Buckland Area Transportation Study

Final Technical Memorandum No. 3

TSM/ TDM, Transit, Bicycle and Pedestrian Alternatives

July 31, 2009

Dewberry

In Conjunction with:

Earth Tech, Inc.
Fitzgerald & Halliday, Inc.

U.S. Department of Transportation
Federal Highway Administration

Table of Contents

List of Tables

List of Figures

List of Acronyms

AASHTO	American Association of State Highway and Transportation Officials
ADT	Average Daily Traffic
APA	Aquifer Protection Areas
AVL	Automated Vehicle Location
BART	Bay Area Rapid Transit
BRT	Bus Rapid Transit
C/CAG	City/County Association of Governments
CERC	Connecticut Economic Resource Center
CERCLIS	Comprehensive Environmental Response, Compensation and Liability Information System
CHP	California Highway Petrol
CMA	Congestion Management Agency
CMP	Congestion Management Plan
CO	Carbon Monoxide
ConnDOT	Connecticut Department of Transportation
CRCOG	Capitol Region Council of Governments
CTDEP	Connecticut Department of Environmental Protection
CTP	County Transportation Plan
CT Transit	Connecticut Transit
DMS	Dynamic Message Signs
DOT	Department of Transportation
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Maps
EJ	Environmental Justice
GIS	Geographic Information Systems
GPS	Global Positioning System
GRH	Guaranteed Ride Home
HCM	Highway Capacity Manual
HAR	Highway Advisory Radio
ITS	Intelligent Transportation Systems
LOS	Level of Service
LWCFA	Land and Water Conservation Funding Act of 1965
LOCHSTP	Locally Coordinated Human Services Transportation Plan

List of Acronyms (cont.)

MEV	Million Entering Vehicles
mp	Mile Post
MTC	Metropolitan Transportation Commission
MTMSA	Multicity TSM Agency
NAAQS	National Ambient Air Quality Standards
NAC	Noise Abatement Criteria
NDDB	Natural Diversity Database
NO_2	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
RITA	Research and Innovative Technology Administration
RTS	Regional Transit Strategy
RWIS	Roadway Weather Information System
SAFE	Service Authority for Freeways and Expressways
SCEL	Stream Channel Encroachment Lines
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SO_2	Sulfur Dioxide
STC	State Traffic Commission
SUBOG	Student Union Board of Governors
TDM	Transportation Demand Management
TOD	Transit Oriented Development
TSM	Transportation Systems Management
UConn	University of Connecticut
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service

1 – TSM/TDM

1.1 Introduction

Technical Memorandum No. 1 identified a number of critical traffic operational issues in the Buckland Hills Area. Those issues that are relevant to Transportation Systems Management (TSM)/Transportation Demand Management (TDM) are as follows:

- The study area roadway system did not keep pace with the level of development in this area. As a result many roadways and intersections currently experience capacity and delay issues during peak hours.
- Most of the arterial roadways providing access to the shopping area experience poor traffic operations as the result of high traffic volumes and multiple intersections/driveways.
- Buckland Road and Buckland Hills Drive have multiple driveways within close vicinity, which results in additional delay and potential safety concerns. Queue spillbacks from downstream intersections can extend back to and beyond driveways, blocking access.

The congestion experienced as a result of these factors limits free movement and hinders emergency vehicle access in the Buckland Hills Area.

One option for mitigating congestion is to increase the capacity of the roadway system by adding lanes, building new roads and improving intersections. However, adding capacity is costly and may raise legal issues related to property acquisition. Another option for mitigating congestion is to either increase the operational efficiency of the existing transportation network or manage the demand. Generally these techniques are cost effective and environmentally friendly, since they are geared toward efficient usage of available resources.

Transportation Systems Management (TSM) techniques support making the existing transportation system operate in a more efficient manner. Typical techniques include improved traveler information, signal system coordination and improved response time to incidents.

Transportation Demand Management (TDM) techniques support a reduction in the number of vehicles using the transportation system. Typical techniques may include fringe parking with shuttle busses, encouraging transit oriented development, pricing strategies for parking, and ridesharing. Improvement of pedestrian and bicycle access, and transit services are also demand management techniques; these are addressed in Section 3 of this document.

The study team evaluated the potential impact of TSM/TDM techniques as input to the SYNCHRO model (please see Technical Memorandum No. 2). TSM techniques focus on preserving the capacity of the roadway facility. Some of these, such as signal coordination, have already been included in the future SYNCHRO analysis results. In addition, the SYNCHRO analysis does not assume any atypical incidents such as accidents. Therefore, these techniques would not have a significant impact on SYNCHRO input. TDM techniques such as rideshare and transit are expected to reduce the single-occupant traffic demand by about 2 to 3%. However, as the population rises in the future, the number of vehicles on the road is also expected to increase. The study team concluded that the reduction in the number of vehicles as a result of TDM techniques is likely to be offset by an increase in the number of vehicles and therefore would not result in significant changes in operation or intersection Level of Service. However, some intersections may experience reductions in delay and queuing. Therefore, TSM/TDM measures need to be included as elements of an overall comprehensive improvement plan for the study area that seeks to improve capacity and reduce single-occupant automobile demand.

1.2 Transportation Systems Management (TSM)

TSM strategies focus on increasing the efficiency, safety and capacity of existing transportation systems through various techniques. Many of the techniques identified below were discussed during stakeholder and technical working group meetings and are being recommended because of the potential benefits they would have if implemented, with State Traffic Commission (STC) approval, throughout the study area. Strategies discussed below include access management, way-finding signage, circulation and connectivity, traffic signal coordination, incident response times and intelligent transportation systems.

1.2.1 Access Management

As per the AASHTO Green Book, access management is regulating access. The principal advantages of access management are the preservation or improvement of service and safety.

Functional classification of streets and roads is the first step in access management. The following table shows the classification of streets in the study area based on their function.

TABLE 1-1
CLASSIFICATION OF STREETS

Arterials	Collectors	Locals
I-84	Tolland Turnpike	Smith Street
I-291	Pleasant Valley Road	Slater Street
Buckland Street	Buckland Hills Drive	Wheeler Road
	Hale Road	Chapel Road
	Deming Street	Pavilions Drive
	Clark Street	Red Stone Road
	Oakland Road	

Normally arterials have the highest amount of access control and local streets have the least amount of access control. As such both interstate highways in the study area are limited access facilities, so there is no question of further access control on them. Buckland Street also has a fairly high amount of access control in place, mainly through the raised median. This study recommends the following improvements to maintain the functional integrity of streets:

1.2.1.1 Intersection of Deming Street and McIntosh Drive

McIntosh Drive is located approximately 200 feet southeast of the intersection of Deming Street and Avery Street. Deming Street carries a very high volume of traffic and it has 6 lanes. The left turns to and from McIntosh Drive are very difficult and cause impedance in the traffic flow on Deming Street. The intersection of Avery Street and Deming Street is signalized and located only 200 feet away from McIntosh Drive. Access management principles recommend spacing of at least 1,000 feet between two intersections; therefore, installation of a traffic signal is not recommended in this location.

In view of the above, this study recommends McIntosh Drive be reconfigured to allow right-in and right-out turns only or closing access between McIntosh Drive and Deming Street. Residents can access Deming Street from Avery Street.

1.2.1.2 Intersection of driveway to McDonalds and Deming Street

This intersection is located about 175 feet south of intersection of Deming Street and Hale Road. The driveway to Panera Bread, located on the opposite side of Deming Street, is right-in only, and the driveway to McDonalds has unrestricted in and out movements. The high traffic volumes on Deming Street and the proximity of the McDonalds driveway to nearby signalized intersections creates an ideal situation for recurrent traffic disruptions caused by left turning vehicles entering or leaving the McDonalds driveway.

In view of the above, this study recommends making the driveway to McDonalds a right-in and right-out only, thereby minimizing disruption to the through traffic

flow on Deming Street. To compensate for the loss of access, allowing u-turns on Deming Street could be considered if conflicts with eastbound traffic on Hale Road can be controlled by means of protected right turn movements.

1.2.1.3 Intersection of Deming Street and Oakland Road

The intersection of Deming Street and Oakland Road is skewed; the two roads intersect at an angle of approximately 15 degrees. Skewed intersections have a number of limitations including limited sight distances and creating confusion among drivers. There is also an additional paved connection between these two roads, located just northwest of the intersection. This connection allows two-way traffic and serves as an alternative to using the skewed intersection.

This study recommends moving the existing Deming Street and Oakland Road intersection northwest and realigning Deming Street to an approximate 90 degree angle to Oakland Road. A roundabout could be an alternative traffic control device in this location and would be in line with the recent development pattern in the area.

The Town of South Windsor is currently examining various options to improve this intersection.

1.2.1.5 Intersection of Slater Street and driveways to Best Buy and Circuit City

A number of comments on traffic congestion at this intersection were received through the web site and during public meetings. The following Figure 1-1 shows an aerial image of this intersection.

FIGURE 1-1
SLATER STREET AND DRIVEWAYS TO BEST BUY (LEFT) AND CIRCUIT CITY (RIGHT)

Source: maps.live.com

The intersection of Slater Street is not controlled by a signal. During peak hour traffic northbound Slater Street backs up beyond the driveways of Best Buy and Circuit City. The situation is further compounded by the traffic from Circuit City crossing Slater Street to reach Best Buy or vice versa. A number of accidents have been reported at this intersection making this a high priority location for access management strategies.

At present Connecticut State Traffic Commission (STC) is considering installing a signal at this location.

1.2.2 Tourist Way-Finding Signage Program

The Buckland Hills Mall area offers an array of opportunities for shoppers, making this area a regional attraction. Since well informed drivers are least likely to cause disturbances in the traffic, it is very important that the shoppers get all the information about their destinations well in advance.

Appropriate way-finding would visually guide commuters, motorists, bicyclists and pedestrians, through the Buckland Hills Mall area by providing in-advance direction to the various shopping alternatives. The following options are recommended for way-finding.

Future advances in Global Positioning Satellite (GPS) technology may play a role in way-finding signage programs.

1.2.2.1 Mall Ambassadors

Mall Ambassadors would be volunteers deployed during peak shopping periods to assist individuals in locating specific businesses in the area and the best possible route of travel. Confusion amongst pedestrians, bicyclists and to some extent motorists can be resolved by deploying these volunteers on streets, in parking lots and in lobbies where they will have direct contact with the public.

1.2.2.2 Advance Guidance Signs

To provide travelers with timely directional information, guidance signs must be appropriately placed to meet their expectations. It is important that shoppers visiting the Buckland area are able to efficiently navigate to and from their desired destinations. This study recommends advance guidance signs be installed on the Interstate highways (Level 1), highway ramps and arterial roadways (Level 2) and local roads within the retail area (Level 3.) The level of detail shown on the various signs will depend on the location, regulatory jurisdiction and physical constraints.

Level 1 guidance signs will identify the exits from Interstate highways which should be taken for the mall. This study recommends a guidance sign be installed at the following locations:

- A minimum of one mile upstream of Exit 62 on I-84 EB and Exit 63 on I-84 WB stating "Mall Next Two Exits"
- On I-84 EB after the merge with traffic from the east frontage road roadway stating "Mall Next Exit"
- On I-84 WB a minimum of one mile before Exit 62 stating "Mall Next Exit"
- One mile upstream of Exit 5 on I-291 S stating "Mall Next Two Exits" with a second sign shortly after Exit 5 stating "Mall – Keep Left"
- On I-384 WB after Exit 1 before the ramp to I-84 EB and I-291 WB stating "Mall"
- All frontage roads should indicate the direction to be taken to reach the mall area with signs that state "Mall" with directional arrows.

Level 2 guidance signs should be installed on ramps upstream of their intersection with city streets. These signs will provide advance notice for travelers to safely maneuver to the proper lane required to reach their destination. This study recommends Level 2 guidance signs be provided at the following locations:

- A guidance sign is recommended at approximately half a mile upstream of Buckland Street on the Exit 62 off-ramp from I-84 EB. This sign should indicate: "← South Windsor", "← Pleasant Valley Road", "← Buckland Hills Drive", "Tolland Turnpike →" and "Theater →".

- A guidance sign is recommended at approximately 1000 feet upstream of Pleasant Valley Road on the Exit 62 off-ramp from I-84 WB. The sign should indicate: "← East Hartford", "South Windsor →", "Manchester →".
- I-84 EB off-ramp at exit 63 is a two-lane ramp. This study recommends that a guidance sign be provided at approximately 1100 feet upstream of its intersection with Deming Street. The sign should indicate: "South Windsor →", "Malls →", "↑ Tolland Turnpike", "↑ Theater" and "← Vernon".
- A guidance sign is recommended at approximately 500 feet upstream of Tolland Turnpike on the Exit 5 off-ramp from I-291 SB. The sign should indicate: "← Manchester", "← South Windsor", "East Hartford →", "← Malls" and "← Theater".
- All arterial roads should indicate the direction to be taken to reach the mall area with signs that state "Mall" with directional arrows (→ or ←). On two lane roads, "Mall" signs in advance of a turn should be posted with the approaching direction indicated with an arrow (|→ or ←|).

Level 3 guidance signs should be installed on major streets and prior to the exits at major mall exit roads. The purpose of these guidance signs is to identify the direction to the on-ramps of Interstate highways and arterial roads in the area. Level 3 guidance signs will also provide advance notice for travelers to safely maneuver to the proper lane to reach their destination from the local roads. This study recommends Interstate route "trail blazer" signs should be placed in advance of and at major intersections to identify the proper lane and direction to major highways. These signs could also identify the shopping center exit which provides the most efficient route to exit the shopping area when installed at the exits of major shopping centers. The study also recommends that signs directing shoppers to neighboring towns or major roads should be included at these locations:

- Buckland Street NB approximately 200 feet north of Pavilions Drive (three lanes). Ground mounted signs should indicate: Left lane - East Hartford, I-84 WB/Hartford, Pleasant Valley Road; Center lane – South Windsor Malls, South Windsor Center, To Route 30 and Right lane - Buckland Hills Drive, Hale Road.
- Buckland Street NB at the I-84 underpass (four lanes).
  The left three lanes are through lanes and the right lane is designated as a right turn only lane to Pavilions Drive. This study recommends an overhead sign mounted on the overpass fascia beam indicating the lane configuration beyond the underpass. The sign should indicate: Left lane - East Hartford, I-84 WB/Hartford, Pleasant Valley Road; Center lane – South Windsor Malls, South Windsor Center, To Route 30 and Right lane - Buckland Hills Drive, Hale Road.
- Deming Street NB approximately 300 feet south of the intersection of Deming Street and Avery Street (five lanes).

Ground mounted signs should indicate: Left lanes – Hale Road, Buckland Hills Road, Manchester Malls; Through lanes – Deming Street, Buckland Road, South Windsor Malls.

- Tolland Turnpike EB approximately 575 feet west of the intersection of Buckland Street and Adams Street (4 lanes).
  Ground mounted signs should indicate: Left lane – South Windsor, To I-84, Malls, Theater, Center lane – Tolland Turnpike, Manchester Center, Left lane – Adams Street, Manchester Center.

Level 3 signs, other than the Interstate Route "trail blazer" signs, should have a style unique to the Buckland Mall Area; however, all signs must comply with design standards for safety given their proximity to vehicular, bicycle and pedestrian traffic.

1.2.2.3 Radio Message

A message containing information about the locations of various shops in the study area can be repeatedly broadcast on a specified station on the radio. Shoppers could then tune in this station to get information on which exit they need to take and which lane they need to be in to get to their destination. Example: "Shoppers interested in visiting XYZ shop should take exit 62 and take right on-ramp."

It is recommended that a sign informing travelers/shoppers about the radio station and broadcast be placed approximately one mile west of exit 62 on eastbound I-84, east of exit 63 on westbound I-84, and north of exit 5 on southbound I-291.

The feasibility of radio message broadcasts is subject to FCC regulations and the availability of radio frequencies. The terrain can impact the effectiveness of the radio signal, and should be evaluated with the cost of the equipment purchase, installation and maintenance.

1.2.2.4 Area Maps

Maps of the area depicting various shops and other attractions can be placed in shopping malls, the transit center and kiosks throughout the area. Easy access to this information will help shoppers and visitors in planning and making well informed decisions.

1.2.3 Modified Linkages/Connectivity

This study has recommended a number of alternatives, such as a single point urban interchange at the intersection of Pleasant Valley Road and Buckland Street, a modified T-intersection at the junction I-84 ramps and Pleasant Valley Road, a Red Stone Extension overpass, and a connection from Pleasant Valley Road to Evergreen Walk, to enhance traffic operations to and from arterials within the study area. These alternatives, when implemented along with access management techniques, proper way-finding

signage, bicycle/pedestrian facilities and improvements to transit operations, are expected to enhance connectivity and improve circulation within the study area.

Please refer to Sections 2 and 3 of this document and Technical Memorandum No. 2 for a detailed description of these alternatives.

1.2.4 Traffic Signal Coordination

When signalized traffic control devices are coordinated traffic moves in platoons, resulting in platoons moving smoothly from one intersection to another. Such smooth movement results in streamlined traffic operations, efficient use of available capacity and more gaps for vehicles on side streets to merge.

The Town of Manchester has recently upgraded the signal equipment in the Buckland Hills Mall area to ensure progression in the traffic movement. The installation of an interconnect traffic control system for the entire Buckland Hills area would improve traffic operations throughout the entire road network. This study recommends upgrades of the signal equipment throughout the study area and taking full advantage of new signal technology to improve traffic flow throughout the area. The system should be operated as a single network controlled at a central command center.

1.2.5 Incidence Response Time

Traffic incidences disrupt the normal smooth traffic flow and increase delay. Traffic incidences also temporarily reduce the capacity of a roadway. The following actions will help minimize the impact of traffic incidences.

- The fire department stations an emergency response team in the Buckland Mall parking area during peak shopping periods. However, a centrally located permanent station would aid in shortening the response time of emergency vehicles during peak as well as off-peak seasons.
- With the help of dynamic message signs travelers can be warned of incidences well in advance and if need be, they can take another route. This will potentially help clear the road for emergency vehicles to attend the incidence in timely manner.
- Callers to emergency services often find it difficult to convey their exact location to the responders resulting in prolonged response times. Due to the lack of landmarks in the area for the caller to reference, emergency responders are often unsure of the exact location of an incident. Further confusion results from the large number of merging ramps and exit points on the frontage roads. These factors result in "over-responding" to incidents by emergency responders on the Exit 60 and 62 frontage roads. Multiple units are dispatched for each call utilizing more equipment and personnel in hopes of reaching the incident quicker. This is a burden on the department's equipment and staff, resulting in increased costs. This study supports the installation of placards or signs on every 1/10 of a mile on light poles or other structures. The placards would display a unique code that

could be easily seen by a caller and provided to emergency services. The police and fire department GIS/GPS systems would pinpoint the caller's location based on the placard code number and provide the emergency responders with the correct route and the caller's location. The installation of cameras at several strategic locations within the corridor study area would also help the responders.

- Better street signage at all the intersections will help callers better identify their locations. Many cities suspend street signs from the mast arm of the signal. This ensures that the street signs are conspicuously placed and they remain well lit in the dark, assuming there is an overhead light fixture at the intersection.

The ideal location for an incidence response center is in the transit center proposed at the existing DOT park and ride facility at the corner of Pleasant Valley Road and Buckland Street, this facility will be centrally located with easy access to internal routes as well as freeways.

1.2.6 Intelligent Transportation Systems (ITS)

As per USDOT Research and Innovative Technology Administration (USDOT RITA), ITS encompass a broad range of wireless and wire line communications-based information and electronic technologies. When integrated into the transportation system's infrastructure, and in vehicles themselves, these technologies relieve congestion, improve safety and reduce lost time and energy.

The main advantage of ITS technology is that it helps utilize the existing infrastructure more efficiently, results in lower congestion, and lowers delays. ITS has many potential applications relevant to the study area including but not limited to the following (source: USDOT RITA- Intelligent Transportation Systems):

1.2.6.1 Transit Management Systems

Transit ITS services include surveillance and communications, such as automated vehicle locations (AVL) systems, computer aided dispatch systems and remote vehicle and facility surveillance cameras, which enable transit agencies to improve operational efficiency, safety and security of the nation's public transportation systems.

1.2.6.2 Arterial Management Systems

Arterial management systems manage traffic along arterial roadways, employing traffic detectors, traffic signals, and various means of communicating information to travelers. These systems make use of information collected by traffic surveillance devices to smooth the flow of traffic along travel corridors. They also disseminate important information about travel conditions to travelers via technologies such as dynamic message signs (DMS) or highway advisory radio (HAR).

1.2.6.3 Incidence Management Systems

Incident management systems can reduce the effects of incident-related congestion by decreasing the time to detect incidents, the time for responding vehicles to arrive, and the time required for traffic to return to normal conditions. Incident management systems make use of a variety of surveillance technologies, often shared with freeway and arterial management systems, as well as enhanced communications and other technologies that facilitate coordinated response to incidents.

1.2.6.4 Emergency Management Systems

ITS applications in emergency management include hazardous materials management, the deployment of emergency medical services, and large and small-scale emergency response and evacuation operations.

1.2.6.5 Traveler Information

Traveler information applications use a variety of technologies, including Internet websites, telephone hotlines, as well as television and radio, to allow users to make more informed decisions regarding trip departures, routes, and mode of travel.

1.2.6.6 Roadway Operations and Maintenance

ITS applications in operations and maintenance focus on integrated management of maintenance fleets, specialized service vehicles, hazardous road conditions remediation, and work zone mobility and safety. These applications monitor, analyze, and disseminate roadway and infrastructure data for operational, maintenance, and managerial uses. ITS can help secure the safety of workers and travelers in a work zone while facilitating traffic flow through and around the construction area. This is often achieved through the temporary deployment of other ITS services, such as elements of traffic management and incident management programs.

1.2.6.7 Road Weather Management

Road weather management activities include road weather information systems (RWIS), winter maintenance technologies, and coordination of operations within and between state DOTs. ITS applications assist with the monitoring and forecasting of roadway and atmospheric conditions, dissemination of weather-related information to travelers, weather-related traffic control measures such as variable speed limits, and both fixed and mobile winter maintenance activities.

The Town of Manchester has recently installed video detection equipment that feeds data to the central traffic management center located in the Town's Traffic Engineer's office.

1.3 Transportation Demand Management (TDM)

TDM addresses traffic congestion by reducing travel demand rather than increasing transportation capacity. Generally TDM focuses on reducing vehicle miles traveled, promoting alternate modes of travel, ride sharing, walking and bicycling. Value parking charges and congestion pricing are some of the emerging TDM trends that many agencies find promising.

Victoria Transport Policy Institute has compiled an encyclopedia on TDM strategies; it is a valuable resource for various emerging trends in the area of TDM. Techniques that might be useful in this study are discussed below.

1.3.1 Regional Ridesharing (Carpooling and Vanpooling) Programs

Ridesharing refers to carpooling and vanpooling. In carpooling one of the participants uses his/her own vehicles whereas in vanpooling generally a rental van is used. The main advantage of ridesharing programs is that they are self sufficient, as all associated costs are born by its members. Past research (Winters and Rudge, 1995) has shown that ridesharing programs can reduce the affected commute trips by 10-30% if implemented with incentives such as HOV Priority and Parking Cash Out.

The *SMART Trip Reduction Manual* published by Pollution Probe (2001) provides information on calculating the benefits of ridesharing to employers and employees.

TABLE 1-2
ESTIMATED MONTHLY COMMUTING COSTS

Round Trip Miles	Drive Alone	3-Rider Car Pool	10-Rider Van Pool
30	$193	$64	$31
40	$257	$86	$37
50	$321	$107	$43
60	$386	$129	$50
70	$450	$150	$56
80	$514	$171	$63

Currently a rideshare program is in place and is used by a number of commuters. A website www.erideshare.com is dedicated to matching profiles of commuters and is a source to find out more about ridesharing. The following suggestions can enhance awareness of ridesharing among commuters.

- Transportation agencies, businesses and employees should all be involved in planning rideshare programs.

- Provide incentives to attract and retain rideshare users, such as mileage-points and vehicle insurance discounts.
- A centralized place, such as a transit center could also be used as a rideshare information hub. This center could be effectively used to promote carpooling/vanpooling, matching commuters, etc.

Possible drawbacks of a rideshare program include, the possibility of encouraging urban sprawl by creating a more affordable commute for participants of rideshare and decreased ridership on public transit. A successful rideshare program integrates transit facilities, therefore allowing the separate programs to complement one another.

ConnDOT has endorsed a number of rideshare programs. Details of these programs can be found at the following websites:

1. www.nuride.com
2. www.easystreet.org
3. www.rideworks.com
4. www.metropool.com
5. www.rideshare.com

1.3.2 Transit Improvements

Please see Section 2 of this document for more information on transit improvements.

1.3.3 Transit Oriented Development (TOD)

A typical TOD has a bus station or rail station at its core and relatively high-density development surrounds the bus or rail station. TOD includes the following design features (Morris, 1996):

- The neighborhood is designed for cycling and walking, with adequate facilities and attractive street conditions.
- Streets have good connectivity and traffic calming features to control vehicle traffic speeds.
- Mixed-use development that includes shops, schools and other public services, and a variety of housing types and prices, within each neighborhood.
- Parking Management to reduce the amount of land devoted to parking compared with conventional development, and to take advantage of the parking cost savings associated with reduced automobile use (NJDOT, 2007).
- Transit stops and stations that are convenient, comfortable and secure, with features such as comfortable waiting areas, real time vehicle arrival

information, venders selling refreshments and periodicals, washrooms, and information.

High-quality transit supports the development of high-density urban centers, which can provide accessibility and agglomeration benefits (efficiencies that result when many activities are physically close together), while automobile-oriented transportation conflicts with urban density because it is space intensive, requiring large amounts of land for roads and parking facilities (Voith, 1998; Boroski, et al, 2002). Large scale Park & Ride facilities tend to conflict with Transit Oriented Development, since a rail station surrounded by large parking lots and arterials with heavy traffic is unlikely to provide a good environment for residential development or pedestrian access. It is therefore important that such facilities be properly located, designed and managed to minimize such conflicts (CBF, 2001).

Transit Oriented Development reduces transportation costs and externalities, increased travel choice, and reduced land paved per capita (Transit Evaluation). It can help achieve virtually all TDM objectives (Cervero, et al., 2004). TOD can increase transit service the efficiency, resulting in improved performance and cost effectiveness. It can help create more Livable Communities, meaning that neighborhoods are physically and socially more desirable places to live. TOD typically reduces parking requirements by 20%, and more if implemented with other Parking Management strategies (Boroski, et al., 2002). Bailey (2007) estimates that households in Transit-Oriented Developments drive 45% less than residents of automobile-dependent neighborhoods, saving an average of 512 gallons of fuel and $1,400 in fuel expenses annually.

This does not mean that every transit improvement leverages automobile travel reductions of this magnitude. Basic transit service or a single transit improvement does not necessarily cause such reductions. Significant transit service improvements integrated with more accessible land use and incentives to reduce automobile use are generally needed to cause significant reductions. Rail transit tends to have the greatest impact on per-capita vehicle travel because it tends to have the greatest land use impacts. Busways probably have smaller impacts. Even rail systems can have little effect if other transportation and land use policies are not supportive, for example, if most riders drive to transit stations located in sprawled, automobile-dependent communities (TDM Encyclopedia).

1.3.4 Bicycle/Pedestrian Facilities

Please see Section 3 of this document for more information on bicycle/pedestrian facilities planned in this area.

1.3.5 Guaranteed Ride Home (GRH)

Guaranteed ride home program serves as a backup program for employees that use alternate transportation modes to get to work. This program, in association with the employers, taxis or rental car agencies, provides an assurance to the employee that if they need to make a trip to home due to an emergency, they are covered. A survey found that the availability of GRH has a value roughly equivalent to subsidized transit fares at a fraction of the cost (Hunt and McMillan, 1998).

TABLE 1-3
TRAVEL IMPACT SUMMARY

Travel Impact	Rating	Comments
Reduces total traffic.	3	Supports commute trip reduction programs
Reduces peak period traffic.	3	
Shifts peak to off-peak periods.	0	
Shifts automobile travel to alternative modes.	3	
Improves access, reduces the need for travel.	0	
Increased ridesharing.	3	
Increased public transit.	3	
Increased cycling.	2	
Increased walking.	2	
Increased Telework.	0	
Reduced freight traffic.	0	

Rating from 3 (very beneficial) to –3 (very harmful). A 0 indicates no impact or mixed impacts.

GRH is an important component of trip reduction programs and supports most other TDM strategies.

1.4 Case Study

The following case studies represent high-growth communities that have some geographical and development characteristics similar to Manchester, East Hartford and South Windsor.

In Technical Memorandum No. 4 – "Land Use Study" growth management techniques of four communities Arlington County, Virginia; Cary, North Carolina; Henderson, Nevada; and Plano, Texas are discussed in detail. Section 3.4 of Technical Memorandum No. 4

discusses adjustments to land form to influence congestion and Section 3.5 discusses if these strategies have worked or not. Appendix B of Technical Memorandum No. 4 discusses community profile, land use profile, transportation system profile and growth management tools applied for each of the four communities.

In order to take the discussion of the role played by development type, traffic volumes and distributions on TSM/TDM techniques further, the case study of San Mateo County, California is discussed below.

San Mateo County, California (source- http://www.abag.ca.gov)

1.4.1 Community Profile

The Coastside Subregional Planning Project area is situated entirely within San Mateo County, covers a large portion of the coast range of the San Francisco Peninsula, and extends some 22 miles down the County's 55-mile coastline.

1.4.2 Land Use Profile

The predominant land use in the developed area of the subregion is single family residential with limited multi-unit, apartment and mobile home development, except in areas of northern Pacifica where more concentrated multi-family unit development also exists. Retail commercial and visitor-serving commercial uses are primarily concentrated along the Highway 1 corridor and in Half Moon Bay's downtown district. Within the Midcoast, the Pillar Point Harbor and adjacent Miramar area contain a variety of restaurant and lodging facilities. The main industrial areas are situated in the Midcoast at the Half Moon Bay Airport and in Princeton where boat yards and other marine-related and storage activities support the fishing operations of the Pillar Point Harbor. Much of the remaining land is used for public recreation or open space and for agricultural operations.

1.4.3 Transportation Systems Profile

Between 1995 and 1996 San Mateo County experienced a 125% increase in congestion, a rate more than double any other county in the Bay Area. With limited utility services and protective coastal planning policies, access to the Coastside south of Pacifica has been constrained by the confined capacity of Highways 1 and 92, both two-lane roads that cross the steep terrain of the Santa Cruz Mountains. More recent data in the June 1997 San Mateo County Transportation Plan (CTP): Alternatives Report indicates that by 2010 key segments of Highways 1 and 92 will operate at the lowest level of service (LOS F) during peak commute times and that the maximum foreseeable public investments in highway and transit improvements will not be able to prevent congestion in the subregion from getting even worse. In addition, planned improvements in mass transit systems including Caltrain and Bay Area Rapid

Transit (BART) do not by themselves offer significant reductions in peak hour congestion countywide and are even less effective within the subregion given the area's geography and remote location, particularly in Half Moon Bay and the Midcoast. In addition to limited road capacity, other factors contributing to current and projected increases in congestion include a jobs-housing imbalance, limited access to transit, and a strong preference for driving alone to work.

The City/County Association of Governments (C/CAG) serves as the Congestion Management Agency (CMA) for San Mateo County. C/CAG is required by state law to prepare and adopt a Congestion Management Program (CMP) every two years to alleviate or control projected increases in roadway congestion. The Trip Reduction & Travel Demand Element (TSM and TDM programs) of the CMP promotes the use of alternative transportation modes and ways to reduce future travel demand.

At the local level, the Multi-City TSM Agency (MTSMA) oversees many of the TDM measures while TSM programs are generally managed by state and regional agencies including the California Department of Transportation (Caltrans) and the Metropolitan Transportation Commission (MTC).

1.4.4 Growth Management Techniques

Although, C/CAG has implemented various tools to ensure mobility, economic vitality, and natural resources protection and management, the following discussion focuses mainly on TSM and TDM programs.

TSM Programs

The Transportation System Management (TSM) programs available throughout the Bay Area include signal synchronization, ramp metering, HOV lanes, rapid accident removal service and Park & Ride lot facilities. However, due to the project area's remote geographical location, limited population and predominant two-lane road system, the only TSM program currently being implemented in the subregion is the presence of the park and ride lots in Pacifica and Half Moon Bay. No other TSM programs currently exist within the subregion.

- Park & Ride Lots
  Today there are three Park & Ride lots within the area, including two situated less than a mile apart along Highway 1 in Pacifica at Linda Mar Boulevard and Crespi Drive. The Linda Mar facility serves as the primary hub for commuter bus service to BART and downtown San Francisco. Half Moon Bay has a facility at the Strawflower Village Shopping Center.

- Rapid Accident Removal
  Sponsored by the MTC Service Authority for Freeways and Expressways (SAFE), Caltrans and the CHP, the Freeway Service Patrol is a network of 50 tow truck drivers who patrol 235 miles of Bay Area freeways quickly clearing accidents and other incidents which contribute to the region's congestion. The program is funded through federal, state and local monies, including a $1 annual vehicle registration fee, and covers selected routes based on several factors, including population, traffic volumes and congestion. The program only serves four-lane or wider freeways. Based on the existing criteria for inclusion in the service sponsored by MTC, the subregion's predominant two-lane road system and population size precludes the Coastside from being served by the program.

TDM Programs

MTSMA offers TDM programs to employers and the community and acts as a key resource for other public agencies and the private sector in facilitating alternative transportation programs. A summary of the primary MTSMA programs operating within the subregion is described below.

- Ridesharing
  A joint program with RIDES for Bay Area Commuters through a $500,000 grant from the Regional Air Quality Management District, the "SMARTPool" van service was created as a demonstration/pilot program primarily serving Coastside commuters to destinations outside the area using vans fueled by compressed natural gas. The purpose of the program has been to demonstrate how vanpooling can serve a medium- distance commute market and reduce drive- alone trips. Also, using clean fuel vans serves to keep fares lower due to lower maintenance and fuel costs while aiding in efforts to reduce air pollution.

- Non-Vehicular Modes
  TDM programs promote non-vehicular transportation modes, particularly bicycling and walking. These modes offer clean, healthful and low-cost commuting alternatives that can be made more attractive by providing the necessary facilities for safe and secure access, e.g. rights-of-way that are clearly marked, free of debris and safe. These modes can also be encouraged by providing changing areas and showers at employment sites and by promotional materials, including brochures and maps.

- Telecommuting
  MTSMA offers businesses resources to test the telecommuting option and is available to assist those interested in setting up a telecommunications program. In May 1996, MTSMA and the City of Pacifica sponsored a six-month telecommuting pilot project with ten individuals who lived and/or worked in Pacifica. The primary objective of the project was to confirm

that telecommuting is a viable commute alternative as well as a productive workstyle option for employers.

- Guaranteed Ride Home
  At participating businesses, Coastside employees using public transit to work are assured they have a ride home when their transit option is unexpectedly eliminated, with employers and MTSMA agreeing to split the cost of either a cab ride or rental car.

- Bus Service
  through MTSMA, the San Mateo County Transit Authority (SamTrans), operates bus service countywide including 11 routes within the subregion. Commute service from a park and ride lot in Pacifica to the two BART stations in Colma and Daly City provides transit users with access to downtown San Francisco while neighborhood routes offer Pacifica residents service within the City and to shopping centers in Daly City and San Bruno. Peak service to the United Airlines Maintenance Base at the San Francisco airport provides Pacifica airport employees with a transit option.

1.4.5 Future Strategies

Vanpools

In the past several years the rapid expansion of commercial development in and around the Redwood Shores Parkway has contributed to increased levels of congestion along the Highway 101 corridor from San Mateo to Redwood City. In response, this summer a unified effort by the two regional TSM Agencies operating in the County will establish a joint Hot Spots Congestion Task Force focused on increasing ridesharing among expanding companies along the corridor.

Today, inexpensive door-to-door shuttle service to San Francisco, Oakland and San Jose International Airports is provided by private operations to travelers throughout the Bay Area. Yet, such service to the subregion is not available. Expanding airport shuttle service to the Coastside has the potential to offer both coastal residents and visitors with a convenient vanpool alternative.

Park & Ride Lots

With previous budget allocations earmarked directly for Park & Ride lot development no longer available, transportation planners have been required to identify other funding strategies. Today, funds for Park & Ride facility development are typically made available through larger transportation improvement projects. State transportation funds are available to local

governments through a regional source of discretionary funds set aside each year for "ready-to-go" projects seeking less than $300,000. Such projects are reviewed each spring for funding the following fiscal year.

One option to the construction of new park and ride lots pursued by Caltrans in recent years involves the leasing of existing parking lot space at shopping centers, churches, and other appropriate locations with convenient access to major transportation corridors. While Caltrans does not pay for the use of the privately-owned parking spaces, they do pay for the liability insurance to cover users of the facility, as well as for necessary signage and stripping, including required handicap access improvements. Most property owners or managers enter into these lease agreements with the expectation that rideshare users will stimulate retail sales or use at their facility.

Non-vehicular Modes

In concert with ongoing TDM efforts, governments in the sub-region should continue to encourage biking, walking, and other alternative transportation modes in the sub-region.

Balancing Job and Housing Growth

For the past several months, elected officials, planners and community leaders throughout San Mateo County have been discussing strategies for promoting a jobs-housing balance and the location of new housing closer to mass transit systems and major transportation corridors. They are now considering a balanced growth program which, in its current form, would foster a balance between new jobs and housing by monitoring the net number of new jobs and new housing created in each city within the County. Under the program, if a city failed to provide an adequate net increase in housing to accommodate net increases in job growth and did not correct the housing deficiency after a two year grace period, then it could lose its share of state transportation funds.

1.5 Comparison and Contrast

Sections 1.2 and 1.3 recommended a number of TSM/TDM techniques to manage the congestion in the study area. However, in order to obtain maximum benefits, these techniques cannot be implemented in isolation. The benefits obtained from one technique always complement that obtained from the other technique. The following discussion focuses on the importance of the integration of various TSM/TDM techniques in San Mateo County, California and what that mean for the study area.

- One of the key elements to their successful implementation is managing TDM programs at micro level (by the city/municipality governments) and managing TSM programs at macro level (DOT/state government).

- Park & Ride lot is also used as a transit hub. This discourages commuters to drive alone to work, and encourages them to the ride bus. This results in more efficient usage of the roadway network.
- Quick incidence response enables emergency responders to reach incidences in a timely manner and improve the travel time of commuters within the incident area. However, reduction in response time requires integration of techniques such as a grid locator system to help the caller identify their geographic location, variable message signs to inform motorists to detour to avoid the incident area, and signal pre-emption to grant priority to emergency responders.
- Balancing job growth and housing growth is also very important. Techniques such as Smart Growth and TOD promote the use of public transportation by creating livable communities. A balance of job and housing growth ensures that jobs stay in the community thereby obviating the need of longer commutes.
- Non-vehicular modes such as walking and bicycling offer clean, healthful and low-cost commuting alternatives. However, successful implementation of non-vehicular modes require provision of safe and secure facilities such as sidewalk, bike lanes, marked crosswalks at intersections, and pedestrian buttons on signal poles.
- Circulator routes serve local areas and commuter routes carry passenger's farther distances. The main idea is segregation of access and mobility functions. Circulator routes provide access to local attractions, transit hub and commuter routes provide mobility by carrying passengers to farther places. These programs will yield optimum benefits if they are complemented by other programs such as HOV priority, GRH, a transit hub, and TOD.

2 – Transit Alternatives

2.1 Introduction

Although transit is one part of a much larger transportation system in the Buckland Hills Mall area, it is critical for improving mobility for those who rely on transit, providing viable choices, and reducing congestion on the arterial and local streets. This section addresses specific issues related to transit in the Buckland Hills Mall area.

The Capitol Region Council of Governments (CRCOG) maintains a comprehensive *Capital Region Transportation Plan* for transit in the Hartford region. The plan "aims to restore balance among transportation modes and provide travelers with more choices."[1] This document expands and compliments the programs outlined in the CRCOG Plan, providing recommendations for transit improvements specific to the Buckland Hills Mall area.

This report is a continuation of analysis of existing transit facilities in the Buckland Hills Mall area presented in Technical Memorandum No. 1. This chapter contains a detailed inventory of existing transit facilities, future conditions, and recommended improvements. This report is divided in four parts. The first part examines existing transit service in the study area, the second part discusses existing and future transit ridership, the third part discusses transit issues and deficiencies, and the fourth part provides recommended transit alternatives and strategies.

2.2 Existing Transit Service

Existing transit service within the Buckland Hills Mall area consists of a network of local and express bus routes operated by Connecticut Transit (CT Transit), plus paratransit[2] and shuttle buses serving specific market areas. CT Transit is the Connecticut Department of Transportation (ConnDOT) owned bus service with over 45 local and 27 express bus routes serving the overall Hartford market, with four local and two express routes serving the Buckland Hills Mall area. With the exception of the Silver Lane service and the Buckland Express Bus 3, 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.

[1] *Capital Region Transportation Plan,* "Transportation 2035," Adopted April 25, 2007, Chapter 2, page 14.
[2] Paratransit is 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 share taxis and jitneys are also important providers.

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

2.2.1 Local Bus Service

CT Transit is the provider of local bus service in the study area. Route descriptions are followed by span of service, route length and scheduled running times, and level of service (frequency). Figure 2-1 shows Hartford and the eastern suburban travel corridors highlighting the local bus routes serving the study area. Figure 2-2 shows the Buckland Hills retail area highlighting the local bus routes and bus stop locations. Figure 2-3 shows a diagram from the Z Route with further detail of the local stop locations in and around the Buckland Hills Mall area, which is representative of the stops made by other routes serving the area.

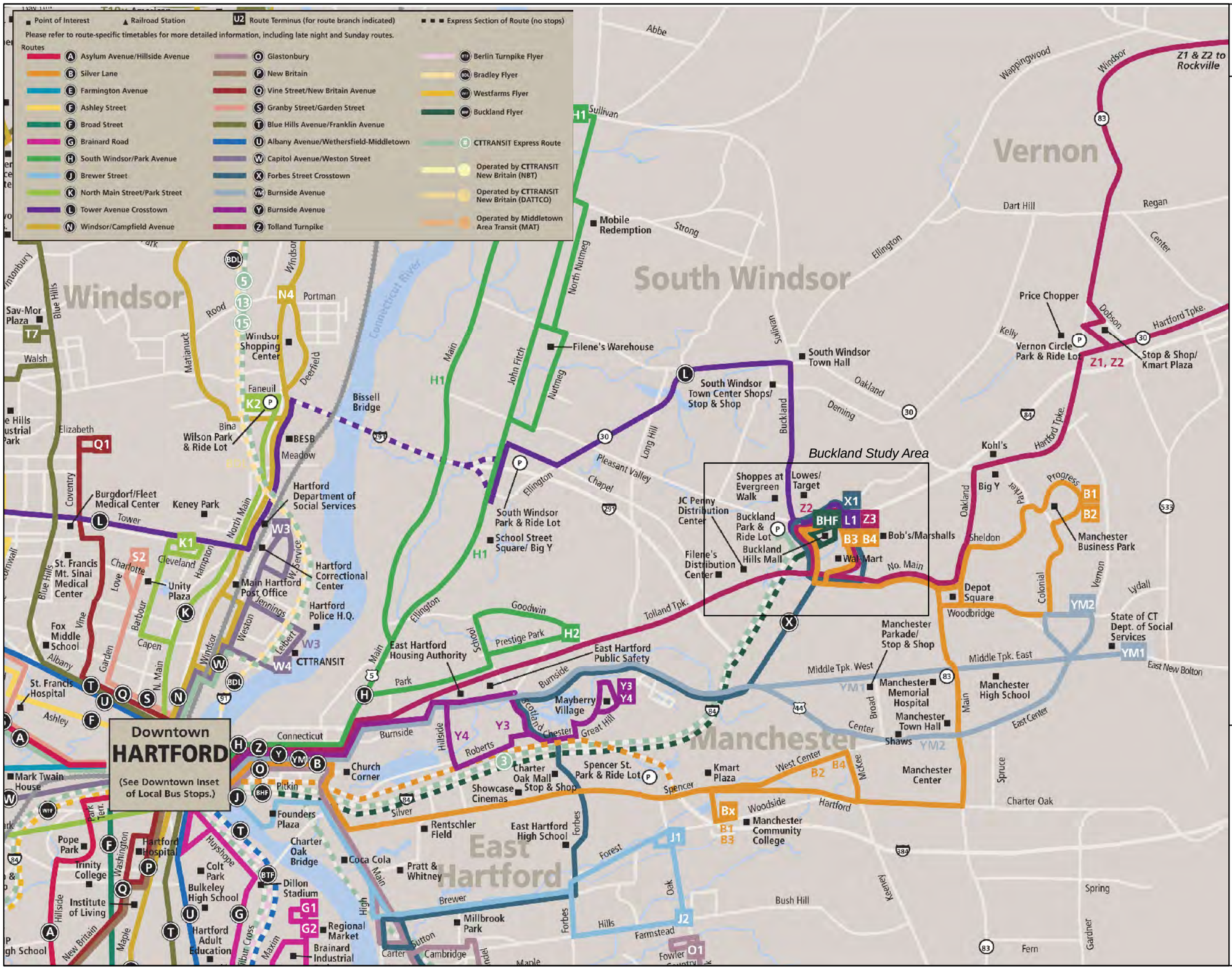
Days and Hours of Operation

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. Table 2-1 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.

The local routes operate seven days per week (except the Silver Lane service, which does not have service to the Buckland Hills Mall area on Sundays, and the Buckland Flyer, which only operates once per day on weekdays) with the earliest weekday service in the study area starting around 6:00 AM. The local weekday service generally ends around 11 PM (last buses departing around 10 PM). The express commuter Route 3 (Buckland Express Bus 3) departs the Buckland Hills Park-and-Ride facility weekdays beginning 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.

EarthTech

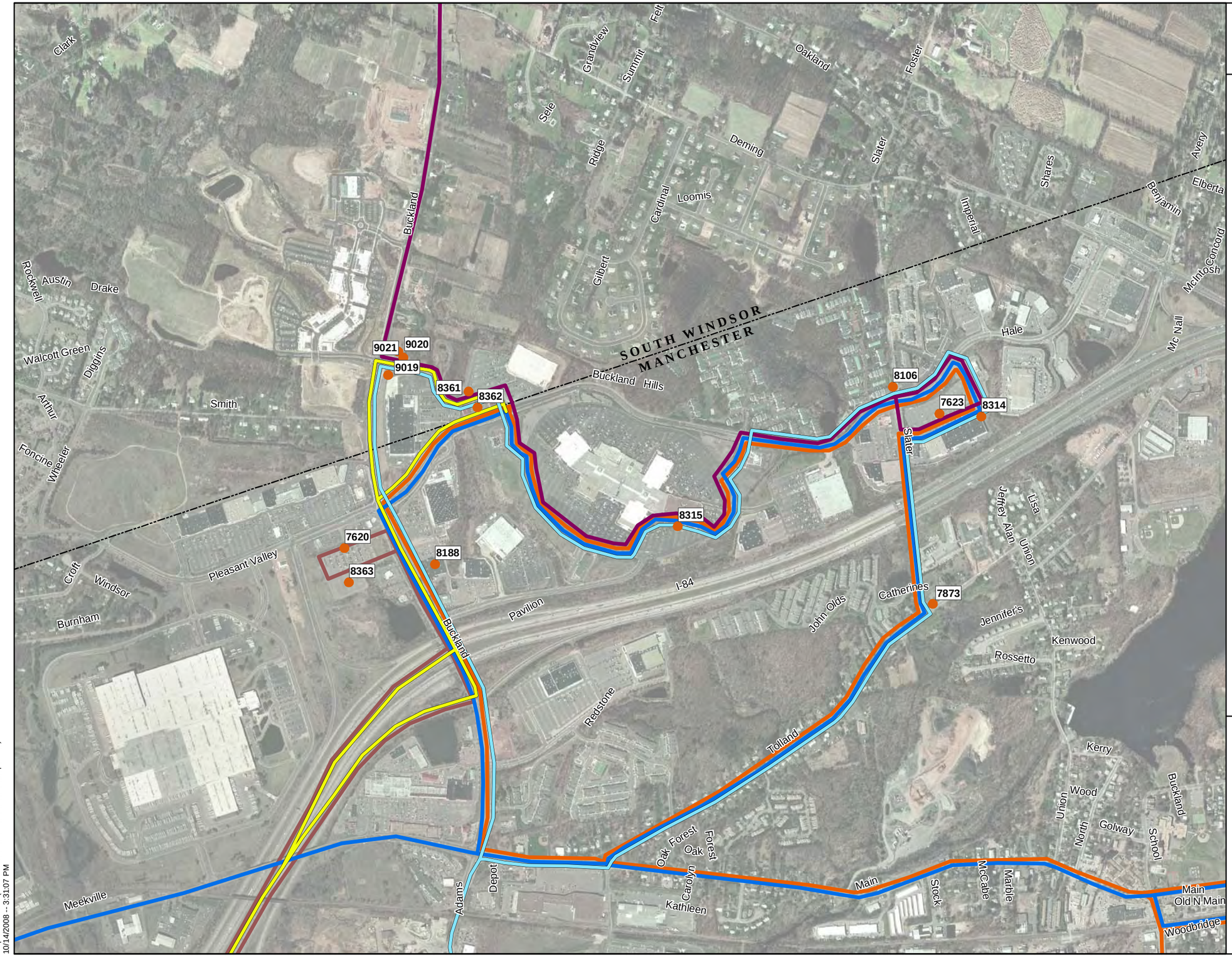


Portion of CT Transit *Hartford Metro Area Bus System Map*. July 2005.

Figure 2-1

Transit Routes Serving Buckland Area

Map Document: (M:\work\BucklandTransit\Fig2_1_TransitRtes.mxd)
8/25/2008 -- 5:59:24 PM



EarthTech

- Buckland Area Stops
- Forbes Street Crossing (X - #91)
- Tower Avenue Crosstown (L - #92)
- Buckland Flyer
- Tolland Turnpike (Z2, Z3)
- Buckland Express
- Silver Lane (B3,B4)
- 7623 Stop ID #

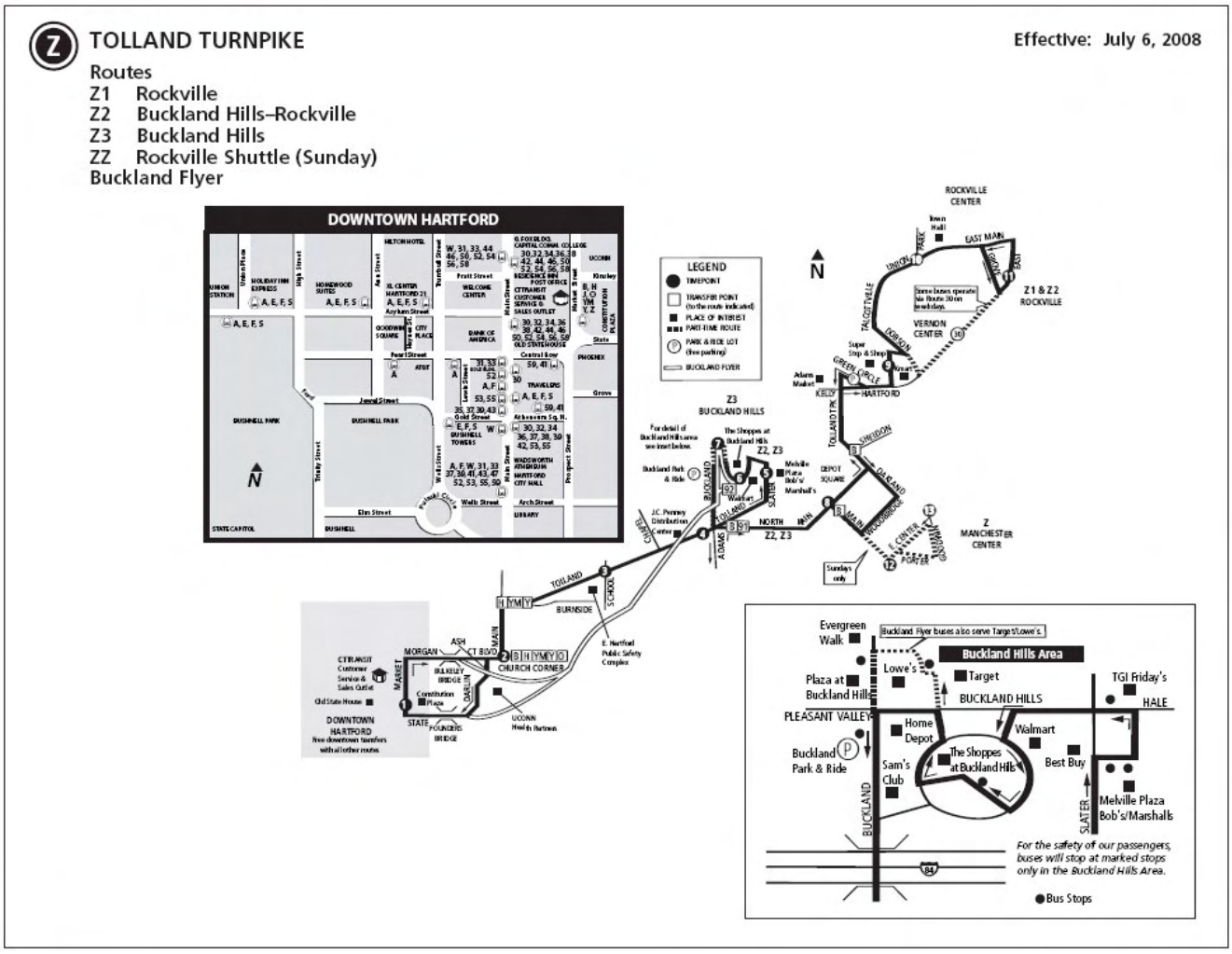
Figure 2-2

Buckland Area Transit Stops

0 1,000 2,000
Feet

Map Document: (M:\work\Buckland\Transit\TransitStops.mxd)
10/14/2008 -- 3:31:07 PM

FIGURE 2-3
BUCKLAND AREA Z-ROUTE AND LOCAL TRANSIT STOPS



The Buckland Express Bus 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, the Monday before a Tuesday holiday, and the Friday after a Thursday holiday.

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 Mall add one additional late night bus during one month per year (during Christmas season) to coincide with late closing times for some retail stores.

TABLE 2-1
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	8:20 PM	8:40 AM	8:20 PM	-	-
	WB	7:38 AM	9:44 PM	9:23 AM	9:44 PM	-	-
L – Tower Avenue Crosstown (#92)	EB	6:00 AM	8:50 PM	7:40 AM	8:50 PM	7:27 AM	5:50 PM
	WB	6:50 AM	10:03 PM	7:29 AM	10:03 PM	8:17 AM	7:02 PM
X – Forbes Street Crosstown (#91)	EB	6:19 AM	8:52 PM	7:27 AM	8:52 PM	8:21 AM	5:41 PM
	WB	7:05 AM	10:03 PM	8:15 AM	10:03 PM	8:25 AM	6:40 PM
Z – Tolland Turnpike (Z2, Z3)	EB	6:20 AM	9:25 PM	7:15 AM	9:25 PM	8:00 AM	5:15 PM
	WB	8:33 AM	10:03 PM	7:28 AM	10:03 PM	8:13 AM	6:39 PM
Z – Buckland Flyer*	EB	-	-	1:00 PM	8: 20 PM	-	-
	WB	9:58 AM	10:25 AM	1:30 PM	10:05 PM	-	-
3 – Buckland Express	EB	6:30 AM	6:27PM	-	-	-	-
	WB	6:15 AM	5:41 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 Melville Plaza/Bob's/Marshalls or the Shoppes at Buckland Hills/Macy's. WB service "begin and end" is for scheduled departure from Melville Plaza/Bob's/Marshalls or the Shoppes at Buckland Hills/Macy's.

*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 2-2 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 20-25 miles per hour (mph). By comparison, the Buckland Flyer and Buckland Express Bus 3 make few or no intermediate stops between the Buckland study area and downtown Hartford, which is reflected in their higher average speeds (up to 34 mph).

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

Route	Route Length (Miles)	Scheduled Running Time (minutes)	Frequency Weekdays	Frequency Saturdays	Frequency Sundays
B-Silver Lane:					
B3 Buckland Mall via MCTC	16	49-75	Hourly	Every 2 hours	-
B4 Buckland Mall via McKee	14	48-57	Once/day	Every 2 hours	-
L/92 - Tower Avenue Crosstown:					
	16	46-57	Hourly	Hourly	Hourly
X/91 – Forbes Street Crosstown:					
	16	47-96	Hourly	Hourly	Hourly
Z – Tolland Turnpike:					
Z2 Buckland Hills Rockville	19	47-84	3X/day	Hourly	Hourly
Z3 Buckland Hills	9	21-39	30-60 min.	Hourly	Hourly
Z - Buckland Flyer	8	25-32	Once/day	Hourly	(seasonal only)
3 Route – Buckland Express	8/12[1]	14-36[2]	5-30 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.

1. Route length of 8 miles assumes no Asylum Hill/Capitol loops. Route length of 12 miles includes Asylum Hill/Capitol loops. The Asylum Hill/Capitol loops are only served for inbound trips during the morning commuter hours and outbound trips during the afternoon commuter hours.
2. Higher range of running time represents routes that include the Asylum Hill/Capitol loops.

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 2-2. A notable exception is the Buckland Flyer service, which significantly increases the level of service for the period from November 25 to December 23 (during peak holiday shopping season) from hourly to every 30 minutes with additional service on Sundays.

The Buckland Express Bus 3 from Buckland Park-and-Ride to Hartford provides the most frequent service with a bus departing every 5-15 minutes during the peak morning and afternoon periods. However, the express bus does not serve the Buckland retail areas, and there is only one mid-day express bus (outbound), no late evening service, and no weekend service.

Bus Stop Facilities

In the year 2000, CRCOG adopted the "Bus Stop Sign and Shelter Policy." This program was initiated to install new bus stop signs at all stops in the Region, install and replace passenger shelters at important bus stops, and better define town responsibilities for maintaining bus stops.

There are 15 bus stops that serve the Buckland Hills Mall area. Five of these stops are located in the vicinity of Lowes and Target Stores on Tamarack Avenue. Three of the stops are located near the Bob's and Marshall's stores off of Buckland Hills Drive. Two stops are provided at the Buckland Park-and-Ride facility. A bus shelter is provided at the Park-and-Ride facility, but other bus stop locations in this area are not obviously marked. The bus stop at TGI Fridays provides a sign, but no shelter or benches. Some locations, such as the two shown in photos below, provide benches, but no shelters. Upgraded signage and benches and the addition of bus shelters would help make transit in this area a more attractive alternative.

Bus stop at Macy's

Bus stop at Target & Lowes stores

2.2.2 Paratransit and Other Alternative Services and Programs

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. Several ongoing programs are also in place to support and improve existing paratransit services. These service and programs are described below.

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. 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.

Human Service Agencies

Transportation services are provided by a variety of human services agencies and programs. These provide services for elderly residents and persons with disabilities. Examples include:

- The American Red Cross Elderly & Handicapped Transportation Services – Many chapters provide transportation to and from medical appointments and other essential trips for people who cannot provide their own transportation.

- The American Cancer Society – The Road to Recovery program offers free transportation for cancer patients.
- The Connecticut Community Disability, Assistive Technology & Transportation Services – Programs in Hartford County include Social Services in Avon and Simsbury; Dial-A-Ride services in Bristol, Collinsville, Enfield, Glastonbury, Newington, and West Hartford; Senior Centers in Canton, Granby, and Southington; and Community and Recreational Services in Farmington.

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).

Job Access Program

CRCOG started the Job Access Program in 1997 to provide rides to work for welfare-to-work clients and other low-income residents who want to work, but who cannot reach certain job sites due to lack of a vehicle, lack of regular bus service to the site, or lack of bus service for second or third shift schedules.

Locally Coordinated Human Services Transportation Plan (LOCHSTP)

ConnDOT completed the Locally Coordinated Public Transit-Human Services Transportation Plan for the State of Connecticut on July 19, 2007. The document outlines unmet transit needs in the state and provides a list of general strategies to address these needs, such as expanding service, encouraging sharing of resources or coordination, centralizing information and dispatching of vehicles, providing subsidies or grants for wheelchair accessible vehicles, and improving inter-regional coordination.

In cooperation with ConnDOT and various human services agencies and transportation providers, CRCOG is creating a locally coordinated human services transportation plan to determine how the region will seek to meet the transportation needs of the low-income residents, the elderly, and persons with disabilities.

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 Easy Street vanpool, which is sponsored by ConnDOT. Section 2.3.4 discusses carpool/vanpool services.

2.2.3 Park-and-Ride Facilities

Commuters who want to avoid traffic congestion and save on commuting costs can leave their cars in commuter parking lots while they use carpools, vanpools, buses or trains for their trips to work. Connecticut maintains a statewide system of Park & Ride lots. The ConnDOT website (www.ct.gov/dot/cwp/view.asp?a=1390&q=259406) lists available Park-and-Ride facilities in the state.

The ConnDOT operates a Park-and-Ride lot off of I-84 at Buckland Street (Exit 62) in Manchester. The lot is located on the southwest corner of Buckland Street at Pleasant Valley Road. This 743-space commuter lot is served by express bus service, and is well used by single-occupant vehicles in the morning and afternoon rush hours.

Park-and-Ride facility at Buckland Hills

2.3.4 Carpool/Vanpool and Other Alternative Mode Commuter Programs

The Rideshare Company (www.rideshare.com) meets the needs of commuters traveling in the Hartford and New London areas. The Rideshare Company also operates Easy Street, the state's comprehensive vanpool program, offering vanpool routes throughout the state. Easy Street (www.easystreet.org) is a not-for-profit commuter vanpool system sponsored by ConnDOT. Currently, there is an Easy Street vanpool route that travels between Manchester and the ATT facility in New Haven, CT.

NuRiding (www.NuRide.com) is similar to airline travel but for the automobile. This free service allows drivers to plan trips online and earn reward points every time they travel with other people. Carpool/vanpools can also be arranged via websites like www.eRideShare.com. With this site or other free services, it is possible to find other people traveling similar commute patterns.

It is also possible to save hundreds of dollars each year in taxes when commuting by train, bus, or eligible vanpools if an employer has a DEDUCT-A-RIDE program

(www.deductaride.com). Under DEDUCT-A-RIDE, a commuter may set aside (through payroll deduction) up to $100.00 per month tax-free from their salary to pay for bus, train, or vanpool fare.

Telecommute Connecticut! (www.telecommutect.com) offers free expert assistance to employers who choose to implement telecommute programs.
Bike to Work Capitol Region (www.crcog.org) is a program supporting commuting by bicycle. This program is supported by an association of agencies, including the Capitol Region Council of Governments, the Connecticut Bicycle Coalition, the Connecticut Departments of Transportation, Public Health, and Environmental Protection, All Aboard!, the Connecticut Chapter of the American Lung Association, and the CT chapter of the Sierra Club.

2.3 Transit Ridership

This part of the report summarizes existing transit ridership and provides future ridership projections in the Buckland Hills area.

2.3.1 Existing Transit Ridership

According to the 2000 Census, about 3.8% of all workers in the Capitol Region take the bus to work. Of those who work in Hartford, about 7.8% commute by bus.[3] For communities east of the Buckland Hills Mall area, approximately 6.3% of workers commute to Hartford by bus.

Ridership at the Buckland Hills Mall area bus stops for the routes discussed above is provided in Table 2-3. There are a total of 887 existing (2006) daily bus boardings and 900 existing bus alightings in the Buckland area. It is noted that bus boardings and alightings are approximately equal. The bus stops with the highest ridership in the Buckland area include the Buckland Park-and-Ride lot, Buckland Commuter stop, Buckland Filenes, and Bob's/Marshalls.

[3] *Capitol Region Transportation Plan*, "Transportation 2035," Adapted April 25, 2007, Chapter 2, page 14.

TABLE 2-3
EXISTING (2006) DAILY RIDERSHIP AT BUCKLAND HILLS AREA BUS STOPS

Town	Location	Stop ID	Boardings	Alightings
Manchester	JC Penny East (Catalogue Sales Center)[1]	8713	0	14
Manchester	JC Penny West (Catalogue Sales Center)[1]	8714	19	0
Manchester	Buckland P&R Lot (north side)	7620	326	289
Manchester	Buckland P&R Lot 2 (south side)	8363	56	0
Manchester	Buckland Street/Commuter (east side)	8188	40	36
South Windsor	Buckland Road/Evergreen Walk 1	9019	1	1
South Windsor	Buckland Rd/Evergreen Walk 2	9020	1	7
South Windsor	Buckland Rd/Target-Lowes	9021	4	0
Manchester	Target and Lowes (south side)	8362	1	10
Manchester	Target and Lowes (north side)	8361	4	10
Manchester	Buckland and Filenes	8315	359	417
Manchester	Hale Rd. and Slater	8106	11	17
Manchester	Bob's and Marshall's (west side)	7623	1	13
Manchester	Bob's and Marshall's (east side)	8314	58	77
Manchester	Slater St. and Tolland	7873	6	9
		TOTALS	**887**	**900**

Source: CTTranist July, 2006.
1. Note that current bus schedules (July 6, 2008) no longer list these two stops.

2.3.2 Future Transit Ridership

Future bus ridership projections were developed for year 2030 for the Buckland Hills study area. A range of growth factors were calculated and applied to the existing (year 2006) bus boardings in the Buckland Hills Mall area to forecast year 2030 bus boardings.

Base population and employment figures for years 2000 and 2030 were supplied by ConnDOT. These data were used as input in the ConnDOT's regional travel demand model, which was used to forecast future year traffic volumes for this study. The population and employment data were summarized for the communities of Manchester, South Windsor, East Hartford, and Vernon. Table 2-4 summarizes population and employment growth in the Buckland area.

TABLE 2-4
EMPLOYMENT AND POPULATION GROWTH SUMMARY - YEAR 2000 TO 2030

	Population				Employment			
Location	**2000**	**2030**	**Difference**	**% Difference**	**2000**	**2030**	**Difference**	**% Difference**
East Hartford, Manchester, S. Windsor, & Vernon[1]	156,790	171,500	14,710	9%	81,370	103,920	22,550	28%
Manchester & S. Windsor[2]	79,152	92,230	13,078	17%	41,240	52,630	11,390	28%
Buckland Area:[3]								
Manchester	8,286	9,783	1,497	18%	13,184	19,189	6,005	46%
S. Windsor	10,323	11,385	1,062	10%	2,328	4,861	2,533	109%

Source: ConDOT Travel Demand Model landuse.

1. Four town totals.
2. Two town totals.
3. Buckland area portions of two towns.

The results indicate that overall population in the Buckland Hills Mall area is expected to increase by 10 and 20 percent (between 0.3 – 0.7 percent per year) to the year 2030. Overall employment in Manchester, South Windsor, East Hartford, and Vernon is expected to grow by approximately 28% (approximately 1% per year). However, in the Buckland areas of Manchester and South Windsor, employment is expected to increase by 46% and 109%, respectively. The projected 8,500+ new jobs in the Buckland Hills Mall area would account for over three-quarters of the new jobs forecast for the towns of Manchester and South Windsor.

The range of population and employment growth rates developed for year 2030 were used to conduct a sensitivity analysis of future bus ridership in the Buckland Hills Mall area. Annual growth rates between 0.5% and 3.5% were applied to year 2006 bus boardings in the Buckland Hills Mall area. Table 2-5 summarizes future bus ridership projections.

The analysis indicates that total daily bus boardings in the Buckland Hills Mall area could range from 1,000 to 1,700 riders by the year 2030. The higher range is considered reasonable if projected development anticipated in the Buckland Hills Mall area continues to occur and future transit improvements are provided. The low range represents a scenario where little or no growth occurs over the next 25 years and no future transit improvements.

TABLE 2-5
FUTURE DAILY BOARDING PROJECTIONS AT BUCKLAND HILLS AREA BUS STOPS

Town	Location	Stop ID	2006 Boardings	Year 2030 Daily Boardings Assuming Annual Growth of:				
				0.5%/year	1%/year	2%/year	3%/year	3.5%/year
Manchester	JC Penney East (Catalogue Sales Center)[1]	8713	0	0	0	0	0	0
Manchester	JC Penney West (Catalogue Sales Center)[1]	8714	19	21	24	28	33	35
Manchester	Buckland P&R Lot (north side)	7620	326	365	404	482	561	600
Manchester	Buckland P&R Lot 2 (south side)	8363	56	63	69	83	96	103
Manchester	Buckland St/Commuter (east side)	8188	40	45	50	59	69	74
S. Windsor	Buckland Rd/Evergreen Walk 1	9019	1	1	1	1	2	2
S. Windsor	Buckland Rd/Evergreen Walk 2	9020	1	1	1	1	2	2
S. Windsor	Buckland Rd/Target-Lowes	9021	4	4	5	6	7	7
Manchester	Target and Lowes (south side)	8362	1	1	1	1	2	2
Manchester	Target and Lowes (north side)	8361	4	4	5	6	7	7
Manchester	Buckland and Filenes	8315	359	402	445	531	617	661
Manchester	Hale Rd and Slater	8106	11	12	14	16	19	20
Manchester	Bob's and Marshall's (west side)	7623	1	1	1	1	2	2
Manchester	Bob's and Marshall's (east side)	8314	58	65	72	86	100	107
Manchester	Slater St and Tolland	7873	6	7	7	9	10	11
Buckland Park & Ride and Commuter Totals:			**422**	**473**	**523**	**625**	**726**	**776**
Grand Totals:			**887**	**993**	**1,100**	**1,313**	**1,526**	**1,632**

Note: Stop ID numbers are shown in Figure 2-2.
1. Current bus schedules (July 6, 2008) no longer list these two stops.

As under existing conditions, the highest bus boardings are expected at the Buckland Park-and-Ride Lot and Buckland Street stops (777 total boardings) and Buckland and Filene's stop (661 boardings). These projections are consistent with future year 2025 No-Build ridership projections presented in the *Hartford East Bus Rapid Transit Feasibility Study, Final Report,* December 2004. This document predicted an increase in Buckland Express Bus 3 ridership from 660 riders in 2002 to 1,046 riders in 2025 (58% total growth, or approximately 2% per year annual growth). The projected boardings indicate that the parking spaces in the Buckland Park-and-Lot would be at or over-capacity in the future. It is noted that other factors such as fuel cost can dramatically change transit demand in the future which is not accounted for in this sensitivity analysis.

2.4 Existing Transit Issues and Deficiencies

Hourly transit service during peak periods 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 amount of time, if should they miss their intended bus. As a result, increased frequencies enhance the reliability and in turn result in increased ridership.

For example, 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. During the remainder of the year, however, the Buckland Flyer schedule is very limited.

Area bus frequency of service on national holidays outside of December actually drops back to Sunday frequencies, making it even more difficult for employees and shoppers to use the service during what are often some of the busiest retail days of the year.[4]

Starting in January, 2008, the mall extended its hours to include early Saturday morning and late Friday nights. Since no transit service is available during these hours, the transit-dependent employees must take a taxi to work these extended hours.

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. 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. Some bus stop locations are in need of updated signage, shelters and amenities. Location and types of amenities and facilities should be coordinated with local officials and business owners.

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

CT Transit's current radio system is not digital and is over 15 years old. CT Transit needs to upgrade its radio system and consider implementing advanced Intelligent Transportation Systems technology to improve system efficiency.

The retail and commuter parking areas in Buckland Hills Mall retail area are not served well by existing local transit service. While the demand for this type of service is not known, such a service could be provided in connection with a local transfer center to support the regional transportation system.

The Buckland Park-and-Ride Lot is well utilized by commuters, but expanded capacity at this location appears to be needed in the future.

In summary, the potential issues and deficiencies identified in the existing transit service within the study area include the following:

- Low frequency of service (hourly at peak times) on local routes year round;

[4] Specific holiday ridership numbers not available.

- 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;
- No service provided early Saturday and late Friday coinciding with the new Mall hours;
- Reduced operating efficiency due to indirect routes and duplication of route segments;
- Inconsistent type and quality of bus stops and amenities;
- Need to maintain efficient paratransit services;
- Outdated technology and equipment;
- Lack of connections between local activity centers (retail and commuter parking areas) represents an opportunity for connecting service; and
- Lack of a local transportation hub (transit center) that could be served by local, regional and shuttle bus services.

2.5 Transit Alternatives

This section describes specific transit alternatives recommended for the Buckland area. Many of the strategies below support the recommendations outlined in the *Capital Region Transportation Plan*[5] adopted in April of 2007. The 2007 plan provided a "Recommended Transit Improvement Program" based primarily on the 2001 Regional Transit Strategy (RTS), which contained a vision for regional transit in the Hartford region with goals to restore balance among transportation modes and provide travelers with more choices.

Transit system improvements and alternatives are described below.

2.5.1 Circulator Shuttle Bus Service

Neighborhood circulator shuttle services can improve access in an activity center while allowing more efficient operation of regional routes. It is recommended that the potential benefits of reinstating a Buckland Hills Circulator shuttle service be examined to connect the Buckland retail activity centers, including the Buckland Hills Mall, and the Park-and-Ride facility on Buckland Street. A new shared circulator shuttle route similar to the free "Star Shuttle Bus" providing circular service in Downtown Hartford could be considered. Such a shuttle service could be patronized by the following users:

- Commuters who park at designated areas;

[5] *Capital Region Transportation Plan,* "Transportation 2035," Adopted April 25, 2007.

- Employees, commuters and shoppers connecting to transit outside the study area;
- Parkers (shoppers) who prefer not to drive within the mall area; and/or
- Pedestrians and bicyclists.

The proposed route for the Circular Shuttle bus service is shown on Figure 2-4. The route would originate at the Buckland Park-and-Ride lot and run north along Buckland Road to Tamarak Avenue and past Lowes/Target and the Home Depot; east along Buckland Hills Drive past Filenes; east along Hale Road past Bob's Stores/Marshalls. It could then connect with Slater Street and run south to the Tolland Turnpike, west on Main Street, north on Buckland Road, and back to the Park-and-Ride facility. Eventually, the shuttle bus service should originate and terminate at Transit Center (see Section 2.5.3 below).

The shuttle buses should provide storage areas for shopper's packages. The service could operate on a fixed route but make stops on demand at designated locations, similar to "Jitney" bus services.[6] Shuttle bus stop locations would be at or near walk-accessible entrance points to shopping areas. These locations would coincide with local bus stop locations, although there would be more stops locations for the shuttle service than for local bus service. The shuttle bus service would provide service with greater frequencies (10-15 minute headways) to compensate for the need for some riders to make a transfer (a "two-seat ride") to access the retail areas along the route.

The shuttle bus service would operate in coordination with local bus service and help reduce overlapping service and the number of stops for local bus routes, thereby reducing costs for that service. Shops and restaurants in the area could provide shopping discounts or coupons to encourage use of the Circulator Shuttle bus service. Use of this new service would help to reduce vehicular travel made by patrons who currently need to drive between/among shopping areas. This in turn would reduce congestion, vehicle-miles-traveled, and air pollution.

Issues such as ownership/operation, the number of buses to serve demand, on and off-peak frequency, parking areas, fuel type, and cost will need to be developed in more detail as planning progresses. Possible funding opportunities for this system include the following FTA grant programs: Rural and Small Urban Areas (#5311) and Job Access and Reverse Commute Program (#5316).[7]

[6] "Jitney" services generally use vans or small buses to provide self-financing, privately operated transit service along busier corridors. Riders are charged a modest fare. In developing countries these are often a primary type of public transit. In North America they often augment conventional public transit.
[7] *Source:* www.fta.dot.gov

EarthTech

- Buckland Area Stops
- Proposed Circular Shuttle Bus
- Forbes Street Crossing (X - #91)
- Tower Avenue Crosstown (L - #92)
- Buckland Express
- Silver Lane (B3,B4)
- Tolland Turnpike (Z2, Z3)
- 7623 Stop ID #

Figure 2-4

Buckland Area Proposed Transit Routes

0 1,000 2,000 Feet

Map Document: (M:\work\BucklandTransit\ProposedRoutes.mxd)
9/30/2008 -- 3:48:09 PM

2.5.2 Existing Bus Service Improvements

Existing bus service in the Buckland area can be expanded and improved and to capture more riders. Specific improvements should include:

- Increase Service Frequency. Provide 30-minute headways or less during peak periods for local bus service and the Buckland Flyer year-round, including national holidays. As per the feedback received from CT Transit, this recommendation is being considered on case-by-case basis.
- Expand Service Hours. Expand hours of service to reflect Mall hours (include Saturday morning and Friday evening service). As per the feedback received from CT Transit, this recommendation is being considered on case-by-case basis.
- Improvements to Existing Routes. Modify existing routes to create more direct service and improve operating efficiency by eliminating redundant route segments and condensing bus stop locations. Specific recommendations are shown on Figure 2-4 and include the following:
    - **Eliminate duplicate routes on circular shuttle route.** Currently, several bus routes duplicate the route of the proposed Circular Shuttle Service (described in Section 2.5.1): The Silver Lane routes B3 & B4, Forbes Street Crossing Route 91, and the Tolland Turnpike routes Z2 & Z3. Of these selected routes, the Tolland Turnpike routes Z2 and Z3 maintain the highest weekday daily ridership in the Buckland Hills area (approximately 300 boardings/day within the study area), and should therefore be retained. The Silver Lane and Forbes Street Crossing Routes experience lower levels of ridership (each with approximately 100 boardings/day within the study area). These two routes could be routed directly to the Buckland Park-and-Ride facility (and eventually to the multi-modal transit center described in Section 2.5.3 below), and riders could transfer to the Tolland Turnpike Z2/Z3 bus routes, or to the proposed new Circular Shuttle. This would result in a 2-seat ride for approximately 200 riders on weekdays.
    - **Eliminate weekday Buckland Flyer service.** The weekday Buckland Flyer service only provides one trip per day, and ridership is very low (6 riders/day). Riders wishing to reach the retail areas from downtown Hartford could use Buckland Express Route 3 and transfer to the Tolland Turnpike bus or the proposed Circular Shuttle service.
- Consolidate Existing Bus Stops. Several existing bus stop locations experience low daily ridership, and should be considered to be combined with other bus stops. Suggestions include the following:
    - Buckland Road/Evergreen Walk 2 (#9020) and Buckland Road/Target-Lowes (#9021) could be eliminated/combined with Buckland Road/Evergreen Walk 1 (#9019).

- Bob's and Marshall's stop on the east side (#8314) could be eliminated/combined with the Bob's and Marshall's stop on the west side (#7623).

Bus service to these eliminated stops and other additional stops that require service can be provided through the proposed Circulator Shuttle bus service.

Assuming that the transit service improvements alone above result in 10-20% increases in transit ridership, an additional 100-200 daily transit passengers would be anticipated within the Buckland Hills study area. It is noted that other factors such as the economy, future land-use development, and fuel costs can also contribute to changes in transit demand in the future. More detailed ridership projections could be provided using ConnDOT's travel demand model.

General bus service improvements could include the following:

- Improve Bus Signage and Shelters. Continue to support the Bus Stop Sign and Shelter Policy for improved bus signage and better bus shelter facilities and amenities. FTA funding[8] could be made available to assist with these programs. The Town of Manchester has recently upgraded bus shelters within the city limits
- Maintain/Improve Level of Paratransit Service. Maintain and improve existing paratransit services (e.g., expanded hours and/or service areas) to better meet identified needs of local riders by continuing to support the Job Access Program and the Locally Coordinated Human Services Transportation Plan;
- Implement Intelligent Transportation Systems. Integrate advanced Intelligent Transportation Systems (ITS) technologies (GPS; advanced vehicle location (AVL) systems; vehicle guidance systems; electronic next bus arrival signs;

[8] FTA grant program for Bus and Bus Facilities (5309, 5318) provides capital assistance for new and replacement buses and related equipment and facilities. Eligible capital projects include purchasing buses for fleet and service expansion, bus maintenance and administrative facilities, transfer facilities, bus malls, transportation centers, intermodal terminals, park-and-ride stations, acquisition of replacement vehicles, bus rebuilds, bus preventive maintenance, passenger amenities such as passenger shelters and bus stop signs, accessory and miscellaneous equipment such as mobile radio units, supervisory vehicles, fare boxes, computers and shop and garage equipment. Eligible recipients are public bodies and agencies including states, municipalities, other political subdivisions of states; public agencies and instrumentalities of one or more states; and certain public corporations, boards and commissions established under state law. Private companies engaged in public transportation and private non-profit organizations are eligible sub recipients. (S*ource:* www.fta.dot.gov.)

transit signal priority; computer-aided dispatch; and next stop announcement systems) into current transit operations, maintenance, and management to improve service reliability and make it easier for riders to use the bus;

- Replace Radio System. Replacement of the CT Transit's current 15-year old radio system with a digital system that will allow CT Transit to begin developing AVL capabilities; and
- Acquire Alternative Fuel Vehicles. Integrate alternative fueled vehicles in the transit fleet as soon as practicable. Standard diesel buses cost approximately $270,000. CNG buses generally cost $25,000 to $50,000 more than comparable diesel buses. In December 1999, electric hybrid buses cost approximately $385,500 per bus. Electric hybrid buses can have 20-30% lower operating costs compared to a conventional diesel bus.[9] Although alternative fuel vehicles require a larger initial capital investment, long-term benefits include fuel cost savings, lower operating costs, reduced dependence on foreign oil, reduced green house emissions, and improved air quality. As alternative fuel vehicle technology progresses, the cost of acquiring alternative fuel vehicles will decrease. Should the state be interested in acquiring alternative fuel vehicles, a detailed cost/benefit analysis would be recommended. CT Transit is currently operating one bus running on alternate fuel and they have plans and assured funding to acquire more such buses in future.

2.5.3 Multi-Modal Transportation Center

A multi-modal transportation center is recommended at the current location of the Buckland Park-and-Ride Lot. The Buckland Park-and-Ride Lot location is centrally located within the Buckland Hills Mall area with excellent access to I-84, Buckland Street, Buckland Road, Pleasant Valley Drive, and Buckland Hills Drive. The transportation center would serve express and local bus services; a new circulator shuttle bus service; adjacent commuter parking; and be accessible to pedestrians and bicyclists. Such a facility would create an opportunity for people to transfer to other bus routes more directly and more quickly, improving transit mobility for the Buckland Hills Mall area and the region. An expansion option would include a proposed bus rapid transit service (described below).

The potential future demand for commuter parking at a future transportation center was evaluated. Year 2000 US Census Journey-to-Work shows that 6.3% of commuters to Hartford east of and including the Buckland Hills Mall area took a bus to work (approximately 900 commuters). Approximately 80% (725) of these bus commuter trips originated from Manchester, South Windsor, and Vernon. Many of these commuters park in the Buckland Park-and-Ride Lot to take the Buckland Express Bus 3 bus to Hartford.

A sensitivity analysis performed for future bus ridership in Section 2.3.2 showed that bus ridership, including park-and-ride commuters, could increase by 70 or 80 percent over the

[9] *Source:* Cleanairnet.org

next 25 years. If these levels of ridership translate to parking at the transportation center location, then the existing capacity of 743 parking spaces at the Buckland Park-and-Ride Lot would be exceeded. In addition to employment and population forecasts, other factors should be considered that would affect transit ridership. As population and employment grows in the region, traffic congestion will get progressively worse, increasing travel times and reducing the reliability. This will encourage more commuters to shift modes to transit. A new transportation center would also encourage commuters and employees to park in order to transfer to local buses or a circulator shuttle bus to area shops.

One of the roadway alternatives being considered is providing a new access point for commuters to the proposed transit center directly from the I-84 westbound HOV lanes. A more direct connection to the transit center would further encourage commuters to transfer to express bus service. Given these factors, a parking supply of increase of 50% (1,100 total spaces) may be warranted.

2.5.4 Bus Rapid Transit (BRT)

The *Capital Region Transportation Plan* recommended bus rapid transit service from Hartford to Manchester and Vernon. A feasibility study of the Manchester Busway (now entitled "Hartford East Busway") was completed and recommended a phased approach for implementing a busway in this corridor, as described below.

- Near term: Operate in I-84 HOV lanes. Construct four transit stations (Reservoir, Buckland, Hartford Turnpike, and Rockville) and two later (Simmons and Manchester). Expand bus operations to serve those locations and downtown Hartford.

- Long term: Construct a second busway and nine stations in the Connecticut Southern Railroad corridor (not including the Manchester Industrial Spur) between Depot Square in Manchester and Governor Street in East Hartford. Expand bus operations to serve those stations.

2.5.5 Transit Alternative Priorities

Recommended transit improvements can be categorized in terms of short-, and long-term measures. Priority should be given to short-term measures that provide ridership benefits at relatively low cost. Short-term measures would include the following:

- Improve bus stop signage and shelters;
- Improve/consolidate existing bus routes;
- Consolidate existing bus stops;
- Increase service frequency;
- Expand service hours;
- Provide Circulator Shuttle bus service;

- Replace bus radio system; and
- Maintain/improve level of paratransit service.

Long-term transit goals include measures that may result in significant ridership benefits, but likely require additional coordination and significant funding. These include:

- Implement Intelligent Transportation Systems;
- Acquire alternative fuel vehicles;
- Construct Multi-modal transportation center; and
- Provide Bus Rapid Transit to Manchester and Vernon.

3 – Bicycle and Pedestrian Alternatives

3.1 Introduction

The Buckland Hills Mall area is growing at a rapid pace and is anticipated to continue growing over next the 25-30 years. Although, the commercial success of businesses in this area has been very beneficial for local economy, it has presented a number of challenges for transportation and land use planning. While issues related to vehicular transportation have been addressed separately, issues related to bike/pedestrian facilities are discussed in this section of the report.

The Capitol Region Council of Governors (CRCOG) maintains a comprehensive Bicycle and Pedestrian Planning Program and it has been coordinating with a number of bicycle/ pedestrian interest groups to implement various initiatives geared toward shared use of transportation facilities. One of the initiatives is "Complete Streets". A complete street is safe, comfortable and convenient for travel via automobile, foot, bicycle and transit. A complete street has the following advantages (source: www.completestreets.org):

1. Offers a full range of travel choices compatible with transit and trains
2. Interconnects other bike friendly networks
3. Is fully accessible to all, including: kids, seniors and people with disabilities
4. Supports and contributes to the quality of life

The analysis of roadway accident data (Table 2-5, Tech. Memo. 1) indicates that pedestrian/vehicular conflicts are minimal (less than 1% of all the accidents) in this area. Also, the accident data did not indicate any involvement of bicyclists in any roadway accidents. However, it would be complacent to assume that accident numbers are low because all the streets are bicycle/pedestrian friendly.

Currently sidewalks are not continuous along most of the streets, the average sidewalk width varies and pedestrian crosswalks are provided at very few intersections within the study area. Bike lanes are not marked on any of the roads within the study area.

This report is a continuation of analysis of existing bike and pedestrian facilities presented in Technical Memorandum No. 1. This report contains detailed inventory of existing bike and pedestrian facilities and recommended improvements to make streets friendly for mixed use. This report also addresses various issues raised during meeting of the Bicycle and Pedestrian Stakeholders Group meeting on April 15, 2008. This report is divided in two parts. Section 3.2 of this report examines bicycle/pedestrian friendliness of the streets in the study area and provides recommended actions to make streets friendlier for shared use. Section 3.3 of this report discusses bike and pedestrian facilities plan.

3.2 Road Network

The following discussion focuses primarily on analysis of existing bike and pedestrian facilities on all the roads in the study area and proposed recommendations for making streets and intersections friendly for shared use. Please see appendix 3-0-1 for key map of the entire region.

3.2.1 Adams Street/Buckland Street

Adams Street becomes Buckland Street north of its intersection with Tolland Turnpike. Buckland Street is a four-lane major collector street that runs north-south within the study area.

Existing Conditions

The following table summarizes locations of sidewalks along this street.

TABLE 3-1
CONTINUITY OF SIDEWALKS ALONG ADAMS STREET, BUCKLAND STREET AND BUCKLAND ROAD

From	To	# of lanes	Sidewalk	
			East	West
Adams Street	Tolland Turnpike	3	Yes	No
Tolland Turnpike	I-84 Ramps	4	Yes	Yes
I-84 Ramps	Pavilions Drive	4	Partial	Yes
Pavilions Drive	Pleasant Valley Road	4	Yes	Yes
Pleasant Valley Road	Tamarack Avenue	4	Yes	No
Tamarack Avenue	Hemlock Avenue	4	Partial	Yes
Hemlock Avenue	Cedar Avenue	4	No	Partial
Cedar Avenue	Deming Street	4	No	Partial
Deming Street	Oakland Road	4	No	No

As per information obtained from CRCOG, Buckland Street is part of a network of existing trails. An existing shared use trail runs parallel to Buckland Street from Tolland Turnpike to Pleasant Valley Road. The following table summarizes the availability of crosswalks at intersections along Buckland Street.

TABLE 3-2
AVAILABILITY OF CROSSWALKS AT INTERSECTIONS ALONG ADAMS STREET, BUCKLAND STREET AND BUCKLAND ROAD

		East	West	North	South
Adams Street	New State Road	No	No	No	No
Buckland Street	Tolland Turnpike	Yes	No	Yes	No
	Redstone Road	Yes	No	Yes	No
	I-84 Ramps (South)	No	Yes	No	No
	Pavilions Drive	Yes	No	Yes	No
	Pleasant Valley Road	Yes	Yes	Yes	Yes
Buckland Road	Tamarack Avenue	No	No	No	No
	Hemlock Avenue	No	No	No	No
	Cedar Avenue	No	No	No	No
	Deming Street	No	No	No	No
	Oakland Road	No	No	No	No

Except the intersection with Pleasant Valley Road, none of the intersections has crosswalks marked on all of its four approaches and quite a few lack any crosswalks at all.

Proposed Recommendations

Buckland Street is a major north-south thoroughfare and a very heavily travelled road. It, serves as a backbone for the transportation system in the study area. Cyclists and pedestrians use this road for a wide range of purposes including commuting, exercise, recreation, etc. Since currently there is a mixed use trail from Tolland Turnpike to Pleasant Valley Road, it is recommended that a continuous bike lane be provided along both sides of this road except for the stretch of the road between Tolland Turnpike and Pleasant Valley Road. The existing mixed use trail is to remain in place. Please see appendices B-1 to B-6 for graphical presentation of recommendations.

- Intersection with New State Road: This is a three legged signalized intersection. It is recommended to provide marked crosswalks on west and south approaches of the intersection.
- Intersection with Tolland Turnpike: This is four legged signalized intersection. Each approach has six lanes and a raised median that serves as a refuge for pedestrians trying to cross the intersection. Also, pedestrian signals are provided at each approach. However, crosswalks are not provided on west and south approaches. It is recommended that crosswalks be provided on west and south approaches.
- Intersection with Brentwood Drive: This is a three legged intersection. The outbound movement from Brentwood Drive is controlled by a stop sign. There is no marked crosswalk to connect sidewalk on east to mixed use trail on west side. It is recommended that a crosswalk be marked on north and east approaches of the

intersection and since, this is a non signalized intersection, it also recommended to provide additional warning signs to warn motorists about pedestrians crossing Buckland Street at this location.

- Intersection with Redstone Road: This is a four legged signalized intersection. The median along Buckland Street is raised, so, it provides some refuge for pedestrians/bikers trying to cross the intersection. It is recommended to provide crosswalks on south and west approaches of the intersection.
- Intersection with I-84 EB ramps: This is a four legged signalized intersection. The median along Buckland Street is raised, so, it provides some refuge for pedestrians/ bikers trying to cross the intersection. It is recommended that crosswalks be provided on the south and east approaches of the intersection.
- Intersection with Pavilions Drive: This is a three legged signalized intersection. The median along Buckland Street is raised, so, it provides some refuge for pedestrians/ bikers trying to cross the intersection. Since, currently crosswalks are provided on all the approaches of this intersection, no additional crosswalks are recommended at this intersection. However, the timing of pedestrian signals needs to be checked to make sure it is adequate enough for users to cross the intersection safely.
- Driveway to Home Depot/Sports Authority: It is recommended to provide a crosswalk on this driveway where sidewalk crosses the driveway. Since there is not going to be any traffic control device at this location, it also recommended to provide advanced signs upstream to warn motorists of impending pedestrian crossing.
- Intersection with Pleasant Valley Road: This is the busiest intersection in the whole area. Each approach of the intersection has 7 lanes. Both the streets have raised medians and islands for pedestrian refuge. Crosswalks are marked on all the legs of the intersection and pedestrian signals are also provided for all bike/ pedestrian movements. Since this is a very wide intersection, it is recommended to check if there is enough time for pedestrians to cross the street safely or not.
- Driveway to KFC: The driveway has right-in entry and right-out exit. It is recommended to provide crosswalks at entrance.
- It is recommended to provide a mixed use trail connection from Buckland Street to Smith Street. This trail will enhance the connectivity among trails in the study area.
- Intersection with Tamarack Avenue: This is a four legged signalized intersection. Buckland Street has 6 lanes on each approach. It is recommended to provide crosswalks on all approaches of this intersection.
- Intersection with Hemlock Avenue: This is a three legged signalized intersection. Buckland Street has five lanes on each approach. It is recommended to provide a crosswalk on west approach of the intersection. A part of sidewalk is missing from Hemlock Ave to Cedar Ave. It is recommended to construct this missing link of sidewalk. It is recommended to provide a crosswalk on west approach of the intersection. A part of sidewalk is missing from Cedar Ave to Deming Street. It is recommended to construct this missing link of sidewalk.

- Intersection with Deming Street: This is a four legged signalized intersection. Buckland Street has six lanes on south approach and five lanes on north approach. Deming Street has four lanes on west approach and three lanes on east approach. It is recommended to provide crosswalks on all approaches of the intersection. A sidewalk on west side of Buckland Street from Deming Street to Oakland Road is recommended.
- Driveway to Buckland Dental Plaza: It is recommended to provide marked crosswalks on north and west approaches of intersection of driveway to Buckland Dental Plaza and Buckland Street. Since this is a non signalized intersection, it is recommended to provide advanced warning signs to warn motorists of impending midblock crosswalk.
- Intersection with Oakland Road: During the April 15, 2008 meeting of project team with Bike-Pedestrian Stakeholders Group, it was advised that this particular intersection is not workable for bike or pedestrian activity. There is a general perception among users that this intersection is very unsafe. A closer look at the intersection revealed that these fears are not unfounded. Each approach of the intersection has five lanes. It is recommended to provide crosswalks and pedestrian signals on all the approaches of intersection.

3.2.2 Chapel Road

Chapel Road is a 4-lane collector street that runs parallel to I-291. Within the study area, it connects Tolland Turnpike on south side and Clark Street on north side. Chapel Road is a part of CRCOG's on the road bike network.

Existing Conditions

This road does not have any intersection of major significance within the study area; hence existing conditions were not presented in a table format. There is a mixed use trail on the east side and a partial sidewalk on the west side of Chapel Road. The surface of the existing bike trail/mixed use trail is uneven and poorly maintained.

Proposed Recommendations

It is recommended that the existing mixed trail be resurfaced to provide a smooth riding surface. A mixed use trail is recommended between Clark Street and Burnham Street Extension. This connection will provide a continuous trail from Clark Street to Tolland Turnpike. . Please see appendices B-7 to B-8 for graphical presentation of recommendations.

- It is recommended that a mixed use trail be provided between Clark Street and Burnham Street Extension.
- The sidewalk on west side of Chapel Road ends about 800' south of Burnham Street Extension. It is recommended that crosswalks be provided on both southbound and northbound lanes on Chapel Road at this location.

- Intersection with Batson Drive: It is recommended that a crosswalk be provided on Batson Drive.
- Intersection with on-ramps to I-291: It is recommended that a crosswalk be provided on on-ramps.
- Intersection with driveway to J C Penny Logistics Center: It is recommended that a crosswalk be provided on the driveway.

3.2.3 Clark Street

Clark Street is a 2-lane collector that runs from Chapel Road on south to Ellington Street at north. South Windsor Walk and Walkways has identified entire stretch of Clark Street as a mixed use facility.

Existing Conditions

The following table summarizes locations of sidewalks along this street.

TABLE 3-3
CONTINUITY OF SIDEWALKS ALONG CLARK STREET

From	To	# of lanes	Sidewalk	
			East	West
Clark Street	Rugby Lane	2	No	No
	Margaret Drive	2	No	No
	Pleasant Valley Road	2	No	No
	Cinnamon Spring Road	2	No	No
	Smith Street	2	No	No
	Stanley Drive	2	No	No
	Deming Street	2	No	No
	Ellington Street	2	No	No

It is interesting to note that some of the side streets that connect to Clark Street, such as Rugby Lane, Margaret Lane, Stanley Drive, have sidewalks on both the sides. However, these sidewalks terminate at intersection as Clark Street does not have any sidewalk along its length.

The following table summarizes availability of crosswalks at intersections along Clark Street.

TABLE 3-4
AVAILABILITY OF CROSSWALKS AT INTERSECTIONS ALONG CLARK STREET

		East	West	North	South
Clark Street	Chapel Road	No	No	No	No
	Rugby Lane	No	No	No	No
	Margaret Drive	No	No	No	No
	Pleasant Valley Road	No	No	No	No
	Cinnamon Spring Road	No	No	No	No
	Sunfield Drive	No	No	No	No
	Smith Street	No	No	No	No
	Stanley Drive	No	No	No	No
	Deming Street	No	No	No	No

As it can be seen from above tables, although this street has been identified as a mixed use pathway, it lacks sidewalks and marked crosswalks.

Proposed Recommendations

It is recommended that continuous sidewalk and exclusive bike lanes be provided on both sides of the street. Please see appendices B-9 to B-12 for graphical presentation of recommendations.

- Intersection with Chapel Road: This is a four legged, all-way stop intersection. It is recommended that crosswalks be provided on all the approaches. Since this is a non signalized intersection, it is recommended to provide additional warning signs to warn motorists about pedestrians crossing Chapel Road and Clark Street at this location.
- Intersection with Rugby Lane: This is a three legged intersection. Only the outbound movement from Rugby Lane is controlled by a stop sign. A marked crosswalk is recommended on Rugby Lane.
- Intersection with Margaret Drive: This is a three legged intersection. Only the outbound movement from Margaret Drive is controlled by a stop sign. A crosswalk is recommended on Margaret Drive.
- Intersection with Pleasant Valley Road: This is a four legged stop controlled intersection. It is recommended that crosswalks be provided on all the approaches. Since this is a non signalized intersection, it is recommended that additional warning signs be provided to warn motorists about pedestrians crossing Pleasant Valley Road and Clark Street at this location.
- Intersection with Cinnamon Spring Road: This is a three legged intersection. Only the outbound movement from Cinnamon Spring Road is controlled by a stop sign. A crosswalk is recommended on the north approach of the intersection. Since this is a non signalized intersection, it is recommended that additional warning signs be provided to warn motorists about pedestrians crossing Clark Road at this location.

- Intersection with Sunfield Drive: This is three legged intersection. Only the outbound movement from Sunfield Drive is controlled by a stop sign. A crosswalk is recommended on Sunfield Drive.
- Intersection with Smith Street: This is three legged intersection. Only the outbound movement from Smith Street is controlled by a stop sign. A crosswalk is recommended on the south approach of intersection. Since this is a non signalized intersection, it is recommended that additional warning signs be provided to warn motorists about pedestrians crossing Clark Road at this location.
- Intersection with Stanley Drive: This is three legged intersection. Only the outbound movement from Stanley Drive is controlled by a stop sign. A crosswalk is recommended on Stanley Drive.
- Intersection with Deming Street: This is three legged intersection. Only the outbound movement from Clark Street is controlled by a stop sign. A crosswalk and pedestrian signal are recommended on Clark Street. A sidewalk is recommended on south side of Deming Street from Clark Street to Sele Drive.

3.2.4 Deming Street

Deming Street is a 2-lane major collector street. Since this street is connected to I-84, it carries traffic to and from interstate as well as local traffic.

Existing Conditions

The following table summarizes locations of sidewalks along this street.

TABLE 3-5
CONTINUITY OF SIDEWALKS ALONG DEMING STREET

From	To	# of lanes	Sidewalk	
			North	South
Ellington Road	Clark Street	2	No	No
Clark Street	Buckland Street	2	No	No
Buckland Street	Slater Street	2	Partial	Partial
Slater Street	Shares Lane	2	No	No
Shares Lane	Hale Road	2	Partial	Partial
Hale Road	Avery Street	4	Yes	No
Avery Street	McIntosh Drive	4	Yes	No
McIntosh Drive	Tolland Turnpike	4	Yes	No

The following table summarizes availability of crosswalks at intersections along Deming Street.

TABLE 3-6
AVAILABILITY OF CROSSWALKS AT INTERSECTIONS ALONG DEMING STREET

		East	West	North	South
Deming Street	Ellington Road	No	No	No	N/A
	Clark Street	No	No	No	No
	Buckland Road	No	No	No	No
	Sele Drive	No	No	No	No
	Summit Drive	No	No	No	No
	Cardinal Way	No	No	No	No
	Castlewood Drive	No	No	No	No
	Red Rock Lane	No	No	No	No
	Slater Street	No	No	No	No
	Imperial Drive	No	No	No	No
	Watson Circle	No	No	No	No
	Shares Lane	No	No	No	No
	Hale Road	No	No	Yes	Yes
	Driveway to McDonalds	No	No	No	No
	Avery Street	No	No	Yes	No
	McIntosh Drive	No	No	Yes	No
	Tolland Turnpike	Yes	No	No	No

Proposed Recommendations

It is recommended that a continuous sidewalk and exclusive bike lanes be provided on both sides of the street. Please see appendices B-13 to B-17 for graphical presentation of recommendations.

- Intersection with Ellington Road: This is a three legged signalized intersection. It is recommended to provide a crosswalk on Deming Street. A sidewalk is recommended on south side of Deming Street from Ellington Road to Clark Street.
- Intersection with Clark Street: This is three legged intersection. Only the outbound movement from Clark Street is controlled by a stop sign. A crosswalk and pedestrian signal are recommended on Clark Street. A sidewalk is recommended on south side of Deming Street from Clark Street to Sele Drive.
- Intersection with Buckland Street: This is a four legged signalized intersection. Buckland Street has six lanes on south approach and five lanes on north approach. Deming Street has four lanes on west approach and three lanes on east approach. It is recommended to provide crosswalks on all approaches of the intersection. A sidewalk on west side of Buckland Street from Deming Street to Oakland Road is recommended.
- Intersection with Sele Drive: This is a three legged intersection. Only the outbound movement from Sele Drive is controlled by a stop sign. Crosswalks are

recommended on west and south approaches of the intersection of Sele Drive. A sidewalk is recommended on the north side of Deming Street.

- Intersection with Grandview Terrace: This is three legged intersection. Only the outbound movement from Grandview Terrace is controlled by a stop sign. No additional improvements to this intersection are suggested at this time.
- Intersection with Summit Drive: This is a three legged intersection. Only the outbound movement from Summit Drive is controlled by a stop sign. Crosswalks are recommended on west and south approaches of the intersection. Since this is a non signalized intersection, it is recommended that additional warning signs be provided to warn motorists about pedestrians crossing Deming Street at this location.
- A sidewalk is recommended on south side of Deming Street from Summit Drive to Cardinal Way.
- Intersection with Cardinal Way: This is a three legged intersection. Only the outbound movement from Cardinal Way is controlled by a stop sign. A crosswalk is recommended on Cardinal Way.
- Intersection with Castlewood Drive: This is a three legged intersection. Only the outbound movement from Castlewood Drive is controlled by a stop sign. A crosswalk is recommended on Castlewood Drive.
- Intersection with Red Rock Lane: This is a three legged intersection. Only the outbound movement from Red Rock Lane is controlled by a stop sign. A crosswalk is recommended on Red Rock Lane.
- Intersection with Slater Street: This is a four legged all-way stop intersection. It is recommended that crosswalks be provided on all the approaches of this intersection. Also, since this is not a signalized intersection, it is recommended that additional warning signs be provided to warn motorists about pedestrians crossing Slater Street and Deming Street at this location.
- A sidewalk is recommended on south side of Deming Street from Slater Street to Hale Road.
- Intersection with Imperial Drive: This is three legged intersection. Only the outbound movement from Imperial Drive is controlled by a stop sign. A crosswalk is recommended on Imperial. Also, since this is a non signalized intersection, it is recommended that additional warning signs be provided to warn motorists about pedestrians crossing Deming Street at this location.
- Intersection with Oakland Road: This is a three legged intersection. Only eastbound movement from Deming Street is controlled by a stop sign. A crosswalk is recommended on Deming Street.
- Intersection with Watson Circle: This is a three legged intersection. Only the outbound movement from Watson Circle is controlled by a stop sign. A crosswalk is recommended on Watson Circle and east approach of the intersection. Also, since this is a non signalized intersection, it is recommended that additional warning signs be provided to warn motorists about pedestrians crossing Deming Street at this location.
- Intersection with Shares Lane: This is a three legged intersection. Only the outbound movement from Shares Lane is controlled by a stop sign. A crosswalk is

recommended on Shares Lane and west approach of the intersection. Also, since this is a non signalized intersection, it is recommended that additional warning signs be provided to warn motorists about pedestrians crossing Deming Street at this location.

- Intersection with Hale Road: This is a four legged signalized intersection. Both Deming Street and Hale Road have five lanes on each approach. It is recommended that crosswalks be provided on east and west approaches of the intersection.
- Intersection with driveway to McDonalds: This is a four legged intersection. Since Deming Street carries high traffic volume and this intersection is not signalized, crosswalks are not recommended on Deming Street. Pedestrians should be encouraged to use crosswalks at adjacent signalized intersections.
- Intersection with Avery Street: This is a four legged signalized intersection and one of the busy intersections in the area. Deming Street has six lanes on east approach and seven lanes on west approach. It is recommended to check timing of pedestrian signals to make sure it is adequate enough for pedestrians to cross.
- Intersection with McIntosh Drive: This is a three legged intersection. The outbound movement from McIntosh Drive is controlled by a stop sign. There is already a crosswalk on McIntosh Drive. However, since this is a non signalized intersection, it is recommended that additional warning signs be provided to warn motorists about pedestrians crossing Deming Street at this location.
- Intersection with Tolland Turnpike: This is a three legged signalized intersection. It is also one of the busiest intersections in the area. It is recommended that crosswalks be provided on the west and south approaches are recommended. Also, provision of pedestrian crossing signals is recommended at this intersection.

3.2.5 Ellington Road and Oakland Road

Oakland Road is Ellington Road west of Buckland Street. It is a two-lane arterial. This is a very important street that carries traffic to and from I-84.

Existing Conditions

The following table summarizes locations of sidewalks along this street.

TABLE 3-7
CONTINUITY OF SIDEWALKS ALONG ELLINGTON ROAD AND OAKLAND ROAD

From	To	# of lanes	Sidewalk	
			East	West
Clark Street	Buckland Road	2	Partial	No
Buckland Road	Felt Road	2	No	No
Felt Road	Slater Street	2	No	No
Slater Street	Deming Street	2	No	No

The following table summarizes availability of crosswalks at intersections along Oakland Road.

TABLE 3-8
AVAILABILITY OF CROSSWALKS AT INTERSECTIONS ALONG ELLINGTON ROAD AND OAKLAND ROAD

		East	West	North	South
Ellington Road	Clark Street	No	No	No	No
	Buckland Road	No	No	No	No
Oakland Road	Felt Road	No	No	No	No
	Slater Street	No	No	No	No
	Ellington Road	No	No	No	No

Proposed Recommendations

CRCOG has identified this road as a part of on- road bicycle network. Since this is state route, and carries relatively higher traffic volume, wider shoulders are recommended instead of exclusive bike lanes. Please see appendices B-18 to B-21 for graphical presentation of recommendations.

- Intersection with Clark Street: This is a three legged signalized intersection. It is recommended to provide a crosswalk on Deming Street. A sidewalk is recommended on south side of Deming Street from Ellington Road to Clark Street.
- Currently the sidewalk is discontinuous between Clark Street and Buckland Street. It is recommended to construct the missing portion of sidewalk.
- Intersection with Buckland Road: During the April 15, 2008 meeting of project team with Bike-Pedestrian Stakeholders Group, it was advised that this particular intersection is not workable for bike or pedestrian activity. There is a general perception among users that this intersection is very unsafe. A closer look at the intersection revealed that these fears are not unfounded. Each approach of the intersection has five lanes. It is recommended to provide crosswalks and pedestrian signals on all the approaches of intersection.
- Intersection with Felt Road: This is four legged signalized intersection. Crosswalks are recommended on south and west approaches of the intersection and pedestrian signals are recommended on west side of Felt Road on either side of Oakland Road.
- Intersection with Slater Street: This is a four legged signalized intersection. It is recommended that a crosswalk be provided on the south approach of the intersection.
- Intersection with Deming Street: This is a three legged signalized intersection. It is recommended to provide a crosswalk on Deming Street. A sidewalk is recommended on south side of Deming Street from Ellington Road to Clark Street.

3.2.6 Pavilions Drive

Pavilions Drive connects Buckland Hills Mall to Buckland Street. It is a four-lane minor collector street that runs east-west in the study area.

Existing Conditions

Pavilions Dr has a continuous sidewalk on north side of the street. None of the intersections to driveways is controlled by any traffic control device. The following table summarizes availability of crosswalks at intersections along Pavilions Road.

TABLE 3-9
AVAILABILITY OF CROSSWALKS AT INTERSECTIONS ALONG PAVILIONS DRIVE

		East	West	North	South
Pavilions Drive	Driveway to Office Depot	No	No	Yes	No
	Driveway to Sams Club (West)	No	No	No	No
	Driveway to Sams Club (East)	No	No	No	No
	Perimeter road of mall	No	No	No	No

Proposed Recommendations

Please see appendix B-22 for graphical presentation of recommendations.

- Exclusive bike lanes are recommended on both side of the street.
- Intersection with driveways to Sams Club: A crosswalk is recommended on both of the drives to Sams Club.
- Intersection with perimeter road of Buckland Hills Mall: This is a three legged stop controlled intersection. A crosswalk is recommended on the west approach of the intersection. Since this is not a signalized intersection, it is recommended that additional warning signs be provided to warn motorists about pedestrians crossing Pavilions Drive at this location.

3.2.7 Pleasant Valley Road/Buckland Hills Drive/Hale Road

Pleasant Valley Road is a major four-lane collector street that runs east-west within the study area. Most of the traffic travelling east-west uses this street to get to their destinations.

Existing Conditions

The following table summarizes locations of sidewalks along this street.

TABLE 3-10
CONTINUITY OF SIDEWALKS ALONG PLEASANT VALLEY ROAD/BUCKLAND HILLS DRIVE/ HALE ROAD

From	To	# of lanes	Sidewalk	
			North	South
Clark Street	Wheeler Road	2	No	Partial
Wheeler Road	Croft Road	2	No	Yes
Croft Drive	JC Penny Center	2	Yes	No
JC Penny Center	Buckland Street	4	Yes	Yes
Buckland Street	Slater Street	4	Yes	Yes
Slater Street	Deming Street	4	Yes	Yes

Pleasant Valley Road has sidewalk on the south side and a mixed use trail on the north side of the street for most of the part and appears to be relatively pedestrian friendly. Pleasant Valley Road becomes Buckland Hills Drive east of its intersection with Buckland Street. Buckland Hills Drive has sidewalks on both the sides. Buckland Hills Drive becomes Hale Road east of its intersection with Slater Road. Hale Road has sidewalks on both sides.

The following table summarizes availability of crosswalks at intersections along Pleasant Valley Road.

TABLE 3-11
AVAILABILITY OF CROSSWALKS AT INTERSECTIONS ALONG PLEASANT VALLEY ROAD/BUCKLAND HILLS DRIVE/ HALE ROAD

		East	West	North	South
Pleasant Valley Road	Clark Street	No	No	No	No
	Wheeler Road	No	No	No	No
	Croft Drive	No	No	No	No
	JC Penny Center driveway (West)	Yes	No	Yes	No
	JC Penny Center driveway (East)	No	No	No	No
	I-84 ramps	No	Yes	Yes	No
	Buckland St	Yes	Yes	Yes	Yes
Buckland Hills Drive	Driveway to Home Depot	No	No	N/A	Yes
	Driveway to mall (west)	No	No	No	No
	Right-in-right-out driveway	No	No	N/A	No
	Driveway to mall (east)	Yes	Yes	No	No
	Driveway to Wal-Mart	No	No	No	No
	Driveway to Best Buy	No	No	No	Yes
	Driveway to condos	No	No	No	No
	Slater Street	Yes	Yes	Yes	Yes
Hale Road	Driveway to Marshalls	No	No	No	Yes
	Driveway to Bed Bath & Beyond	Yes	No	Yes	No
	Driveway to Bernie's	No	No	No	No
	Service road to DSW Shoes	Yes	No	No	No
	Driveway to Ethan Allen	Yes	Yes	No	No
	Deming Street	No	No	Yes	Yes

It can be seen from the table that only two intersections have crosswalks marked on all the four approaches.

Proposed Recommendations

CRCOG has identified Pleasant Valley Road as part the of on-road bicycle network. Since the existing mixed use trail runs parallel to Pleasant Valley Road, this study do not recommend installing/painting separate bike on the road. Please see appendices B-23 to B-28 for graphical presentation of recommendations.

- Intersection with Clark Street: This is a four legged stop controlled intersection. It is recommended that crosswalks be provided on all the approaches. Since this is a non signalized intersection, it is recommended that additional warning signs be provided to warn motorists about pedestrians crossing Pleasant Valley Road and

Clark Street at this location. Provide sidewalk on the north side of the street from Clark Street to Manchester Trail.

- Intersection with Cinnamon Springs Road: This is a three legged intersection. It is recommended that a crosswalk be provided on Cinnamon Springs Road.
- Intersection with Amato Drive/ Cinnamon Springs Road: This is a four legged intersection. It is recommended that a crosswalk be provided on east approach of the intersection. Since this is a non signalized intersection, it is recommended that additional warning signs be provided to warn motorists about pedestrians crossing Pleasant Valley Road at this location.
- Intersection with Ivy Lane: This is a three legged intersection. It is recommended that a crosswalk be provided on east approach of the intersection. Since this is a non signalized intersection, it is recommended that additional warning signs be provided to warn motorists about pedestrians crossing Pleasant Valley Road at this location.
- Intersection with Wheeler Road: This is a three legged intersection and only the southbound movement of Wheeler Road is controlled by a stop sign. It is recommended that a crosswalk be provided on Wheeler Road.
- Intersection with Croft Drive: This is a four legged intersection controlled by a two-way stop sign. It is recommended that crosswalks be provided on north and east approaches of the intersection. Since, this is a non signalized intersection, it is recommended that additional warning signs be provided to warn motorists about pedestrians crossing Pleasant Valley Road at this location.
- Because of complicated geometry of proposed intersection improvements on I-84 ramps and Buckland Street, it is recommended to continue bike lanes on Manchester Trail to Evergreen Walk to either Buckland Street or Oakland Road. It would be a much safer operation to funnel bikers away from intersection of Pleasant Valley Road and Buckland Street.
- Intersection with JC Penny Logistics Center Drive (west): This is a four legged signalized intersection. It is recommended that crosswalks be provided on west and south approaches of the intersection.
- Intersection with I-84 ramps: This is a four legged signal controlled intersection. This is one of the busiest intersections in the area. Pleasant Valley Road and the driveway to the mall have raised islands. It is recommended that a crosswalk be provided on south approach of the intersection.
- Intersection with Buckland Street: This is the busiest intersection in the whole area. Each approach of the intersection has 7 lanes. Both the streets have raised medians and islands for pedestrian refuge. Crosswalks are marked on all the legs of the intersection and pedestrian signals are also provided for all bike/ pedestrian movements. Since this is a very wide intersection, it is recommended to check if there is enough time for pedestrians to cross the street safely or not.
- Intersection with driveway to Home Depot: This is a three legged signalized intersection. Buckland Hills Drive has a painted median on west side of the intersection. No further improvements are recommended at this time.
- Intersection with driveway to Target: This is a four legged signalized intersection with crosswalks marked on all the approaches. Buckland Hills Drive has six lanes

on each approach and drives to malls have five lanes. Both the drives have raised median. A pedestrian signal is also recommended at northwest corner of the intersection. It is recommended that bike lanes be provided on driveway to Target. These bike lanes will meander through parking lots to eventually meet Buckland Street.

- Right-in-right-out driveway to Buckland Hills Mall: The drive to the mall is only right in and right out. The driveway has a raised median. A marked crosswalk is recommended at this signal. Since this is not a signalized intersection, it is recommended that additional warning signs be provided to warn motorists about pedestrians crossing Buckland Hills Drive at this location.
- Intersection with driveway to Lazyboy: This is a three legged intersection. Only the outbound movement from the driveway is controlled by a stop sign. It is recommended that a crosswalk be provided on the west approach of the intersection. Since this is not a signalized intersection, it is recommended that additional warning signs be provided to warn motorists about pedestrians crossing Buckland Hills Drive at this location.
- Intersection with driveway to an apartment complex: This is a three legged intersection. Only the outbound movement from the driveway is controlled by a stop sign. It is recommended that a crosswalk be provided on the west approach of the intersection. Since this is not a signalized intersection, it is recommended that additional warning signs be provided to warn motorists about pedestrians crossing Buckland Hills Drive at this location.
- Intersection with Driveway to mall (east): This is a four legged signalized intersection. Buckland Hills Drive has six lanes on west approach and five lanes on east approach. Both north and south approaches have raised medians but lack crosswalks. It is recommended that crosswalks be provided on north and south approaches of the intersection.
- Intersection with driveway to Wal-Mart: This is a three legged intersection. Traffic movement out of driveway is controlled by a stop sign. There is a mixed use trail from Buckland Hills Drive to apartment complex just north of intersection. It is recommended that a crosswalk be provided on Buckland Hill Drive on east side of the intersection and a crosswalk on driveway. Since this is not a signalized intersection, it is recommended that additional warning signs be provided to warn motorists about pedestrians crossing Buckland Hills Drive at this location.
- Intersection with driveway to Best Buy: This is a three legged intersection and only the outbound movement is controlled by a stop sign. Additional signing to encourage pedestrians to use crosswalks at signalized intersection is recommended. Since there is a crosswalk about 100' away, it is recommended to not provide any crosswalk on Buckland Hills Drive at this location.
- Intersection with driveway to apartment complex: This is a three legged intersection and only the outbound movement is controlled by a stop sign. Since there is a pedestrian crosswalk already available at Slater Street Intersection, it is not advisable to provide crosswalks on Buckland Hills St at this location.

Additional signing to encourage pedestrians to use crosswalks at signalized intersection is recommended.

- Intersection with Slater Street: This is a four legged signalized intersection. Crosswalks and pedestrian signals are provided on all the approaches. It is recommended to check if the pedestrian signal timing is adequate enough or not.
- Intersection with driveway to Marshalls: This is a four legged signalized intersection. It is recommended that crosswalks be provided on north, east and west approaches.
- Intersection with driveway to Bed Bath & Beyond: This is three legged intersection. Only the outbound movement from the driveway is controlled by a stop sign. Currently pedestrian crosswalks are provided on north and east approaches. Since this is not a signalized intersection, it is recommended that additional warning signs be provided to warn motorists about pedestrians crossing Hale Road at this location.
- Intersection with driveway to Bernie's: This is a four legged signalized intersection. It is recommended that crosswalks be provided on the north, south and east approaches of this intersection.
- Intersection with service road to DSW Shoes: This is a three legged intersection. Only the outbound movement from service road is controlled by a stop sign. Currently a crosswalk is marked on service road. It is recommended that a crosswalk be provided on north approach of Hale Road. Since this is not a signalized intersection, it is recommended that additional warning signs be provided to warn motorists about pedestrians crossing Hale Road at this location.
- Intersection with driveway to Ethan Allen: This is a four legged intersection; controlled by stop signs on driveway. Hale Road has five lanes on each approach. It is recommended that a crosswalk be provided on south approach of the intersection. Since this is not a signalized intersection, it is recommended that additional warning signs be provided to warn motorists about pedestrians crossing Hale Road at this location.
- Intersection with Deming Street: This is a four legged signalized intersection. Both Deming Street and Hale Road have five lanes on each approach. It is recommended that crosswalks be provided on east and west approaches of the intersection.

3.2.8 Redstone Road

Redstone Road is a 2-lane minor collector street that runs east-west within the study area. Although, CRCOG has not identified this street as a part of bike network, this street has a potential to become a very important link of the shared use network and provide access to Buckland Hills Mall.

Existing Conditions

It has a continuous sidewalk on north and a partial sidewalk on south side. The following table summarizes availability of crosswalks at intersections along Redstone Road.

TABLE 3-12
AVAILABILITY OF CROSSWALKS AT INTERSECTIONS ALONG REDSTONE ROAD

		East	West	North
Redstone Road	Buckland Street	Yes	No	Yes
	Driveway to gas station	No	No	No
	Driveway to movie theater (West)	No	No	No
	Dogwood Lane	No	No	No
	Driveway to movie theater (East)	No	No	No
	Driveway to shopping center	No	No	Yes

Proposed Recommendations

Please see appendices B-29 to B-30 for graphical presentation of recommendations.

- Intersection with Buckland Street: Please see section 3.2.1
- Intersection with driveway to Showcase Cinema (west): This is a three legged, non signalized intersection. A crosswalk is recommended on the driveway.
- Intersection with Brentwood Drive: This is a three legged, non signalized intersection. It is recommended that crosswalks be provided on Brentwood Drive and Red Stone Road. Also, since this not a signalized intersection, it is recommended that additional warning signs be provided to warn motorists about pedestrians crossing Red Stone Road at this location.
- Intersection with driveway to Showcase Cinema (east): This is a three legged, non signalized intersection. A crosswalk is recommended on the driveway. Intersection with driveway to commercial complex: This is a three legged, non signalized intersection. A crosswalk is recommended on the driveway.

3.2.9 Slater Street

Slater Street is a 2-lane collector street that runs north-south within the study area. Slater Street connects Tolland Turnpike to Deming Street.

Existing Conditions

A portion of Slater Street between Hale Road and Deming Street is discontinuous. The street ends in a cul-de-sac at an apartment complex. A bituminous trail running north-south joins this cul-de-sac to other part of Slater Street that ultimately connects to Deming Street. The following table summarizes locations of sidewalks along this street.

TABLE 3-13
CONTINUITY OF SIDEWALKS ALONG SLATER STREET

From	To	# of lanes	Sidewalk	
			East	West
Tolland Turnpike	Catherines Way	2	Yes	No
Catherines Way	I-84 Bridge	2	No	Yes
I-84 Bridge	Buckland Hills Drive	2	Yes	Yes
Buckland Hills Drive	Cul-de-sac (south)	2	Yes	No
Cul-de-sac (south)	Cul-de-sac (north)	No	No	No
Cul-de-sac (north)	Deming Street	2	No	No
Deming Street	Oakland Road	2	No	No

It can be seen from the above table that Slater Street has sidewalk at least on one side along its stretch. The following table summarizes availability of crosswalks at intersections along Slater Street.

TABLE 3-14
AVAILABILITY OF CROSSWALKS AT INTERSECTIONS ALONG SLATER STREET

		East	West	North	South
Slater Street	Tolland Turnpike	No	No	No	No
	Catherines Way	No	No	Yes	No
	Driveway to Circuit City	No	No	No	No
	Hale Road	Yes	Yes	Yes	Yes
	Slater Street	No	No	No	No
	Oakland Road	No	No	No	No

Proposed Recommendations

CRCOG has identified a portion of Slater Street from Hale Road to Oakland Road as part of the on road bike network. It is recommended that exclusive bike lanes be provided on both side of the road from Tolland Turnpike to Oakland Road. Also, the current sidewalk is not continuously provided on any side. It is recommended to connect gaps in sidewalk locations so as to form a continuous passage throughout the stretch of the street. Please see appendices B-31 to B-32 for graphical presentation of recommendations.

- Intersection with Tolland Turnpike: This is a three legged all-way stop intersection. It is recommended that crosswalks be provided on all the approaches of this intersection. Since this is not a signalized intersection, it is recommended that additional warning signs be provided to warn motorists about pedestrians crossing Slater Street and Tolland Turnpike at this location.
- Intersection with Catherines Way: This is a three legged intersection. Only the outbound movement from Catherines Way is controlled by a stop sign. Also, since this is not a signalized intersection, it is recommended that additional

warning signs be provided to warn motorists about pedestrians crossing Slater Street at this location.

- Intersection with driveway to Best Buy: This is a four legged intersection. Only outbound movements from drives are controlled by stop signs. This intersection is always heavily congested because of high turning movements. Currently there are sidewalks on both the sides of Slater Street, but there is no crosswalk across the street. It is recommended that crosswalks be provided on south and north approaches of Slater Street. Also, since this is not a signalized intersection, it is recommended that additional warning signs be provided to warn motorists about pedestrians crossing Slater Street at this location.
- Intersection with Hale Road: This is a four legged signalized intersection. Crosswalks and pedestrian signals are provided on all the approaches. It is recommended to check if the pedestrian signal timing is adequate enough or not.
- Intersection with driveway to Marshalls: This is a four legged signalized intersection. It is recommended that crosswalks be provided on north, east and west approaches.
- Intersection with Deming Street: This is a four legged all-way stop intersection. It is recommended that crosswalks be provided on all the approaches of this intersection. Also, since this is not a signalized intersection, it is recommended that additional warning signs be provided to warn motorists about pedestrians crossing Slater Street at this location.
- Intersection with Oakland Road: This is a four legged signalized intersection. It is recommended that a crosswalk be provided on the south approach of the intersection.

3.2.10 Smith Street

Smith Street is a two-lane local residential street.

Existing Conditions

The cul-de-sac at the east end of Smith St is about 100’ west of Buckland Street. Smith Street being a residential street, it is not connected to Buckland Street, but there is an unofficial bike trail from Buckland Street to the cul-de-sac.

Proposed Conditions

It is anticipated that there must be relatively higher pedestrian and bike traffic on this street. Bike lanes and sidewalks would make this street more attractive for shared use. A number of warning signs on the road about presence of cyclists and pedestrians would make this street friendlier for shared use. Please see appendices B-33 to B-34 for graphical presentation of recommendations.

- Intersection with Clark Street: This is three legged intersection. Only the outbound movement from Smith Street is controlled by a stop sign. A crosswalk is

recommended on the south approach of intersection. Since this is a non signalized intersection, it is recommended that additional warning signs be provided to warn motorists about pedestrians crossing Clark Road at this location.

- Currently there is a crosswalk on north side of Smith Street from Austin Circle to Kebalo Lane. It is recommended that a sidewalk be provided from Clark Street to Austin Circle.
- Intersection with Misty Meadow Lane: This is a three legged intersection, with only the outbound movement from Misty Meadow Ln being controlled by a stop sign. It is recommended that a crosswalk be provided on the west approach of the intersection.
- Intersection with Austin Circle (east and west): This is a three legged intersection, with only the outbound movement from Austin Circle being controlled by a stop sign. It is recommended that a crosswalk be provided on the north approach of the intersection.
- Intersection with Wheeler Road/Kebalo Lane: This is a four legged all-way stop controlled intersection. It is recommended that a crosswalk be provided on the north approach of the intersection.
- Smith Street ends in a cul-de-sac just west of Buckland Street. It is recommended that a crosswalk be provided on the north side of Smith Street.

3.2.11 Tolland Turnpike

Tolland Turnpike is a major collector that runs east-west within the study area. The number of lanes varies from 2 to 4.

Existing Conditions

The following table summarizes locations of sidewalks along this street.

TABLE 3-15
CONTINUITY OF SIDEWALKS ALONG TOLLAND TURNPIKE

From	To	# of lanes	Sidewalk	
			North	South
I-291	I-84	4	No	No
I-84	Buckland Street	4	Yes	No
Buckland Street	Allied Way	4	Yes	Yes
Allied Way	John Olds Drive	2	Yes	No
John Olds Drive	Slater Street	2	Partial	No
Slater Street	Union Street	2	Yes	No
Union Street	Lisa Drive	2	No	Partial
Lisa Drive	Donahue Lane	2	No	Partial
Donahue Lane	Deming Street	2	No	Yes

Based on the information obtained from CRCOG, Tolland Turnpike is a part of proposed bicycle network and thus a shared use facility. There is no separate bike lane marked on

Tolland Turnpike. The existing mixed use trail extends for about 200 feet west of intersection of Tolland Turnpike and Buckland Street. The table also indicates that sidewalks are not continuous along the street. The following table summarizes availability of crosswalks at intersections along Tolland Turnpike.

TABLE 3-16
AVAILABILITY OF CROSSWALKS AT INTERSECTIONS ALONG TOLLAND TURNPIKE

		East	West	North	South
Tolland Turnpike	Chapel Road	Yes	Yes	Yes	N/A
	JC Penny Center	No	Yes	No	N/A
	Driveway to McDonalds	No	Yes	No	N/A
	Buckland Street	Yes	No	Yes	No
	Allied Way	No	Yes	No	Yes
	John Olds Drive	No	No	No	N/A
	Slater Street	No	No	No	N/A
	Union Street	Yes	No	No	No
	Jefferson Street	No	No	No	No
	Donahue Lane (East)	Yes	No	No	No
	Deming Street	No	No	No	Yes

It can be seen from the above table that not all the intersections have crosswalks marked on all the approaches.

Proposed Recommendations

Since CRCOG has identified Tolland Turnpike as shared use facility, a provision of exclusive bike lane in each direction is recommended. A continuous sidewalk, at least one side of the road, is also recommended. Please see appendices B-35 to B-40 for graphical presentation of recommendations.

- Intersection with Chapel Road: This is three legged signalized intersection. An existing bike trail crosses Tolland Turnpike at Chapel Road. This is the only intersection that has crosswalks marked on all of its approaches. A pedestrian crossing signals is also provided at this intersection. Since this intersection is used by bicyclists very often to cross Tolland Turnpike, it is recommended that pedestrian signals be checked if they function properly, and if the timing is adequate enough for safely crossing the intersection, etc.
- One of the comments received from website feedback was about poor design of rail road crossings. The pavement at railroad crossing need to be reconstructed to make sure that all the users, especially bikers, can cross the rails without any safety concerns.
- Intersection with JC Penny logistic center: This is a three legged signalized intersection. It is recommended that crosswalks be provided on east and north approaches.

- Intersection with driveway to McDonalds: This is a three legged signalized intersection. There is a bus stop at southwest corner of the intersection. It is recommended that crosswalks be provided on north approach is recommended at this intersection.
- Intersection with Buckland Street: This is four legged signalized intersection. Each approach has six lanes and a raised median that serves as a refuge for pedestrians trying to cross the intersection. Also, pedestrian signals are provided at each approach. However, crosswalks are not provided on west and south approaches. It is recommended that crosswalks be provided on west and south approaches.
- Intersection with Allied Way: This is four legged signalized intersection. There are quite a few shopping centers and homes around this intersection. It is recommended to check if the timing of pedestrian signals is adequate or not.
- As the portion of Tolland Turnpike from Allied Way to Deming Street is not a part bike network, it is recommended that wide shoulders be provided for this stretch of the road.
- Intersection with Dogwood Lane: This is a three legged intersection. Only the outbound movement from Dogwood Lane is controlled by a stop sign. It is recommended to provide a crosswalk on north approach of the intersection.
- Intersection with driveway to Vintage Oak Apartments (north and south): This is a three legged intersection. Only the outbound movement from driveway is controlled by a stop sign. It is recommended that crosswalks be provided on the north approach of the intersection.
- Intersection with John Olds Drive: This is a three legged intersection. Only the outbound movement from John Olds Drive is controlled by a stop sign. It is recommended that crosswalks be provided on John Olds Drive and west approach of Tolland Turnpike. Since this is not a signalized intersection, it is recommended that additional warning signs be provided to warn motorists about pedestrians crossing Tolland Turnpike at this location.
- Intersection with Slater Street: This is a three legged all-way stop intersection. It is recommended that crosswalks be provided on all the approaches of this intersection. Since this is not a signalized intersection, it is recommended that additional warning signs be provided to warn motorists about pedestrians crossing Tolland Turnpike at this location.
- Intersection with Union Street/Jeffery Alan Drive: This is a four legged all-way stop intersection. It is recommended that crosswalks be provided on the north, south and west approaches of the intersection. Since this is not a signalized intersection, it is recommended that additional warning signs be provided to warn motorists about pedestrians crossing Tolland Turnpike at this location.
- Intersection with Jefferson Street: This is a four legged two-way stop intersection. It is recommended that crosswalks be provided on the south and west approaches of the intersection. Since this is not a signalized intersection, it is recommended that additional warning signs be provided to warn motorists about pedestrians crossing Tolland Turnpike at this location.

- Intersection with Donahue Lane: This is a four legged two-way stop intersection. East approach of the intersection has a crosswalk already in place, so a crosswalk is recommended on the south approach. Since this is not a signalized intersection, it is recommended that additional warning signs be provided to warn motorists about pedestrians crossing Tolland Turnpike at this location.
- Intersection with Deming Street: This is a three legged signalized intersection. It is also one of the busiest intersections in the area. It is recommended that crosswalks be provided on the west and south approaches. Also, provision of pedestrian crossing signals is recommended at this intersection.

3.2.12 Wheeler Road

Wheeler Road is a two-lane minor collector. It connects Pleasant Valley Road on the south and Smith Street on the north. This street mainly caters to residential areas that are along its alignment.

Existing Conditions

The following table summarizes locations of sidewalks along this street.

TABLE 3-17
CONTINUITY OF SIDEWALKS ALONG WHEELER ROAD

From	To	# of lanes	Sidewalk	
			East	West
Pleasant Valley Road	Smith Street	2	No	No

The following table summarizes availability of crosswalks at intersections along Wheeler Road.

TABLE 3-18
AVAILABILITY OF CROSSWALKS AT INTERSECTIONS ALONG WHEELER ROAD

		East	West	North	South
Wheeler Road	Pleasant Valley Road	No	No	No	N/A
	Smith Street	No	No	No	No

Proposed Conditions

Please see appendix B-41 for graphical presentation of recommendations.

- Intersection with Pleasant Valley Road: Please see section 3.2.7
- It is recommended to provide wide shoulders on both the sides of the street from Pleasant Valley Road to Smith Street.
- Intersection with Smith Street: Please see section 3.2.10

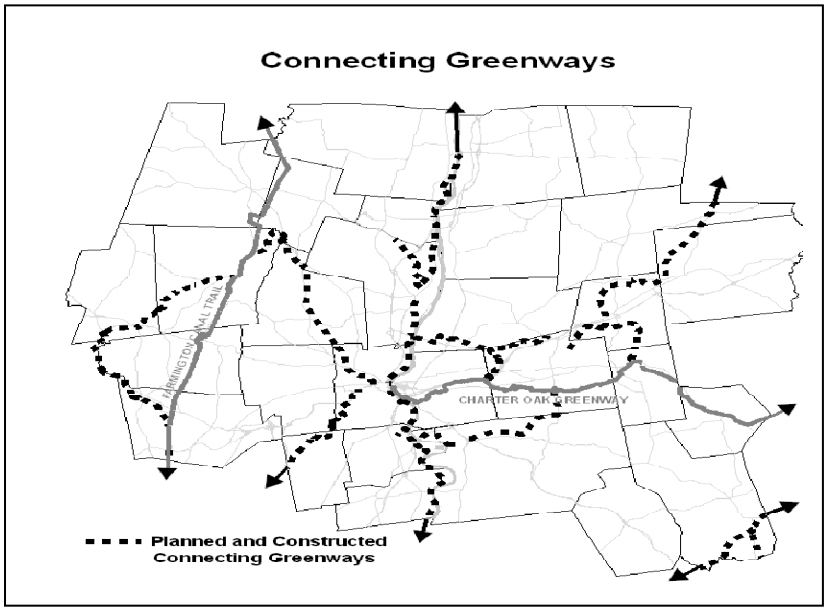
3.3 Bicycle and Pedestrian Facilities Plan

The above discussion focused mainly on how streets and intersections can be made friendlier for shared use. The following discussion focuses on a number of options to improve connectivity and circulation of bike and pedestrian facilities.

3.3.1 Improving Connectivity and Circulation of Shared Use Facilities

CRCOG has mapped existing and potential bike trails in the entire region. These trails are currently used for recreational as well as commuting purposes.

FIGURE 3-1 CONNECTING GREENWAYS



http://www.crcog.org/publications/TransportationDocs/RTP2007/4-Bikes_Peds.pdf

As shown above, the Charter Oak Greenway, partially completed, from Hartford to Providence, RI and the Farmington Canal Trail from New Haven to Northampton, MA are two primary greenways or multiuse shared trail systems identified as interregional greenways which, once linked, will become part of the planned East Coast Greenway that will eventually connect Maine to Florida. CRCOG has proposed to develop/build a secondary set of trails that link to the primary trails and serve significant sub-areas of the region. Once all the streets in the study area are upgraded to share use facilities, the network of bike paths will greatly increase connectivity within the study region and will improve accessibility of these primary trails from study area.

During one of the meetings, an idea was proposed to locate bike trails on top of existing sewer lines. More data is needed to determine feasibility of this idea.

3.3.2 Pedestrian Facilites Guidelines

Various institutions like ITE, AASHTO, and ASCE have done significant research on making streets safer for pedestrian use. It is reasonable to assume that pedestrians will try to avoid a facility that they feel is unfriendly and/or unsafe in favor of one they perceive to be safe and attractive.

The following are some of guidelines obtained from MUTCD, ITE's 'Alternative Treatments for At-Grade Pedestrian Crossings', CRCOG's 'Regional Pedestrian Plan', CALTRANS's 'Pedestrian and Bicycle Facilities in California', AASHTO Green Book and SCRCOG's 'Bicycle and Pedestrian Plan'.

- Sidewalks and walkways enhance pedestrian safety and mobility.
- All sidewalks and pedestrian facilities should be built in accordance with the American with Disabilities Act (ADA) requirements.
- Marked crosswalks alone do not necessarily increase pedestrian safety. Other measures may be needed:

    - Medians to provide a pedestrian refuge.
    - Proper illumination of the crosswalk to ensure that the pedestrian is safe at night.
    - Signs, signals, etc that alert motorists about impending pedestrian crossing.
    - In-Roadway Warning Lights are special flashing lights installed on the roadway surface to enhance driver awareness at uncontrolled pedestrian crossings. This is a new concept and used as a supplement to the standard signing and it has a great safety potential since it fulfills the need, commands attention and gives adequate time for an appropriate response by the driver.

- As per MUTCD guidelines, traffic control signals may be installed based on pedestrian needs according to the following criteria:

    - Signalized intersections with substantial pedestrian volumes.
    - There are less than 60 gaps per hour in the major street traffic.
    - Nearest traffic signal is more than 100 meters away.
    - A new traffic signal will not seriously disrupt progressive traffic flow in the major street.
    - Traffic gaps do not provide sufficient time to cross the street.
    - Where blocks are long and controlled intersections are spaced far apart, mid-block marked crosswalks may be appropriate.

- Shorter crossing distances are safer. Provision of a raised median/ island can serve the dual purpose of channelizing traffic and serving as refuge for crossing pedestrians.

- Raised crosswalks and raised intersections slow traffic enabling motorists more reaction time when they see pedestrians at the crosswalk.
- Midblock pedestrian crossings are generally unexpected by the motorist and should be discouraged unless, in the opinion of the engineer, there is strong justification in favor of such installation.
- Skewed intersections are generally undesirable for all the roadway users.
- Modern roundabouts are known to reduce traffic speed and simplify pedestrian crossings.
- Increase illumination at intersections/ midblock crossings to increase visibility of pedestrians.
- Pedestrian signals:

    - Exclusive pedestrian signals are effective only if more than 1200 pedestrians are crossing that particular intersection per day.
    - Where pedestrian traffic is regular and frequent, concurrent pedestrian phases should come up automatically.
    - A pedestrian interval countdown display helps pedestrian make an informed decision.
    - Adjust the signal timing to accommodate the average walking speeds of anticipated intersection users. MUTCD standard identifies a normal walking speed as 4 ft/s. However, research has shown that older pedestrians cross more slowly than younger pedestrians, approximately 2.8 ft/s. Some cities like San Francisco have started using 2.8 ft/s walking speed and they try to use 2.5 ft/s where feasible.
    - Signal heads should be visible to pedestrians, too.

3.3.3 Bicycle Facilities Design Guidelines

The design of bicycle facilities is different from that of pedestrian facilities mainly because bikers have varying levels of expertise. AASHTO Guide for Development of Bicycle Facilities classifies cyclists in three categories:

1. **A**dvanced riders are skilled riders. They ride for convenience and speed and prefer to have a direct access to destinations. They are familiar with all the traffic laws and comfortable riding on the road.
2. **B**asic riders know how to ride the bike well but are more comfortable riding on shared use paths, neighborhood streets, etc. They prefer to stay away from the streets carrying heavy traffic.
3. **C**hildren riding on their own are generally not familiar with traffic rules and may have limited bike riding skills. Low speed neighborhood streets, shared use paths with well defined markings can accommodate children without encouraging them to ride in the travel lane of busy streets.

Since Buckland Hills Mall area is a well known shopping attraction, large number of people visit this area and obviously they come with different levels of bike riding skills,

varying familiarity with the region and may have different objectives of visiting the area. So, in a nutshell, the bike facilities should be designed to cater to the needs of all the kinds of users.

- Typical layout of bike lanes: A number of public agencies and interest groups have done significant research on the design features related to bike lanes. This study recommends using the following roadway dimensions wherever bike lanes are proposed.

    - Width of through lanes: 10'
    - Width of bike lanes:5'
    - Width of parallel curbside parking stalls:7'

  Please see Appendix C for the design guidelines of the City of Chicago.
- Traffic Control for Bicycle Facilities: The Manual on Uniform Traffic Control Devices (MUTCD) contains a whole chapter on this subject. Further details can be found by visiting the website- http://mutcd.fhwa.dot.gov/HTM/2003/part9/part9-toc.htm.
- Bike Parking Facilities: Even if appropriate bike lanes are provided for cyclists to ride on, they may not be able to exploit that facility to the fullest level if appropriate bike parking facilities are not in place. As per Portland Bicycle Plan, some of the essential requirements of bike parking facilites are as below.

    - Close to destination: A short term parking facility should be within 50' of a main entrance to the building. Close proximity to a main entrance is desirable for long term parking but not required.
    - Easily Accessible: Bicycle parking facility should not be impeded by nearby stationary objects, cars, etc. Directional signs should be used to locate bicycle parking areas when it is not visible from the street.
    - Plentiful: There should be enough parking facilities even to meet peak demand.
    - Secure and coverd: It is very important that the parking facility should be safe and prefarably covered.

  The following Figure 3-2 shows a picture of weather protected bike parking facility.

FIGURE 3-2 WEATHER PROTECTED BIKE SHELTER

Source: Bike Parking Brochure, The City of Cambridge, MA

Please see Appendix B-0 for the proposed locations of bike parking facilities.

- Bike Stations: It is a good idea to make available bikes on rental basis for the visitors who arrive in cars or buses. An attended facility that can provide bike parking, bike rentals, spare parts, etc is likely to boost bike ridership in the region. Ideal location for such bike stations is typically major transit locations. Please see Appendix B-0 for the most suitable location of bike station. More information on bike stations can be obtained by visiting the web site www.bikestation.org
- Exclusive on-street bike lanes: Use of bicycles on sidewalks should be discouraged because it might result in crashes and injuries to both bicyclists and pedestrians. Exclusive bike lanes encourage bicyclists to use street as opposed to sidewalks. As per Chicago Bike Lane Design Guide, exclusive bike lanes have following benefits:

    1. Bike lanes do not cause traffic jams. Bike lanes are only 5' wide- not enough to carry a motor vehicle. When some drivers prefer to ride bike instead of car, there is a reduction in the number of cars on the road, and it actually alleviates the congestion.
    2. Bike lanes are known to reduce the speed of the traffic by about 5 mph. However, slower speeds means the traffic is more organized and streamlined. So, generally overall travel time remains the same.
    3. Bike lanes do not eat away on-street parking. The bike lane is striped between parking lane and motor vehicle travel lane.

- On-street parking: Parked vehicles can pose a serious hazard to bicyclists. So, bicyclists tend to shy away from parked vehicles, even if that means travelling in a travel lane. As per ITE's Innovative Bicycle Treatments: An Informational

Report, several techniques are available to help maximize the separation between bicyclist and parked vehicle:

- Minimize the parking lane width and widening the bike lane width. Some research suggests that narrower the parking lane, the closer vehicles park to the curb. The traditional 8' wide parking lane can be reduced to 7' to achieve the result.
- Angled parking should be avoided in the areas of high bike traffic.
- Marked parking spaces indicating the parking lane limits may help guide drivers to park closer to the curb.

- Integration with transit mode: Integration of bike paths with transit mode helps in realizing the full potential of the facility. As per CALTRANS Bike Ped Design Guide, transit enables the bicyclists to take longer trips, bicycle access enlarges transit's catchment area, transit enables bicyclists to pass through topographical barriers and bicyclists can increase transit ridership during surplus capacity periods such weekends, holidays, etc. Desirable bike-friendly design features to improve bicycle access to transit mode include:

  - Clearly visible signage for bicycle routes, parking facilities and bus stops serving bicyclists.
  - Bicycle compatible roads or bicycle lanes on station access roads.
  - Bicycle routes through park & ride lots.
  - Bicycle paths from neighboring communities that are shorter than roadways.
  - Adequate lighting.
  - Establishment of bike stations and other advanced secure bicycle storage facilities at transit stations and park & ride lots.

- A variety of additional material on bike lane design and planning is available on-line. For example:

  - City of San Francisco, California
    http://sfgov.org/bac/anlreport1001.htm
    www.sfbike.org/campaigns/bicycle_network
  - City of Cambridge, Massachusetts
    http://www.ci.cambridge.ma.us/~CDD/envirotrans/bicycle/lanes/bikelane-toc.html
  - City of Philadelphia, Pennsylvania
    http://www.phila.gov/streets/the_bicycle_network.html
  - City of Portland, Oregon
    http://www.trans.ci.portland.or.us/plans/bicyclemasterplan/default.htm
  - Oregon Department of Transportation
    http://www.odot.state.or.us/techserv/bikewalk/index.htm

- Florida Department of Transportation
  http://www11.myflorida.com/safety/ped_bike/handbooks_and_research/bhchpt4.pdf
- Pedestrian and Bicycle Information Center
  www.bicyclinginfo.org
- Association of Pedestrian and Bicycle Professionals
  www.apbp.org
- Institute of Transportation Engineers
  www.ite.org
- Corvallis, Oregon
  http://www.ci.corvallis.or.us/pw/transport/bikeped.html

3.3.4 Frequently Asked Questions

The following discusstion on frequently asked questions is obtained from the Chicago Bike Lane Design Guide.

What is a bike lane and who is permitted to use them?

Bicycle-or bike-lanes are marked lanes in the public right-of-way that are for use by bicyclists. Bike lanes are usually striped with a 6" stripe separating the bike lane from the vehicle travel lane, and a 4" stripe separating the bike lane from the parking lane. If there is no on-street parking, then the bike lane is against the curb and no 4"stripe is necessary. Bike lanes are marked with a bike symbol and arrow indicating the direction of travel. Motorists are not allowed to travel or park in the bike lanes and are subject to a fine if they do so. They are allowed to cross the lanes when turning or when entering or exiting a legal parking space.

Can bicyclists still use the roadway where there is a bike lane?

Cyclists are still permitted to travel in the regular vehicle travel lanes even when a bike lane is present. When making a left turn, a bicyclist is expected to make the turn from the left lane and not the bike lane. Cyclists should signal and make sure it is clear before moving into the vehicle travel lane. Motorists should always be aware that cyclists may merge to avoid an obstacle in the bicycle lane or may need to move to the appropriate lane to make a left hand turn.

This street seems too narrow for a bike lane?

There is limited space on most streets in most urban areas in the US. Transportation agencies must work with their transit partners and local community groups to develop a design standard that safely accommodates cars, bikes, and buses on streets as narrow as 44' wide. The City of Chicago, for instance, has determined that bicycle lanes work well on 44' wide streets. If the street is less than 44' wide, even if it is a good street for bicycling, the street is too narrow to stripe bike lanes. On those streets narrower than 44' wide that are recommended for bicycle travel, most agencies will post special signs that

indicate the street is a designated bike route, but would not use any pavement markings.

Why put bicyclists on the street; why not on sidewalks or bikepaths?

Sidewalks are for pedestrians. Bicycle use on sidewalks with high numbers of pedestrians results in crashes and injuries for both bicyclists and pedestrians. In most cases, the street is the safest place for bicyclists to ride in the city. National studies have shown that riding on the sidewalk (and especially when riding against traffic in the wrong direction) is a significant contributor to car/bike collisions because the motorist is not looking for a relatively fast moving vehicle on the sidewalk. Bicycles are legal vehicles and bicyclists have the same rights and responsibilities as motorists when traveling on the street. Many cities prohibit persons 12 years and older from riding on the sidewalk unless it is specifically posted for bicycle use. Bicycle paths (trails or shared use paths) are good facilities for some trips, but have limited usefulness for most trips throughout the city. Bike lanes encourage bicyclists to use the street as opposed to the sidewalk, which eases congestion and improves safety on the sidewalks. Streets by their very nature serve the bicyclist in the same way they serve every other user: they get people where they want to go. The street system is already in place and streets provide access to virtually all destinations: homes, businesses, shops, schools, churches, parks, etc. There is not enough space or money to create separated bike paths all over the city.

Why are bike lanes usually on the arterial streets? Why not put more lanes on the side streets.

Several criteria are used when determining which streets to put bike lanes on: Direct streets, streets with relatively low traffic speeds and volumes, and streets that have controlled (stop signs or stop lights) intersections. Quieter residential or side streets are great streets to ride on but can be dangerous when they cross big streets that do not have a controlled intersection and they therefore are not good candidates for bike lanes. Arterial streets offer directness and access to most destinations; therefore they are popular choices for getting around. Bike lanes on arterial streets offer cyclists the assistance they need when in busier conditions.

There is too much traffic on the street to establish a bike lane.

Bicycle lanes have been successfully implemented on streets with upwards of 30,000 vehicles per day.

What happens to the car parking?

In many cases, on-street parking is not affected by installing bike lanes. The bike lane is striped between the parking lane and the motor vehicle travel lane. In some isolated instances, one or two parking spaces may be lost near an intersection to provide proper alignment and sight distances.

Will the bike lane cause traffic jams?

Traffic jams result from too many cars trying to use the same space on streets. Bike lanes use only 5 feet of lane space—not enough to carry a motor vehicle. And bikes are twenty times as space-efficient as autos. Bike lanes can actually alleviate congestion. When some drivers choose to bike instead of drive, additional road space is freed up and everybody wins.

Will bike lanes slow down traffic?

Bike lanes have been shown to reduce the speeds of motor vehicles in adjacent lanes by about 5 miles per hour. This usually benefits most urban streets because they work best when cars are traveling between 25 and 35 miles per hour. Overall travel times on streets with bike lanes usually remain the same. Bike lanes help to calm and organize the traffic. That means fewer accidents. That's because bike lanes help create a buffer zone at the edge of the traffic lane. This buffer improves safety for people entering or exiting their parked cars and makes it easier for drivers to see children about to enter the roadway—giving them more time to react.

What happens at the intersections?

At intersection approaches, the bike lane striping is usually dashed to indicate that motorists may be entering and crossing the bike lane to make a right hand turn. There are pavement markings and signs to indicate this. Where there is not adequate width to stripe the bike lane up to the intersection approach, the curbside lane should be signed as a shared-use lane. In some cases use of the shared-use lane is restricted to buses, bikes and right turns.

Would it be possible to include some assistance for the cyclists through the big intersections, like the six-way intersections?

Generally, in the U.S., pavement markings are not continued through an intersection because they are difficult to maintain. There may be some intersections where high levels of bike use and safety issues would warrant consideration of marking the bike lane through the intersection.

Is the bike lane necessary?

Arterial streets are very popular streets for bicycling because of the mix of commercial, residential and institutional land uses they serve. Small segments of bike lane can provide an opportunity for someone to ride their bike when they might otherwise not.

How long will the bike lane markings last?

Some bike lanes are striped using paint. Paint is not permanent and typically lasts two years. Some bike lanes are striped using Thermoplastic. Thermoplastic lasts longer, about three to five years.

Will the bike lane affect traffic on the street?

No significant impact on traffic operation is anticipated. Bike lanes encourage the safe interaction of bicycles and motor vehicles and can discourage dangerous traffic movements such as weaving and passing on the right. In addition to making the road safer for all current users, studies show that bike lanes can reduce traffic congestion by encouraging people to bicycle instead of drive. Much of the funding for Chicago's bike lane program, for example, is funded through Federal grants to reduce congestion.

What about bus stops, what happens to cyclists there?

Before the intersection, where most bus stops are located, the bike lane is dashed to indicate that the bus can pull across the bike lane and to notify the cyclist that buses will be pulling over. Bikes and buses have to merge just like the buses do with motor vehicle traffic. When a bus is at the bus stop the cyclist should either wait behind the bus or pass on the left. The cyclist should not pass the bus on the right because they would run into people getting off the bus.

Is it a concern that the bike lane does not connect to other bike lanes?

Even if a bike lane won't take you all the way to your final destination, a segment of bike lane will make your trip safer and more enjoyable. Most bike trips in the city involve using a combination of streets with bike lanes and streets without bike lanes. Studies indicate that a little assistance is a big factor in encouraging people to bicycle.

Why doesn't the proposed bike lane continue the whole distance of the street?

There might be sections of the street that are less than 44' wide. Those sections are not wide enough to stripe a bike lane, so they will be signed with bike route signs. Bike lanes are provided where possible.

A bike lane is great but how do you get to the bike lanes?

Bicyclists ride normally in traffic on streets that link to bike lanes. Residential streets are great for getting to and from the bike lane. Most people learn quickly which streets work best for bike riding in their own neighborhood. Many cities provide bike maps and safety information on how to ride safely on streets with and without bike lanes.

Why not make some of the one-way streets, two-way for cyclists?

An increasing number of cities (Chicago, Minneapolis, Portland etc) have streets that are one-way for cars but have been modified to permit two-way bicycle use. When designing these special situations, care must be taken to make sure both cyclists and motorists know where they should operate and what traffic to expect along the street and at intersections.

Bike lanes give a false sense of security. Cars pass in the bike lane, they park in the bike lane, where is the enforcement for automobiles?

On most streets with consistent on-street parking, using the bike lane illegally as a passing lane is not a problem. It becomes a problem when there are longer stretches with an empty parking lane. Double parking is a barrier bicyclists face with or without a bike lane. Communities need to work with their local police districts to enforce safe and proper use of the bike lanes.

Why not put the bike lane on the inside of the parked cars?

Putting the bike lane on the curbside of the parked cars does not work very well for two reasons. 1) It causes crashes at intersections and driveways because the motorist is not expecting bikes to emerge from behind parked cars. If the cyclist is moving next to motor traffic, then they have a greater chance of being seen. 2) If the cyclist is riding between the parked car and the curb and there is debris in the road or someone loading their car, then they have no place to move to. With the bike lane on the outside of the parked cars, if the cyclist has to avoid an obstacle, then they can safely merge with traffic and then move back into the bike lane.

How do you get cyclists to obey the laws? I never see cyclists stop at stop signs.

All groups (motorists, cyclists, and pedestrians) are human beings and they don't always obey the laws. If you were to go out to a stop sign at any location you would see all of these user groups not behaving correctly. Enforcement needs to be reasonable, design needs to be good, and users need to be educated. It seems that when you add a bike lane it gives cyclists permission to ignore traffic lights and stop signs. Actually the opposite is true. National studies have shown that bike lanes influence positive behavior and improve safety. Well designed facilities encourage proper behavior and decrease the likelihood of crashes. Bike lanes have also been shown to discourage riding on the sidewalk, which is illegal and hazardous for adult bicyclists.

"Bike lanes are not going to solve all the problems on the road. We think that bike lanes can make the street a safer place for both the motorist and the cyclist alike, it is a win/win situation."
—Lissa Morgan, former Chicago Bike Program consultant

3.3.5 Additional Recommendations

As a part of this study, we hosted workshops and advisory committee meetings to fine tune the deisgn of bike/pedestrian facilities. Some of the key recommendations that resulted from these meeting are as follows:

- Education is key to the success of improving public safety and optimizing how people use the infrastructure to expedite traffic flow. Traffic enforcement officers could be trained to be familiarized with bicycling movements in traffic to understand how new infrastructure should be used by cars and cyclists.

- The Buckland Hills Mall area spans two municipalities namely South windsor and Manchester. Currently both the municipalities have their own codes related to bike movement. It would be much easier for both motorists and cyclists if there is just one uniform code in place.
- While the provision of motions sensors/HAWK signals is being tested elsewehere in the country, this study does not specify or prohibit application of any particular technology. Midblock crosswalks are recommended at various locations in this study area and any of these sites can be used as a test site if the local government desires to.
- A map of bike routes and bicycle parking facilities would encourage more people to use the service; public-private partnerships could exist with bicycle parking facilities on the premises of developers.

Appendix A
References Cited

Literature

American Association of State and Highway Transportation Officials (AASHTO), 1999. *Guide for the Development of Bicycle Facilities*

AASHTO 2004. *Policy on Geometric Design of Highways and Streets*

AASHTO, 2004. *AASHTO Guide the Planning, Design, and Operations of Pedestrian Facilities*

Linda **Bailey** (2007), *Public Transportation and Petroleum Savings in the U.S.: Reducing Dependence on Oil*, ICF International for the American Public Transportation Association

John **Boroski**, Topaz Faulkner, B. Arrington, Stuart Mori, Terry Parker, and Daniel Mayer (2002), *Parking and TOD: Challenges and Opportunities (Special Report); California Statewide Transit-Oriented Development Study: Factors for Success in California*, Business, Transportation and Housing Agency, CalTrans

CBF (2001), *Building Healthier Neighborhoods with Metrorail: Rethinking Parking Policies*, Chesapeake Bay Foundation

California Department of Transportation, July 2005. *Pedestrian and bicycle Facilities in California: A technical Reference and Technology Transfer Synthesis for Caltrans Planners and Engineers.*

Capitol Region Council of Governments (CRCOG), 2005. *Walking Matters: Regional Pedestrian Plan*

CRCOG, 2003. *Walkable Communities Workshop findings*

Robert **Cervero**, et al (2004), *Transit-Oriented Development in the United States: Experience, Challenges, and Prospects*, TCRP Report 102, Transit Cooperative Research Program, Transportation Research Board

Chicago Bike Lane Design Guide, 2002

Connecticut Department of Transportation. *Connecticut Statewide Bicycle and Pedestrian Transportation Plan*

Federal Highway Administration (FHWA) 2008. *Designing Sidewalks and Trails for Access: Best Practices Design Guide (Part II)*

John D. **Hunt** and JDP McMillan (1998), *A Stated Preference Examination of Attitudes Towards Carpooling to Work in Calgary*, Transportation Research Board Annual Meeting

Institute of Transportation Engineers (ITE) 2001. *Alternative Treatments for At-Grade Pedestrian Crossings.*

ITE, 2002. *Innovative Bicycle Treatments: An Informational Report*

Manual on Uniform Traffic Control Devices (MUTCD) 2003

MUTCD, 2003 California Supplement, 2004. *Chapter 4L: In-Roadway Lights*

Marya **Morris** (1996), *Creating Transit-Supportive Land-Use Regulations*, Planning Advisory Service Report No. 468, American Planning Association

National Center for Bicycling and Walking, 2003. *Pedestrian Facilities Reference Guide: Intersections*

Oregon Department of Transportation, 1995. *Oregon Bicycle and Pedestrian Plan*

Pollution Probe 2001. *Trip Reduction Manual.*

Portland Office of Transportation, 1996. *Portland Bicycle Plan: End-of-trip Facilities*

South Central Regional Council of Governors (SCRCOG), 2007. *South Central Regional Bicycle and Pedestrian Plan*

Victoria Policy Transport Institute, 2008. *TDM Encyclopedia*

Richard **Voith** (1998), "The Downtown Parking Syndrome: Does Curing the Illness Kill the Patient?" *Business Review*, Vol. 1

Washington State Department of Transportation, 1997. *Pedestrian Facilities Guidebook: Incorporating Pedestrians Into Washington's Transportation System*

Websites

http://www.wecyclect.org

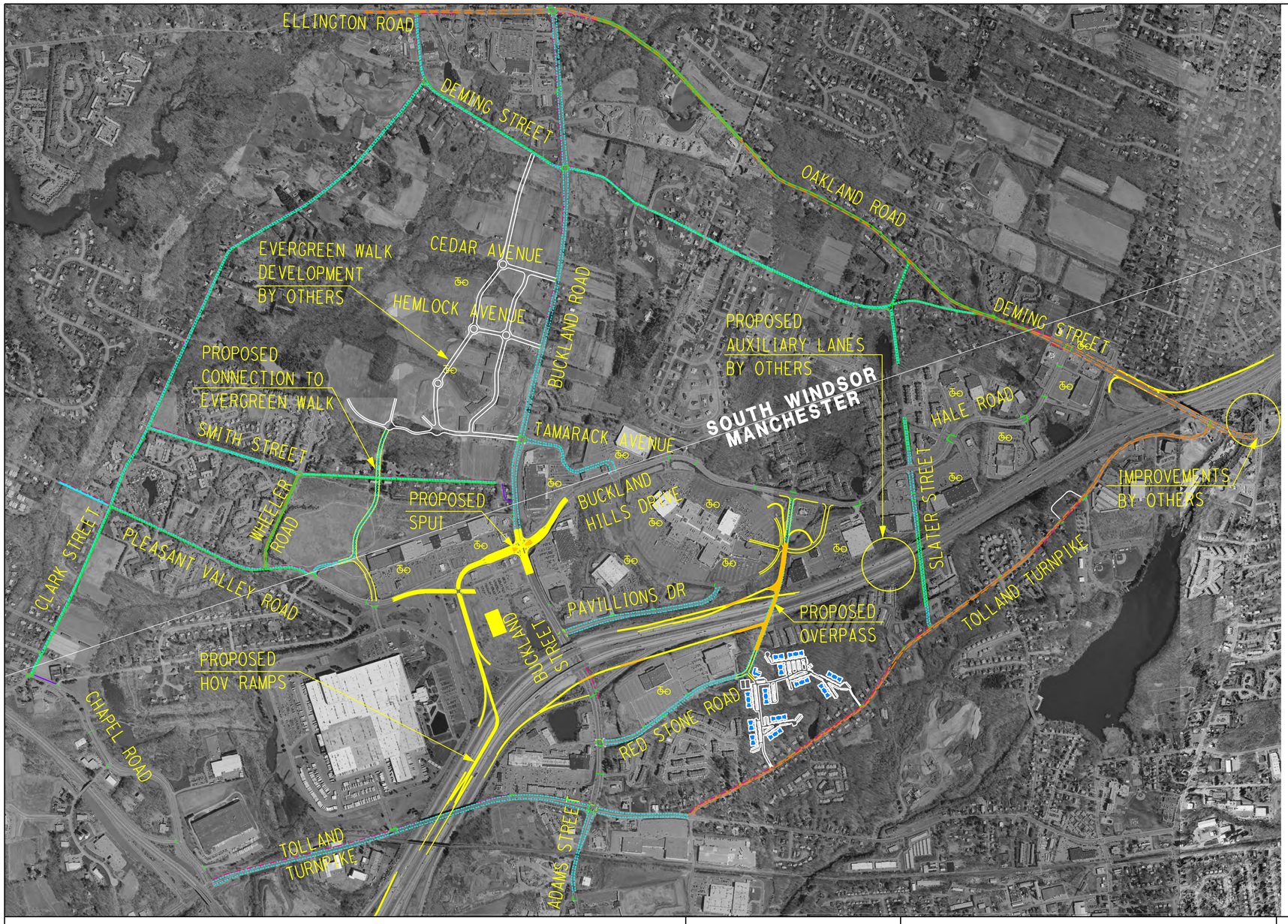
http://www.bikestation.org

http://www.completestreets.org

http://www.bicyclinginfo.org

http://www.abag.ca.gov

Appendix B
Exhibits of Bicycle and Pedestrian Facilities



- PROPOSED TRANSIT CENTER AND BIKE STATION
- PROPOSED BIKE PARKING FACILITIES

BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHLDR WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED ROADWAY WIDENING

KEY MAP

SHEET NO. B-0

BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED ROADWAY WIDENING

BUCKLAND ST

SHEET NO. B-1

BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

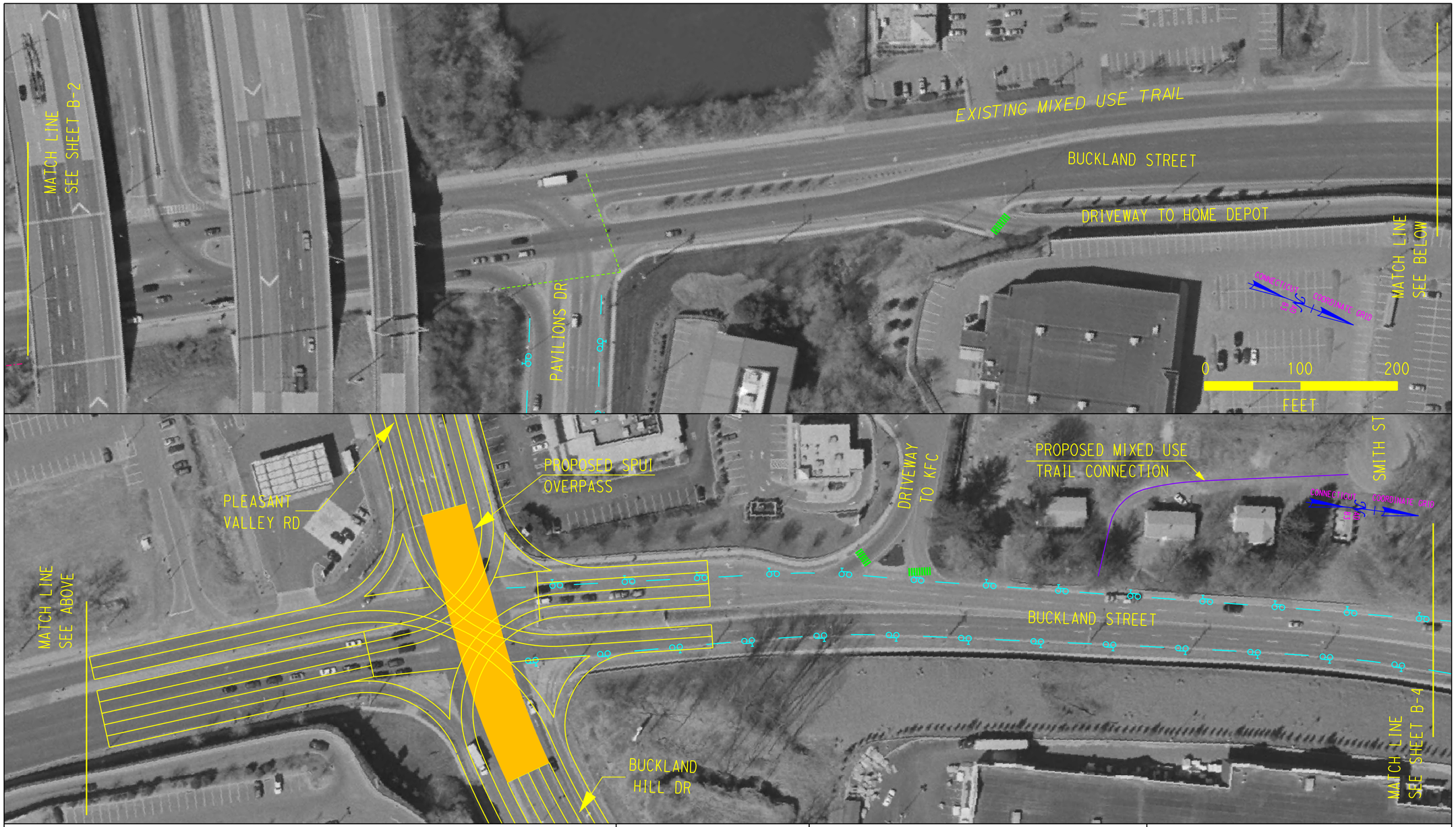
DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED ROADWAY WIDENING

BUCKLAND STREET

SHEET NO. B-2



BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED ROADWAY WIDENING

BUCKLAND STREET

SHEET NO. B-3

BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED ROADWAY WIDENING

BUCKLAND ROAD

SHEET NO. B-4

BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

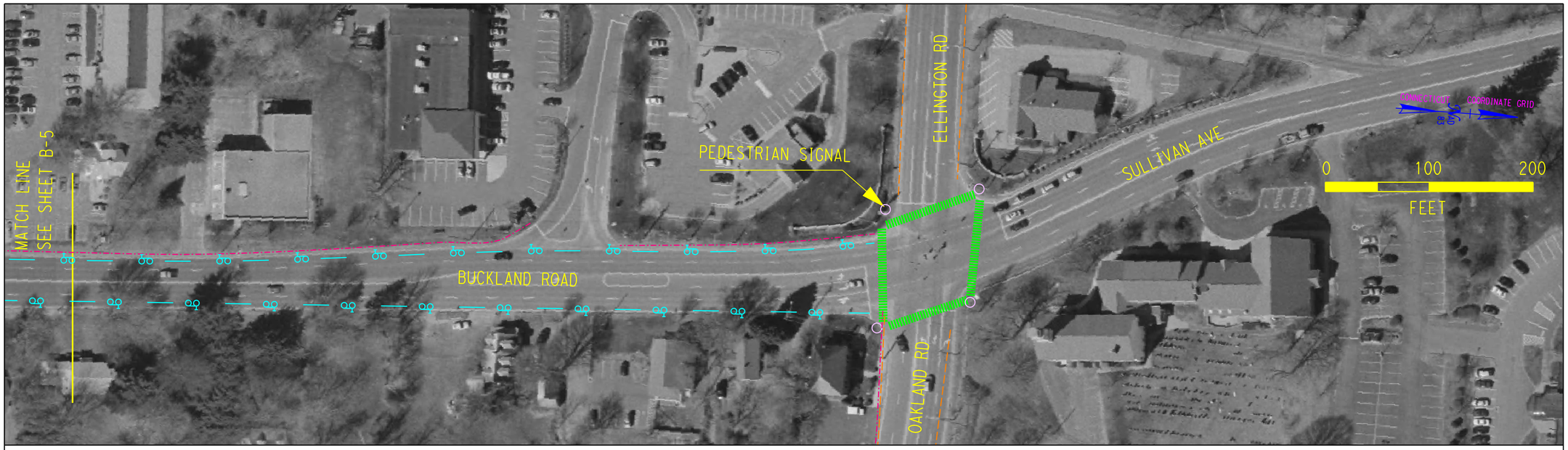
DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED ROADWAY WIDENING

BUCKLAND ROAD

SHEET NO. B-5



BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

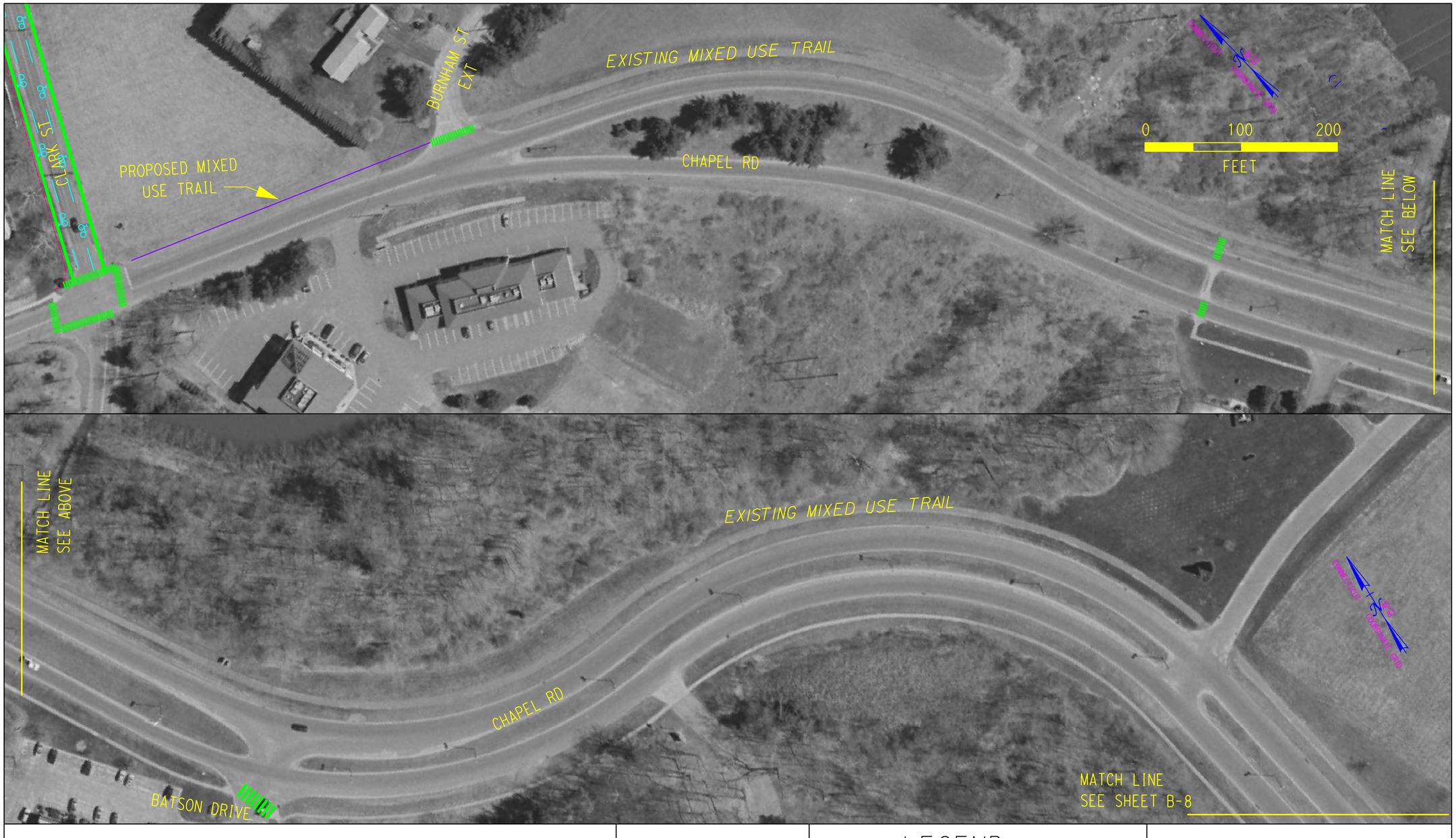
DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED ROADWAY WIDENING

BUCKLAND ROAD

SHEET NO. B-6



BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED ROADWAY WIDENING

CHAPEL ROAD

SHEET NO. B-7

BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED ROADWAY WIDENING

CHAPEL ROAD

SHEET NO. B-8

BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED ROADWAY WIDENING

CLARK STREET

SHEET NO. B-9

BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED ROADWAY WIDENING

CLARK STREET

SHEET NO. B-10

BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED ROADWAY WIDENING

CLARK STREET

SHEET NO. B-11

BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED ROADWAY WIDENING

CLARK STREET

SHEET NO. B-12

BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED ROADWAY WIDENING

DEMING STREET

SHEET NO. B-13

BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

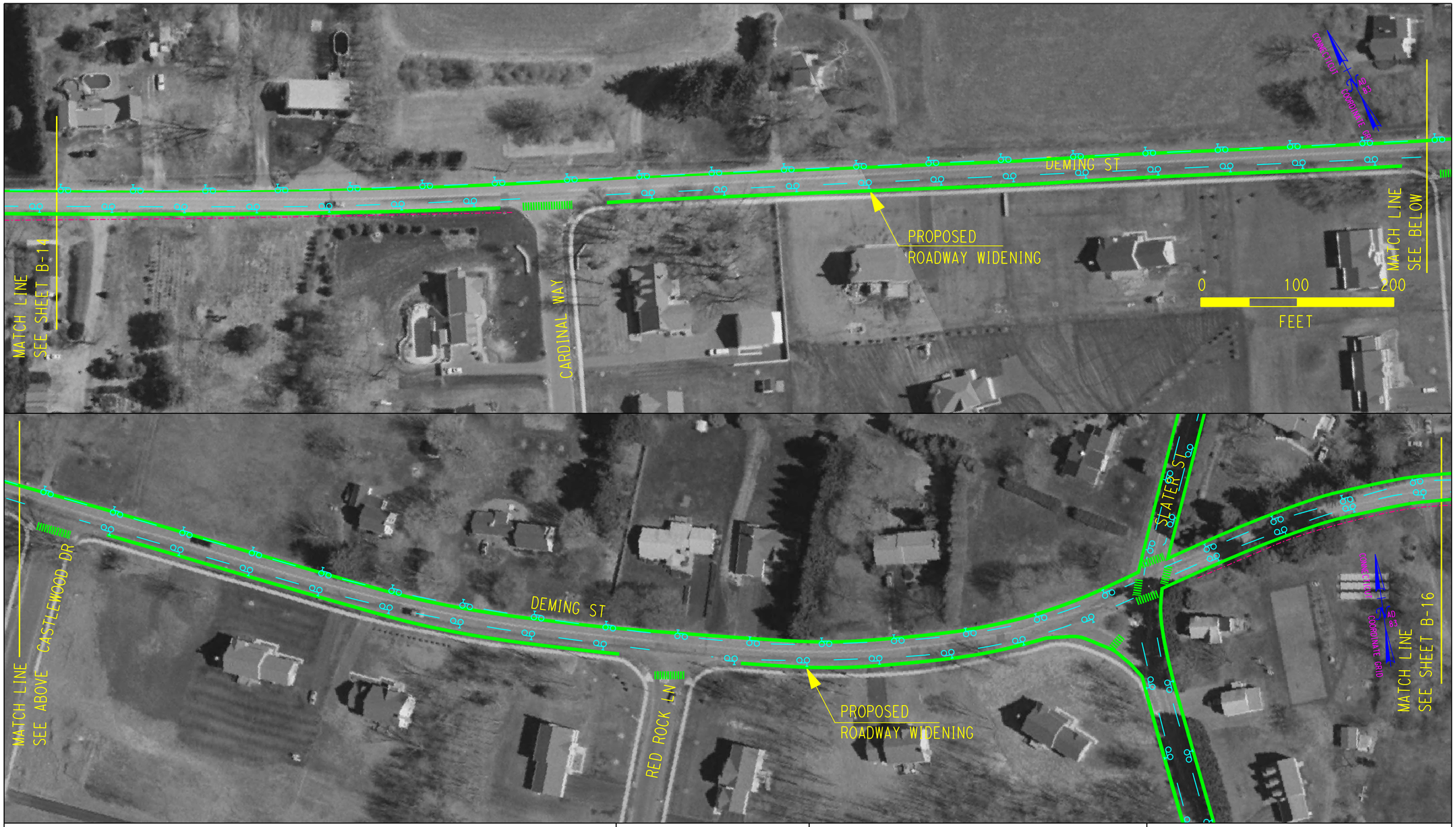
DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED ROADWAY WIDENING

DEMING STREET

SHEET NO. B-14



BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED ROADWAY WIDENING

DEMING STREET

SHEET NO. B-15

BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED ROADWAY WIDENING

DEMING STREET

SHEET NO. B-16

BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

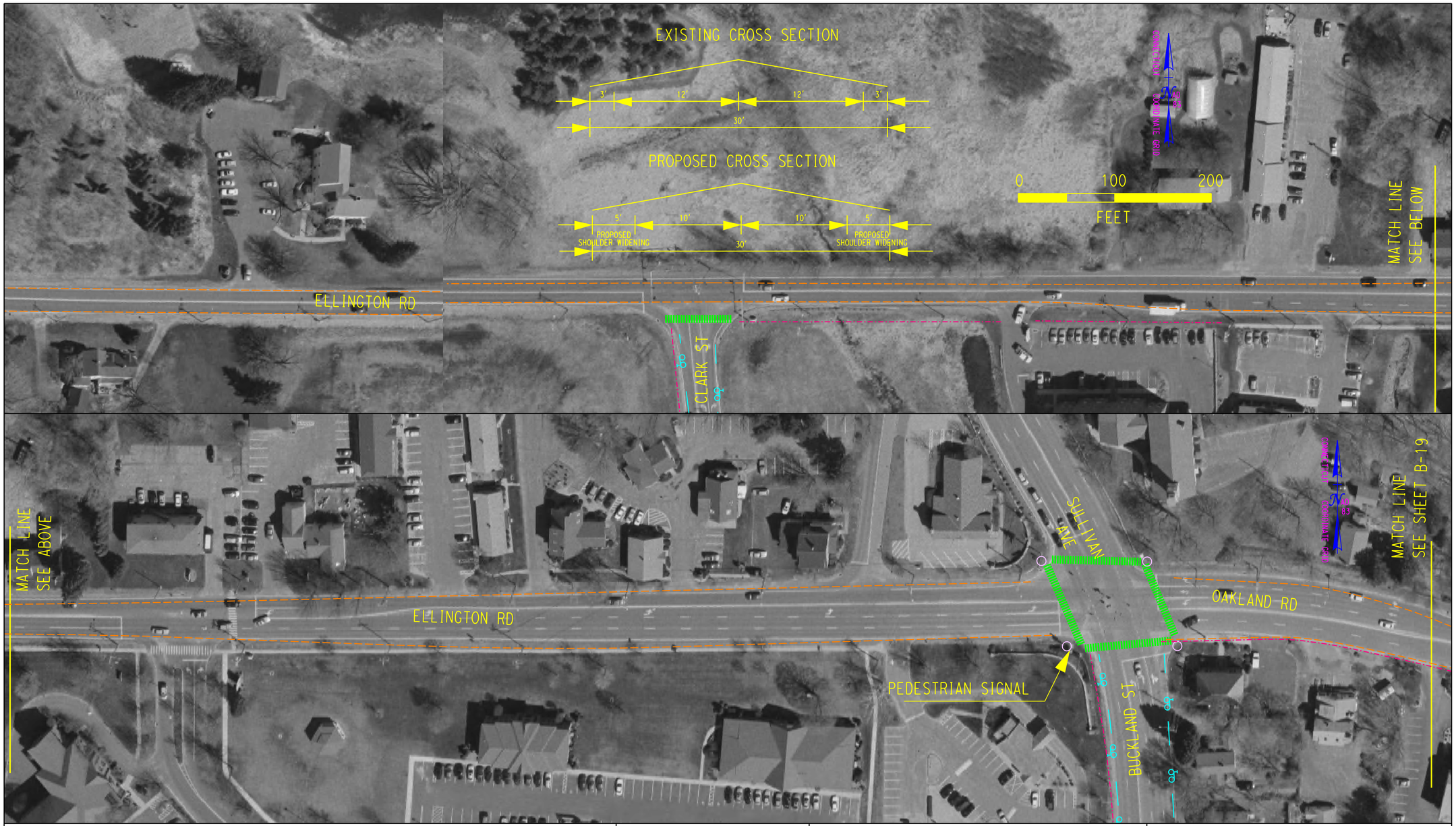
DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED ROADWAY WIDENING

DEMING STREET

SHEET NO. B-17



BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED MIXED USE TRAIL

ELLINGTON ROAD

SHEET NO. B-18

BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED MIXED USE TRAIL

OAKLAND ROAD

SHEET NO. B-19

BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

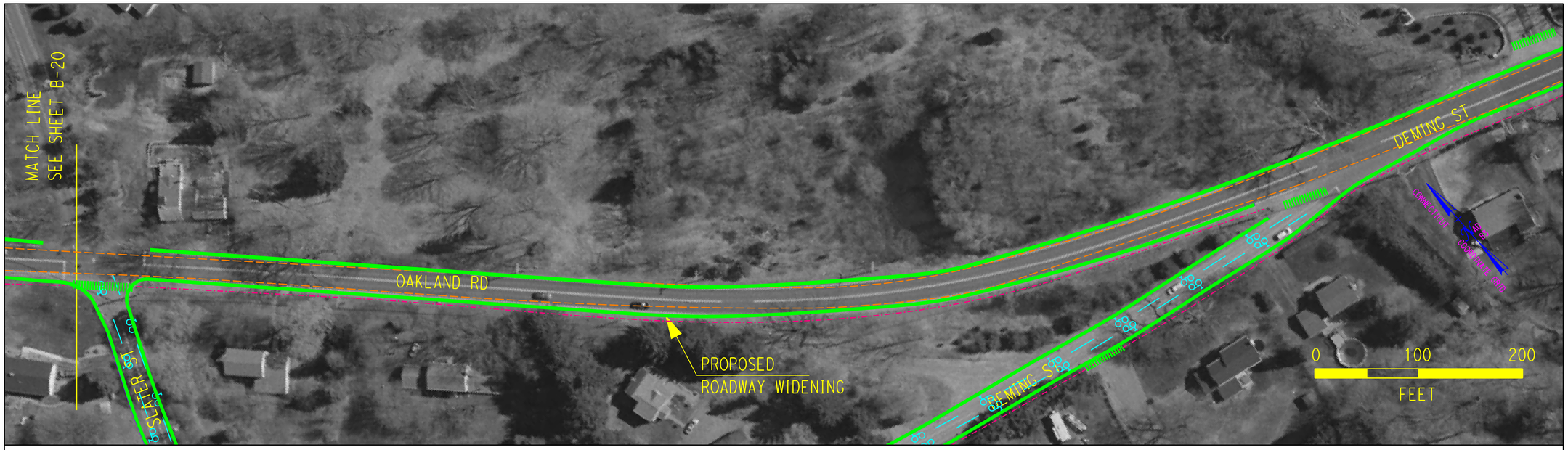
DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED MIXED USE TRAIL

OAKLAND ROAD

SHEET NO. B-20



BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED MIXED USE TRAIL

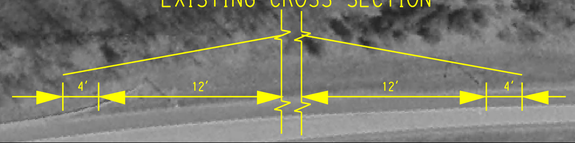
OAKLAND ROAD

SHEET NO. B-21

BUCKLAND ST

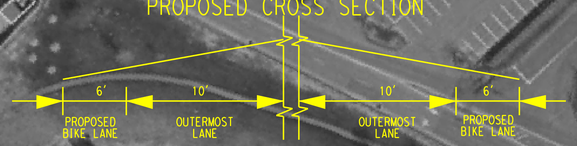
PAVILIONS DR

EXISTING CROSS SECTION



MATCH LINE
SEE BELOW

PROPOSED CROSS SECTION



MATCH LINE
SEE ABOVE

PAVILIONS DR

0 100 200
FEET

BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED ROADWAY WIDENING

PAVILIONS DRIVE

SHEET NO. B-22

BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

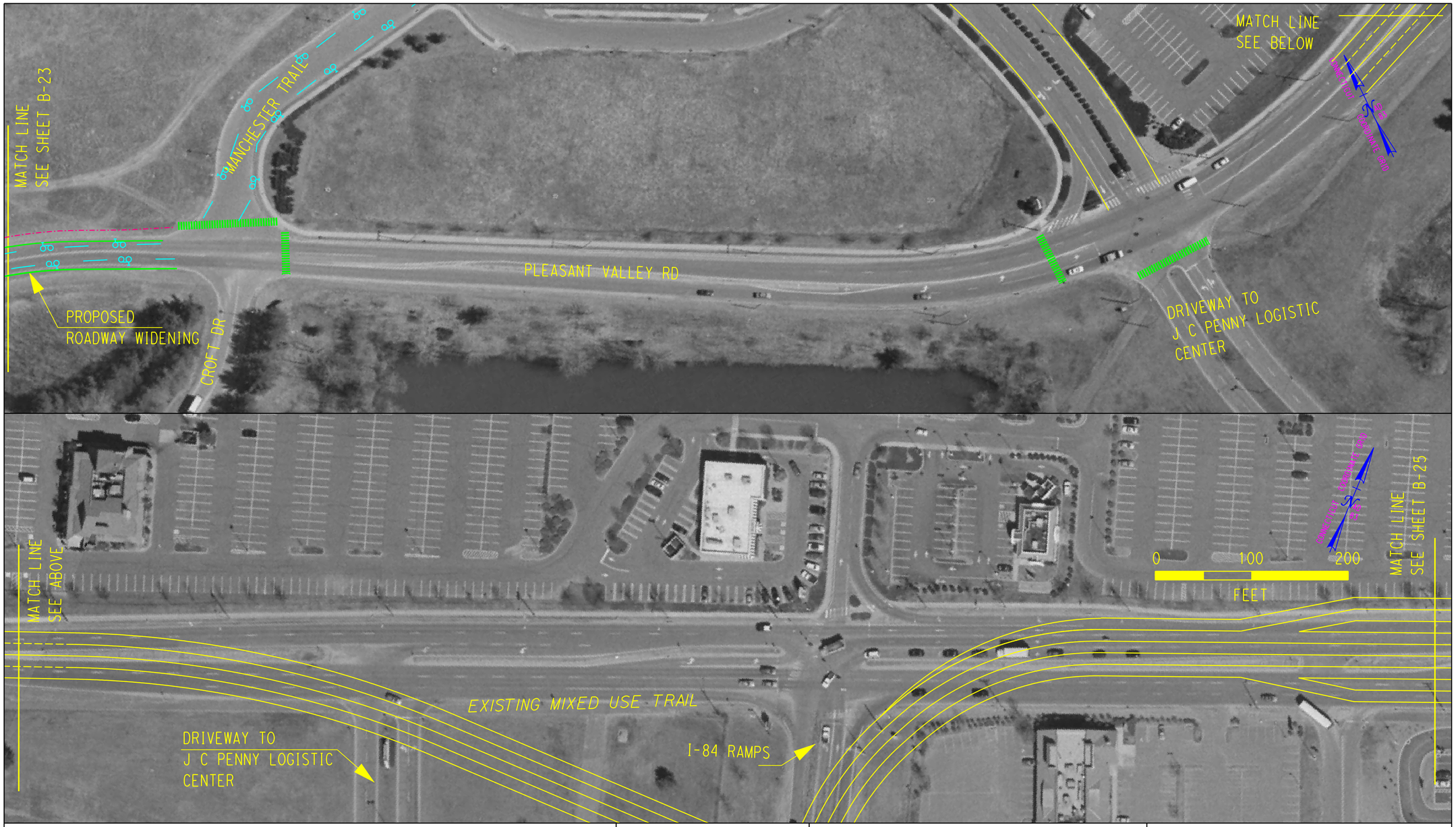
DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED ROADWAY WIDENING

PLEASANT VALLEY ROAD

SHEET NO. B-23



BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

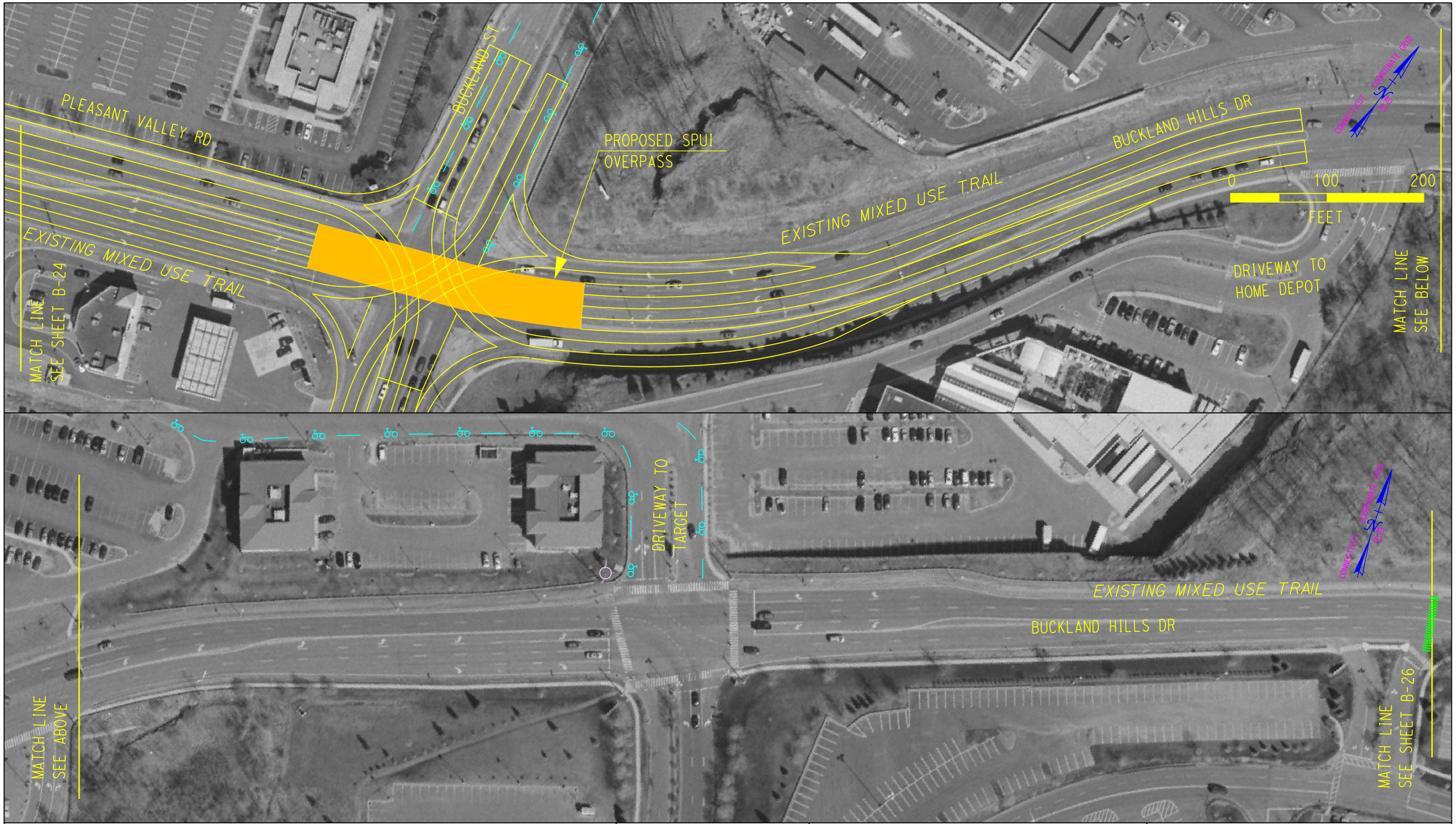
DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED ROADWAY WIDENING

PLEASANT VALLEY ROAD

SHEET NO. B-24



BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED ROADWAY WIDENING

PLEASANT VALLEY ROAD

SHEET NO. B-25

BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED ROADWAY WIDENING

PLEASANT VALLEY ROAD

SHEET NO. B-26

BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

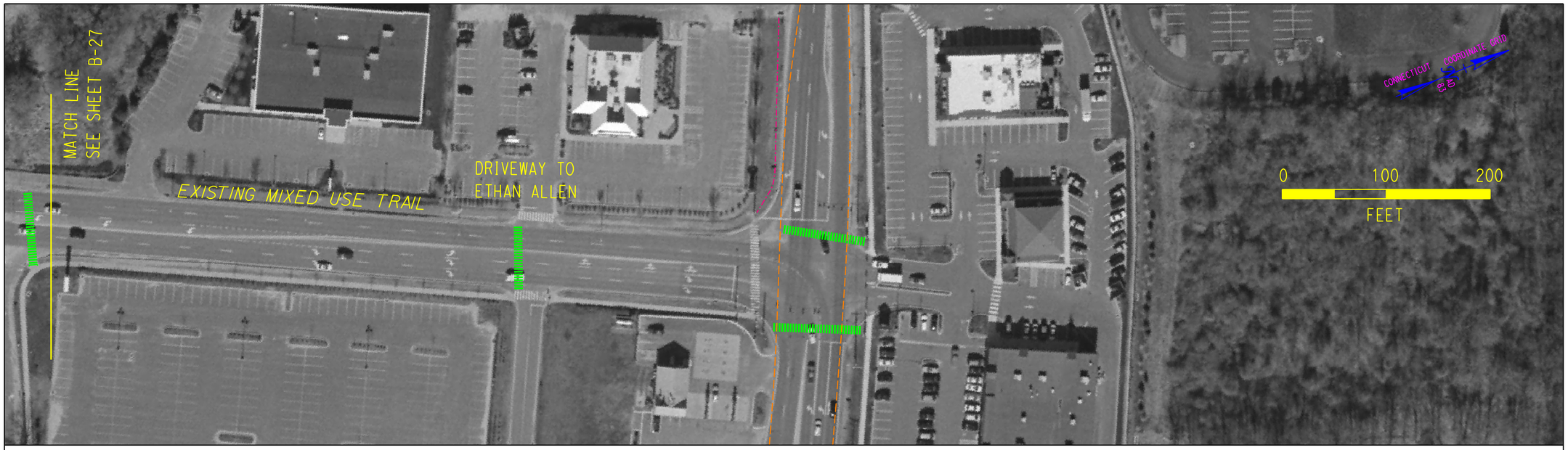
DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED ROADWAY WIDENING

PLEASANT VALLEY ROAD

SHEET NO. B-27



BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

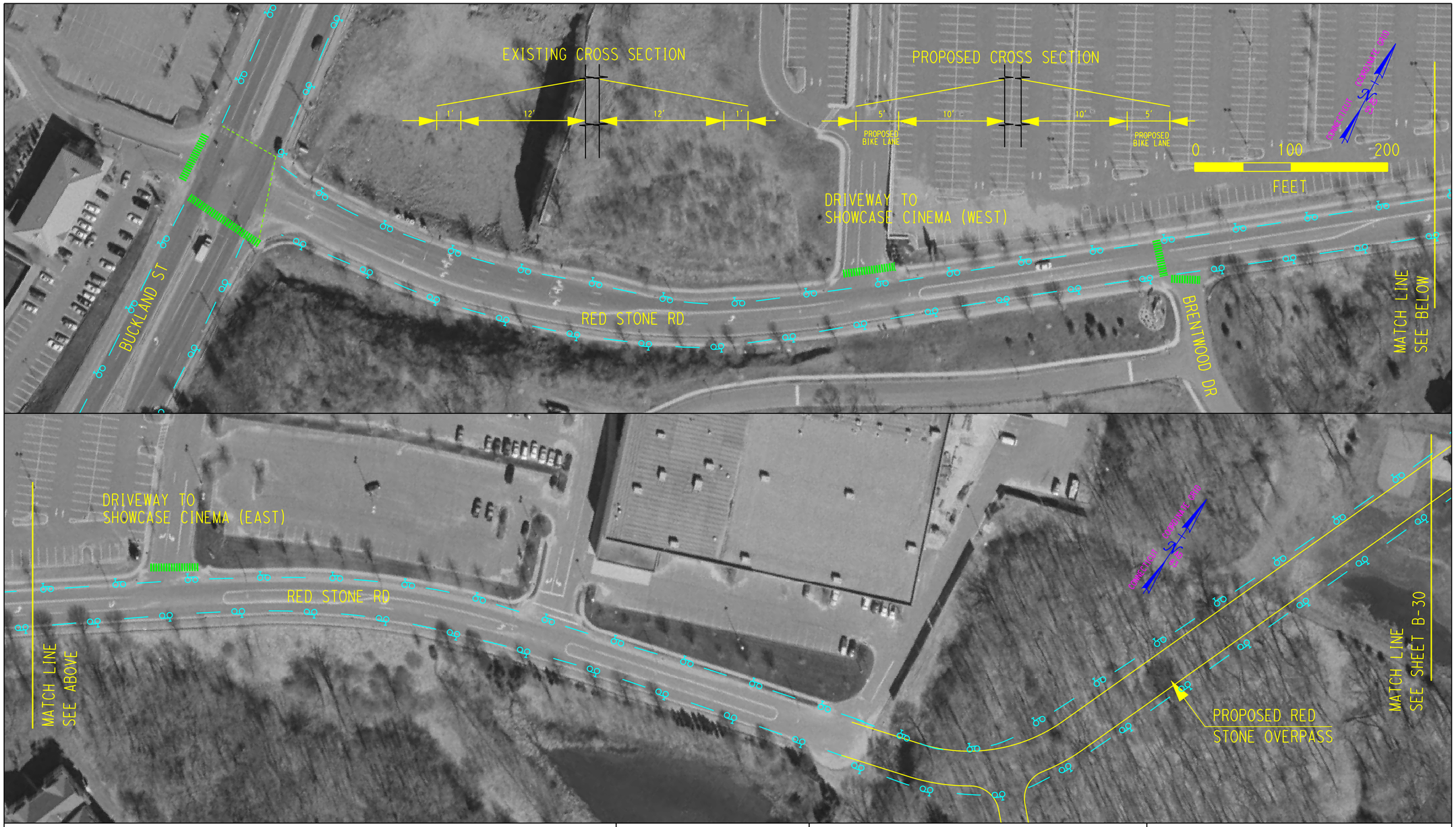
DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED ROADWAY WIDENING

PLEASANT VALLEY ROAD

SHEET NO. B-28



BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

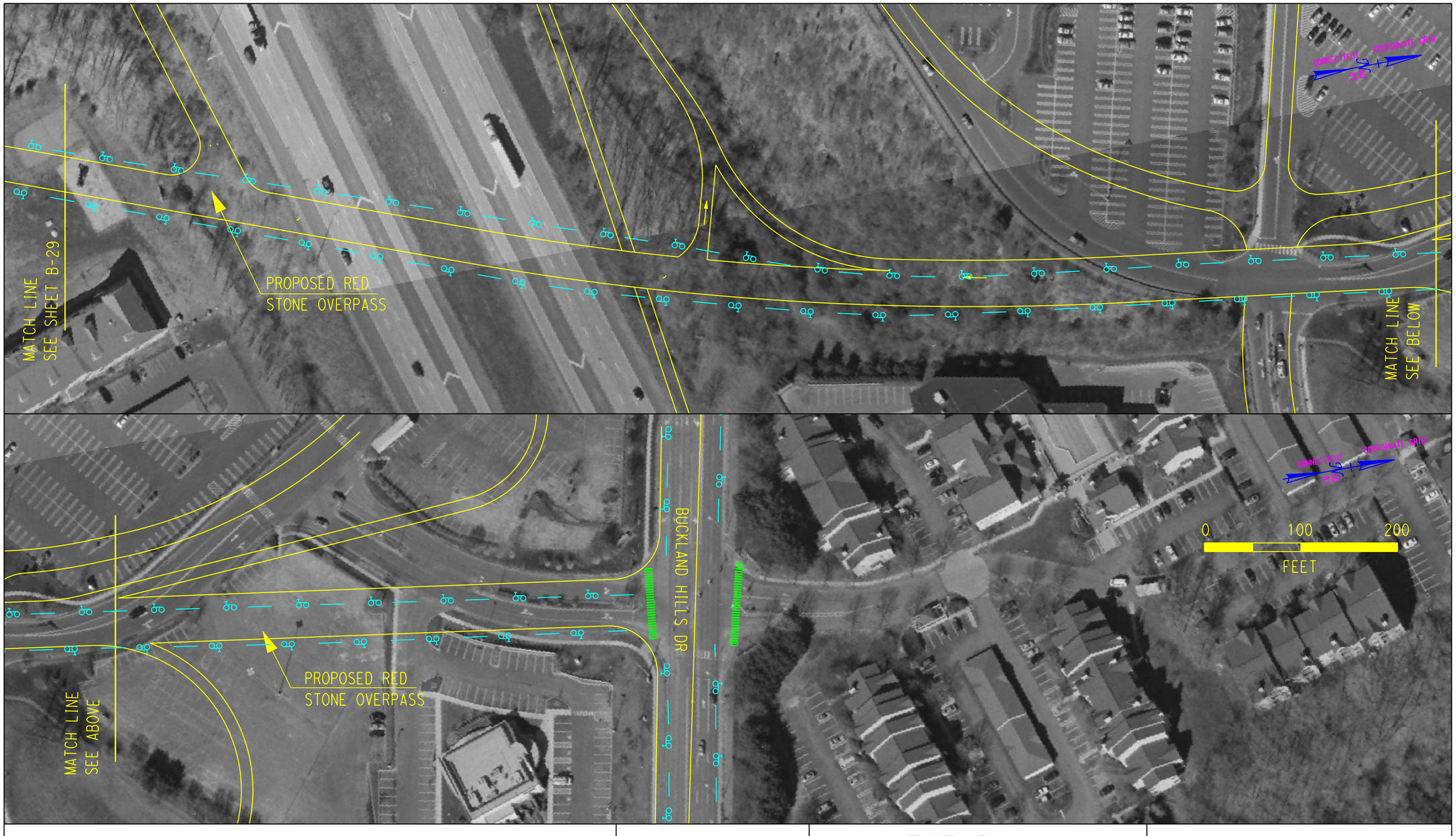
DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED ROADWAY WIDENING

RED STONE ROAD

SHEET NO. B-29



BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

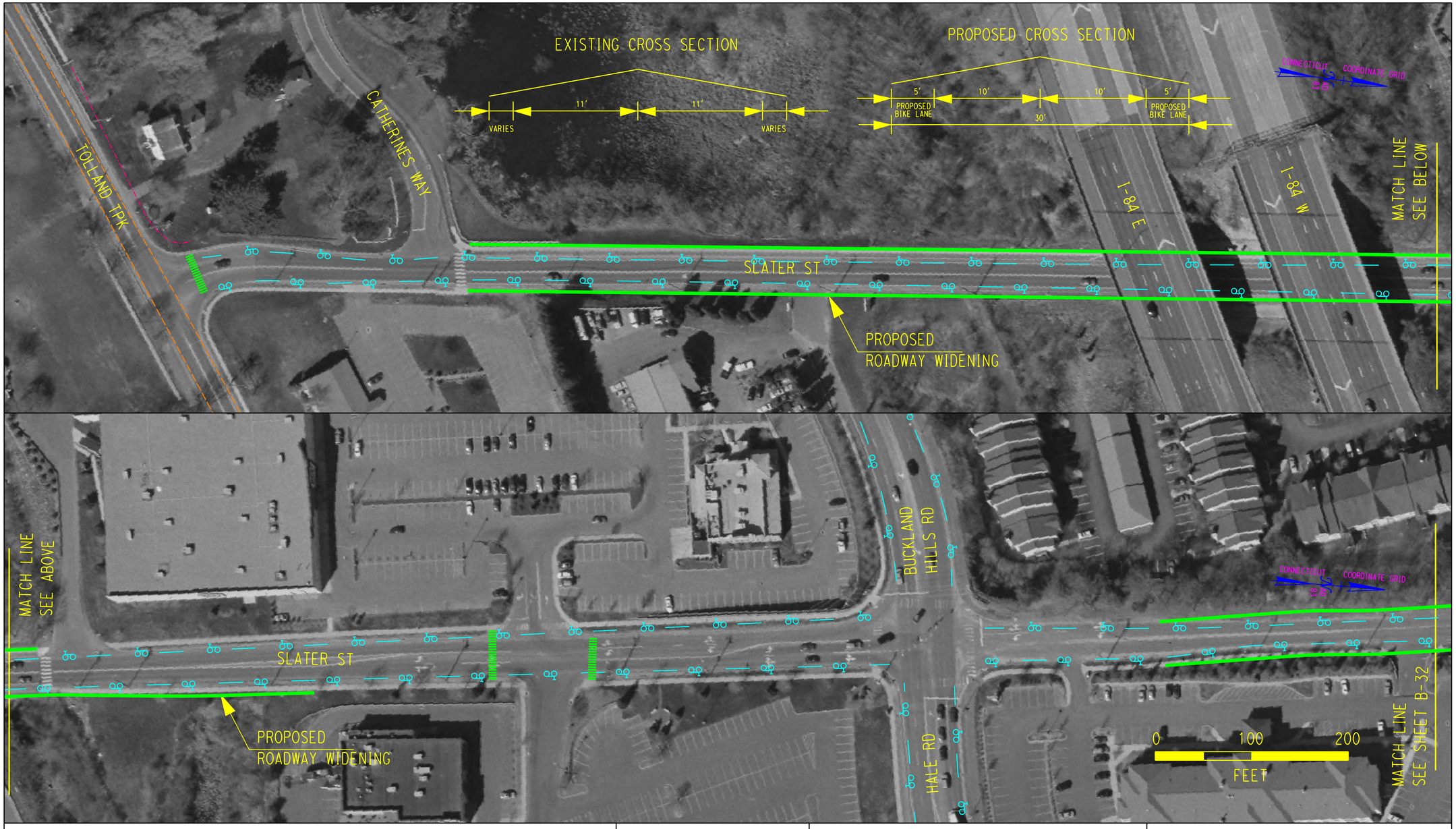
DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED ROADWAY WIDENING

RED STONE ROAD

SHEET NO. B-30



BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED ROADWAY WIDENING

SLATER STREET

SHEET NO. B-31

BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED ROADWAY WIDENING

SLATER STREET

SHEET NO. B-32

BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED ROADWAY WIDENING

SMITH STREET

SHEET NO. B-33

BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

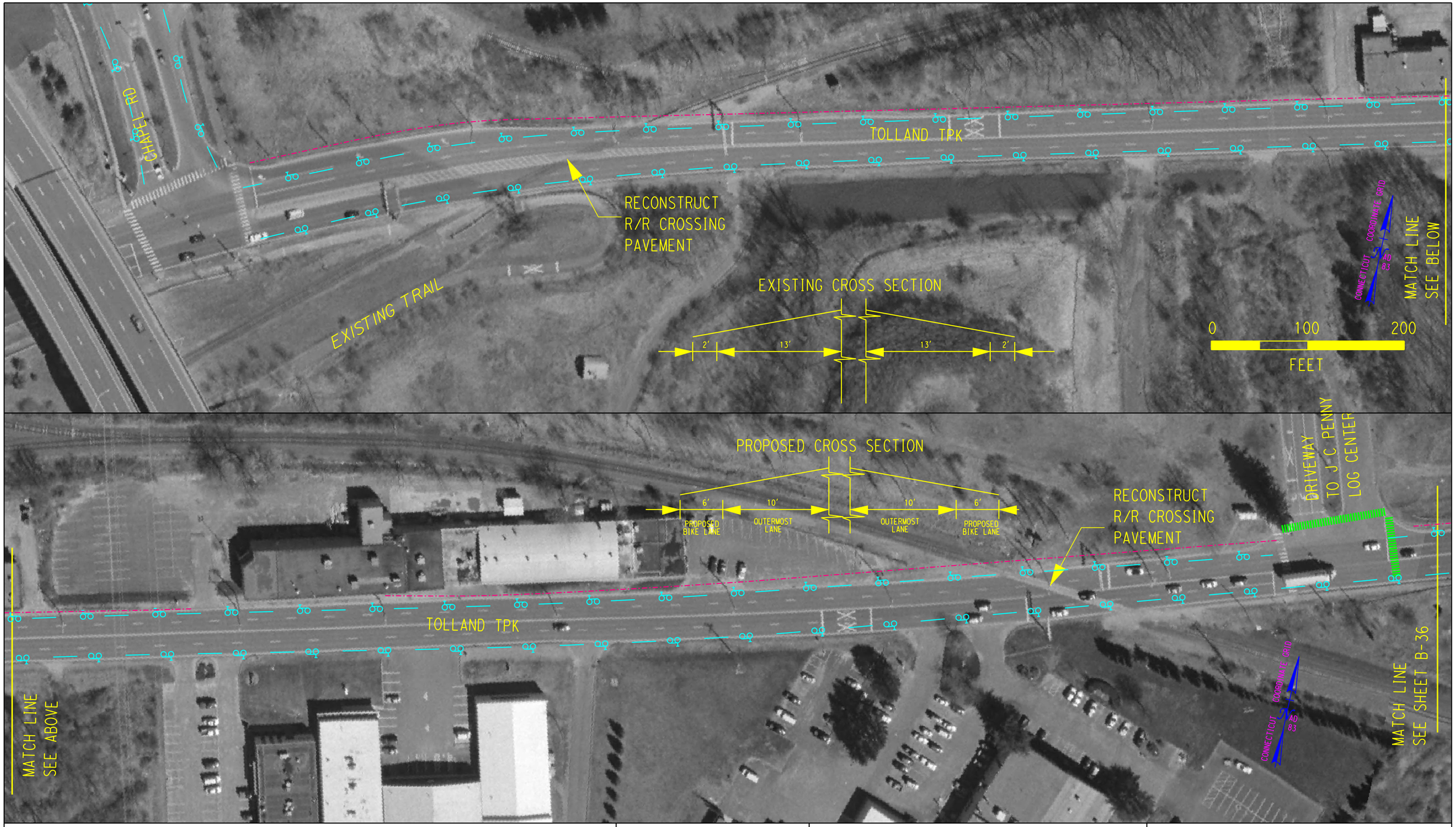
DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED ROADWAY WIDENING

SMITH STREET

SHEET NO. B-34



BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED ROADWAY WIDENING

TOLLAND TURNPIKE

SHEET NO B-35

BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED ROADWAY WIDENING

TOLLAND TURNPIKE

SHEET NO B-36

BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED ROADWAY WIDENING

TOLLAND TURNPIKE

SHEET NO B-37

BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED ROADWAY WIDENING

TOLLAND TURNPIKE

SHEET NO B-38

BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

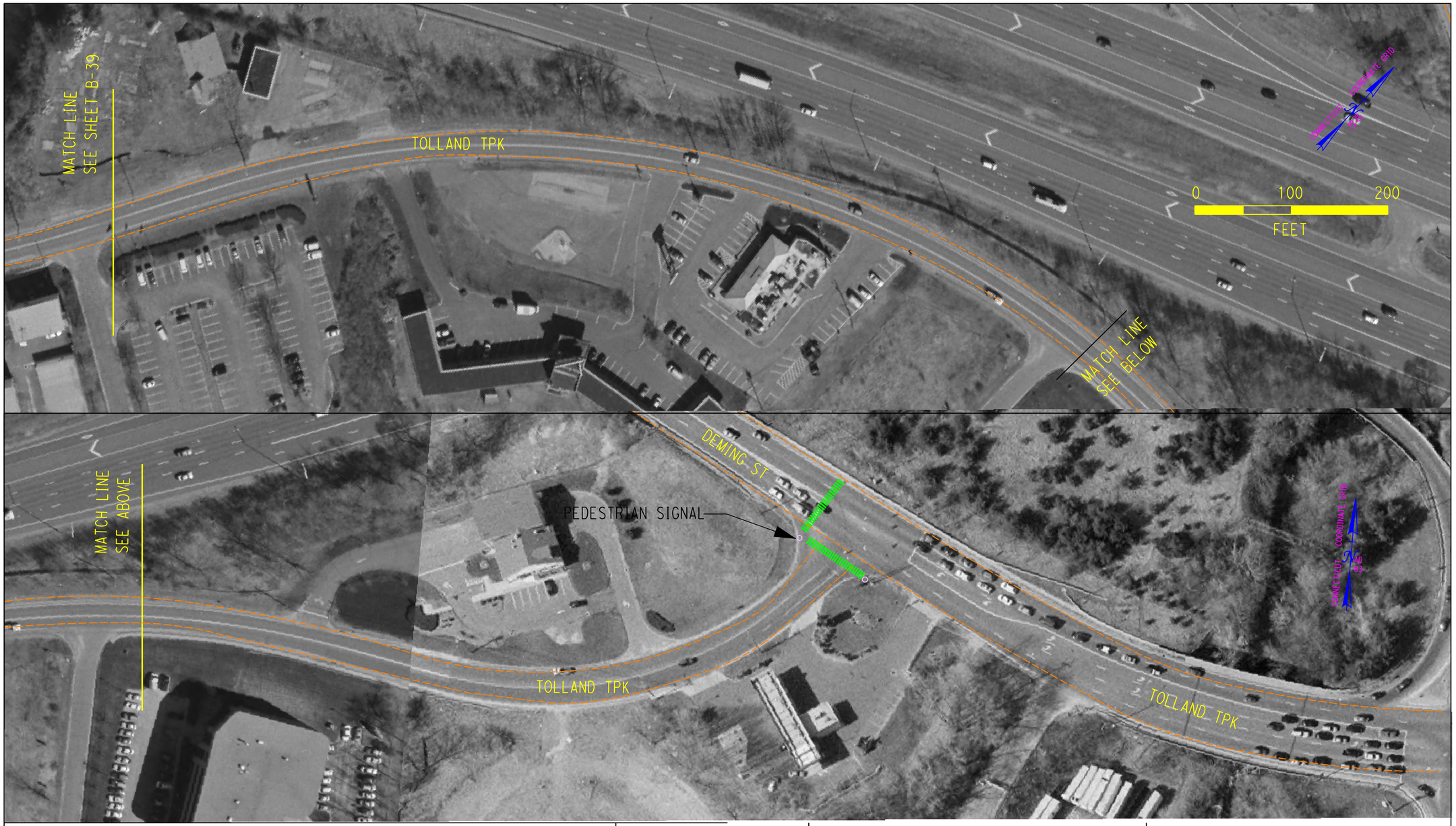
DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED ROADWAY WIDENING

TOLLAND TURNPIKE

SHEET NO B-39



BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED ROADWAY WIDENING

TOLLAND TURNPIKE

SHEET NO B-40

BUCKLAND AREA TRANSPORTATION STUDY
BICYCLE AND PEDESTRIAN STUDY

DEWBERRY
59 ELM STREET
SUITE 101
NEW HAVEN CT 06510

LEGEND

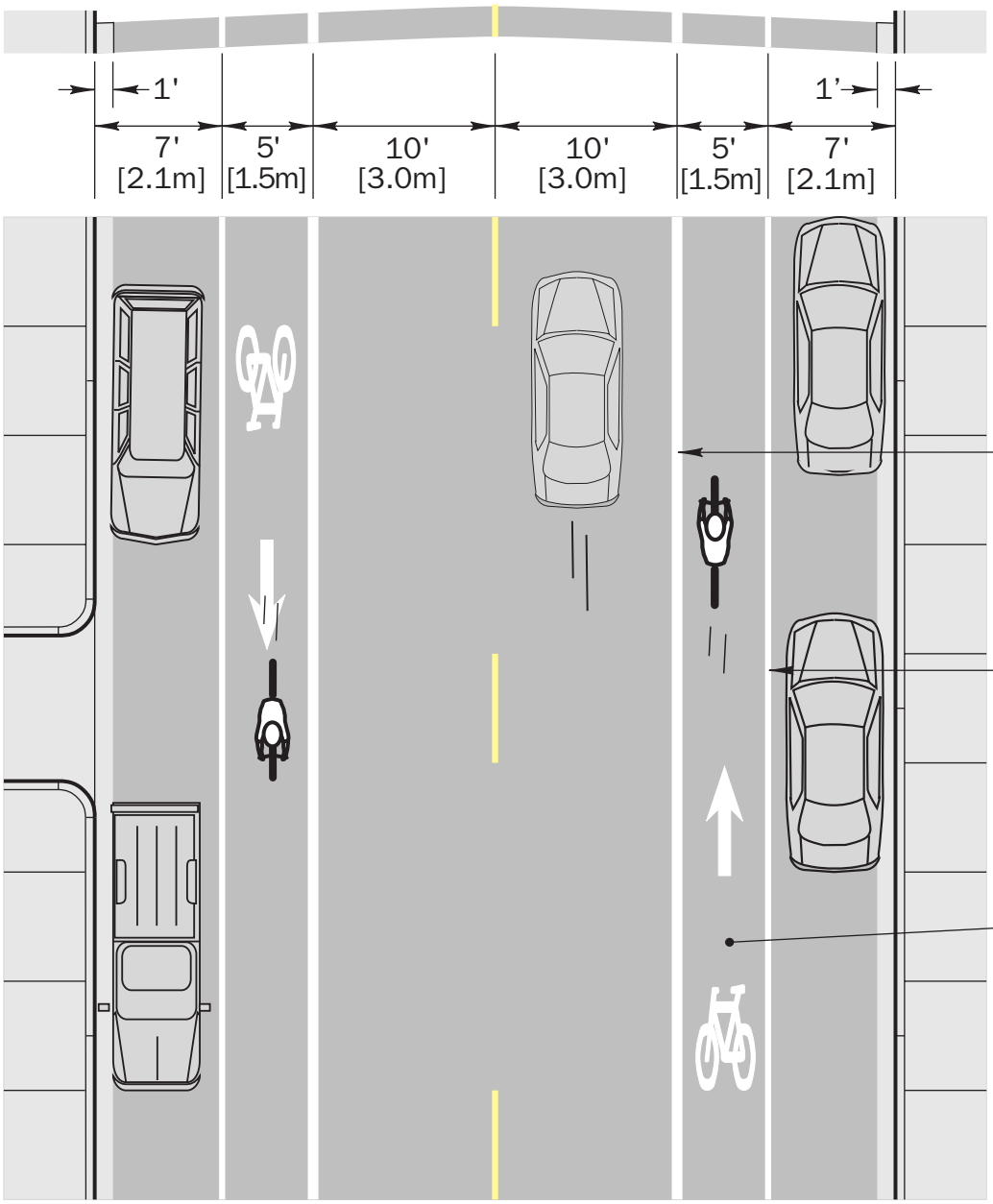
- PROPOSED CROSSWALK
- PROPOSED SHOULDER WIDENING
- PROPOSED SIDEWALK
- PROPOSED BIKE LANE
- PROPOSED ROADWAY WIDENING

WHEELER ROAD

SHEET NO. B-41

Appendix C
Bike Lane Design Guidelines

Standard Road Striping
Bike Lane on 44' Wide Street



NOTE: Measured curbface to curbface including gutterflag

Bike Lane Stripe

Thermoplastic pavement marking line 6" [150mm] wide solid white

Parking Stripe

Thermoplastic pavement marking line 4" [100mm] wide solid white

Bike Lane Symbol & Arrow

Pre-cut plastic

NOTE: Bike lane and parking stripes remain continuous when passing alley and driveway entrances

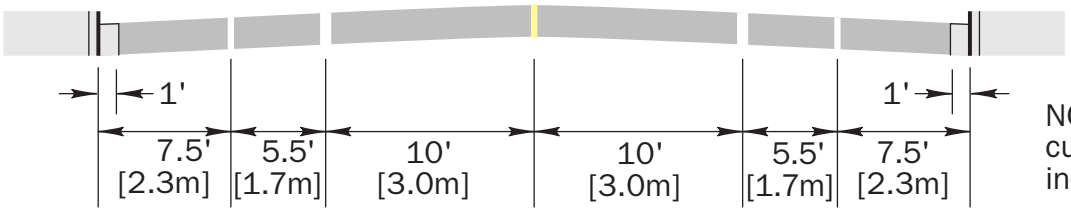
City of Chicago
Richard M. Daley, Mayor

DEPARTMENT OF TRANSPORTATION
Miguel d'Escoto, Commissioner

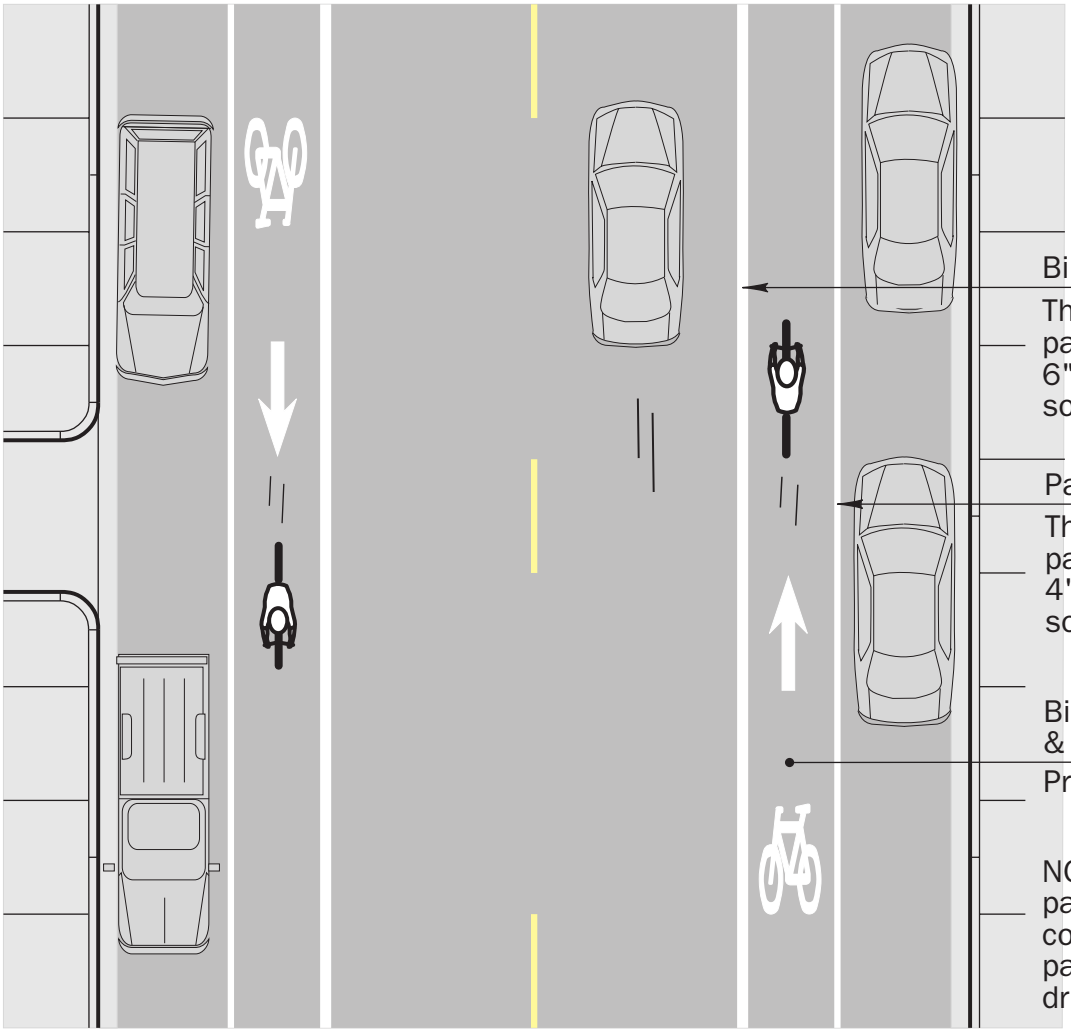
BUREAU OF TRAFFIC
Donald Grabowski, Deputy Commissioner

CITY OF CHICAGO		
44' Wide Street with Bike Lane		
REVISED 5-16-02	SCALE 1"=10'	
H:\Traffic\Bike Lanes\Design Manual\Mid-block\2w,pbs\44'.fh8		No. __ of __

Standard Road Striping
Bike Lane on 46' Wide Street



NOTE: Measured curbface to curbface including gutterflag



Bike Lane Stripe

Thermoplastic pavement marking line 6" [150mm] wide solid white

Parking Stripe

Thermoplastic pavement marking line 4" [100mm] wide solid white

Bike Lane Symbol & Arrow

Pre-cut plastic

NOTE: Bike lane and parking stripes remain continuous when passing alley and driveway entrances

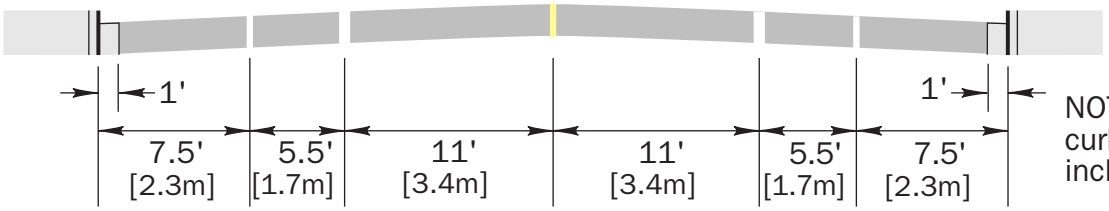
City of Chicago
Richard M. Daley, Mayor

DEPARTMENT OF TRANSPORTATION
Miguel d'Escoto, Commissioner

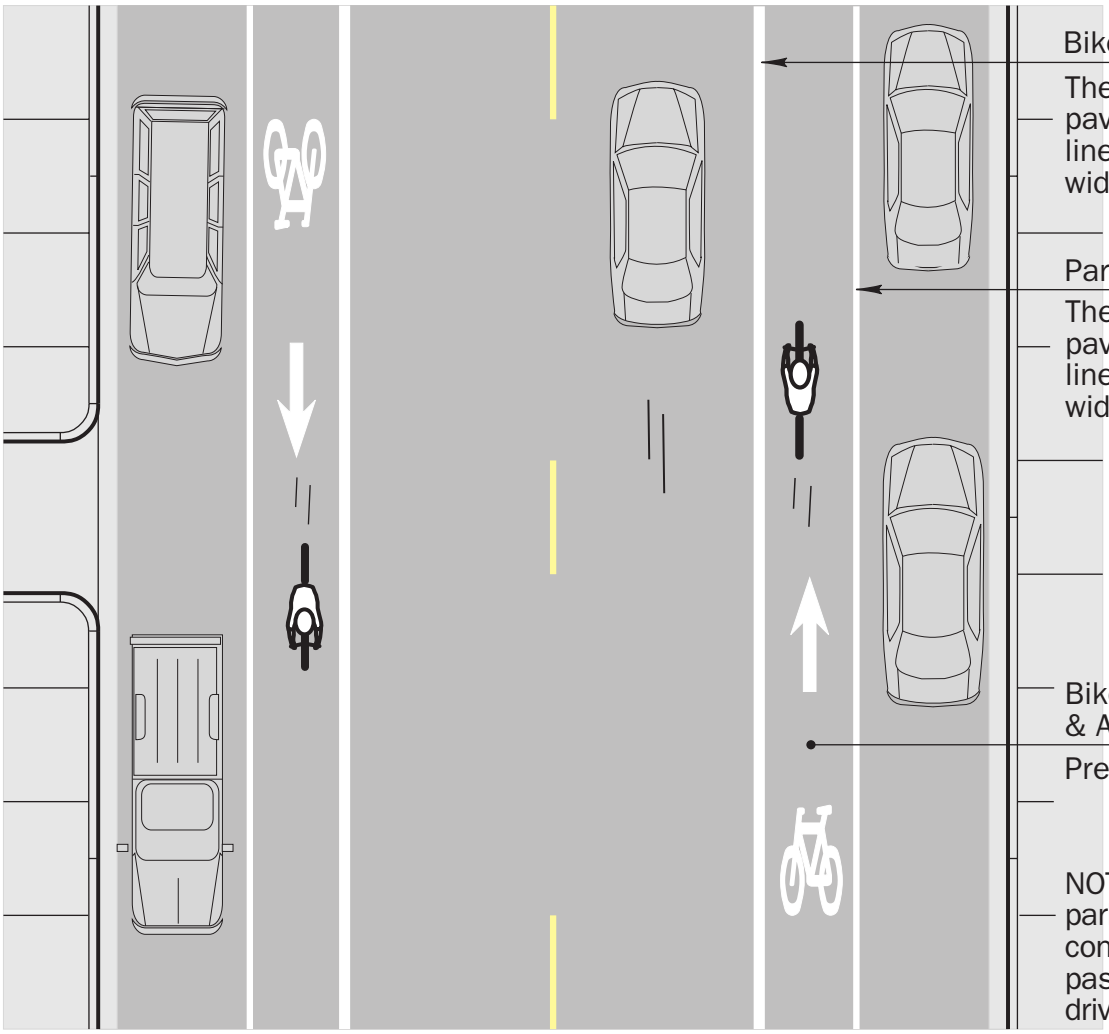
BUREAU OF TRAFFIC
Donald Grabowski, Deputy Commissioner

CITY OF CHICAGO		
46' Wide Street with Bike Lane		
REVISED 5-16-02	SCALE 1"=10'	
H:\Traffic\Bike Lanes\Design Manual\Mid-block\2w,pbs\46'.fh8	No. __ of __	

Standard Road Striping
Bike Lane on 48' Wide Street



NOTE: Measured curbface to curbface including gutterflag



Bike Lane Stripe

Thermoplastic pavement marking line 6" [150mm] wide solid white

Parking Stripe

Thermoplastic pavement marking line 4" [100mm] wide solid white

Bike Lane Symbol & Arrow

Pre-cut plastic

NOTE: Bike lane and parking stripes remain continuous when passing alley and driveway entrances

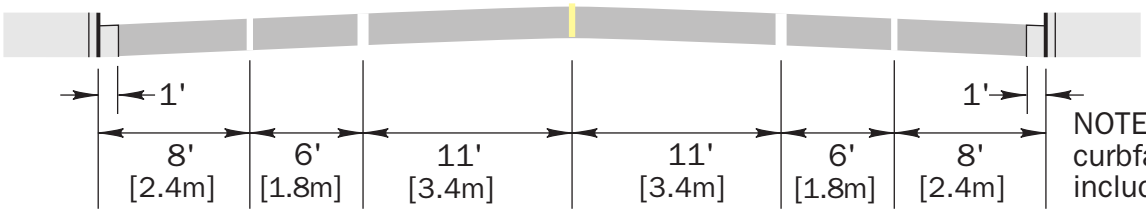
City of Chicago
Richard M. Daley, Mayor

DEPARTMENT OF TRANSPORTATION
Miguel d'Escoto, Commissioner

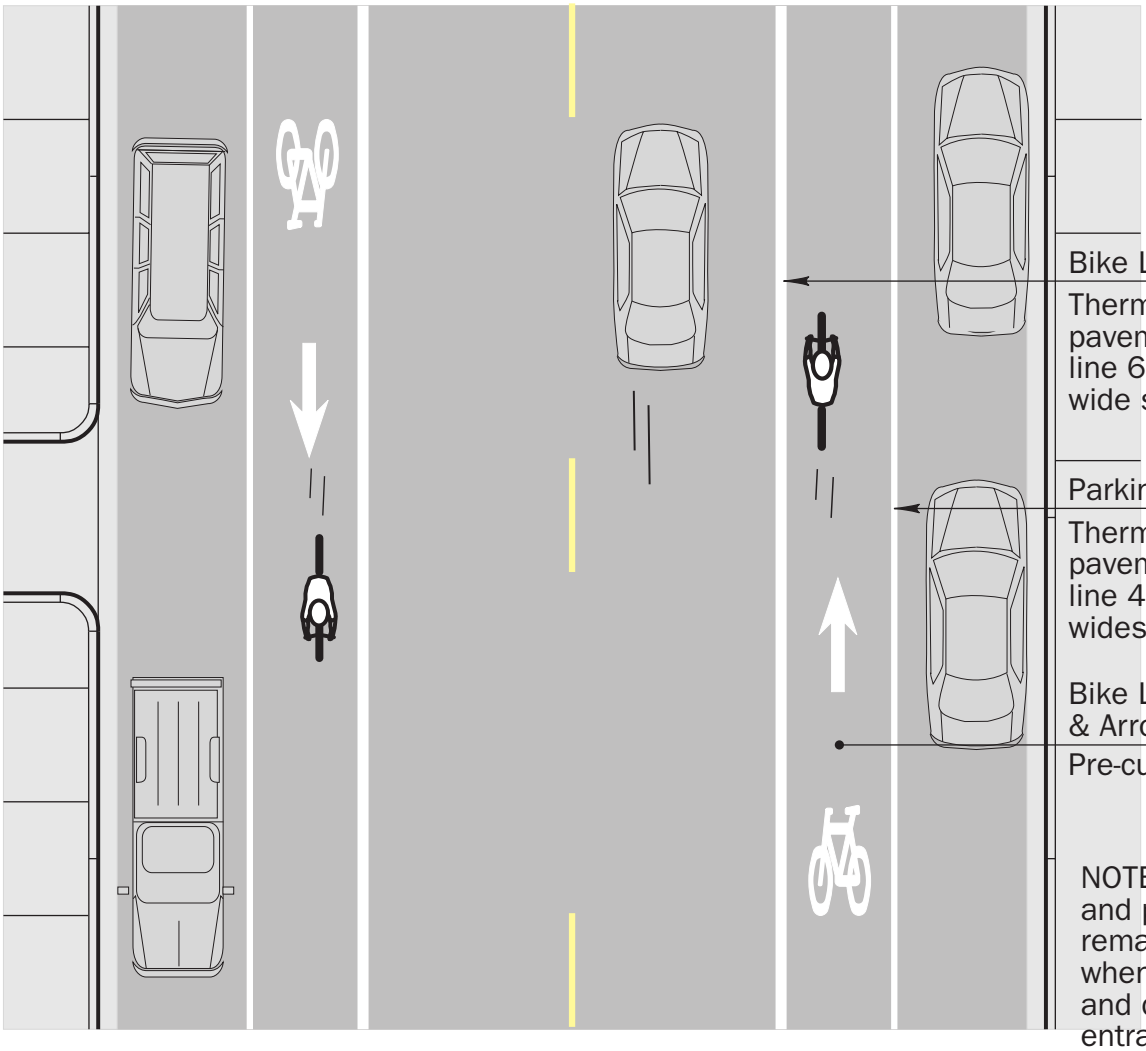
BUREAU OF TRAFFIC
Donald Grabowski, Deputy Commissioner

CITY OF CHICAGO		
48' Wide Street with Bike Lane		
REVISED 5-16-02	SCALE 1"=10'	
H:\Traffic\Bike Lanes\Design Manual\Mid-block\2w,pbs\48'.fh8	No. __ of __	

Standard Road Striping
Bike Lane on 50' Wide Street



NOTE: Measured curbface to curbface including gutterflag



Bike Lane Stripe
Thermoplastic pavement marking line 6" [150mm] wide solid white

Parking Stripe
Thermoplastic pavement marking line 4" [100mm] widesolid white

Bike Lane Symbol & Arrow
Pre-cut plastic

NOTE: Bike lane and parking stripes remain continuous when passing alley and driveway entrances

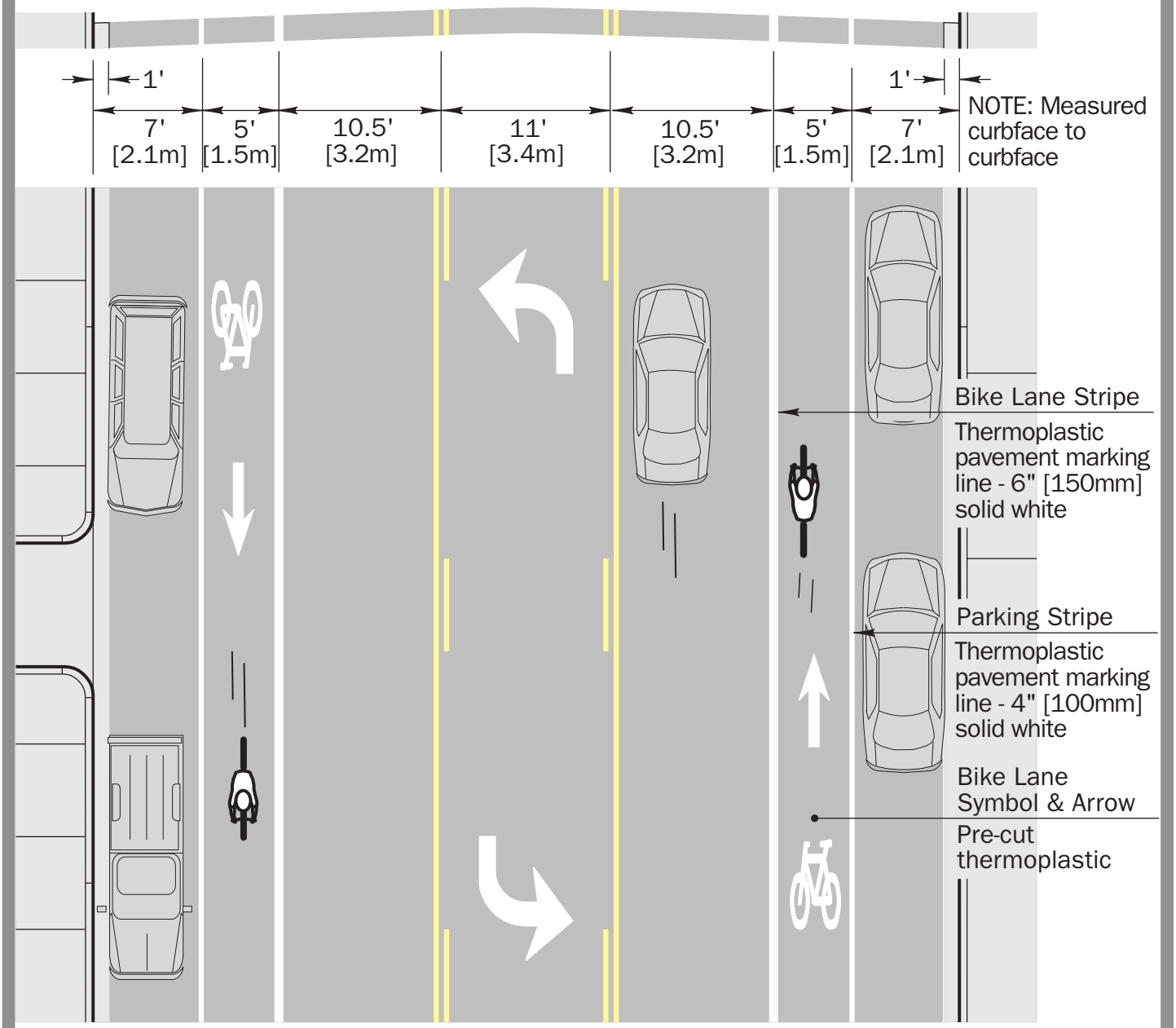
City of Chicago
Richard M. Daley, Mayor

DEPARTMENT OF TRANSPORTATION
Miguel d'Escoto, Commissioner

BUREAU OF TRAFFIC
Donald Grabowski, Deputy Commissioner

CITY OF CHICAGO		
50' Wide Street with Bike Lane		
REVISED 5-16-02	SCALE 1"=10'	
H:\Traffic\Bike Lanes\Design Manual\Mid-block\2w,pbs\50'.fh8	No. __ of __	

Bike Lane on 55' Wide Street
With Parking on Both Sides



NOTE: Bike lane and parking stripes remain continuous when passing alley and driveway entrances

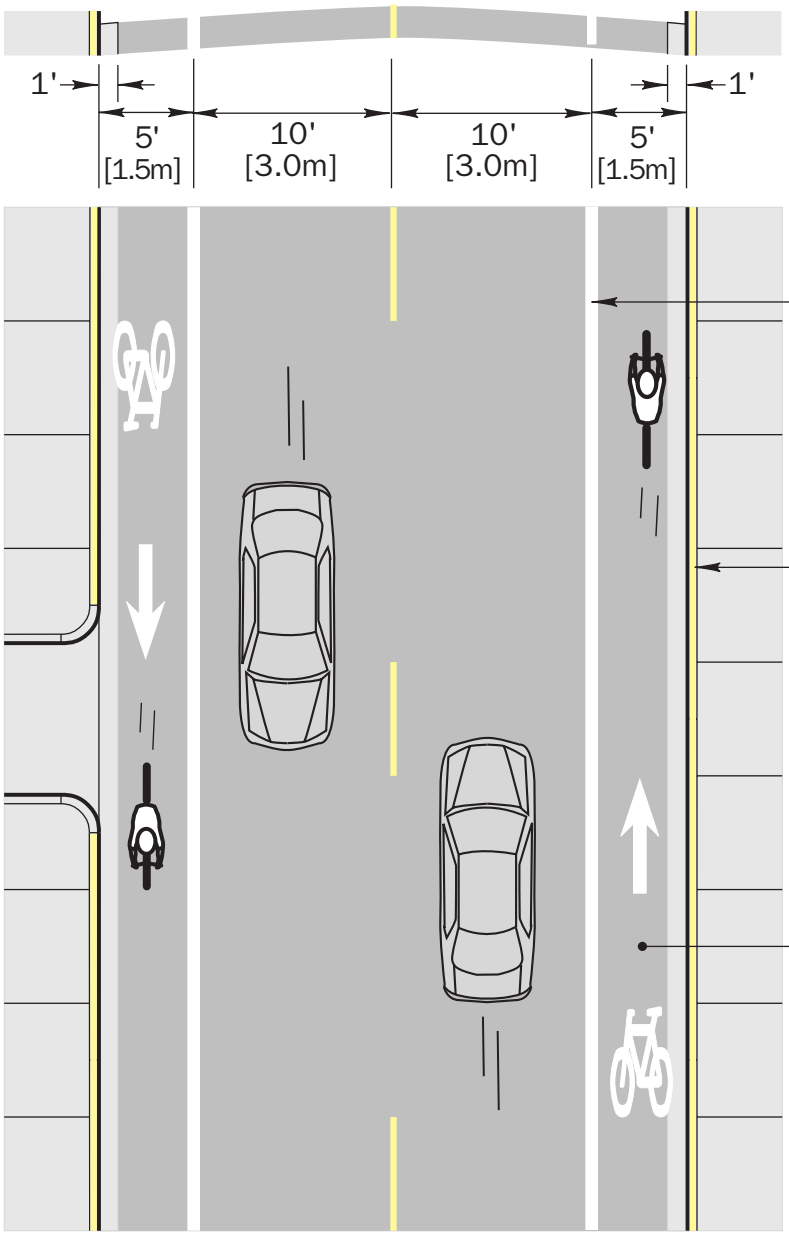
City of Chicago
Richard M. Daley, Mayor

DEPARTMENT OF TRANSPORTATION
Miguel d'Escoto, Commissioner

BUREAU OF TRAFFIC
Donald Grabowski, Deputy Commissioner

CITY OF CHICAGO		
55' [16.7m] Street with Bike Lane		
REVISED 5-16-02	SCALE 1"=10'	
H:\Traffic\Bike Lanes\Design Manual\Mid-block\2w,np\55 with Center T.L..FH9	Sheet __ of __	

Bike Lane on 2-way Street
With No Parking on Both Sides



NOTE: Measured curbface to curbface.

Bike Lane Stripe

Thermoplastic pavement marking line
8" [200mm] wide
solid white

No Parking Stripe

Pre-formed Inlay Tape marking line
4" [100mm] wide
solid yellow

NOTE: Apply to top of curb

Bike Lane Symbol & Arrow

Pre-cut plastic

NOTE: Bike lane and parking stripes remain continuous when passing alley and driveway entrances.

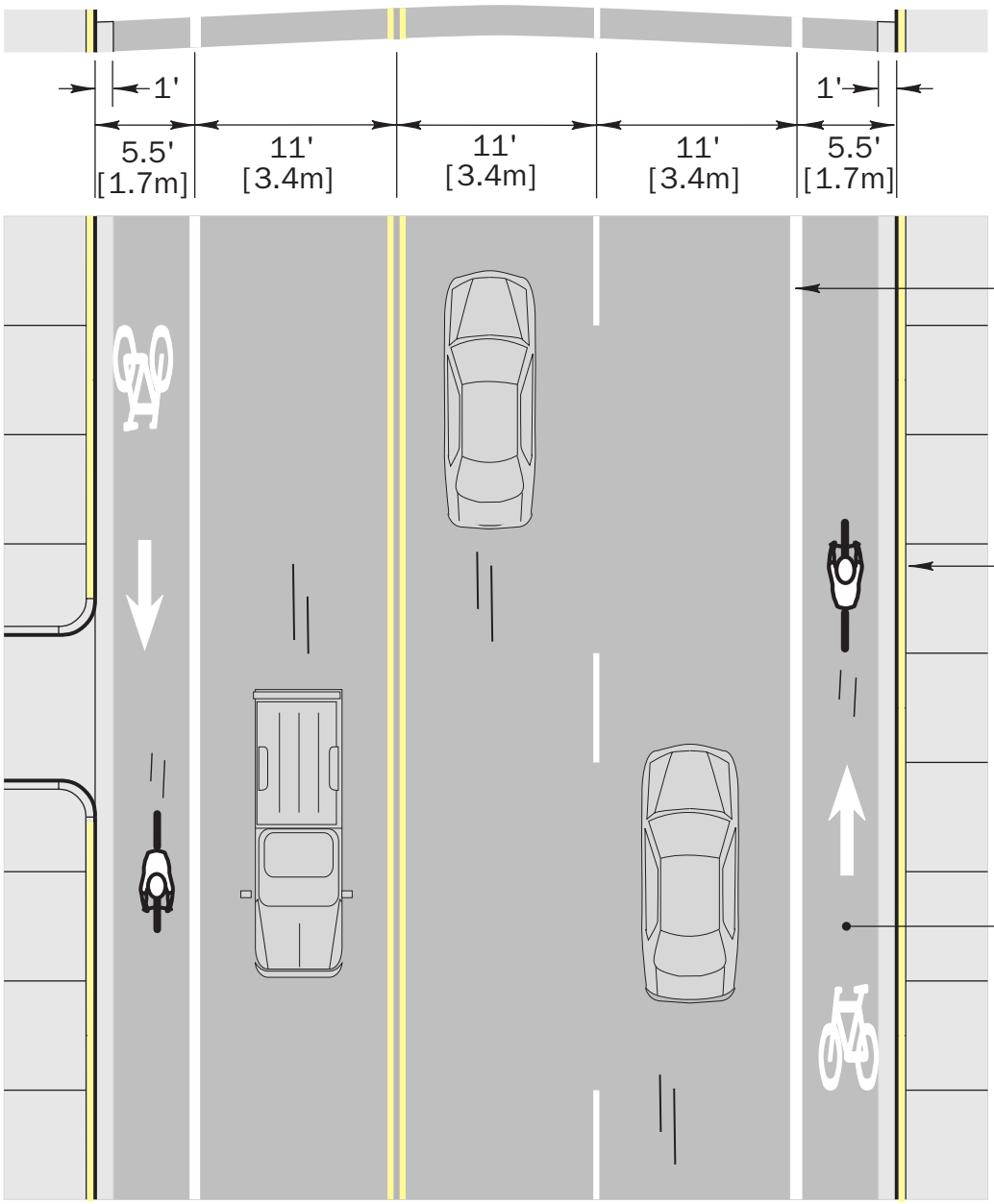
City of Chicago
Richard M. Daley, Mayor

DEPARTMENT OF TRANSPORTATION
Miguel d' Escoto, Commissioner

BUREAU OF TRAFFIC
Donald Grabowski, Deputy Commissioner

CITY OF CHICAGO			
Bike Lane with No Parking			
REVISED	5-16-02	SCALE	1"=30'
H:\Traffic\Bike Lanes\Design Manual\Mid-block\2w,np\38'.fh8		Sheet __ of __	

Bike Lane on 44' Wide Street
No Parking on Both Sides



NOTE: Measured curbface to curbface

Bike Lane Stripe
Thermoplastic pavement marking line 8" [200mm] wide solid white

No Parking Stripe
Pre-formed Inlay Tape marking line 4" [100mm] wide solid yellow

NOTE: Apply to top of curb

Bike Lane Symbol & Arrow
Pre-cut plastic

NOTE: Bike lane and parking stripes remain continuous when passing alley and driveway entrances

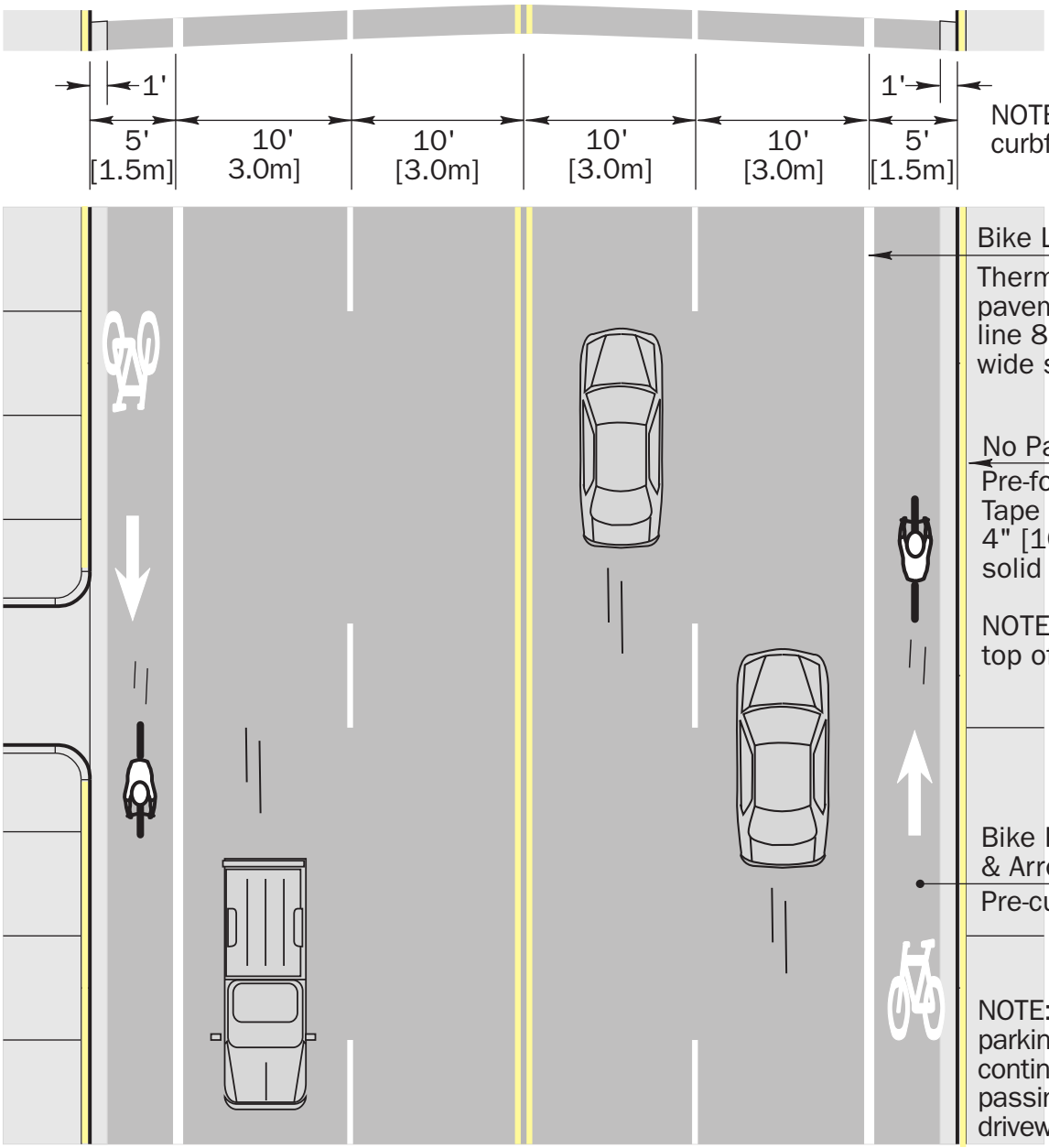
City of Chicago
Richard M. Daley, Mayor

DEPARTMENT OF TRANSPORTATION
Miguel d'Escoto, Commissioner

BUREAU OF TRAFFIC
Donald Grabowski, Deputy Commissioner

CITY OF CHICAGO		
44' Wide Street with Bike Lane		
REVISED 5-16-02	SCALE 1"=10'	
H:\Traffic\Bike Lanes\Design Manual\Mid-block\2w,np\44'.fh8		No. __ of __

Bike Lane on 50' Wide Street
No Parking on Both Sides



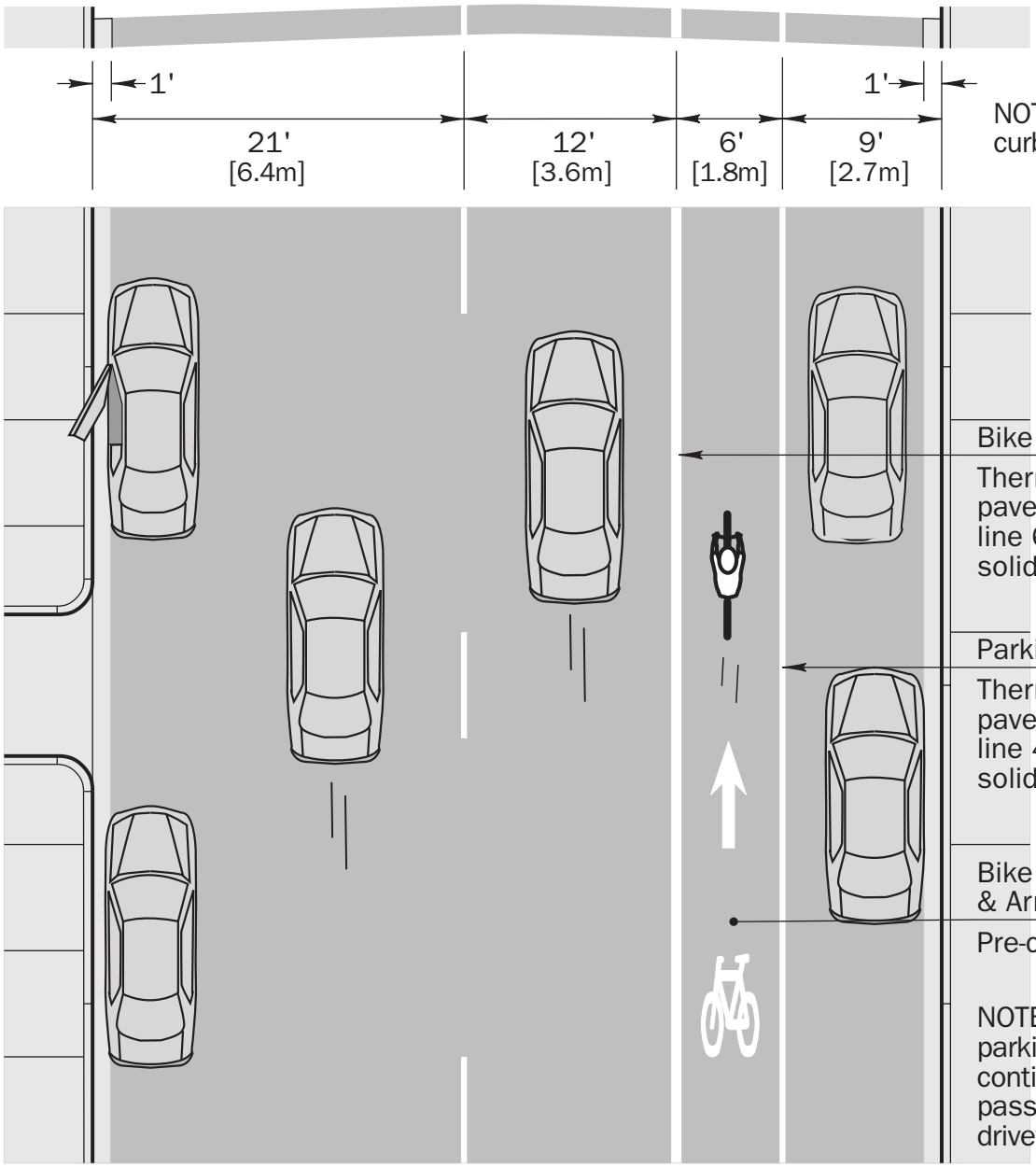
City of Chicago
Richard M. Daley, Mayor

DEPARTMENT OF TRANSPORTATION
Miguel d'Escoto, Commissioner

BUREAU OF TRAFFIC
Donald Grabowski, Deputy Commissioner

CITY OF CHICAGO	
50' Wide Street with Bike Lane	
REVISED 5-16-02	SCALE 1"=10'
H:\Traffic\Bike Lanes\Design Manual\Mid-block\2w,np\50'.fh8	No. __ of __

48' Wide One-way Street
Parking on Both Sides



City of Chicago
Richard M. Daley, Mayor

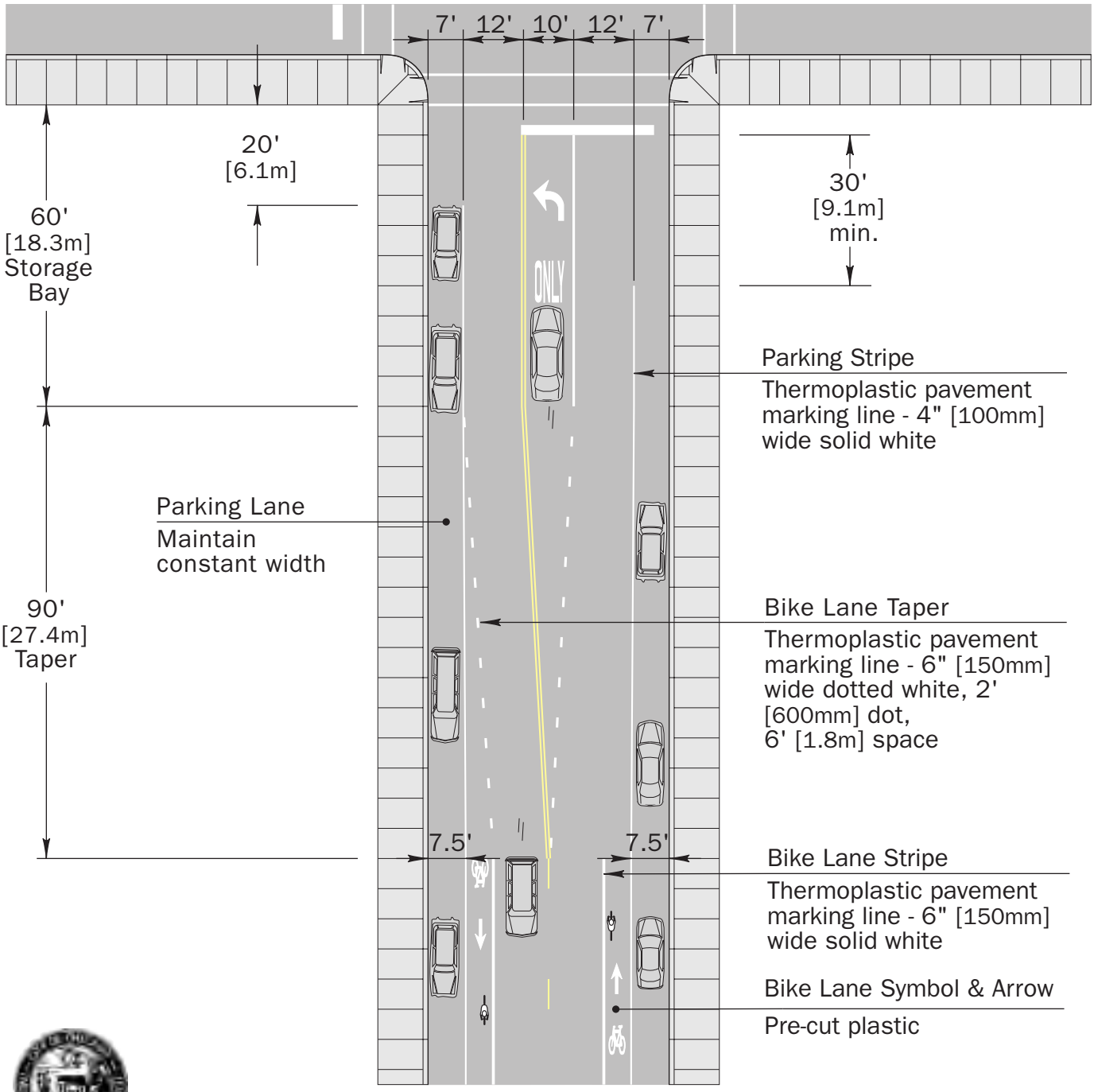
DEPARTMENT OF TRANSPORTATION
Miguel d'Escoto, Commissioner

BUREAU OF TRAFFIC
Donald Grabowski, Deputy Commissioner

CITY OF CHICAGO	
48' Wide One-way Street	
REVISED 5-16-02	SCALE 1"=10'
H:\Traffic\Bike Lanes\Design Manual\Mid-block\1w,pbs\48'-2.FH9	No. __ of __

Bike Lane at 48' Wide Intersection

With Left Turn Bays



City of Chicago
Richard M. Daley, Mayor

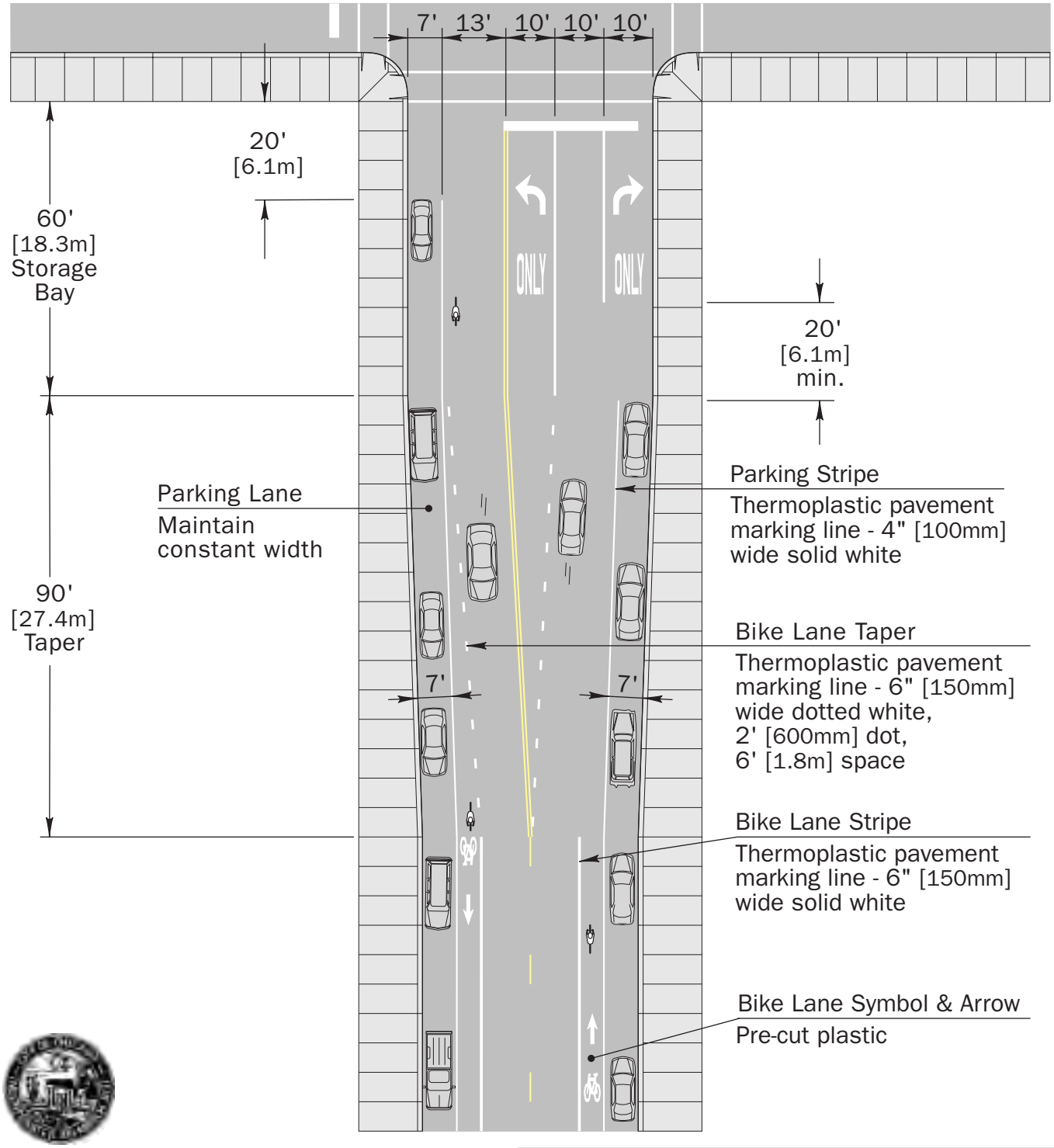
DEPARTMENT OF TRANSPORTATION
Miguel d'Escoto, Commissioner

BUREAU OF TRAFFIC
Donald Grabowski, Deputy Commissioner

CITY OF CHICAGO			
Bike Lanes at 48' Wide Intersection			
REVISED	5-16-02	SCALE	1"=30'
H:\Traffic\Bike Lanes\Design Manual\Intersections\Channelized\48'.FH9		No. __ of __	

Bike Lane at 50' Wide Intersection

With Left and Right Turn Bays



City of Chicago
Richard M. Daley, Mayor

DEPARTMENT OF TRANSPORTATION
Miguel d'Escoto, Commissioner

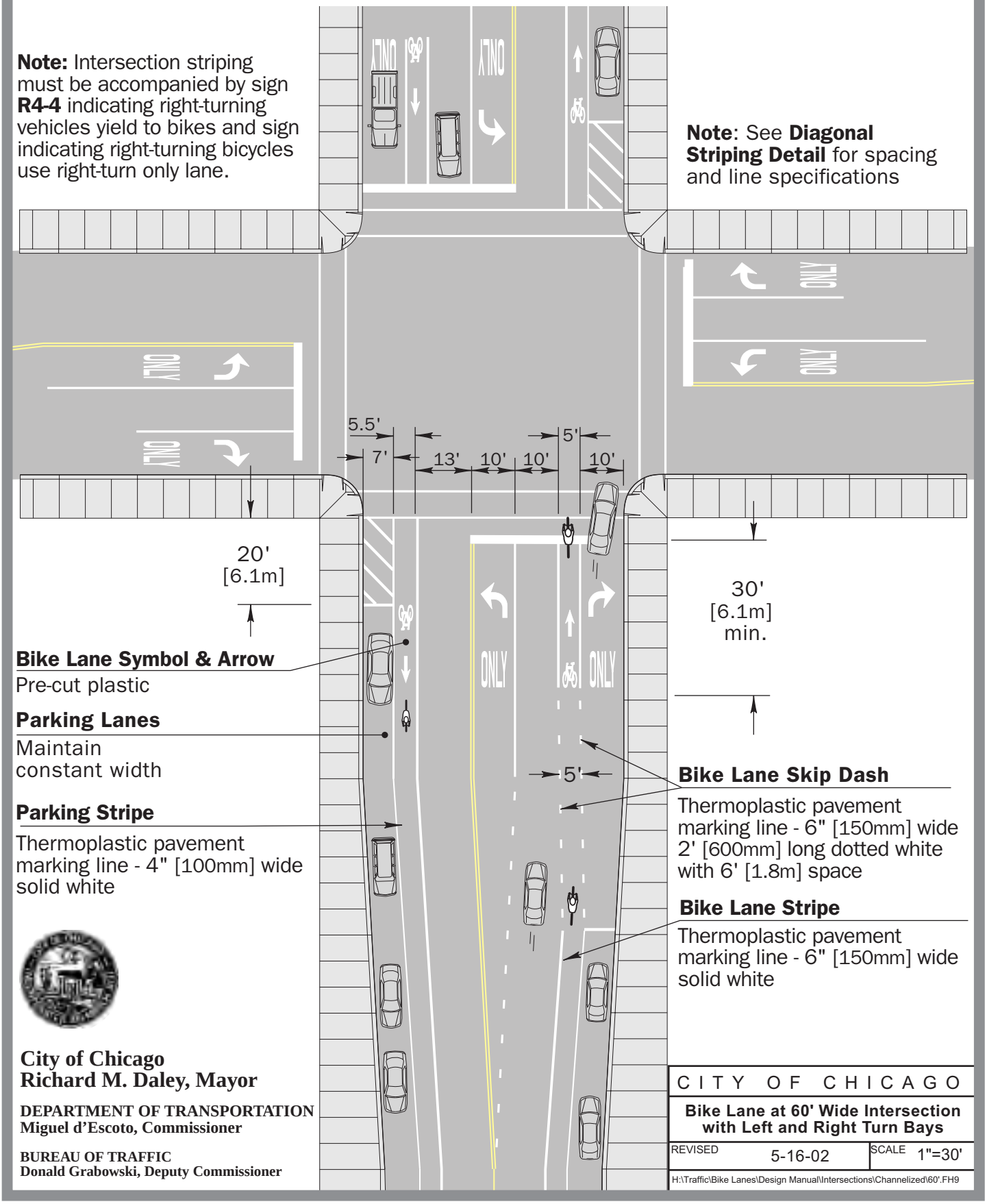
BUREAU OF TRAFFIC
Donald Grabowski, Deputy Commissioner

C I T Y O F C H I C A G O		
Bike Lane at 50' Wide Intersection		
REVISED 5-16-02	SCALE 1"=30'	
H:\Traffic\Bike Lanes\Design Manual\Intersections\Channelized\50'.FH9	No. __ of __	

Bike Lane at 60' Wide Intersection

With Left and Right Turn Bays

Note: Intersection striping must be accompanied by sign **R4-4** indicating right-turning vehicles yield to bikes and sign indicating right-turning bicycles use right-turn only lane.



Note: See **Diagonal Striping Detail** for spacing and line specifications

Bike Lane Symbol & Arrow
Pre-cut plastic

Parking Lanes
Maintain constant width

Parking Stripe
Thermoplastic pavement marking line - 4" [100mm] wide solid white

Bike Lane Skip Dash
Thermoplastic pavement marking line - 6" [150mm] wide 2' [600mm] long dotted white with 6' [1.8m] space

Bike Lane Stripe
Thermoplastic pavement marking line - 6" [150mm] wide solid white

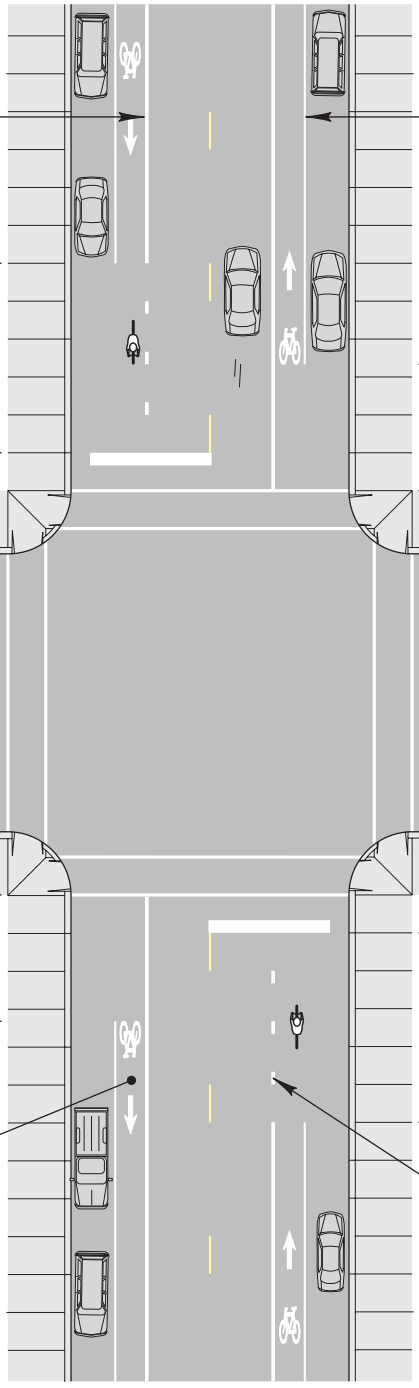
City of Chicago
Richard M. Daley, Mayor

DEPARTMENT OF TRANSPORTATION
Miguel d'Escoto, Commissioner

BUREAU OF TRAFFIC
Donald Grabowski, Deputy Commissioner

CITY OF CHICAGO		
Bike Lane at 60' Wide Intersection with Left and Right Turn Bays		
REVISED	5-16-02	SCALE 1"=30'
H:\Traffic\Bike Lanes\Design Manual\Intersections\Channelized\60'.FH9		

Bike Lane with Parking
Intersection with 2-way Arterial Street



Bike Lane Stripe

Thermoplastic pavement marking line - 6" [150mm] wide solid white

Parking Stripe

Thermoplastic pavement marking line - 4" [100mm] wide solid white

30' [9.1 m]

20' [6.1 m]

20' [6.1 m]

30' [9.1 m]

Bike Lane Symbol & Arrow

Pre-cut plastic

Bike Lane Stripe

Thermoplastic pavement marking line - 6" [150mm] wide 2' [600mm] long dotted white with 6' [1.8m] space

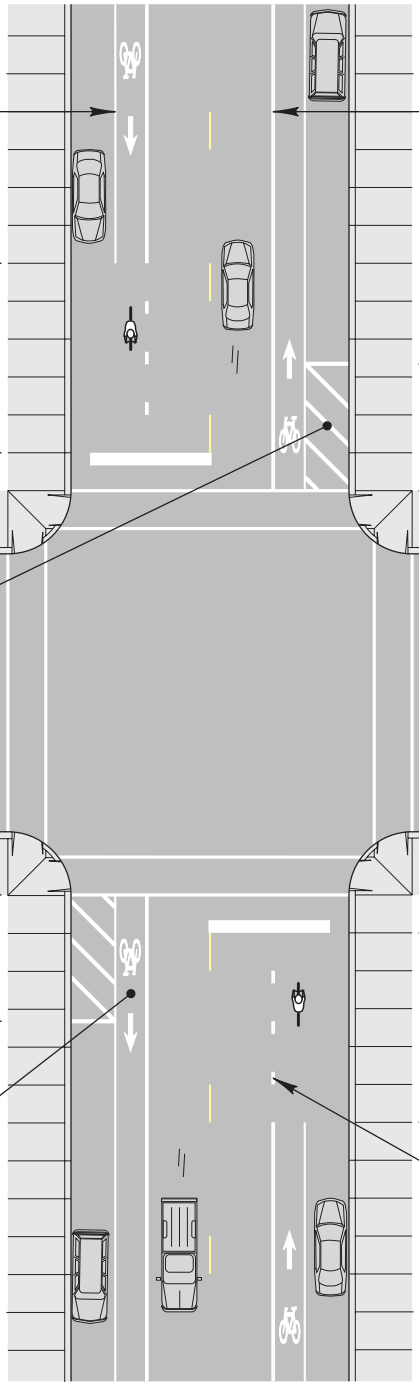
City of Chicago
Richard M. Daley, Mayor

DEPARTMENT OF TRANSPORTATION
Miguel d'Escoto, Commissioner

BUREAU OF TRAFFIC
Donald Grabowski, Deputy Commissioner

CITY OF CHICAGO	
Intersection with 2-way Arterial Street, Parking	
REVISED 5-16-02	SCALE 1"=30'
H:\Traffic\Bike Lanes\Design Manual\Intersections\Arterial street crossing\2Wwp.fh8	No. __ of __

Bike Lane with Limited Parking
Intersection with 2-way Arterial Street



Parking Stripe

Thermoplastic pavement marking line - 4" [100mm] wide solid white

Bike Lane Stripe

Thermoplastic pavement marking line - 6" [150mm] wide solid white

30' [9.1 m]

20' [6.1 m]

Diagonal Striping

To be used when utilization of legal on-street parking is less than 25% over 24 hour period

NOTE: See **Diagonal Striping Detail** for spacing and line specifications

20' [6.1 m]

30' [9.1 m]

Bike Lane Symbol & Arrow

Pre-cut thermoplastic

Bike Lane Stripe

Thermoplastic pavement marking line - 6" [150mm] wide 2' [600mm] long dotted white with 6' [1.8m] space

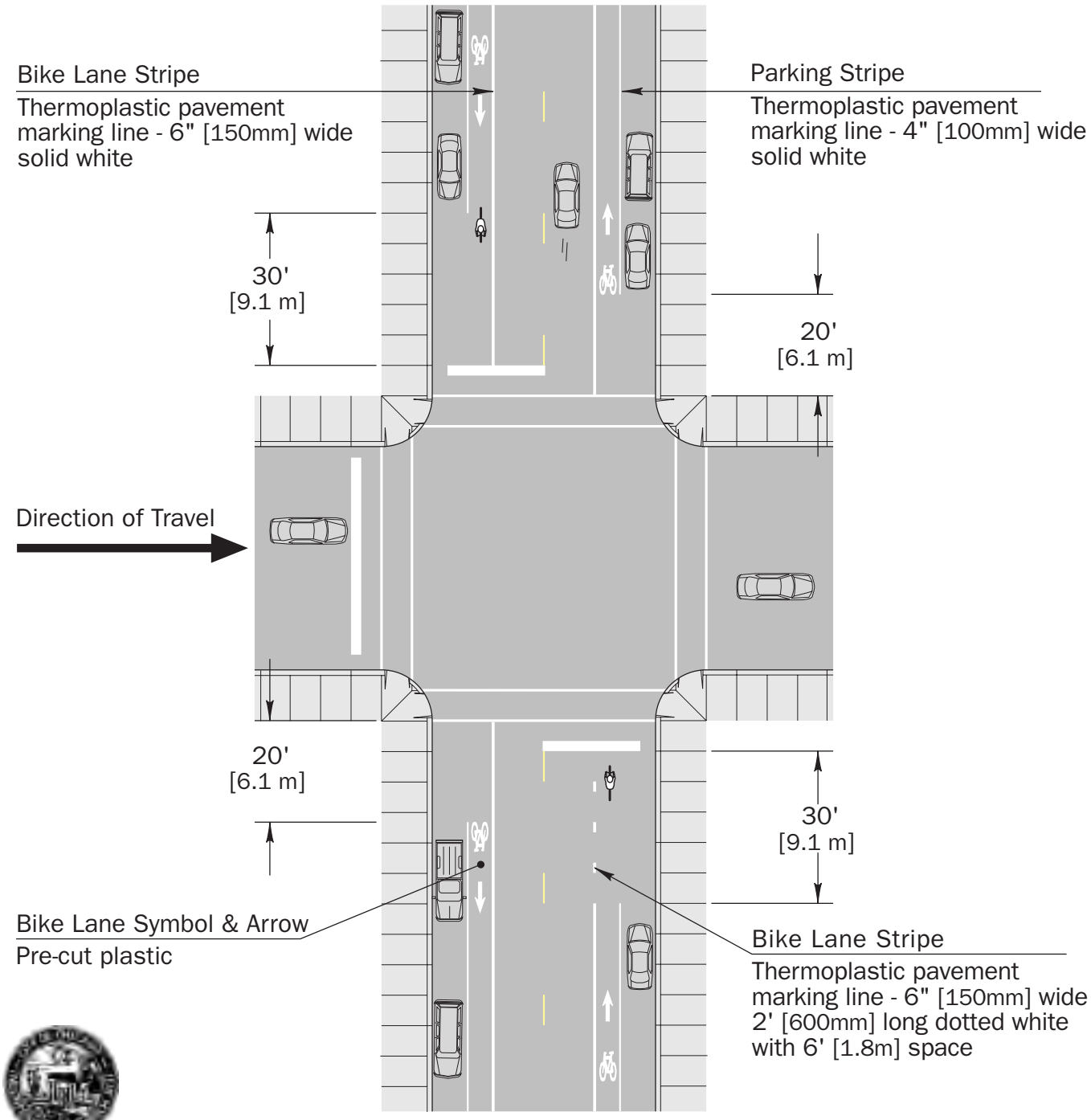
City of Chicago
Richard M. Daley, Mayor

DEPARTMENT OF TRANSPORTATION
Miguel d'Escoto, Commissioner

BUREAU OF TRAFFIC
Donald Grabowski, Deputy Commissioner

C I T Y O F C H I C A G O		
Intersection with 2-way Arterial Street, Limited Parking		
REVISED 5-16-02	SCALE 1"=30'	
H:\Traffic\Bike Lanes\Design Manual\Intersections\Arterial street crossing\2Wwp-limited parking.fh8	No. __ of __	

Bike Lane with Parking
Intersection with 1-way Arterial Street



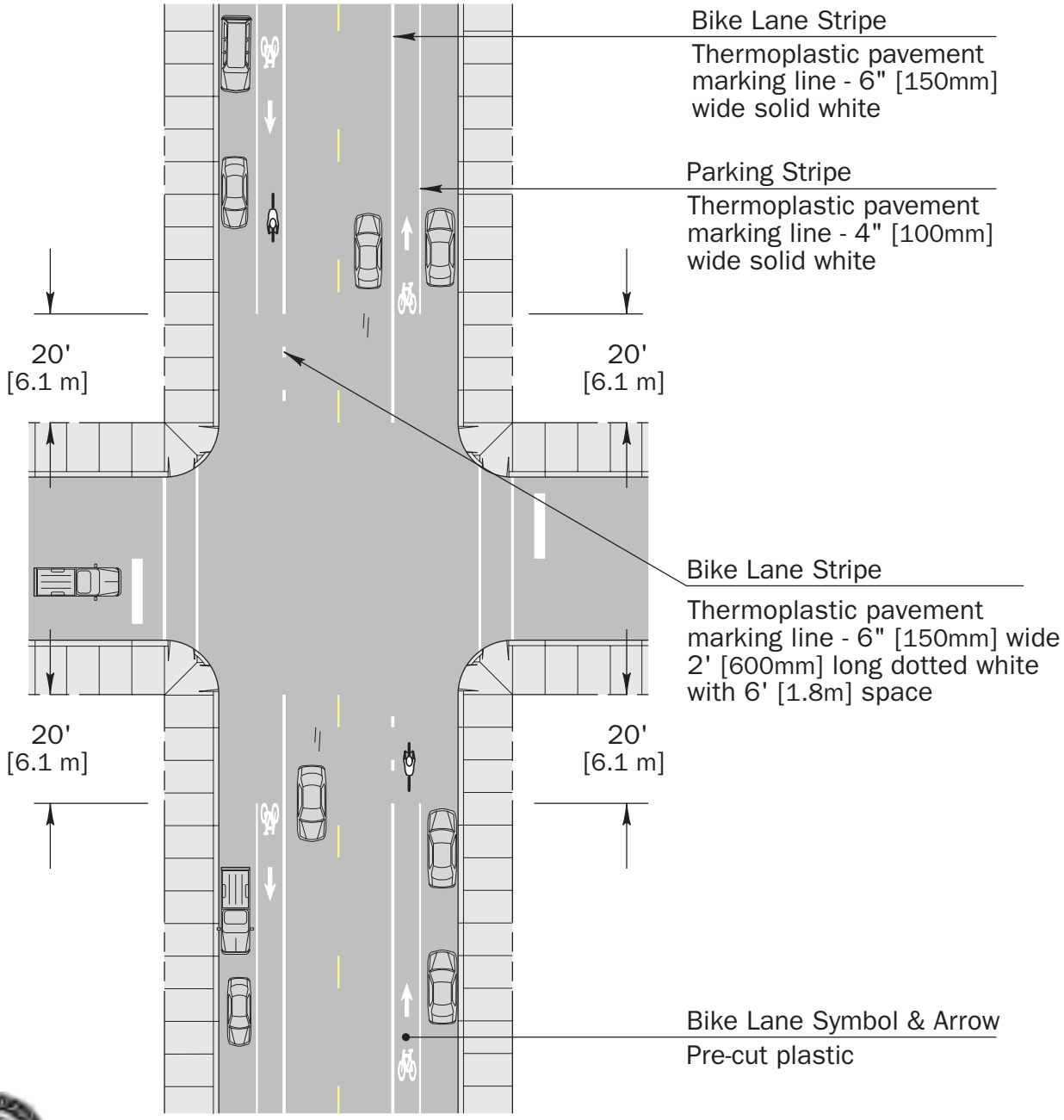
City of Chicago
Richard M. Daley, Mayor

DEPARTMENT OF TRANSPORTATION
Miguel d'Escoto, Commissioner

BUREAU OF TRAFFIC
Donald Grabowski, Deputy Commissioner

C I T Y O F C H I C A G O		
Intersection with 1-way Arterial Street, Parking		
REVISED 5-16-02	SCALE 1"=30'	
H:\Traffic\Bike Lanes\Design Manual\Intersections\Arterial street crossing\1Wwp.fh8	No. __ of __	

Bike Lane with Parking
Intersection with 2-way Local Street



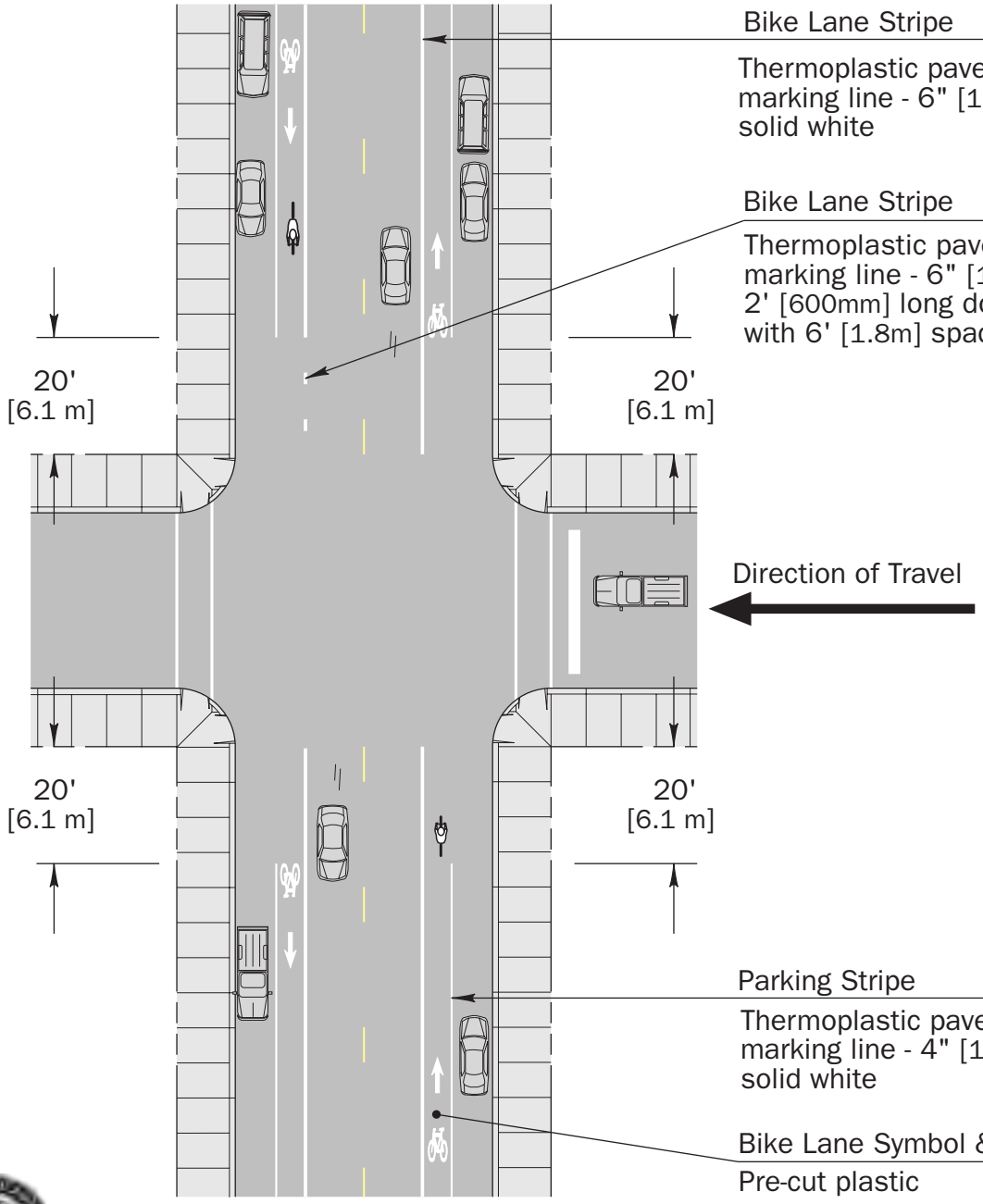
City of Chicago
Richard M. Daley, Mayor

DEPARTMENT OF TRANSPORTATION
Miguel d'Escoto, Commissioner

BUREAU OF TRAFFIC
Donald Grabowski, Deputy Commissioner

C I T Y O F C H I C A G O		
Intersection with 2-way Local Street, Parking		
REVISED 5-16-02	SCALE 1"=30'	
H:\Traffic\Bike Lanes\Design Manual\Intersections\Local\2 way with parking.fh8	No. __ of __	

Bike Lane with Parking
Intersection with 1-way Local Street



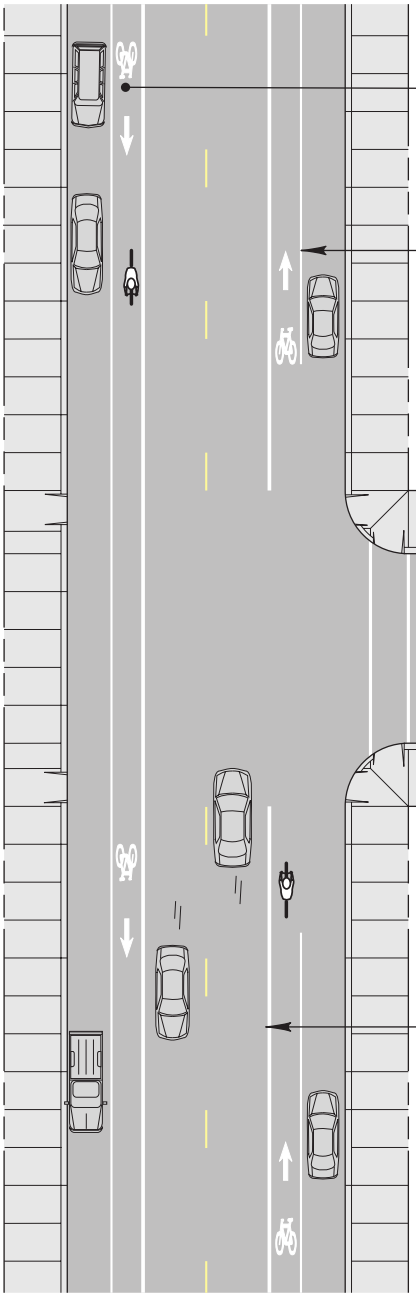
City of Chicago
Richard M. Daley, Mayor

DEPARTMENT OF TRANSPORTATION
Miguel d'Escoto, Commissioner

BUREAU OF TRAFFIC
Donald Grabowski, Deputy Commissioner

C I T Y O F C H I C A G O		
Intersection with 1-way Local Street, Parking		
REVISED 5-16-02	SCALE 1"=30'	
H:\Traffic\Bike Lanes\Design Manual\Intersections\Local\1 way with parking.FH9	No. __ of __	

Bike Lane with Parking
Intersection with One-way Local T



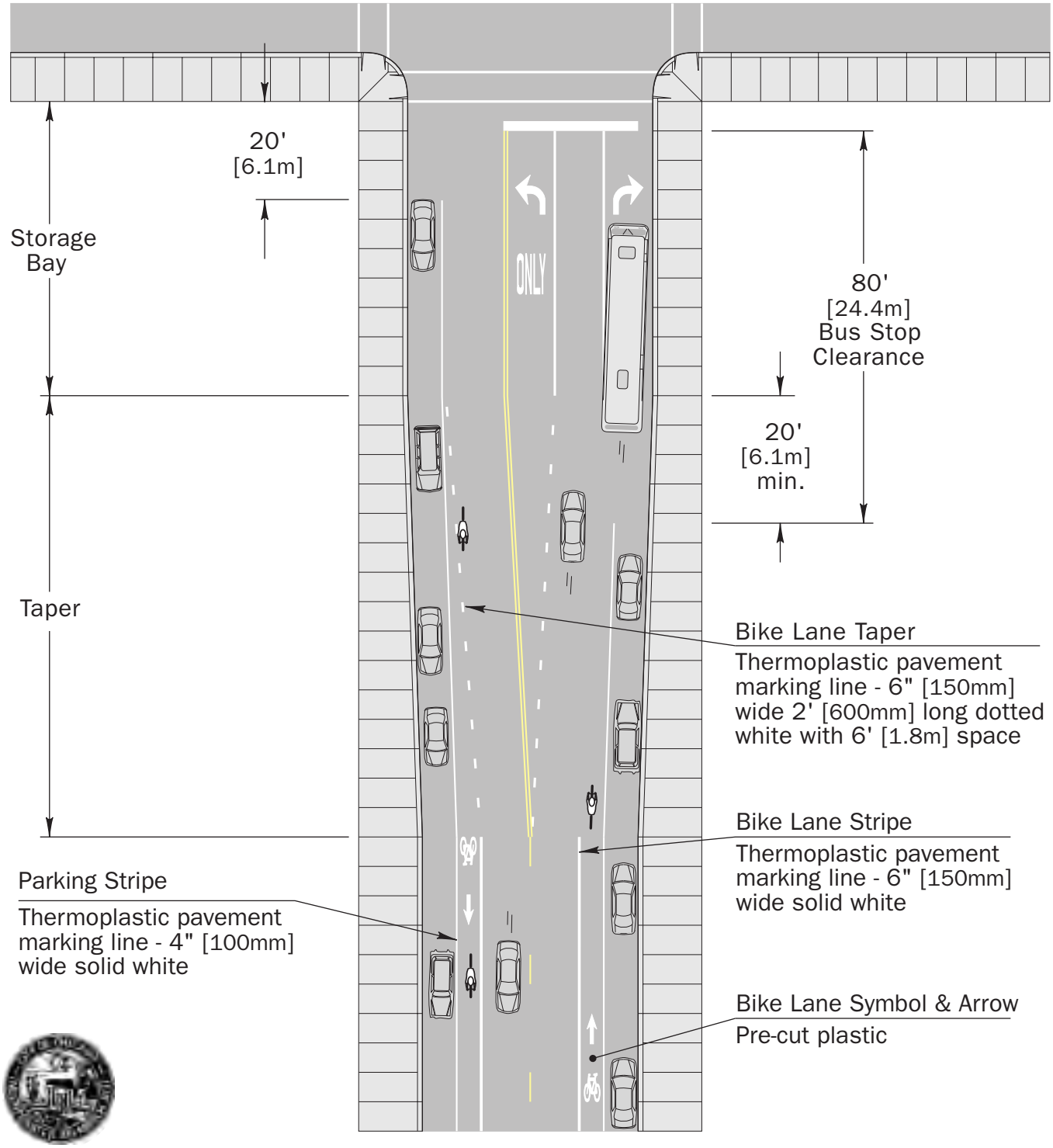
City of Chicago
Richard M. Daley, Mayor

DEPARTMENT OF TRANSPORTATION
Miguel d'Escoto, Commissioner

BUREAU OF TRAFFIC
Donald Grabowski, Deputy Commissioner

CITY OF CHICAGO			
Intersection with One-way Local T, Parking			
REVISED	5-16-02	SCALE	1"=30'
H:\Traffic\Bike Lanes\Design Manual\Intersection\Local\local T 1-way out.fh9		No. __ of __	

Bike Lane with Bus Stop
Channelized Intersection



Bike Lane Taper

Thermoplastic pavement marking line - 6" [150mm] wide 2' [600mm] long dotted white with 6' [1.8m] space

Bike Lane Stripe

Thermoplastic pavement marking line - 6" [150mm] wide solid white

Parking Stripe

Thermoplastic pavement marking line - 4" [100mm] wide solid white

Bike Lane Symbol & Arrow

Pre-cut plastic

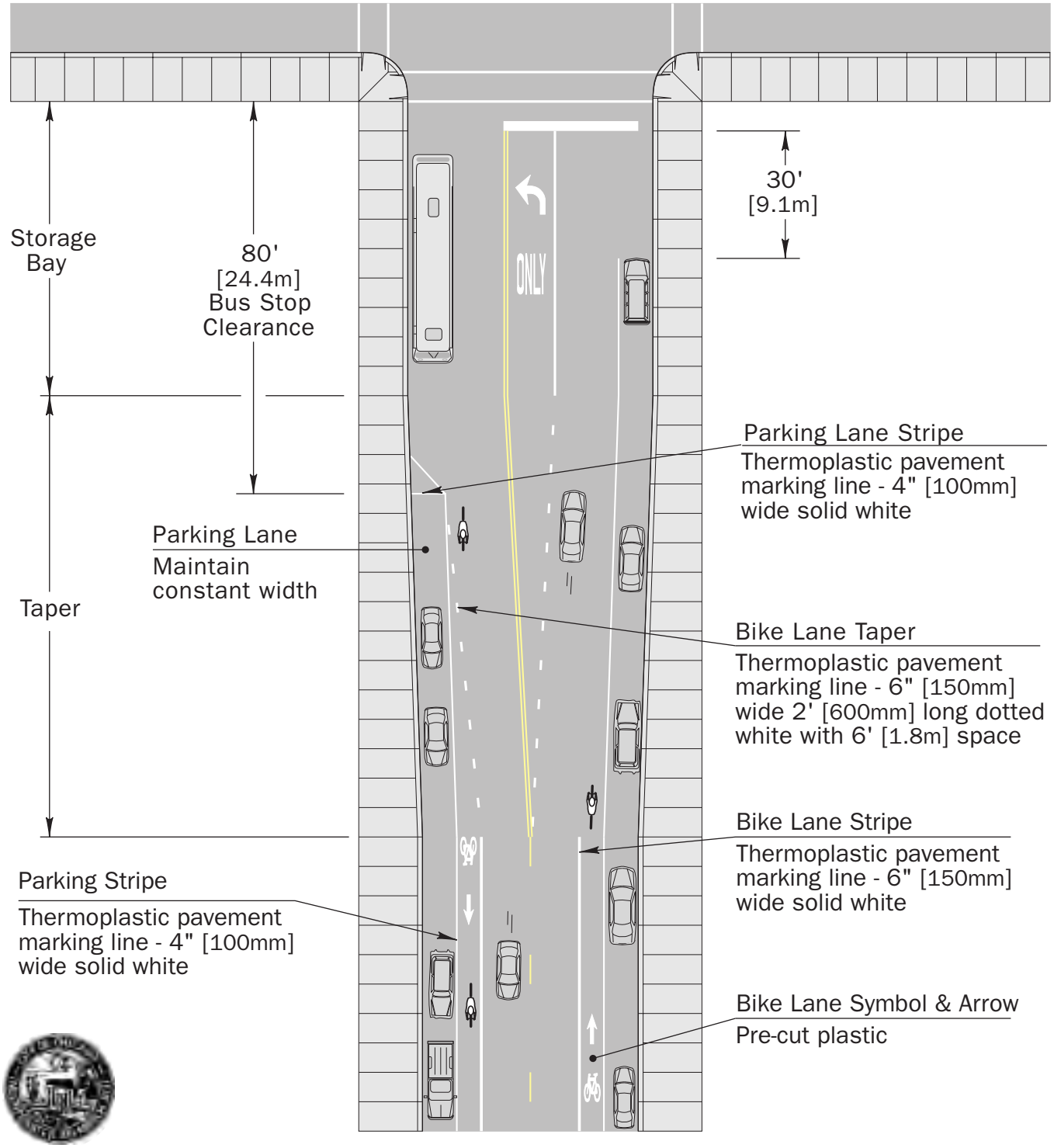
City of Chicago
Richard M. Daley, Mayor

DEPARTMENT OF TRANSPORTATION
Miguel d'Escoto, Commissioner

BUREAU OF TRAFFIC
Donald Grabowski, Deputy Commissioner

C I T Y O F C H I C A G O	
Bus Stop, Channelized	
REVISED 5-16-02	SCALE 1"=30'
H:\Bike Lanes\Design Manual\Bus Stops\BSatChannel.fh8	No. __ of __

Bike Lane with Bus Stop
Far-side of Channelized Intersection



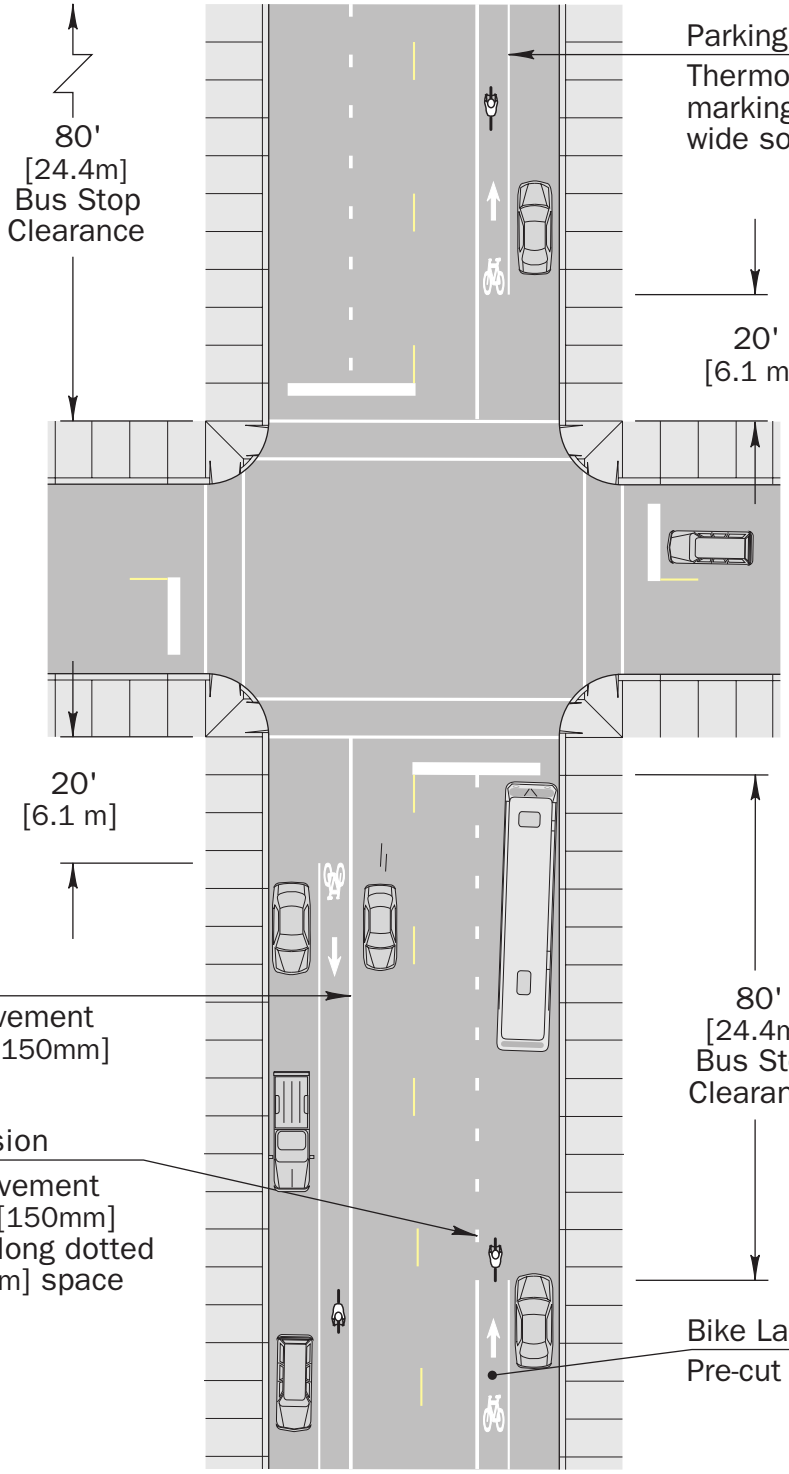
City of Chicago
Richard M. Daley, Mayor

DEPARTMENT OF TRANSPORTATION
Miguel d'Escoto, Commissioner

BUREAU OF TRAFFIC
Donald Grabowski, Deputy Commissioner

CITY OF CHICAGO	
Bus Stop, Far-side Channelized	
REVISED 5-16-02	SCALE 1"=30'
H:\Bike Lanes\Design Manual\Bus Stops\Channel-far.fh8	No. __ of __

Bike Lane with Bus Stop
Non-Channelized Intersection



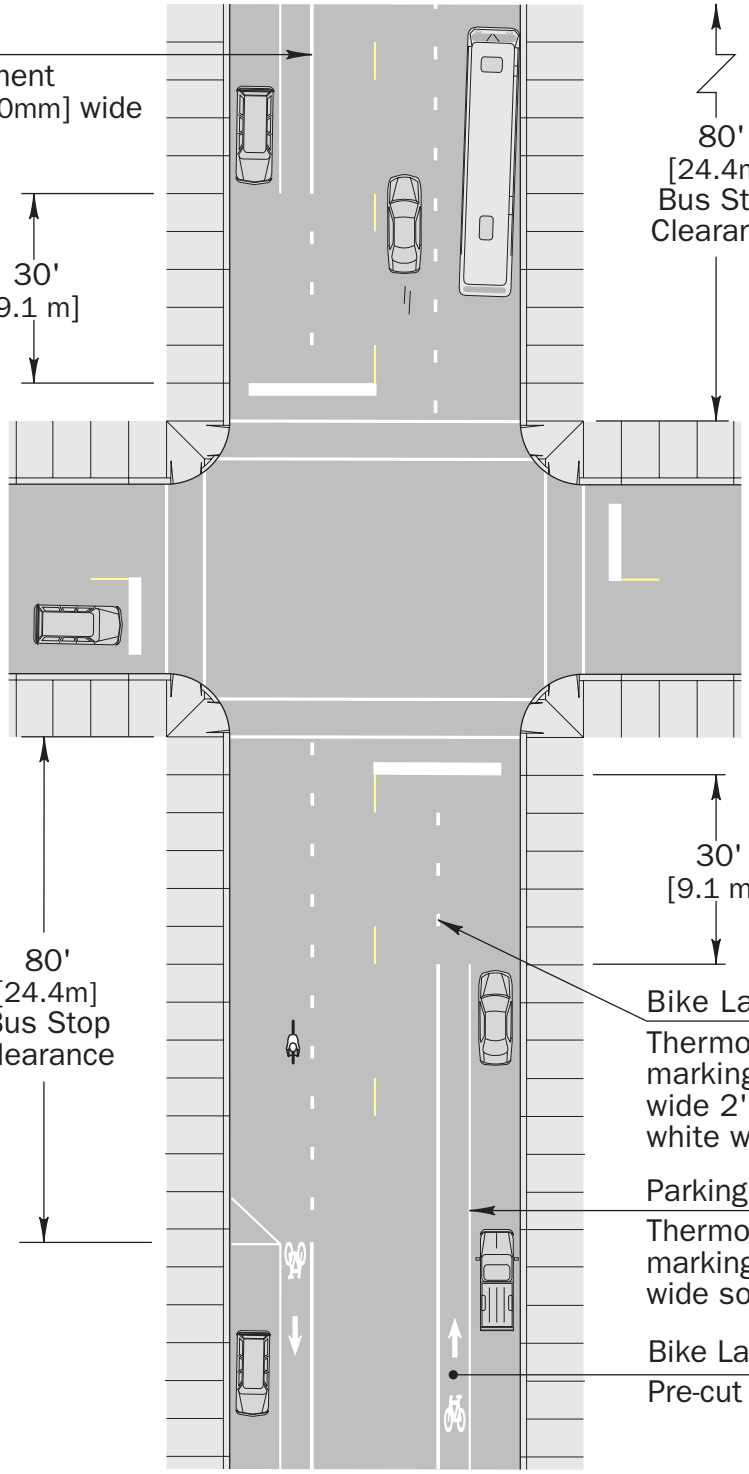
City of Chicago
Richard M. Daley, Mayor

DEPARTMENT OF TRANSPORTATION
Miguel d'Escoto, Commissioner

BUREAU OF TRAFFIC
Donald Grabowski, Deputy Commissioner

CITY OF CHICAGO			
Bus Stop, Non-channelized			
REVISED	5-16-02	SCALE	1"=30'
H:\Bike Lanes\Design Manual\Bus Stops\BSatNonChannel.fh8		No. __ of __	

Bike Lane with Bus Stop
Far Side of Non-Channelized Intersection



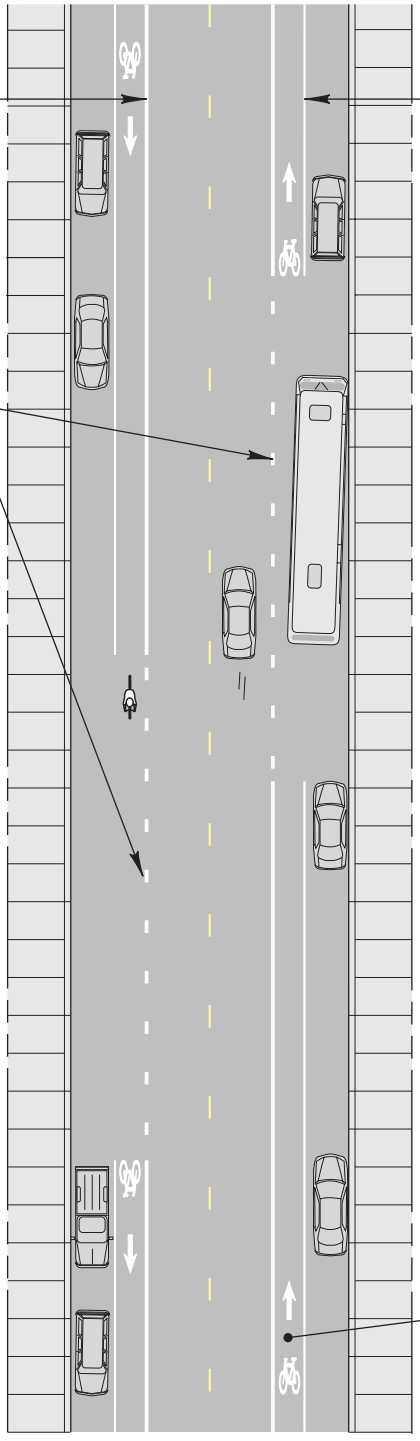
City of Chicago
Richard M. Daley, Mayor

DEPARTMENT OF TRANSPORTATION
Miguel d'Escoto, Commissioner

BUREAU OF TRAFFIC
Donald Grabowski, Deputy Commissioner

CITY OF CHICAGO			
Bus Stop, Far Side Non-Channelized			
REVISED	5-16-02	SCALE	1"=30'
H:\Bike Lanes\Design Manual\Bus Stops\BSatNonChannel.fh8		No. __ of __	

Bike Lane at Mid-Block Bus Stop



Bike Lane Stripe

Thermoplastic pavement marking line - 6" [150mm] wide solid white

Parking Stripe

Thermoplastic pavement marking line - 4" [100mm] wide solid white

Bike Lane Extension

Thermoplastic pavement marking line - 6" [150mm] wide 2' [600mm] long dotted white with 6' [1.8m] space

80' [24.4m] Bus Stop Clearance

80' [24.4m] Bus Stop Clearance

Bike Lane Symbol & Arrow

Pre-cut plastic

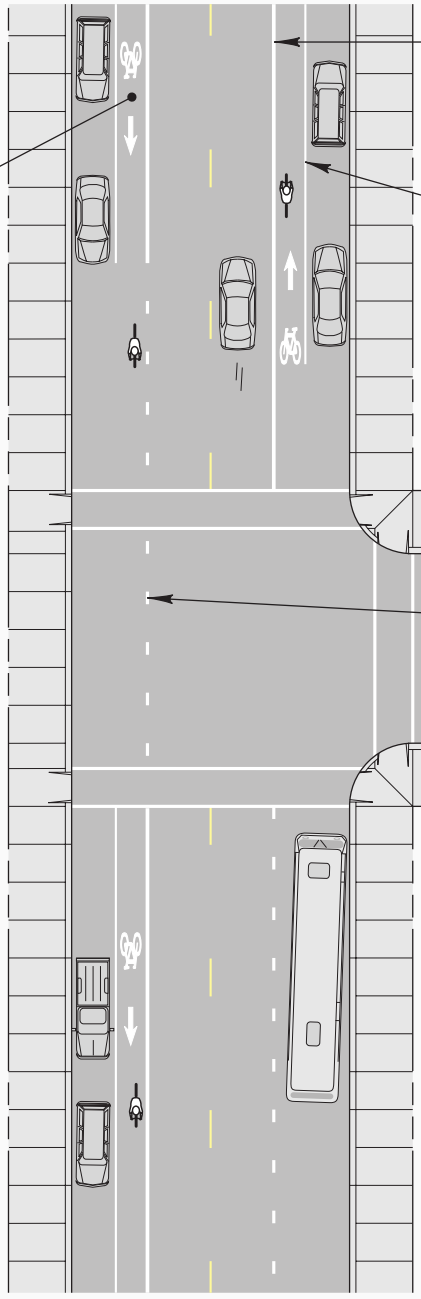
City of Chicago
Richard M. Daley, Mayor

DEPARTMENT OF TRANSPORTATION
Miguel d'Escoto, Commissioner

BUREAU OF TRAFFIC
Donald Grabowski, Deputy Commissioner

CITY OF CHICAGO			
Bus Stop, T-intersection			
REVISED	5-16-02	SCALE	1"=30'
H:\Traffic\Bike Lanes\Design Manual\Bus Stops\Mid_block.fh8		No. __ of __	

Bike Lane with Bus Stop
T-Intersection



Bike Lane Stripe

Thermoplastic pavement marking line - 6" [150mm] wide solid white

Bike Lane Symbol & Arrow

Pre-cut plastic

Parking Stripe

Thermoplastic pavement marking line - 4" [100mm] wide solid white

20' [6.1m]

80' [24.4m] Bus Stop Clearance

Bike Lane Extension

Thermoplastic pavement marking line - 6" [150mm] wide 2' [600mm] long dotted white with 6' [1.8m] space

80' [24.4m] Bus Stop Clearance

City of Chicago
Richard M. Daley, Mayor

DEPARTMENT OF TRANSPORTATION
Miguel d'Escoto, Commissioner

BUREAU OF TRAFFIC
Donald Grabowski, Deputy Commissioner

CITY OF CHICAGO			
Bus Stop, T-Intersection			
REVISED	5-16-02	SCALE	1"=30'
H:\Traffic\Bike Lanes\David\Bike Lane Specs Manual\T-intersections\local T with bus stop.fh9			No. __ of __

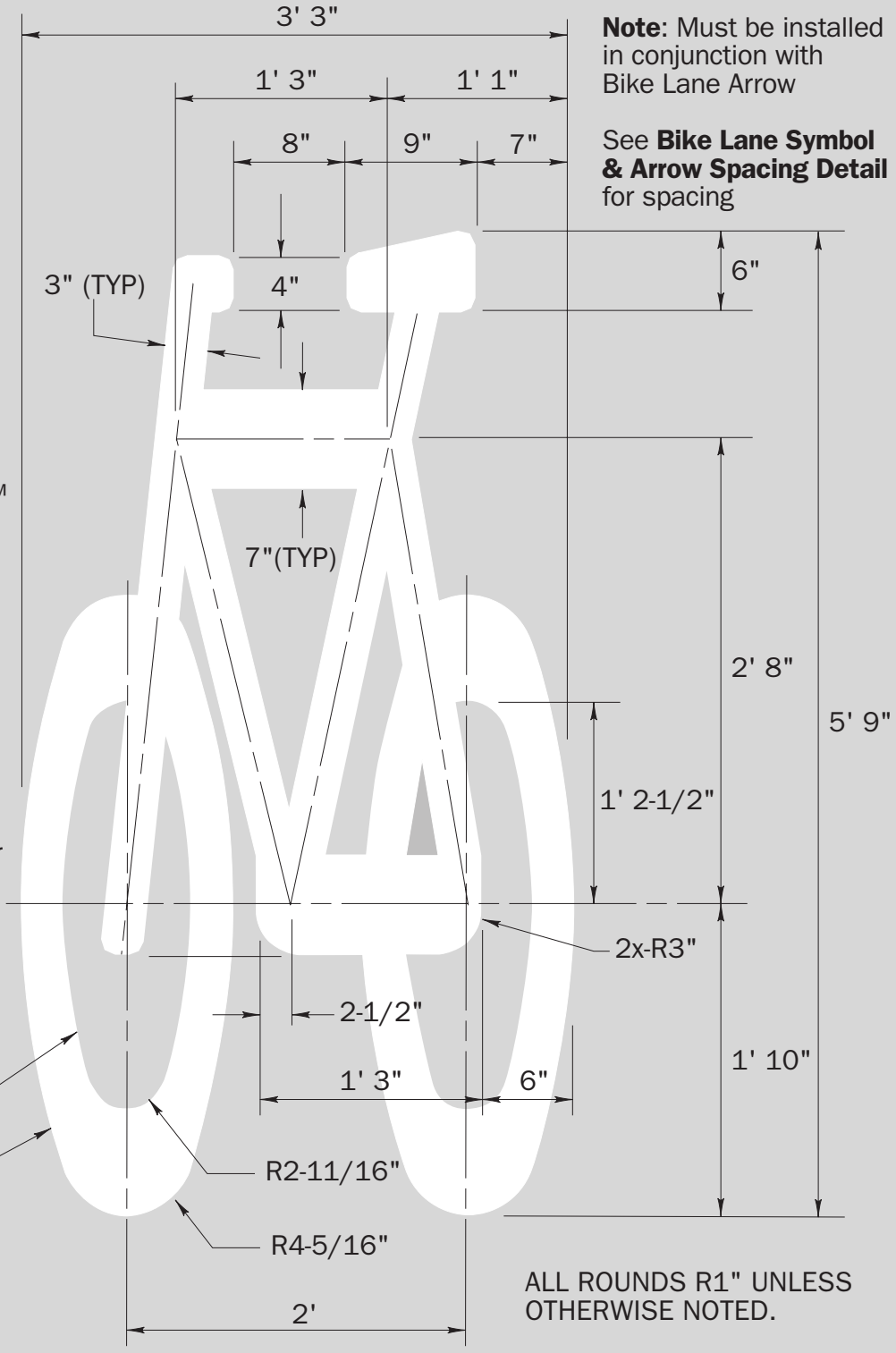
Bike Lane Symbol Detail

Pavement Marking Type:
3M™ Stamark™ Series L420 or equivalent White.

Installation Guidelines:
- Air temperature 60°F (15°C) and rising.
- Pavement temperature 70°F (21°C) and rising.
- Overnight temperatures not below 40°F (4°C)
- No rainfall should occur within 24 hours prior to application.

Adhesive:
The use of 3M™ Stamark™ Contact Cement E-44T or equivalent is required on all surfaces. Allow time for primer to dry before applying symbol.

Tamping:
Symbol markings must be tamped three times back and forth (six passes) over each part of the tape with a tamper cart carrying 200 lb. (90kg) of weight. Start in the center and work your way to the edges of the marking to remove any trapped air.



Note: Must be installed in conjunction with Bike Lane Arrow

See **Bike Lane Symbol & Arrow Spacing Detail** for spacing

ALL ROUNDS R1" UNLESS OTHERWISE NOTED.

City of Chicago
Richard M. Daley, Mayor

DEPARTMENT OF TRANSPORTATION
Miguel d'Escoto, Commissioner

BUREAU OF TRAFFIC
Donald Grabowski, Deputy Commissioner

CITY OF CHICAGO		
Bike Lane Symbol Detail		
REVISED 5-16-02	SCALE 1" = 1'	
H:\Traffic\Bike Lanes\Design Manual\Symbols\Bike Symbol.fh8		No. __ of __

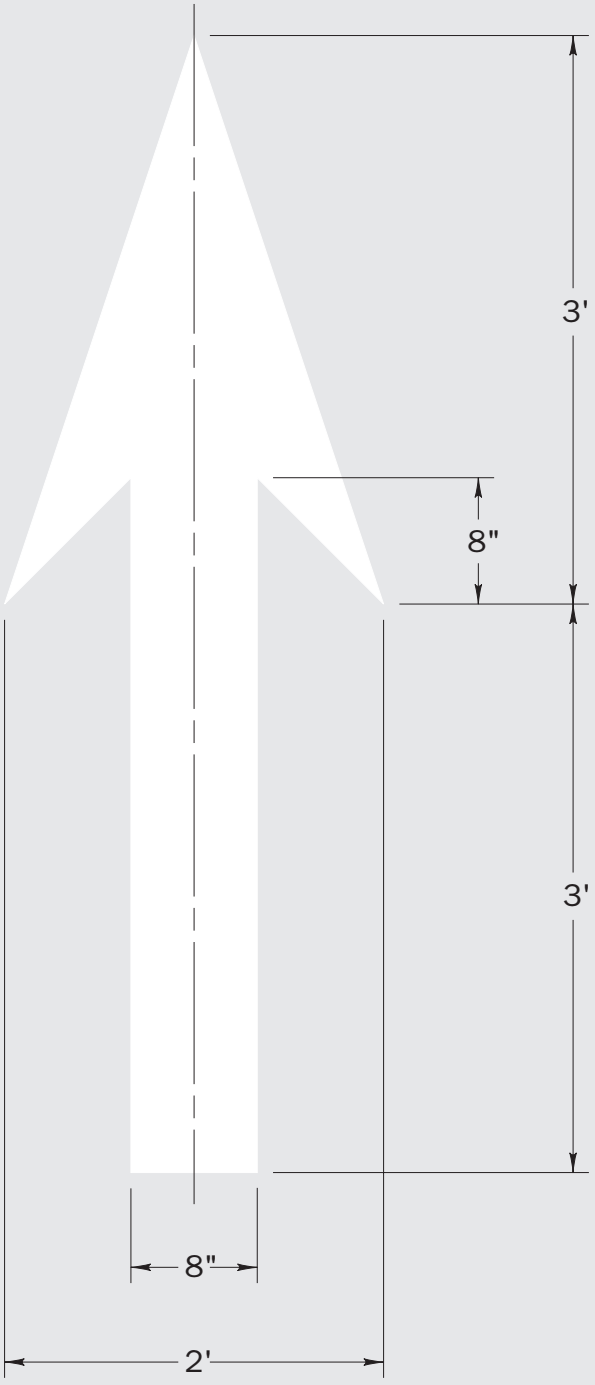
Bike Lane Arrow Detail

Pavement Marking Type:
3M™ Stamark™ Series
L420 or equivalent White.

Installation Guidelines:
- Air temperature 60ºF (15ºC) and rising.
- Pavement temperature 70ºF (21ºC) and rising.
- Overnight temperatures not below 40ºF (4ºC)
- No rainfall should occur within 24 hours prior to application.

Adhesive:
The use of 3M™ Stamark™ Contact Cement E-44T or equivalent is required on all surfaces. Allow time for primer to dry before applying symbol.

Tamping:
Symbol markings must be tamped three times back and forth (six passes) over each part of the tape with a tamper cart carrying 200 lb. (90kg) of weight. Start in the center and work your way to the edges of the marking to remove any trapped air.



Note: Must be installed in conjunction with Bike Lane Symbol

See **Bike Lane Symbol & Arrow Spacing Detail** for spacing

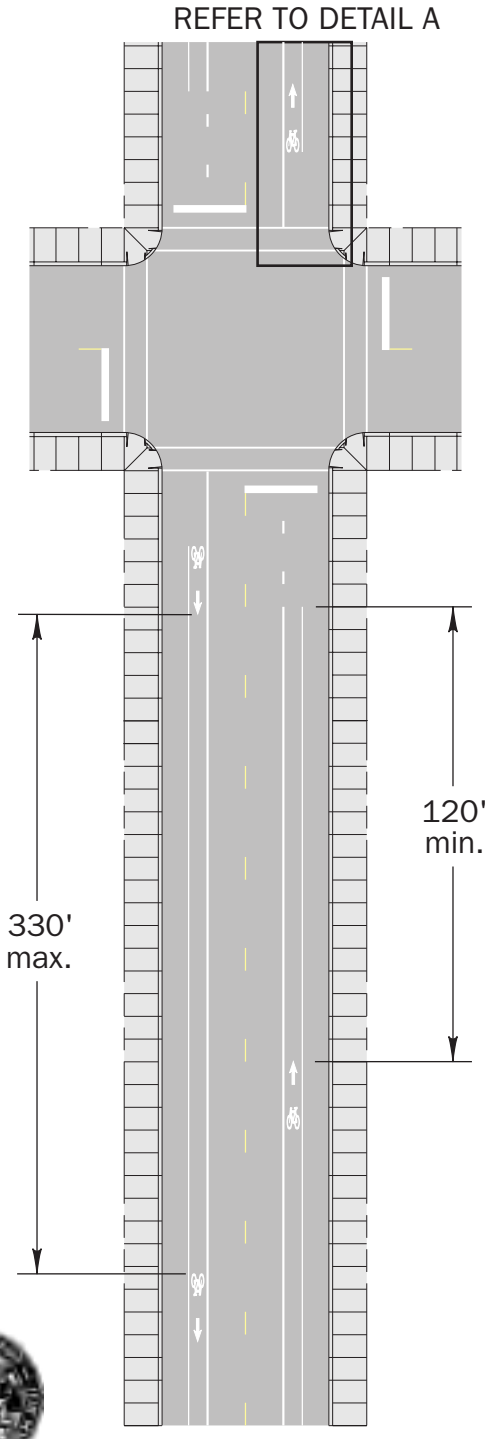
City of Chicago
Richard M. Daley, Mayor

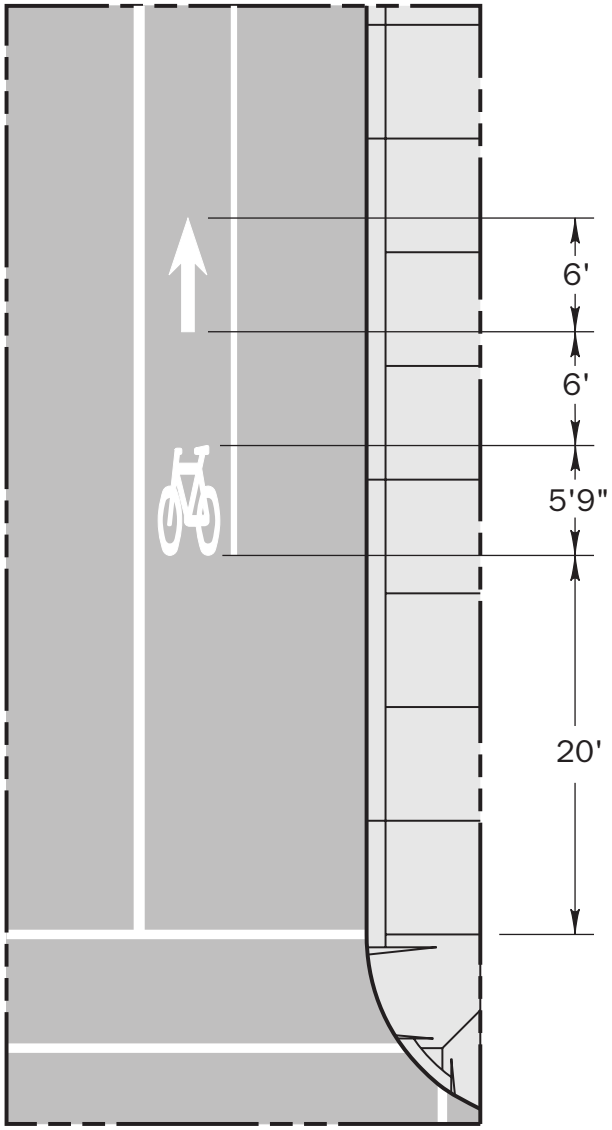
DEPARTMENT OF TRANSPORTATION
Miguel d'Escoto, Commissioner

BUREAU OF TRAFFIC
Donald Grabowski, Deputy Commissioner

CITY OF CHICAGO			
Bike Lane Arrow Detail			
REVISED	5-16-02	SCALE	1" = 1'
H\Bike Lanes\Design Manual\Symbols\Bike arrow.fh8		No. __ of __	

Bike Lane Symbol & Arrow Spacing





DETAIL A
SCALE 1'=10'

City of Chicago
Richard M. Daley, Mayor

DEPARTMENT OF TRANSPORTATION
Miguel d'Escoto, Commissioner

BUREAU OF TRAFFIC
Donald Grabowski, Deputy Commissioner

CITY OF CHICAGO		
Bike Lane Symbol & Arrow Spacing		
REVISED 5-16-02	SCALE 1"=50'	
H:\Traffic\Bike Lanes\Design Manual\Symbols\Symbol & Arrow Spacing.fh8	No. __ of __	

Diagonal Striping Detail

Parking Stripe

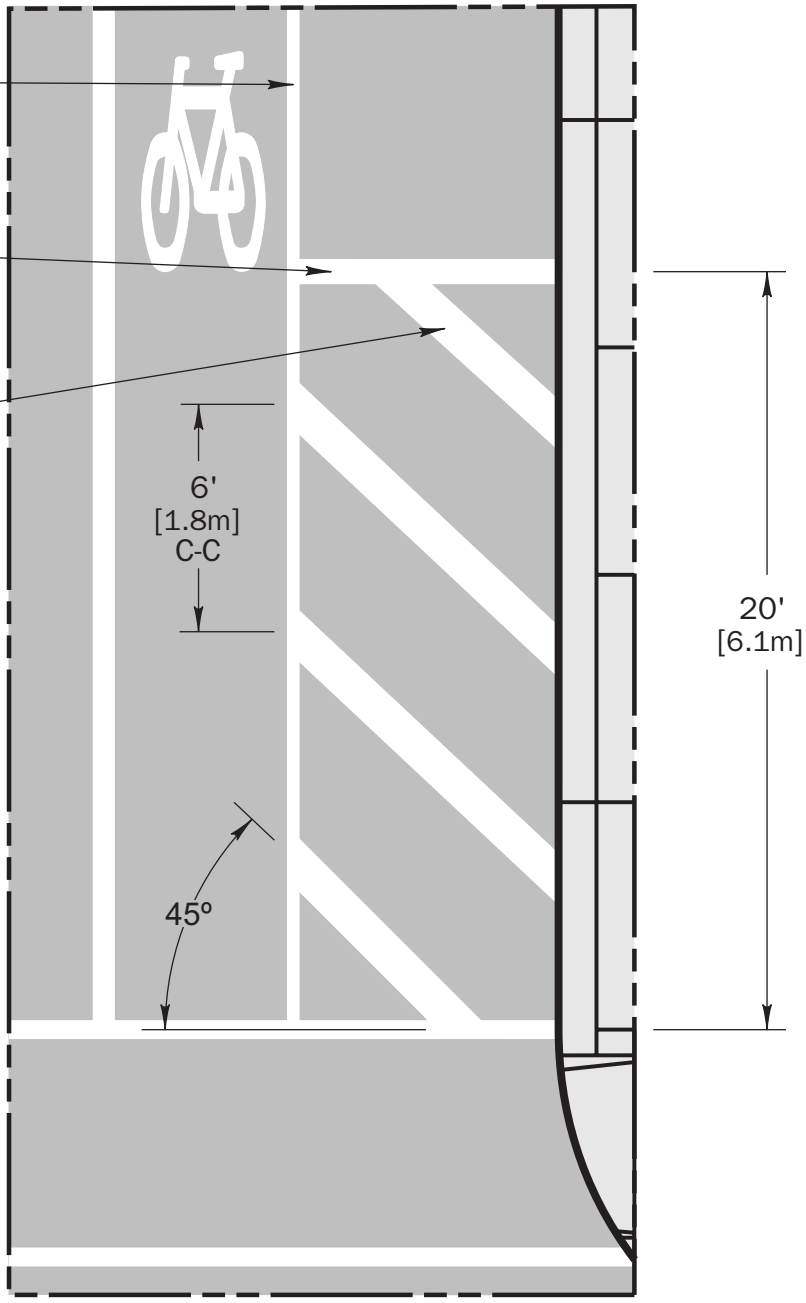
Thermoplastic pavement marking line - 4" [100mm] wide solid white

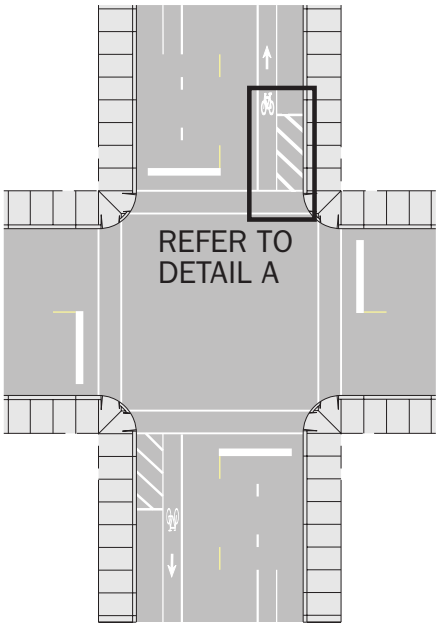
End Line

Thermoplastic pavement marking line - 8" [200mm] wide solid white

Diagonal Line

Thermoplastic pavement marking line - 12" [300mm] wide solid white diagonal on 6' [1.8m] centers





DETAIL A
SCALE 1"=5'

City of Chicago
Richard M. Daley, Mayor

DEPARTMENT OF TRANSPORTATION
Miguel d'Escoto, Commissioner

BUREAU OF TRAFFIC
Donald Grabowski, Deputy Commissioner

CITY OF CHICAGO			
Diagonal Striping Detail			
REVISED	5-16-02	SCALE	1"=50'
H:\Traffic\Bike Lanes\David\Bike Lane Specs Manual\Symbols\Diagonal Striping Detail.fh8		No. __ of __	

Standard Sign
Lane Ahead

Sign Type

Number: R3-16

Size: 24" x 30"

Color: Black on White
Reflective

Type: 2 3/4" Highway Gothic

Symbol: 13" x 7 1/2"

Note: Must be installed in conjunction with **Lane Ends** signs.

Signs must be installed according to the Chicago Department of Transportation 's sign hanging standards and at the direction of the resident engineer.

City of Chicago
Richard M. Daley, Mayor

DEPARTMENT OF TRANSPORTATION
Miguel d'Escoto, Commissioner

BUREAU OF TRAFFIC
Donald Grabowski, Deputy Commissioner

CITY OF CHICAGO			
Lane Ahead			
REVISED	10-8-02	SCALE	1" = 6"
H:\Bike Lanes\Design Manual\Signs\lane ahead.FH9		No. __ of __	

Standard Sign
Lane Ends

Sign Type

Number: R3-16a

Size: 24"x 30"

Color: Black on White
Reflective

Type: 2 3/4" Highway Gothic

Symbol: *13" x 7 1/2"*

Note: Must be installed in conjunction with **Lane Ahead** signs.

Signs must be installed according to the Chicago Department of Transportation's sign hanging standards and at the direction of the resident engineer.

City of Chicago
Richard M. Daley, Mayor

DEPARTMENT OF TRANSPORTATION
Miguel d'Escoto, Commissioner

BUREAU OF TRAFFIC
Donald Grabowski, Deputy Commissioner

CITY OF CHICAGO			
Lane Ends			
REVISED	10-8-02	SCALE	1" = 6"
H:\Bike Lanes\Design Manual\Signs\lane ends.FH9			No. __ of __

Standard Sign
Right Lane Bike Only

Sign Type

Number: R3-17

Size: 24" x 30"

Color: Black on White
Reflective

Font: 2 3/4" Highway Gothic

Symbol: 10 1/2" x 6 1/2"

Note: Must be installed in conjunction with **Bike Lane Ahead** and **Bike Lane Ends** signs.

Signs must be installed according to the Chicago Department of Transportation 's sign hanging standards and at the direction of the resident engineer.

City of Chicago
Richard M. Daley, Mayor

DEPARTMENT OF TRANSPORTATION
Miguel d'Escoto, Commissioner

BUREAU OF TRAFFIC
Donald Grabowski, Deputy Commissioner

CITY OF CHICAGO			
Right Lane Bike Only			
REVISED	10-8-02	SCALE	1" = 6"
H:\Bike Lanes\Design Manual\Signs\right lane.FH9		No. __ of __	

Standard Sign
Right-Turn Only Except Bikes

Sign Type

Number: Special #2

Size: 24" x 30"

Color: Black on White
Reflective

Type: Highway Gothic

ONLY: 4"

EXCEPT: 2 3/4"

Symbol: 6" x 10 1/5"

Note: Must be installed in conjunction with **Shared Lane Yield to Bikes** signs at all right-turn only lanes.

Signs must be installed according to the Chicago Department of Transportation's sign hanging standards and at the direction of the resident engineer.

City of Chicago
Richard M. Daley, Mayor

DEPARTMENT OF TRANSPORTATION
Miguel d'Escoto, Commissioner

BUREAU OF TRAFFIC
Donald Grabowski, Deputy Commissioner

CITY OF CHICAGO			
Right-turn Only Except Bikes			
REVISED	5-16 -02	SCALE	1" = 6"
H:\Bike Lanes\Design Manual\Signs\only except.FH9		No. __ of __	

Standard Sign
Right-Turn Only Except Bikes and Buses

Sign Type

Number: Special #3

Size: 24" x 30"

Color: Black on White
Reflective

Type: Highway Gothic

ONLY: 4"

EXCEPT: 2 3/4"

Symbol: 6" x 10 1/5"

Note: Must be installed in conjunction with **Shared Lane Yield to Bikes** signs at all right-turn only lanes with bus stops.

Signs must be installed according to the Chicago Department of Transportation's sign hanging standards and at the direction of the resident engineer.

City of Chicago
Richard M. Daley, Mayor

DEPARTMENT OF TRANSPORTATION
Miguel d'Escoto, Commissioner

BUREAU OF TRAFFIC
Donald Grabowski, Deputy Commissioner

CITY OF CHICAGO			
Right-turn Only Except Bikes			
REVISED	5-16-02	SCALE	1" = 6"
H:\Bike Lanes\Design Manual\Signs\only except bus.FH9		No. __ of __	

Standard Sign
Shared Lane Yield to Bikes

Sign Type

Number: Special #1

Size: 24" x 24"

Color: Black on Yellow Reflective

Font: 2 3/4" Highway Gothic

Symbol: 13" x 7 1/2"

Note: Must be installed at the beginning of shared lane at point where bike lane striping ends.

Signs must be installed according to the Chicago Department of Transportation's sign hanging standards and at the direction of the resident engineer.

City of Chicago
Richard M. Daley, Mayor

DEPARTMENT OF TRANSPORTATION
Miguel d'Escoto, Commissioner

BUREAU OF TRAFFIC
Donald Grabowski, Deputy Commissioner

CITY OF CHICAGO			
Shared Lane Yield to Bikes			
REVISED	5-16-02	SCALE	1" = 6"
H:\Bike Lanes\Design Manual\Signs\shared lane.FH9		No. __ of __	

Standard Sign
Bike Lane at Intersection

Sign Type

Number: Special

Size: 30"x30"

Color: Black on White
Reflective

Type: 5" Highway Gothic

Symbol: 10" x 6 1/2"

Note: Must be installed at intersections where bike lane continues to stop bar to the left of the right-turn only lane.

Signs must be installed according to the Chicago Department of Transportation's sign hanging standards and at the direction of the resident engineer.

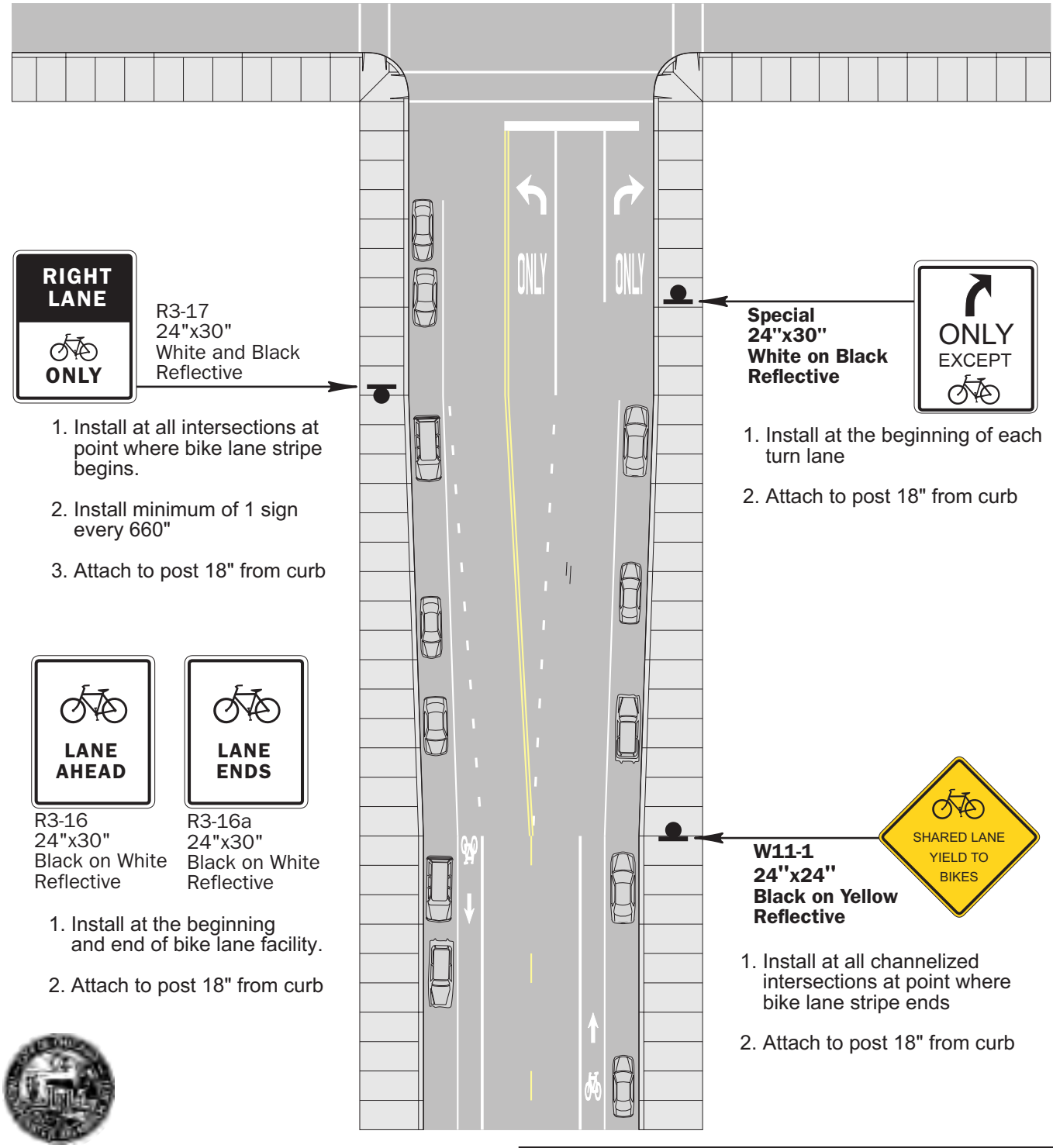
City of Chicago
Richard M. Daley, Mayor

DEPARTMENT OF TRANSPORTATION
Miguel d'Escoto, Commissioner

BUREAU OF TRAFFIC
Donald Grabowski, Deputy Commissioner

CITY OF CHICAGO			
Bike Lane at Intersection			
REVISED	3-28-02	SCALE	1" = 6"
H\Bike Lanes\Design Manual\Symbols\bike lane intersect.fh8		No. __ of __	

Typical Bike Lane Signage



RIGHT LANE
ONLY

R3-17
24"x30"
White and Black
Reflective

1. Install at all intersections at point where bike lane stripe begins.
2. Install minimum of 1 sign every 660"
3. Attach to post 18" from curb

LANE AHEAD

R3-16
24"x30"
Black on White
Reflective

LANE ENDS

R3-16a
24"x30"
Black on White
Reflective

1. Install at the beginning and end of bike lane facility.
2. Attach to post 18" from curb

Special
24"x30"
White on Black
Reflective

ONLY
EXCEPT

1. Install at the beginning of each turn lane
2. Attach to post 18" from curb

SHARED LANE
YIELD TO
BIKES

W11-1
24"x24"
Black on Yellow
Reflective

1. Install at all channelized intersections at point where bike lane stripe ends
2. Attach to post 18" from curb

City of Chicago
Richard M. Daley, Mayor

DEPARTMENT OF TRANSPORTATION
Miguel d'Escoto, Commissioner

BUREAU OF TRAFFIC
Donald Grabowski, Deputy Commissioner

CITY OF CHICAGO			
Typical Bike Lane Signage			
REVISED	5-16-02	SCALE	1"=30'
H:\Bike Lanes\Design Manual\Typical Signange		No. __ of __	