b>Location</b>	<b>Description</b>
Northwest Park (P1)	448 Tolland Turnpike, Manchester	Municipally-owned, 26- acre park open to the public.
Bernie Daley Memorial Field (P2)	Northeastern quadrant of Buckland Street/Tolland Turnpike intersection	Municipal baseball field open to the public
Veterans Memorial Park (P6)	Sunset Ridge Drive, East Hartford along south side of I-84	Municipally owned public park
Wapping Park (P3)	West of the Deming Road / Clark Street intersection in South Windsor	Public Park / open space managed by the Town of South Windsor and the CTDEP
East Hartford Nature Park (P4)	Long Hill Road, East Hartford	Hiking Trails open to the public on 43 acres of municipally-owned land.
Hockanum River Linear Park	Hockanum River from Vernon to East Hartford	15-miles of non-continuous trails
Charter Oak Greenway	Wickham Park (East Hartford) to Charter Oak Park (Manchester)	Paved trail system along I-84/I-384

Source: Fitzgerald & Halliday, Inc., September 2006

#### **4.2.16 Pedestrian and Bicycle Trails / Greenways**

The *Capitol Region Transportation Plan: A Guide for Transportation Investments through the Year 2030*, (2004), the Town of Manchester’s *1998 Plan of Conservation and Development*, and the Town of South Windsor’s *Plan of Conservation and Development* (2002), were consulted for this evaluation.



Pedestrian and bicycle trails and greenways serve multiple purposes by providing an alternate means of transportation, a place for passive and active recreation, and open space and wildlife habitat. Trails and greenways link land uses, such as neighborhood areas with schools. The Hockanum River Linear Park and the Charter Oak Greenway are community resources serving these multiple purposes. The Hockanum River Linear Park and the Charter Oak Greenway also have regional significance; they have been identified by CRCOG as links within a larger greenway system.

- Hockanum River Linear Park: 15 miles of non-contiguous trails follow the course of the Hockanum River, which runs south of and parallel to I-84 in Manchester from East Hartford to Vernon. Future plans include linking these pedestrian-only trails and developing a contiguous path through Manchester and beyond.
- Charter Oak Greenway: Beginning at Charter Oak Park in Manchester, this greenway runs parallel to I-384, connecting Manchester Community Technical College with Veterans Memorial Park and Wickham Park. The Charter Oak Greenway continues northwest into South Windsor.

Proposed bicycle facilities include a bikeway on Tolland Turnpike (south of I-84 and north of North Main Street).

#### **4.2.17 Section 6(f) Resources**

Section 6(f) of the Land and Water Conservation Funding Act of 1965 (LWCFA) states that any lands purchased or improved with Federal LWCFA funding may not be “converted” to another use without being replaced in kind by land of like size and value. A search of the National Park Services website: <http://waso-lwcf.ncrc.nps.gov/public/index.cfm> revealed that there are no Section 6(f) properties within the study area.

#### **4.2.18 Population and Employment Trends**

Population and housing information for this study was obtained primarily from the 2000 U.S. Census and the CRCOG’s Trends Shaping Our Region: A Census Data Profile of Connecticut’s Capitol Region (Trends) (2003). According to CRCOG’s Trends, the region’s population increased from 418,191 to 721,320 between 1950 and 2000. Population growth increased in suburban areas, including Manchester and South Windsor, and decreased in Hartford, the region’s urban core. Populations within the study area that could potentially be impacted by future improvement alternatives are discussed in greater detail in the Environmental Justice section of this report.

As shown in Table 4-7, the 2000 study area population of 9,212 comprises only about 1 percent of the Capital region’s overall population. Approximately 70 percent of the population in the study area is of workforce age (17-64). The study area has a lower



elderly population (7.7%) than the Capitol Region (13.9%), Hartford County (14.6%), or Connecticut (13.8%).

**TABLE 4-7**  
**COMPARISON OF CENSUS 2000 SELECTED DEMOGRAPHIC DATA**

	<b>Affected Census Block Groups</b>	<b>Capitol Region</b>	<b>Hartford County</b>	<b>State of CT</b>
<b>Population Characteristics</b>				
Population	9,212	721,320	857,183	3,405,565
Males	4,495	348,010	411,933	1,648,523
Females	4,717	373,318	445,250	1,757,042
School Age (0–17)	1,972	178,828	210,431	839,574
Labor Force (17–64)	6,450	442,002	521,537	2,096,704
Elderly (65+ Years)	790	100,490	125,215	469,287
% Elderly	7.7%	13.9%	14.6%	13.8%
White	7,856	546,755	658,229	2,777,794
Minority	1,356	174,565	198,954	627,771
% Minority	15.9%	24.2%	23.2%	18.4%
<b>Household Characteristics</b>				
Occupied Housing Units	4,102	279,871	335,098	1,301,670
Housing Units without Vehicles	170	31,203	37,535	124,626
% Housing Units without Vehicles	4.1%	11.1%	11.2%	9.6%
<b>Income/Poverty</b>				
Median Household Income	\$67,935	\$63,415	\$50,756	\$53,935
Below Poverty	300	62,592	77,440	259,514
Percent Below Poverty	3.2%	8.7%	9.0%	7.6%
<b>Employment Status</b>				
Labor Force	5,907	367,543	438,197	1,765,319
Employed	5,698	345,138	410,358	1,664,440
Unemployed	209	22,405	27,839	100,879
Percent Unemployed	3.9%	6.1%	6.4%	5.7%

U.S. Census 2000.



Minority Population Distribution: Table 4-7 shows that the study area as a whole has a lower minority population (15.9%) than the Capitol Region (24.2%), Hartford County (23.2%), or Connecticut (18.4%).

Employment and Income: As shown in Table 4-7, the median household income in the study area (\$67,935) and the Capitol Region (\$63,415) are higher than Hartford County (\$50,756) and Connecticut (\$53,935). The unemployment rate in the study area (3.9%) is lower than the Capitol Region (6.1%), Hartford County (6.4%), or Connecticut (5.7%). The percentage of the population below the poverty level is also lower in the study area (3.2%), as compared to the Capitol Region (8.7%), Hartford County (9.0%), and Connecticut (7.6%).

#### **4.2.19 Business Activity and Major Employers**

The Capitol Region Council of Government’s *Achieving the Balance: A Plan of Conservation and Development for the Capitol Region* (CRCOG Plan), the Town of Manchester’s *1998 Plan of Conservation and Development*, the Town of South Windsor’s *Plan of Conservation and Development*, and the Connecticut Economic Resource Center (CERC) town profiles are among the sources consulted for this evaluation.

The Capitol Region, located in the CRCOG and Springfield area, is positioned between New York and Boston in New England’s “Knowledge Corridor.” Trends that impact the socioeconomic conditions of the region include residential movement of people from the city to the suburbs and the slow transition from a manufacturing based economy to a more service-based economy. According to the CRCOG Plan, Buckland Hills, located along the Manchester-South Windsor town line, is an “Area of Regional Significance,” defined as having the capacity to “support large regional-scale commercial and industrial development.”

The CRCOG region is strong in the insurance industry and, as the state’s capitol, is a center for government services. Table 4-8 shows that jobs in the services sector account for the largest percentage of employment in Manchester (39.3%) and East Hartford (48.5%), and second highest in South Windsor (26.6%). Manufacturing still accounts for the highest percentage in South Windsor (31.4%), primarily due to industries along U.S. Route 5, west of the study area. The trade sector is strong in all three communities: Manchester at 33.5%, East Hartford at 24.6%, and South Windsor at 21.4%.





**TABLE 4-8**  
**2005 ECONOMIC PROFILE**

	<b>Manchester</b>	<b>South Windsor</b>	<b>East Hartford</b>
Jobs	27,805	11,302	21,092
Employers	2,554	1,315	1,885
% Employed by Sector			
Agriculture	0.7%	1.2%	0.5%
Construction/Mining	4.4%	8.0%	5.9%
Manufacturing	12.2%	31.4%	7.0%
Transportation and Utilities	2.7%	6.2%	3.6%
Trade	33.5%	21.4%	24.6%
Finance, Insurance, and Real Estate	3.4%	3.9%	6.1%
Services	39.3%	26.6%	48.5%
Government	3.8%	1.3%	3.9%

Source: CERC Colchester Town Profile, 2005

Table 4-9 lists the top five employers in each community: Manchester, South Windsor, and East Hartford.

**TABLE 4-9**  
**MAJOR EMPLOYERS**

<b>Manchester</b>	<ul style="list-style-type: none"> <li>• Allied Printing Services</li> <li>• W.E. Andrews</li> <li>• Dynamic Gunver Technologies</li> <li>• Gerber Scientific Products</li> <li>• The Journal Publishing Company</li> </ul>
<b>South Windsor</b>	<ul style="list-style-type: none"> <li>• Evergreen Walk Lifestyle Center (Shoppes)</li> <li>• Connecticut Light &amp; Power Co.</li> <li>• May Company</li> <li>• Town Center of South Windsor</li> <li>• Gerber Companies</li> </ul>
<b>East Hartford</b>	<ul style="list-style-type: none"> <li>• Pratt &amp; Whitney</li> <li>• United Technologies Corporation</li> <li>• Coca-Cola Bottling Company</li> <li>• Riverside Health &amp; Riverside Center</li> <li>• Connecticut Natural Gas</li> </ul>

Source: CERC Town Profiles, Manchester, South Windsor, East Hartford, 2005

In addition to these top employers, there are numerous other businesses in the study area. The following subsections, while not providing a comprehensive listing of businesses, reflect the types and concentration of economic activity in the study area and its environs.

**Buckland Area:** The Shops at Buckland Hills is located between Buckland Street and Deming Street in Manchester. It is an expansive retail center with adjacent residential



uses, such as the Pavilions Apartment Homes. The overall complex is comprised of numerous stores, restaurants, and hotels including, among others:

### Shops at Buckland Hills

- Sports Authority
- Pier 1
- Office Depot
- Home Depot
- Lowes
- Target
- JC Penney
- Sears
- Hopps
- Bed, Bath & Beyond
- Ruby Tuesdays
- Barnes & Noble
- Borders Books and Music
- Macy's
- Filenes
- Dicks Sporting Goods
- Wal-Mart
- Bernie's
- Petco
- Baby's R Us
- Better Bedding
- Several smaller stores and restaurants
- Best Buy
- Tweeter
- Hometown Buffet
- Bobs
- Seaman's Furniture
- Circuit City
- Christmas Tree Shoppes
- Fairfield Inn & Suites Marriott
- Residence Inn Marriott
- TGI Fridays

The Plaza at Buckland Hills, located in Manchester at the northwest corner of Buckland Street and Pleasant Valley Road (across from Shops at Buckland Hills) includes PetSmart, Toys R Us, CompUSA, and Olive Garden, as well as several other small stores and restaurants.

Evergreen Walk, located across from Buckland Hills on the west side of Buckland Road between Hemlock and Tamarack, is a relatively new development (2004–05), which includes the following:

- LA Fitness
- Highland Park Market
- Old Navy
- Brooks Brothers
- Brookstone
- The Gap
- Pottery Barn
- Banana Republic
- Other stores featuring shoes, clothing, jewelry, home furnishings, as well as several restaurants.

Evergreen Run is a newer (2006) commercial development, with Verizon Wireless and several unoccupied storefronts, located on the east side of Buckland Road, across from Evergreen Walk.

On Buckland Road in South Windsor, there are several retail strips, as well as medical and office buildings. At the intersection of Buckland Road with Oakland, Ellington, and



Sullivan, there are several banks, office buildings, and Town Center Plaza, with Super Stop & Shop and CVS.

In the immediate vicinity of I-84 on both Deming Street (Route 30) and Buckland Street in Manchester, there are several plazas primarily catering to travelers, such as gas stations, fast food and sit-down restaurants, coffee shops. In addition, there are several retail stores in this area.

I-84 Corridor between I-384 and Deming Street (Exit 63): South of I-84, at intersection of Buckland and Adams Streets, there is a Honda dealership, as well as The Plaza at Burr Corners, with a McDonalds, Firestone Tire and several other retail stores.

On Tolland Turnpike, south of I-84 near Deming Street, there are several commercial plazas, including Big Y Plaza, as well as gas stations, restaurants, hotels, and several car dealerships.

I-291 Corridor between Route 5 and I-84: Between I-291 and Buckland Hills, there are several industrial companies. The JC Penney Logistics Center and the Filene's distribution center are located in this area. Businesses catering to travelers, such as gas stations and convenience stores are located in the immediate vicinity of the on- and off-highway ramps.

I-384 Corridor between Spencer Street and I-84: Along the Connecticut Southern rail line, there are several industrial companies, including Dynamic Technologies, Sermatech, and Alloy Specialties.

#### **4.2.20 Environmental Justice**

Demographic data and regional Environmental Justice policy information for this section was obtained primarily from the 2000 U.S. Census and CRCOG's *Atlas of Minority and Low-Income Populations in the Capitol Region* (2003) and *Environmental Justice and CRCOG's Transportation Planning Program* (2002).

Title VI of the Civil Rights Act of 1964 requires that "no person in the United States shall, on the ground 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 financial assistance." Title VI bars intentional discrimination as well as any disparate impact discrimination (i.e. a neutral policy or practice that has the effect of a disparate impact on protected groups).

In 1994, President Clinton issued Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*. The Executive Order further amplifies Title VI by providing that "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental



affects of its programs, policies, and activities on minority populations and low-income populations.”

This section evaluates the presence of low income and minority populations within the study area using 2000 U.S. Census data. The purpose is to determine where target environmental justice (EJ) groups are located so that appropriate planning can occur that will take these populations into consideration during the potential development of transportation improvements.

There are no legislated standards for defining the number of low income and minority individuals that constitute an environmental justice target area. However, CROCOG was one of four agencies, nationwide, selected to participate in an Environmental Justice Challenge Grant program designed to assess the effectiveness of its transportation program’s EJ policy. According to CROCOG’s EJ policy (Personal Communication, August 2006), an EJ target area is defined by the following criteria:

- Minority Target Area: An area where the majority of residents (50% or greater) are members of a minority group.
- Low-Income Target Areas: An area where 20% of residents are at or below the 150% poverty level.

Based on these criteria and the Census 2000 population data (shown in Table 4-7), there are no EJ minority- or low-income target areas in the study area.

#### **4.2.21 Planned Economic Development and Future Land Use**

According to the Town of Manchester’s *Plan of Conservation and Development* (September 1998), the study area is within a “Development Area,” designated for growth. According to the Proposed Land Use map for the Town of Manchester, industrial uses are planned in the vicinity of the confluence of I-84 and I-291. To the east, along I-84, mixed uses are planned. To the south, mixed uses and general commercial are planned.

The Town of South Windsor’s *Plan of Conservation and Development* (July 2002), designates Buckland Road in South Windsor as “Buckland Road Gateway Development Zone,” with commercial uses planned. This area is the fastest growing part of the study area.

Additional shops are planned in the Evergreen Walk development, along the western side of Buckland Road. The east side of Buckland Road in South Windsor is currently receiving inquiries for development, but there are wetland constraints in this area. Build-out may occur up to the wetland limit. There are also plans for development of additional retail space at the former Buckland Plaza in Manchester (south of the Tolland Turnpike and North Main Street intersection). Additional commercial land is also available in the Shops at Buckland Hills.



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