

DRAFT
FOR REVIEW

I-84 Viaduct Study

OPTIONS FOR REPLACING THE I-84 VIADUCT IN DOWNTOWN HARTFORD



SEPTEMBER 2010

Acknowledgements [TO BE ADDED]

The I-84 Viaduct Study was funded by the City of Hartford, Federal Highway Administration and the Connecticut Department of Transportation. It was administered by the Capitol Region Council of Governments, with the technical assistance of Goody Clancy and its subconsultants.

The alternatives developed under this study are the result of a collaborative effort among local residents, stakeholders, local officials and regional and State planners. This effort was guided by the HUB of Hartford Committee. CRCOG would like to express its appreciation to the members of this Committee and others for contributing their time and valuable knowledge of local issues to the development of these recommendations.

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Table of Contents

OVERVIEW	2
PURPOSE OF THIS STUDY	6
STUDY PROCESS	7
I-84 TODAY	15
Traffic and Transportation	15
Urban Design	18
Economic Development	18
ALTERNATIVES	24
Preliminary Alternatives	25
Composite Alternatives	29
Baseline—Enhanced Viaduct	30
Alternative 1	34
Alternative 2	38
Alternative 3	42
COMPARATIVE ASSESSMENT OF ALTERNATIVES	46
NEXT STEPS	52

Overview

Like many similar highway structures of its era, Hartford's I-84 Viaduct is nearing the end of its useful life. Today, communities across the nation are beginning to grapple with the challenge of how best to repair or replace these aging structures in ways that respond not only to transportation needs, but also to urban design and economic development imperatives. As it looks for solutions to replace or repair the I-84 Viaduct, Hartford has an historic opportunity to renew its transportation infrastructure and improve the cohesiveness and vitality of its center city.

This study is the result of a collaborative planning effort involving the City of Hartford, the Connecticut Department of Transportation (ConnDOT) and the Capital Region Council of Governments (CRCOG) that begins the process of exploring replacement options for the I-84 Viaduct. The study was advanced under the auspices of the HUB of Hartford Committee, a broadly representative steering committee formed by the City of Hartford with representation from governmental, business, neighborhood and civic groups. The HUB Committee has its origins as a grassroots citizens group formed in 2006 following an initial study of the I-84



The Viaduct structure is nearing the end of its useful life and will need to be replaced.

Viaduct that envisioned rehabilitation of the structure largely as currently built. The mandate of this study is to explore a broader range of replacement options.

Built in 1965, the Viaduct is a $\frac{3}{4}$ mile long section of elevated highway that extends from the Sisson Avenue interchange to the Asylum and Capitol Avenue interchanges that serve Hartford's downtown, the Capitol, other major employment centers and surrounding neighborhoods. The highway accommodates trips to and from Hartford's core, trips between local communities outside of the Hartford, and longer regional trips. This segment of highway is the state's highest volume roadway with daily traffic volumes of approximately 175,000 vehicles.

The Viaduct also accounts for a significant amount of regional congestion. Major state transit initiatives involving new commuter rail service and bus rapid transit are currently being actively advanced to improve transportation options in the area, and reduce automobile dependency. Transportation demand management (TDM) measures are also being used to manage peak hour congestion and reduce vehicle miles travelled (VMT). But even with full implementation of these initiatives, volumes on I-84 Viaduct will continue to be very high, reinforcing the importance of determining a replacement strategy for the aging structure.

While the Viaduct plays a critical transportation function, it has long been viewed as a blighting influence on the surrounding



The Viaduct and its ramps divide the city—separating downtown and the Capitol from surrounding neighborhoods, and each other. Much valuable land is wasted.

urban environment. The highway forms a major barrier that divides Hartford’s core, a “no man’s land” separating neighborhoods from each other and downtown. Much of the land around and under the highway remains underutilized and unattractive, overshadowed by the presence of the highway and associated access ramps. These factors limit the economic vitality of the core and detract from the city’s cohesiveness and identity.

This study seeks to address transportation, urban design and economic development considerations in an integrated way and seeks solutions that work effectively from multiple perspectives at reasonable public cost. In an era when public budgets face many competing demands, creative and cost effective solutions that address multiple goals are of critical importance.

HUB OF HARTFORD COMMITTEE VISION STATEMENT

This vision was developed by the Committee in advance of the I-84 Viaduct Study.

“The Hub of Hartford will be a lively and walkable, mixed-use, mixed-income urban place, a regional crossroads centered on Union Station, where business, government, community and recreational uses integrate seamlessly in a historic context supplemented by compatible new development. The buildings, trees and landscaped areas will define public streets and spaces that reconnect previously separated city precincts: the state government complex, the Frog Hollow and Asylum Hill neighborhoods and offices, the downtown, and Bushnell Park. Cyclists, walkers and transit riders share the road comfortably with automobiles.”



I-84 today: the Viaduct and associated ramps. View looking west from downtown towards Asylum Hill.



Some of the alternatives considered offer potentially dramatic opportunities to enhance the city's core and reconnect it to surrounding neighborhoods.

One especially significant conclusion of the study is the potential benefit of replacing the I-84 Viaduct combined with improving the study area's rail corridor. I-84 replacement options that also involve realignment of portions of the rail line have the potential to substantially improve the cohesiveness of the city's downtown while providing cost and operational efficiencies for development of rail and road infrastructure.

This study initially examined a very broad range of replacement concepts for the Viaduct structure and ultimately narrowed these to a smaller set of the most promising solutions.

Each of the alternatives reviewed in this study has the potential to offer significant public benefits over a baseline option, which would largely reconstruct the highway in its current form. Some of the alternatives considered offer potentially dramatic opportunities to enhance the city's core and reconnect it to surrounding neighborhoods.

The alternatives discussed here represent a starting point in consideration of replacement options. Significant additional work will be needed, however, to address the highly complex design, environmental, engineering, construction phasing, and funding issues that are keys to advancing a successful project.



Purpose of this study

This study evaluates several options for replacement of the existing I-84 Viaduct in Hartford. These alternatives have been developed through a multi-phase study incorporating significant public input. The results of the study will be used by ConnDOT as a starting point for a more in depth assessment of replacement alternatives over the

coming years. While the study identifies a number of promising options for further analysis, it is expressly not the intent of this study to recommend a single option as the preferred approach. Rather the analyses and findings described here are intended to provide the starting point for the more detailed work that must now follow.

Study process

The HUB of Hartford Committee served as a Steering Committee for the study effort. The HUB Committee was appointed by the City of Hartford. Chaired by Dr. Robert Painter, the Committee includes representation from a broad cross-section of project stakeholders. In addition to representation from the City of Hartford and ConnDOT, the Committee includes representatives of other governmental entities, business, neighborhoods, and civic organizations. The study was administered by CRCOG. CRCOG staff played the lead role in coordination of the study effort and related public outreach. The study consultant team was led by Goody Clancy, a Boston-based planning and design firm. The consultant team also included Wilbur Smith Associates, Fitzgerald & Halliday, and W-ZHA.

Work Phases

The study process involved three phases of work:

- **Phase 1: The I-84 Viaduct Today** This initial phase focused on the current condition of the I-84 Viaduct and the role it plays in the city and the region. This assessment considered economic development, urban design and transportation issues. During this initial phase, the consultant team conducted interviews with HUB Committee members and other key project stakeholders.



- **Phase 2: Preliminary Alternatives** This phase involved development and assessment of a wide range of possible replacement alternatives. This was a screening level assessment to determine what kind of alternatives were most suitable for further analysis.
- **Phase 3: Composite Alternatives** This phase focused on development and assessment of a second round of concept alternatives and a largely qualitative evaluation of their relative merits from economic development, urban design, transportation and cost perspectives.

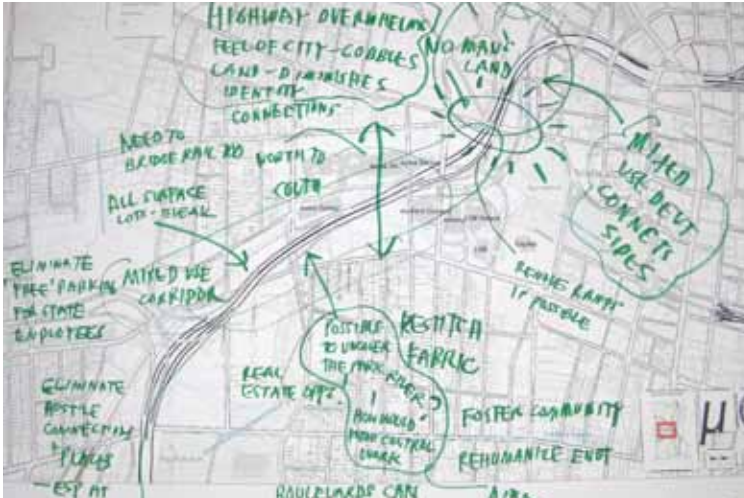


Public Workshops/Meetings

Each of the three study phases culminated in a major public forum or workshop to discuss study findings.

- Phase I: I-84 Today
- Phase II: Preliminary Alternatives
- Phase III: Composite Alternatives

These meetings attracted significant public involvement and contributed key insights that were incorporated in subsequent study efforts. Additional information on these meetings is included in Appendix A.



Technical Workshops

Over the course of the study, CRCOG coordinated a number of workshops to review key technical considerations and to share technical information and perspectives. These informal workshops included participation from the consultant team as well as CRCOG and ConnDOT staff. The technical workshops contributed to the identification of study alternatives and options.

Coordination with City Staff

Over the course of the study, CRCOG coordinated meetings with City staff to review study progress and seek input. Meetings included representatives of planning, public works and economic development departments.



Coordination with the Connecticut Department of Transportation

Over the course of the study, the team coordinated its efforts with ConnDOT and sought input on key planning and policy questions.

Planning Context

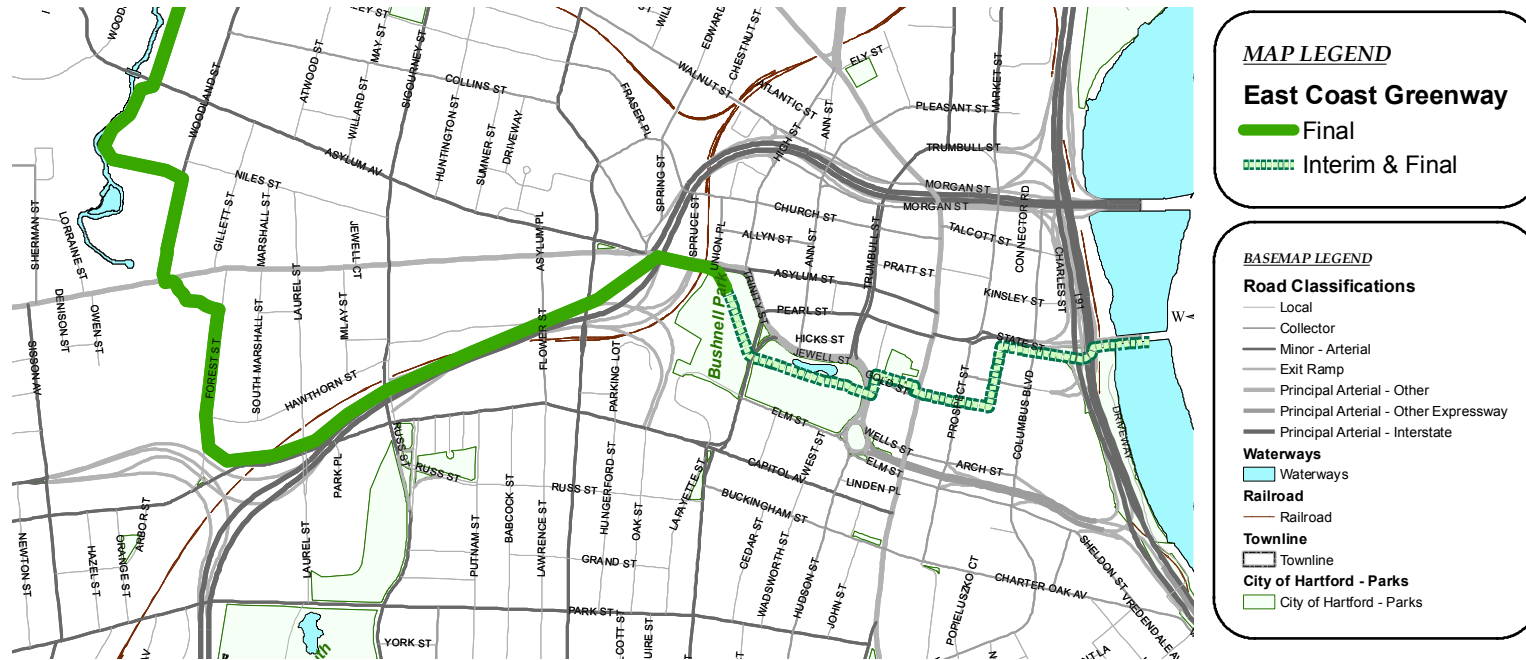
Several ongoing or completed planning efforts establish the broad context and goals for the I-84 Viaduct Study:

- **One City, One Plan.** One City One Plan—POCD 2020 is Hartford's recently adopted Plan of Conservation and Development. This plan establishes the overall framework for guiding development within the city and was endorsed by the City Council in April 2010 and formally adopted by the Planning and Zoning Commission in June 2010.
- **New Haven/Springfield Commuter Rail.** ConnDOT is advancing implementation of commuter rail service between New Haven, Hartford and Springfield, Massachusetts. The corridor was identified as a key component in meeting the goals of improving and sustaining regional economic viability and improving regional livability in CRCOG's Regional Transit Strategy (RTS). This was further recognized by the Connecticut Transportation Strategy Board as an important first step in implementing a statewide strategic plan. Funding has been allocated to undertake the implementation study. In addition to serving commuters traveling between the towns and cities along

the corridor, the service could provide a connection to Bradley International Airport, multiple links to Amtrak Intercity service and a direct link to the existing Metro North and Shore Line East Commuter Rail in New Haven. Rail service will pass through the I-84 Corridor currently crossing the highway at two locations within the Viaduct study area. Hartford's Union Station, located at the heart of the Viaduct study area, is a key rail station on this line.

- **Hartford/New Britain Busway.** The Busway will be a dedicated Bus Rapid Transit (BRT) facility along a 9.4-mile corridor between downtown New Britain and downtown Hartford. Within the I-84 Viaduct area, the busway will generally run parallel to the active Amtrak rail line.

Buses using this corridor will have more competitive travel times when compared with automobiles, since they will bypass congestion on arterial streets and I-84. The facility will permit bus access at intermediate points, so circulator bus routes could readily serve surrounding neighborhoods and then use the busway, thus providing a one-seat ride. In addition, the busway will include express, shuttle, circulator, and connecting feeder bus service. A total of up to 11 transit stations will serve the users of the busway. Two busway stations are located within the I-84 Viaduct study area—one at Hawthorn Street and the terminus at Union Station.



- East Coast Greenway.** The East Coast Greenway is an initiative to link the major cities of the east coast via a multi-use path extending from Maine to Florida. The alignment for the Connecticut portion of the greenway travels through the I-84 Viaduct study area. Many segments of this national trail are moving forward, including a segment stretching from Bolton to East Hartford.

- iQuilt.** The iQuilt initiative is an effort to knit together Hartford's cultural resources in support of economic growth and redevelopment within the Capitol District. iQuilt is co-led by The Bushnell and the Greater Hartford Arts Council, with involvement from a range of state, city and private entities. In considering replacement strategies for the I-84 Viaduct, potential synergies may emerge with the iQuilt initiative.

Case Studies

The study team reviewed a wide range of comparable projects from other communities to identify potential lessons that may be relevant to the I-84 Viaduct project. This assessment uncovered a wide range of replacement strategies for urban highway viaducts. Of particular interest were models that proposed alternative roadway formats such as boulevards and tunnels.

Five projects that have either been completed, are currently planned or are in the study phase are briefly reviewed here. Of these, only Boston’s I-93/Big Dig represents a project with traffic volumes comparable to the I-84 Viaduct (see chart on this page for a comparison of volumes on the case study projects and other highways with the I-84 Viaduct). None of the highways reviewed integrates a rail corridor, which adds significant complexity to planning for the I-84 Viaduct, although Boston’s Big Dig did consider including a rail corridor with the highway tunnel before eliminating rail for cost and technical reasons.

Some general conclusions can be drawn from these projects:

- **Boulevard forms are most applicable to much lower volumes than the I-84 Viaduct.** San Francisco’s Embarcadero carried approximately 60,000 vehicles as a viaduct but only approximately 26,000 vehicles today as an attractive urban boulevard. Toronto is considering an 8-lane urban boulevard to replace portions of the Gardiner Expressway but even this roadway carries considerably less traffic than the I-84 Viaduct.

HOW DO I-84 TRAFFIC VOLUMES COMPARE TO OTHER ROADS?

NJ Turnpike, Newark, NJ	315,000
George Washington Bridge, NY/NJ	300,000
I-95 Virginia/Washington DC	280,000
I-93/Big Dig, Boston, MA	190,000
I-84 Viaduct	175,000
I-195 Providence, RI	160,000
Gardiner Expressway, Toronto, Ontario	120,000
Alaskan Way Viaduct, Seattle, WA	100,000
I-90 Mass Turnpike, Boston, MA	100,000
I-291, Springfield, MA	80,000
Syracuse I-81, NY	90,000
I-93, Concord, NH	70,000
Embarcadero Freeway, CA	60,000
Farmington Avenue, CT	15,000

Note: daily traffic; all numbers are approximate; recorded years vary. Highways shaded above served as case studies.

- Tunnel models such as Boston's Big Dig and Seattle's proposed Alaskan Way Viaduct offer the potential for real transformations of surrounding urban environments. **Tunnel structures, however, typically involve order-of-magnitude higher costs than other alternatives.**
- For projects such as Syracuse's, **where replacement of a viaduct with a surface boulevard is being considered, the potential to transfer some current traffic to other available highway corridors can be an important consideration in determining feasibility.**

San Francisco: Embarcadero

- Served as a **spur connecting to Bay Bridge**
- Created **barrier** between city and waterfront
- Demolished in 1991 and replaced with an attractive **surface boulevard**
- Freeway carried approximately **60,000 vehicles** per day; replacement boulevard carries approximately **26,000 vehicles**



Toronto: Gardiner Expressway

- Carries **downtown traffic** and **some regional through traffic**
- **Barrier** between downtown and the waterfront
- Approximately **120,000 vehicles per day**
- **8-lane surface boulevard proposed** as an alternative



Case studies provide valuable insights on potential replacements for the I-84 Viaduct.

Seattle: Alaskan Way Viaduct

- Carries primarily **through traffic**; does not provide local access
- Creates **physical barrier** between city and waterfront
- Approximately **100,000 vehicles per day**
- Current proposal: replace with a **4-lane bored tunnel** that can accommodate 80,000-85,000 vehicles per day for approximately **\$4.2 billion** (state and local funds)



Syracuse: I-81

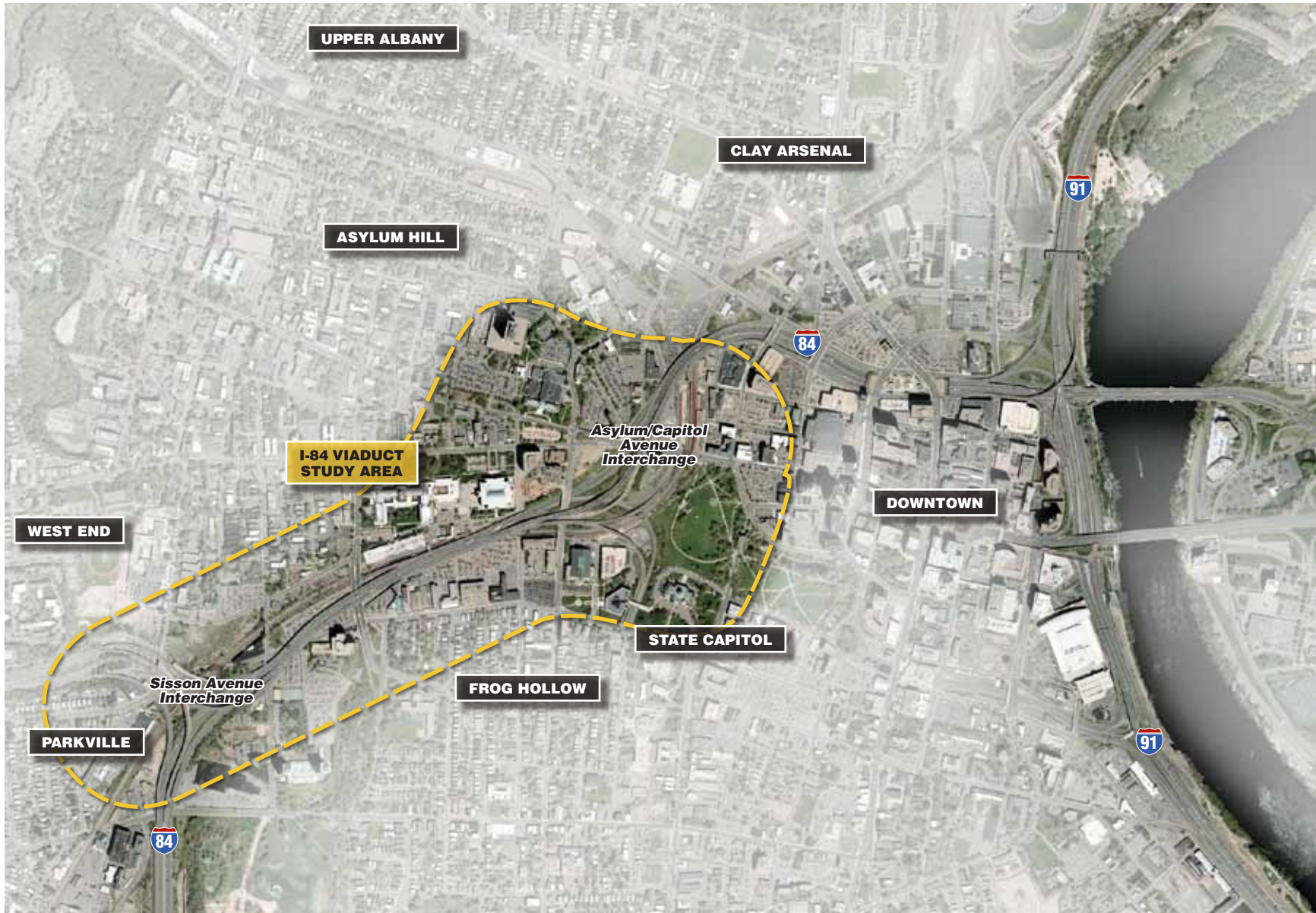
- Carries **downtown and regional through traffic**
- Approximately **90,000 vehicles per day**
- **Separates downtown** from medical/educational institutions
- Onondaga Citizens League recently supported concept of highway removal and replacement with a **surface boulevard**
- I-81 seen as **downtown bypass** option



Big Dig: Boston Central Artery

- Like I-84, carries regional **through traffic and downtown traffic**
- I-93 viaduct was long seen as a **barrier** between downtown, the waterfront and neighborhoods
- Approximately **190,000 vehicles per day** before project
- Project **increased roadway capacity** through tunnel and surface boulevard
- **Highway in tunnel**; surface boulevard carries local traffic
- More than **20-year** construction period
- Overall project cost \$14.6 billion; **state paid approximately \$6 billion**



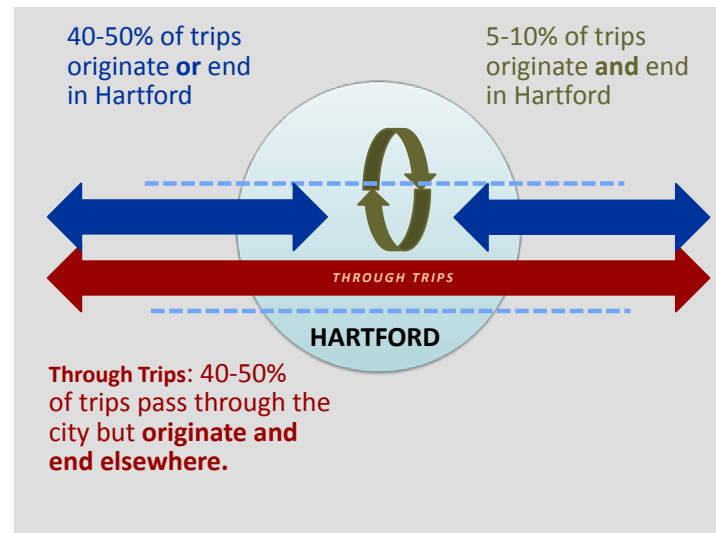


I-84 today

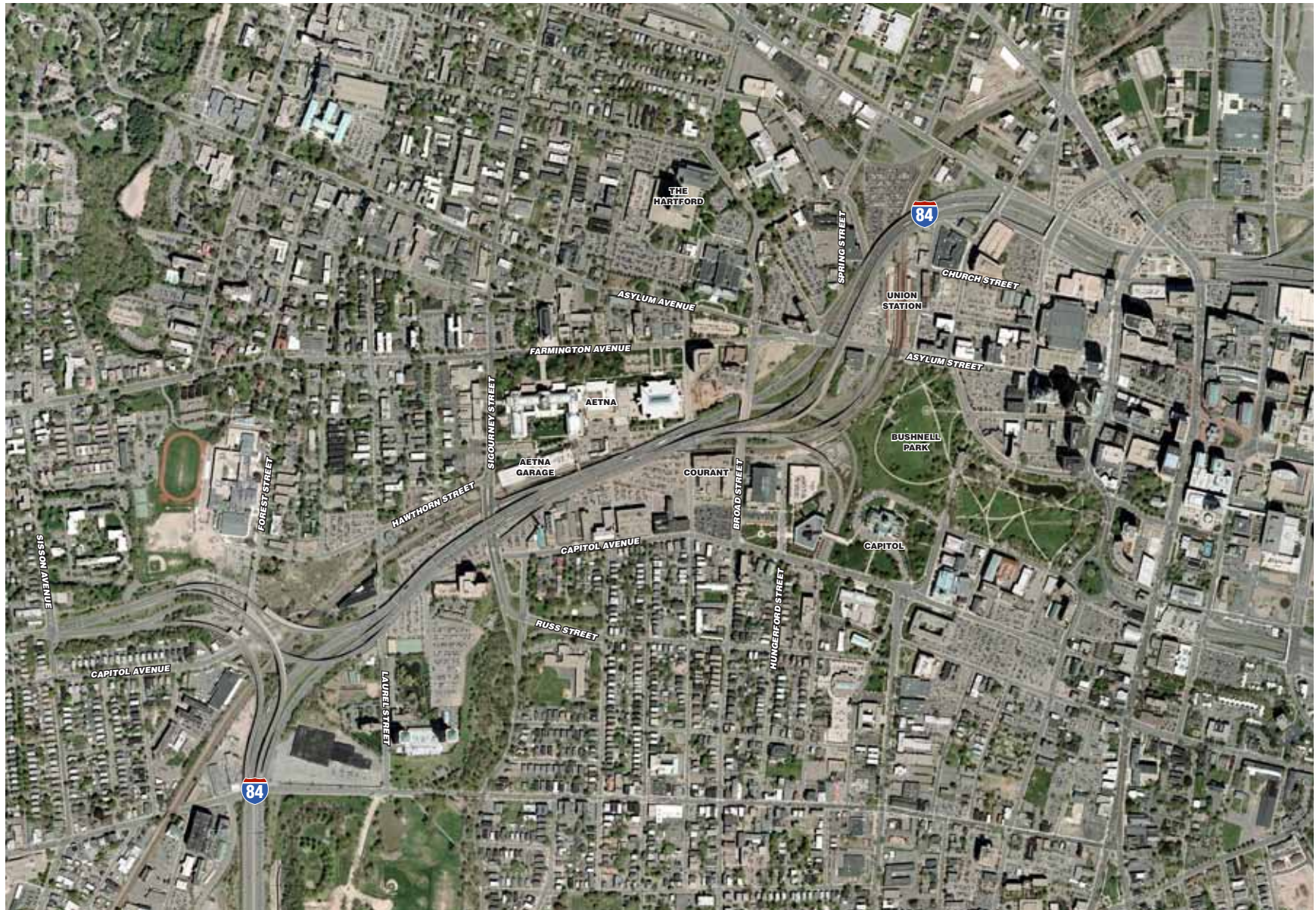
The portion of I-84 that is the focus of this study extends for approximately ¾ mile near downtown Hartford, between the Asylum and Capitol Avenue interchange and the Sisson Avenue interchange. In 2006 ConnDOT commissioned a detailed technical analysis of the condition of the I-84 Viaduct structure. This assessment identified the need for near term repair and a more comprehensive long term rehabilitation strategy.

Traffic and Transportation

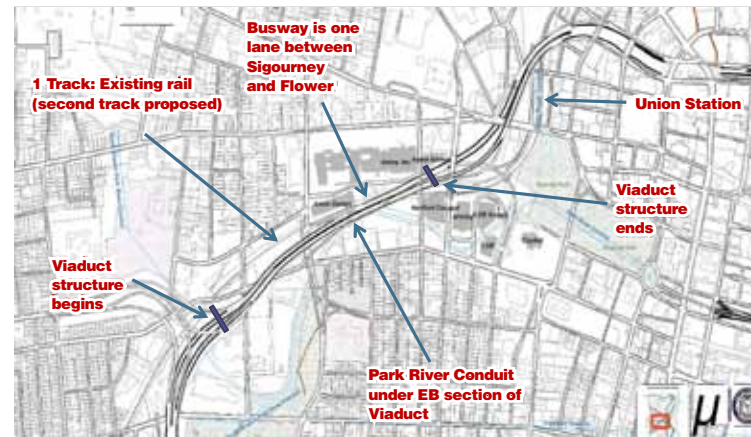
- The I-84 Viaduct carries daily traffic volumes of 175,000 vehicles, making it Connecticut’s most heavily used highway. Approximately 45% of the vehicle trips on the Viaduct have origins or destinations in the City of Hartford; approximately 45% of the trips are regional with origins and destinations outside of the City of Hartford; approximately 10% of trips have origins and destinations within Hartford. Of the regional trips that pass through the city, approximately 2/3 are shorter regional trips—for example a trip from East Hartford to West Hartford; 1/3 of regional trips are longer trips. These longer regional trips representing approximately 15% of overall traffic on the Viaduct are the most likely candidates for diversion to another highway corridor should such a strategy be considered, and if necessary capacity is in place on other roadways.



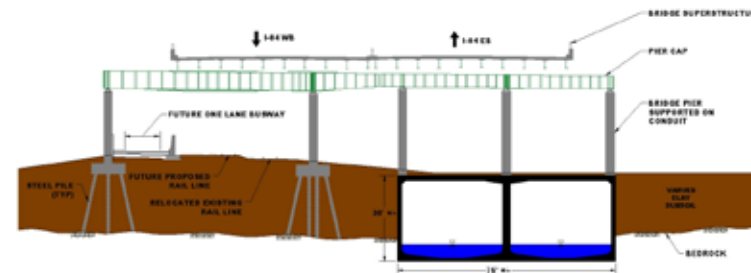
- Eight ramps provide access to the highway in the study area serving downtown Hartford, surrounding neighborhoods, the State Capitol complex, and major corporate campuses for Aetna, The Hartford, and other organizations.
- This section of I-84 is also one of the region’s most congested roadways. I-84 west of I-91 accounts for 53% of all delays on the region’s freeways.
- The Viaduct structure is in poor condition and requires frequent repairs involving significant expense. The state has initiated a repair program intended to stabilize the structure until a permanent replacement can be put in place.



- Regional transportation plans focus on major transit projects that will enhance access to Hartford's core; regional initiatives also focus on travel demand management (TDM) measures to reduce peak period congestion as well as vehicle miles travelled (VMT). Several of these efforts are being advanced collaboratively with major area employers. Even with the success of those efforts, traffic volumes on the I-84 Viaduct will continue to be very high.
- The Viaduct shares the corridor with a rail line providing Amtrak service and future proposed Springfield/Hartford/New Haven commuter rail service. The rail line and the highway cross twice within the corridor, adding to the complexity of the design of the highway and associated access ramps.
- The planned Hartford/New Britain Busway project will also be accommodated on a dedicated right of way through the I-84 corridor, located adjacent to the rail line. Two Busway stations are located within the corridor: the terminus at Union Station and a station adjacent to the Aetna campus on Hawthorn Street.
- Union Station, located within the I-84 Viaduct study area, serves as a regional transportation hub for bus and Amtrak inter-city rail services. Union Station is envisioned as serving an increasingly important role as a focus for transit-oriented development (TOD) within the downtown area.
- The Park River Conduit runs under a small section of the Eastbound I-84 Viaduct, approximately 700 feet east of Sigourney Street.



Other Key Factors and Constraints



I-84 Viaduct at Park River Conduit

- Pedestrian and bicycle access through the I-84 Viaduct study area is hindered by highway infrastructure that contributes to hostile conditions for those modes. Pedestrian and cycling options are key components of the emerging multi-modal network and should be prioritized accordingly.
- City streets provide access to I-84 and accommodate local trips. Continued planning of these streets is essential to achieve a balance between mobility and quality of life for the adjacent communities. These streets must accommodate the needs of all users and modes.

Urban Design

- The Viaduct is widely considered to be a major barrier occupying a wide swath of land that divides Hartford, separating neighborhoods from downtown and each other. The Viaduct crosses major arterial roadways such as Capitol Avenue and the Farmington Avenue/Asylum Avenue corridor, and other streets such as Sigourney Street, Broad Street and Laurel Street.
 - > At Asylum Avenue, viaduct structures for road and rail pass over the street. When combined with the three closely spaced highway ramps that connect to Asylum Avenue the result is an unattractive “no man’s land” that has limited appeal as a pedestrian environment. Consequently, the highway creates a great divide between the major employment centers of Aetna and The Hartford with more than 10,000 employees and the nearby downtown core, limiting the potential synergies between these corporate campuses and the downtown as a whole.
 - > At Broad Street, the Viaduct structure and associated access ramps create an inhospitable pedestrian environment between the highway and Farmington Avenue, making a walk from Asylum Hill to downtown or Frog Hollow a challenging experience.
 - > At Sigourney Street, crossing the highway as a pedestrian is more appealing than at Asylum or Broad streets, but the combination of the overhead Viaduct, an elevated street over the rail line, and two highway access ramps creates its own challenges to establishing an appealing pedestrian experience.

- > Capitol Avenue, near the Sisson Avenue interchange, passes below multiple highway ramps and the rail line, creating a sharply defined barrier between surrounding neighborhoods and downtown Hartford.
- > The Sisson Avenue ramps occupy an excessively large land area, having originally been designed to connect with a future highway to the north that was never constructed.
- The Viaduct structure and its environmental impacts including noise and air quality have created an unappealing urban environment, that extends beyond the footprint of the highway.
- Much of the land around the highway is underutilized, used primarily for surface parking lots.
- The Viaduct structure is visually unappealing and in a state of poor repair.

Economic Development

The success of the Hartford economic region is largely dependent on its access and relationship to the metro centers of Boston and New York. From an inter-regional perspective, I-84 is a critical truck and auto corridor linking Hartford to the New York and Boston metro areas. From an intra-regional perspective, I-84 provides customer and employee access to downtown Hartford, St. Francis Hospital, and the corporate campuses of Aetna and The Hartford.

The Hartford region is challenged by negative perceptions of the downtown core. I-84 Viaduct contributes to the downtown’s economic challenges because it

- 1) Separates major regional employers from the downtown,
- 2) Establishes a barrier between near-in neighborhoods like Asylum Hill, Clay Arsenal, Frog Hollow and the downtown,
- 3) Inhibits vehicular, pedestrian and bike connections that contribute to quality of life and real estate value, and
- 4) Compromises the development potential of parcels adjacent to it, particularly around Union Station—Hartford’s multi-modal transportation center.

A key regional economic development objective for the Metro Region is to attract and retain young, highly skilled workers. A vital core, strong urban neighborhoods, transportation choices, and quality places are important factors to the young, discerning workforce. Because the Viaduct structure and associated ramps create an inhospitable pedestrian environment, they contribute to downtown’s negative image.

With proper planning, the reconstruction of the Viaduct can create an urban framework that successfully re-stitches the Asylum/Farmington area back into the downtown, unlocks transit-oriented development potential and revitalizes Downtown West.

The study team reviewed recent economic development assessments and analyses of the Hartford region to establish a context for assessment of the I-84 Viaduct corridor. Based on this review, the following economic development criteria—related to market access, real estate development and community development—were established for evaluation of potential viaduct replacement concepts:

MARKET ACCESS CRITERIA

- Maintains or enhances inter-regional east/west vehicular flow, particularly trucks.
- Maintains or enhances intra-regional east/west vehicular flow to support commuters.
- Provides convenient access to St. Francis Hospital, Aetna and The Hartford employees.
- Enhances the functionality and effectiveness of alternative transit systems like the busways, commuter rail and the downtown circulator.

REAL ESTATE DEVELOPMENT CRITERIA

- Supports the evolution of Union Station as a regional multi-modal transportation center.
- Increases and enhances the development opportunities within walking distance of Union Station in order to fully capitalize on transit-oriented development potential.
- Creates development parcels suitable for residential and commercial development.

COMMUNITY DEVELOPMENT CRITERIA

- Establishes vehicular, pedestrian and bike connections that create a quality environment, reduce vehicle dependency and foster economic activity.
- Reduces I-84’s impact as a barrier between nearby neighborhoods (Asylum Hill, Clay Arsenal, Frog Hollow) and downtown and fosters community development in these neighborhoods.

SISSON



The Sisson Avenue ramps occupy an excessively large land area, having originally been designed to provide connection to a future highway to the north that was never constructed.



Capitol Avenue, near the Sisson Avenue interchange, passes below multiple highway ramps and the rail line, creating a sharply defined barrier between surrounding neighborhoods and downtown Hartford.



SIGOURNEY



At Sigourney Street, the combination of the overhead viaduct, an elevated street over the rail line, and two highway access ramps creates its own challenges to establishing an appealing pedestrian experience.

FLOWER



The Viaduct structure and its environmental impacts including noise and air quality have created an unappealing urban environment. Much of the land around the highway is underutilized, used primarily for surface parking lots.

ASYLUM/BROAD



The highway creates a great divide between the major employment centers of Aetna and The Hartford and the nearby downtown core, limiting the potential synergies between these corporate campuses and the downtown as a whole.



At Broad Street, the Viaduct structure and associated access ramps create an inhospitable pedestrian environment between the highway and Farmington Avenue, making a walk from Asylum Hill to downtown or Frog Hollow a challenging experience.



At Asylum Avenue and on Broad Street, viaduct structures for road and rail pass over the street. When combined with the three closely spaced highway ramps that connect to Asylum Avenue the result is an unattractive “no man’s land.”



Alternatives

The purpose of the alternatives assessment was to consider broad approaches to replacement of the I-84 Viaduct and to evaluate at a preliminary level the potential suitability of these approaches. **This assessment considers the comparative strengths and weaknesses of alternative approaches from economic development, transportation, urban design and cost perspectives. Significant additional analysis and evaluation of options will be needed to identify a final approach. This analysis provides a starting point for further more detailed assessment of replacement options to be undertaken over the coming years.**

The study has involved assessment of a wide range of replacement alternatives in two cycles of study:

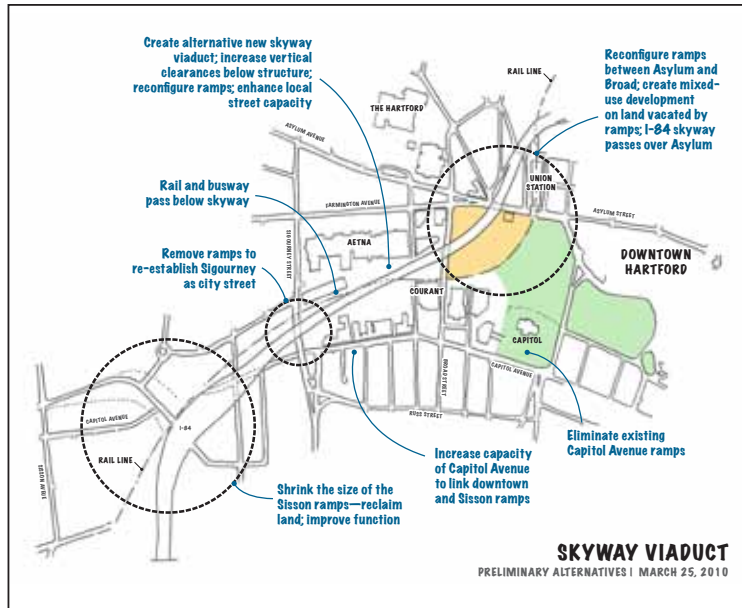
- **Preliminary Alternatives** were developed in the initial phase of analysis. Based on public review and discussion of these alternatives a second cycle of alternatives were considered.
- **Composite Alternatives** were developed and analyzed in the second phase of analysis. The primary focus of this section is on the review of this second cycle of alternatives.

GOALS

- Maintain or enhance transportation function
- Reduce the visual and environmental impacts of the highway
- Promote a walkable, bikeable environment that supports transit use and enhance transit access
- Reconnect the city across the highway
- Strengthen the downtown core
- Foster transit-oriented development around the Union Station transit hub

ASSUMPTIONS—FIXED ELEMENTS

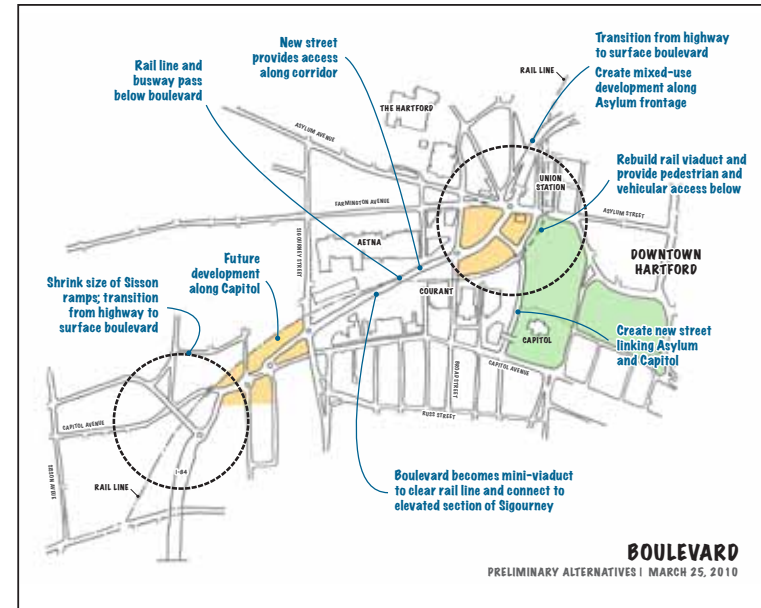
- The highway remains essentially within its existing corridor—any major change in alignment was not considered because of likely community impacts
- The rail line cannot be dropped vertically throughout the corridor to a below-grade alignment



SKYWAY VIADUCT
NOT RECOMMENDED FOR FURTHER STUDY

Replaces the existing Viaduct with a more visually attractive “Skyway” Viaduct that carries through traffic. Many existing ramps are removed; access to the core is provided by interchanges at the edge of the area. The Skyway is elevated higher above ground than the existing Viaduct to reduce its presence as a barrier that divides the city.

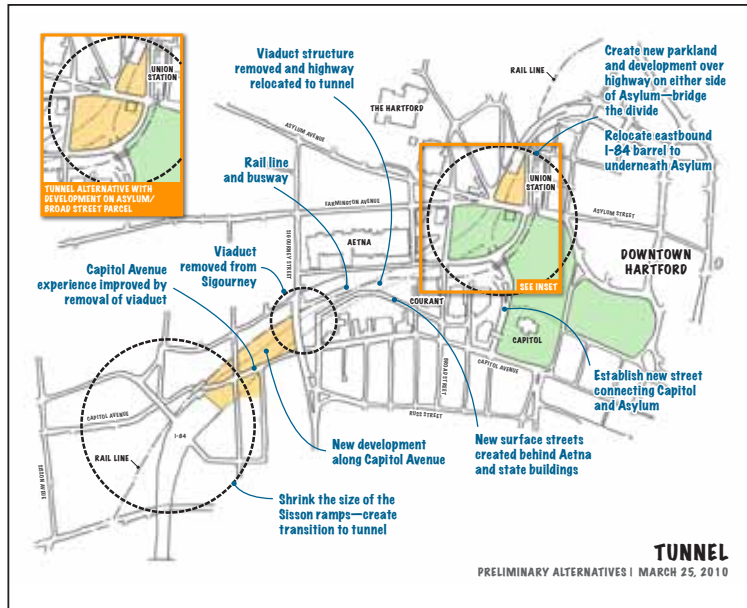
Conclusion/Comment: Limited local access prioritizes the needs of regional through traffic but does not adequately address Hartford’s access needs



BOULEVARD
NOT RECOMMENDED FOR FURTHER STUDY

Replaces the Viaduct with a high volume tree-lined urban street.

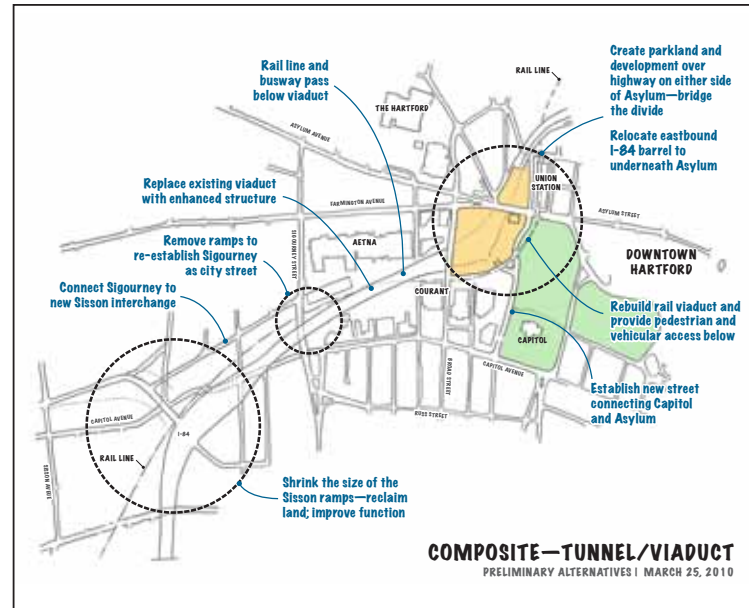
Conclusion/Comment: Very poor from multiple perspectives; need to cross rail line and location behind existing structures limits potential to create an attractive urban boulevard



TUNNEL

Replaces the existing Viaduct with a tunnel between Sisson and Asylum. New development would occur over the tunnel on land formerly occupied by the Viaduct. Existing ramp locations could be maintained.

Conclusion/Comment: Great benefits at high cost



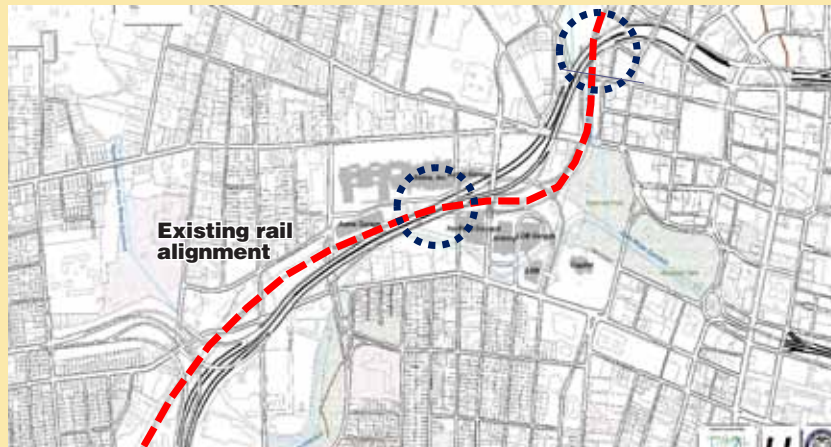
COMPOSITE—TUNNEL/VIADUCT

Incorporates new development over the highway, linking downtown and Asylum Hill. An enhanced viaduct structure would replace the existing Viaduct in the remainder of the corridor.

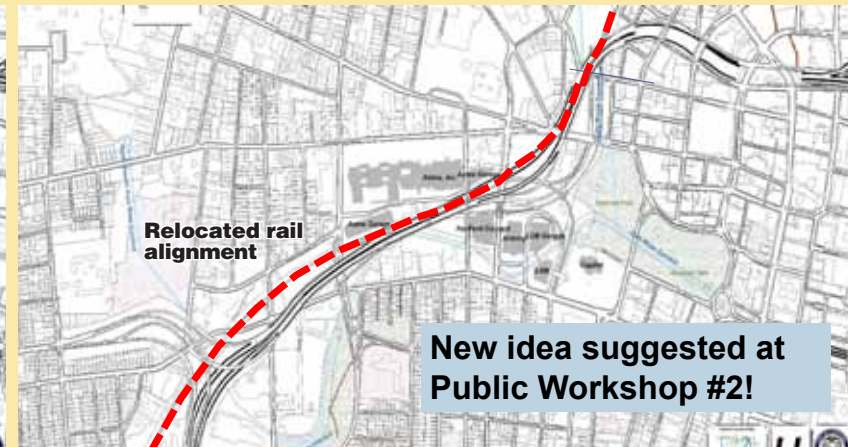
Conclusion/Comment: Good benefits at reasonable cost

A NEW VARIABLE: HOW COULD RELOCATION OF THE RAIL LINE HELP?

The rail line and the highway cross in two locations...



Eliminating highway crossings could have major benefits...



A new variable that was incorporated into the analysis of Composite Alternatives was relocation of the rail line within the study area in order to avoid crossings of the highway and the rail corridor. Several participants in a March public workshop raised this possibility, and the study team committed to evaluate potential benefits. Options that locate the rail line both north and south of I-84 were initially considered. The southside relocation offered limited benefits, created significant new challenges and was

quickly eliminated from consideration. Relocation of the rail line to the north side of the highway corridor offered potentially significant benefits and the study team incorporated this variable in two of the four options reviewed. Five potential benefits are particularly notable:

- Enhanced rail geometries that offer operational and safety improvements
- Elimination of the rail viaduct over Asylum Street removing vehicular clearance concerns and also enhancing visual connections between Asylum Hill and downtown;

because of significant grade changes in Asylum Street, relocation of the rail to the north would allow rail to pass below instead of above the street

- Removal of the rail viaduct from the edge of Bushnell Park
- Potential replacement of the highway Viaduct with a surface roadway, offering potential construction cost and ongoing maintenance savings
- Simplification of highway access ramps to Capitol Avenue

Composite Alternatives

Following discussion and evaluation of the Preliminary Alternatives, the study team developed four Composite Alternatives: three alternative concepts and a baseline.

Two of the alternatives incorporate enhanced viaduct structures; one alternative involves a surface roadway; and one alternative relocates the highway into a tunnel structure throughout the corridor.

The Composite Alternatives are as follows:

- **Baseline—Enhanced Viaduct:** Highway replaced with enhanced viaduct structure
- **Alternative Concept 1:** Highway replaced with enhanced viaduct structure; improved connections across highway
- **Alternative Concept 2:** Viaduct replaced by surface roadway; rail line relocated to north side of I-84; city reconnected across highway
- **Alternative Concept 3:** Viaduct replaced by tunnel; rail line relocated to north side of I-84; city reconnected across highway

The narrative and concept sketches on the following pages provide a description and assessment of each alternative from transportation, urban design, economic development, and cost perspectives. Cost analysis is provided in terms of a “cost factor”. The baseline alternative is given a cost of 1.0 and other alternatives are expressed in terms of costs relative to the baseline. Additional discussion of cost is provided in the section entitled Comparative Assessment of Alternatives.

Baseline—Enhanced Viaduct

HIGHWAY REPLACED WITH ENHANCED VIADUCT STRUCTURE

The Baseline Alternative would replace the existing structure with a new viaduct. The replacement structure would incorporate a more attractive, lower maintenance design. Other notable changes include a redesign of the Sisson Avenue interchange to a more compact format with better local street connections. West Boulevard would be extended across Sisson Avenue to connect to Hawthorn Street while also providing access to new highway ramps. The Asylum/Broad Street portion of the highway would be largely unchanged.

Baseline—Enhanced Viaduct HIGHWAY REPLACED WITH ENHANCED VIADUCT STRUCTURE

SISSON/WEST BOULEVARD

- New more compact interchange replaces Sisson interchange
- Some land freed for development around former interchange
- Enhanced local street connections
- Capitol Avenue and Laurel Street pass under I-84 Viaduct
- New West Boulevard extension connects to Hawthorn Street

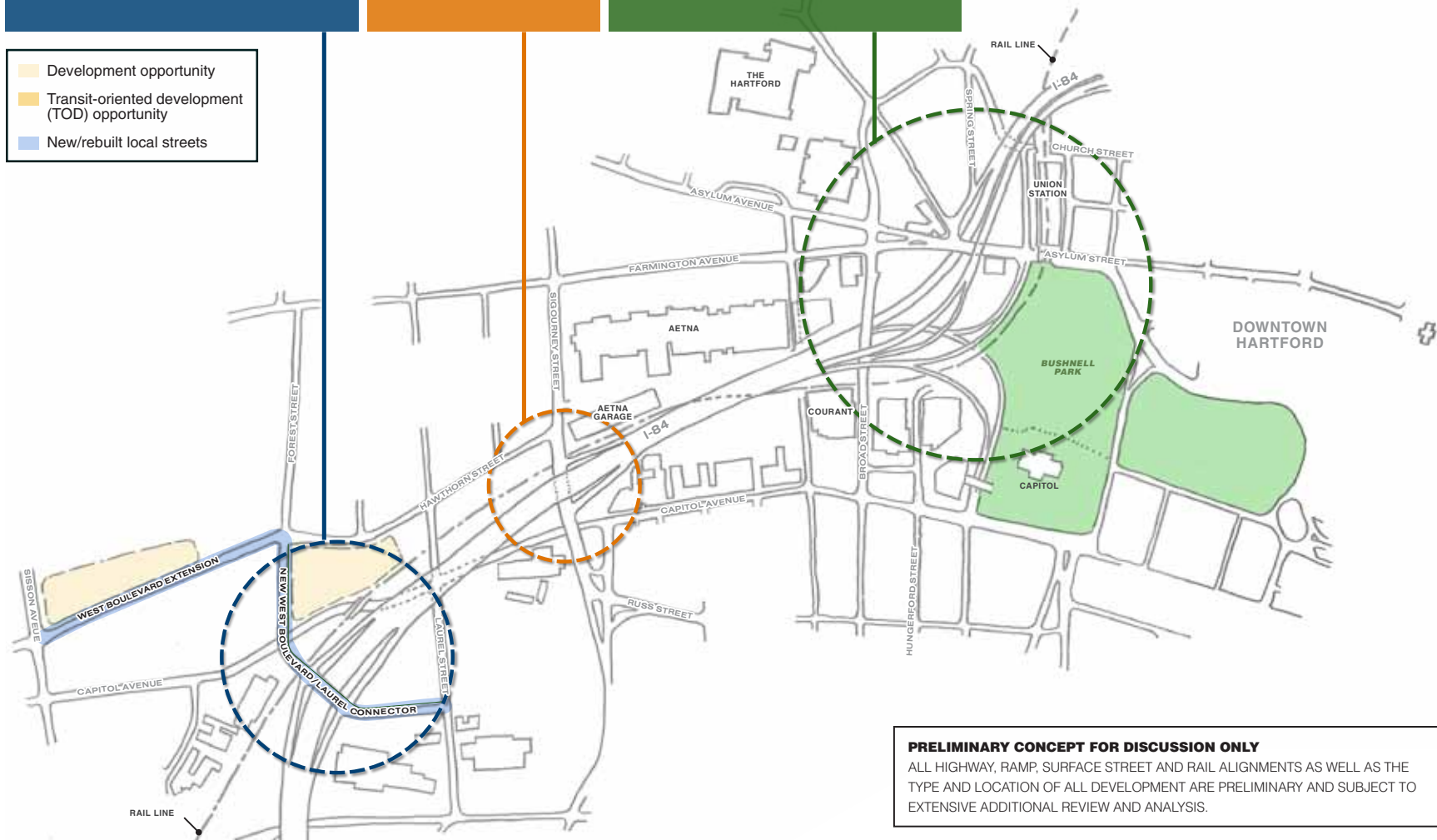
SIGOURNEY

- Rebuilt I-84 Viaduct continues to pass over Sigourney Street; Sigourney ramps rebuilt in existing configuration
- Highway function provided in rebuilt Viaduct structure between Broad Street and Sisson interchange

ASYLUM/BUSHNELL PARK

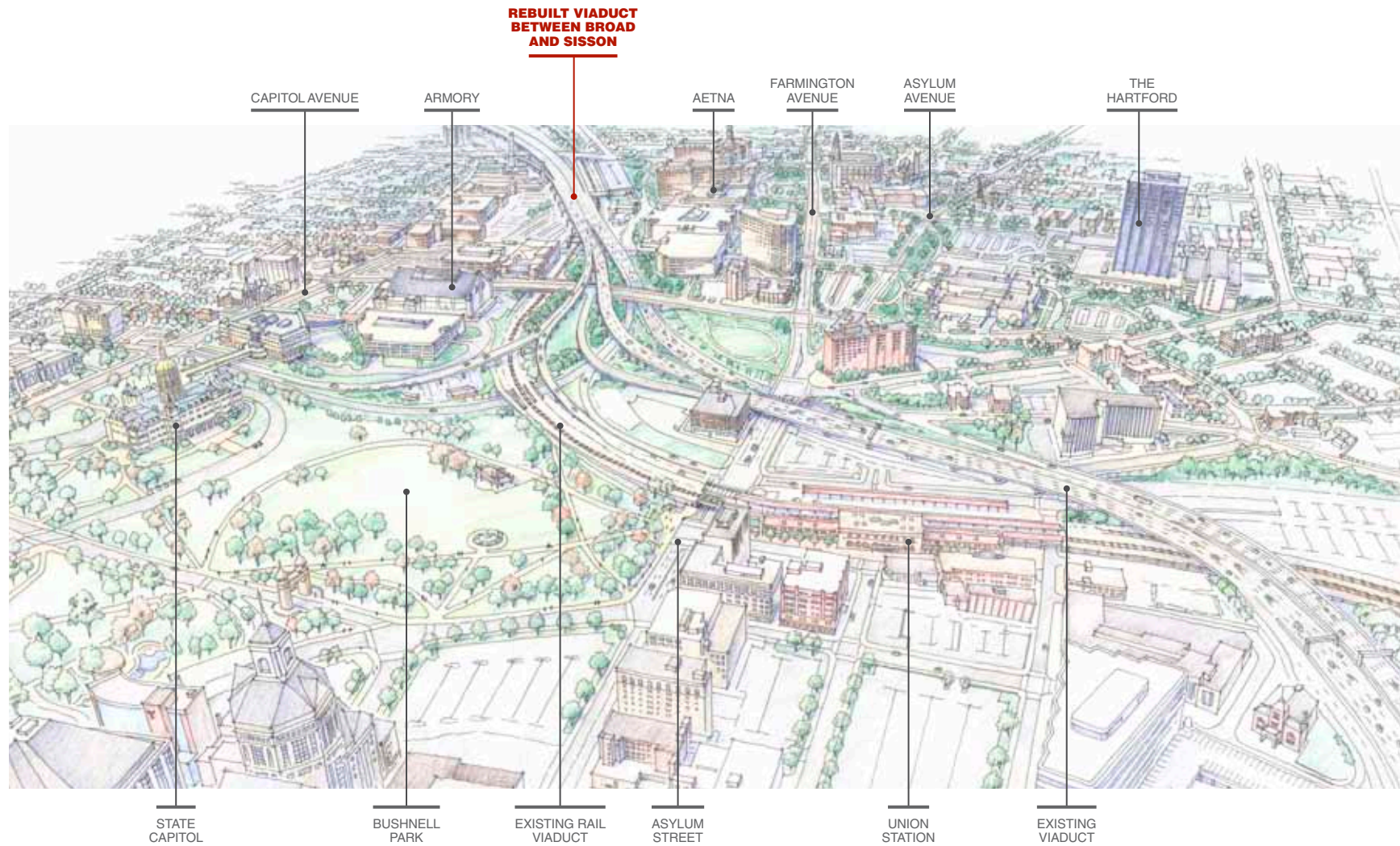
- Highway repaired/rebuilt in current configuration
- Streetscape improvements to enhance character of local streets

- Development opportunity
- Transit-oriented development (TOD) opportunity
- New/rebuilt local streets



PRELIMINARY CONCEPT FOR DISCUSSION ONLY
ALL HIGHWAY, RAMP, SURFACE STREET AND RAIL ALIGNMENTS AS WELL AS THE TYPE AND LOCATION OF ALL DEVELOPMENT ARE PRELIMINARY AND SUBJECT TO EXTENSIVE ADDITIONAL REVIEW AND ANALYSIS.

Baseline—Enhanced Viaduct HIGHWAY REPLACED WITH ENHANCED VIADUCT STRUCTURE



Baseline—Enhanced Viaduct HIGHWAY REPLACED WITH ENHANCED VIADUCT STRUCTURE

ASSESSMENT

Description	Urban Design Assessment	Transportation Assessment	Economic Development Assessment	Cost Factor
<p>Overview: Replaces the existing Viaduct with a more visually attractive viaduct structure that is less costly to maintain.</p> <p>Sisson Avenue: Reduce size of ramps.</p> <p>Sigourney: Maintain existing ramps to Sigourney Street.</p> <p>Asylum: Maintain existing ramps; improve sidewalks/streetscape on Asylum and Broad; I-84 and rail viaduct remain in existing location over Asylum.</p>	<p>POOR</p> <p>More attractive, visually appealing viaduct design.</p> <p>Redesign of Sisson ramps modestly improves character of Capitol Avenue connection to downtown.</p> <p>As no significant changes are incorporated between Broad and Asylum, this alternative does not reduce the sense of a barrier between downtown, Asylum Hill and the Farmington Avenue corridor.</p>	<p>GOOD</p> <p>Enhanced Viaduct maintains existing function of highway. Redesign provides an opportunity to address some safety and operational deficiencies.</p> <p>No major improvements to encourage multi-modal transportation, travel demand management, and/or a reduction in overall vehicle miles travelled.</p>	<p>FAIR</p> <p>Access to Markets</p> <ul style="list-style-type: none"> • Inter-Regional Access – Good • Intra-Regional Access – Good • Convenient Access to Anchors – Good (except to the Capitol) • Enhances Functionality of Other Forms of Transportation – Poor (neighborhoods are cut-off resulting in poor bike and ped access) <p>Real Estate Development</p> <ul style="list-style-type: none"> • Union Station Multi-Modal Functionality – Poor (Viaduct acts as a barrier compromising bike and ped connections) • TOD Potential – Poor (limited land available for transit-oriented development) <p>Community Development</p> <ul style="list-style-type: none"> • Connections – Poor (unattractive pathways; highway cuts off Asylum Hill, Clay Arsenal, and Frog Hollow from each other and downtown) • Opportunities for Land Use Synergy – Poor (the Viaduct acts as a barrier that separates the activity north and south of the highway) 	<p>1.0</p>

Alternative Concept 1

HIGHWAY REPLACED WITH ENHANCED VIADUCT STRUCTURE: IMPROVED CONNECTIONS ACROSS HIGHWAY

Alternative Concept 1 would replace the existing structure with a new viaduct. The replacement structure would incorporate a more attractive, lower maintenance design.

This alternative would incorporate major changes to the Asylum Avenue and Broad Street areas. A new local street—the Asylum/Broad Connector—would link Broad Street and Asylum Street adjacent to the existing rail viaduct. A New Connector Road would link this street below the rail viaduct to Capitol Avenue. The eastbound barrel of I-84 that currently passes over Asylum would be relocated to below street level, enhancing the visual continuity of the street. New development over the highway on the approximately 8-acre triangular parcel of land between Asylum/Broad Street and the rail viaduct would

bring new life and vitality to the area, improving its pedestrian character and strengthening linkages across the highway corridor. Approximately 350,000–500,000 square feet of mixed-use, transit-oriented development could be located here.

This alternative eliminates the Sigourney Street highway ramps, replacing these with access from a redesigned interchange towards Sisson Avenue.

Redesign of the former Sisson Avenue interchange would result in a more compact format with better local street connections. West Boulevard would be extended across Sisson Avenue to connect to Hawthorn Street while also providing access to new highway ramps.

Alternative Concept 1

HIGHWAY REPLACED WITH ENHANCED VIADUCT STRUCTURE:
IMPROVED CONNECTIONS ACROSS HIGHWAY

SISSON/WEST BOULEVARD

- New more compact interchange replaces Sisson interchange
- Some land freed for development around former interchange
- Enhanced local street connections
- Capitol Avenue and Laurel Street pass under I-84 Viaduct
- New West Boulevard extension connects to Hawthorn Street

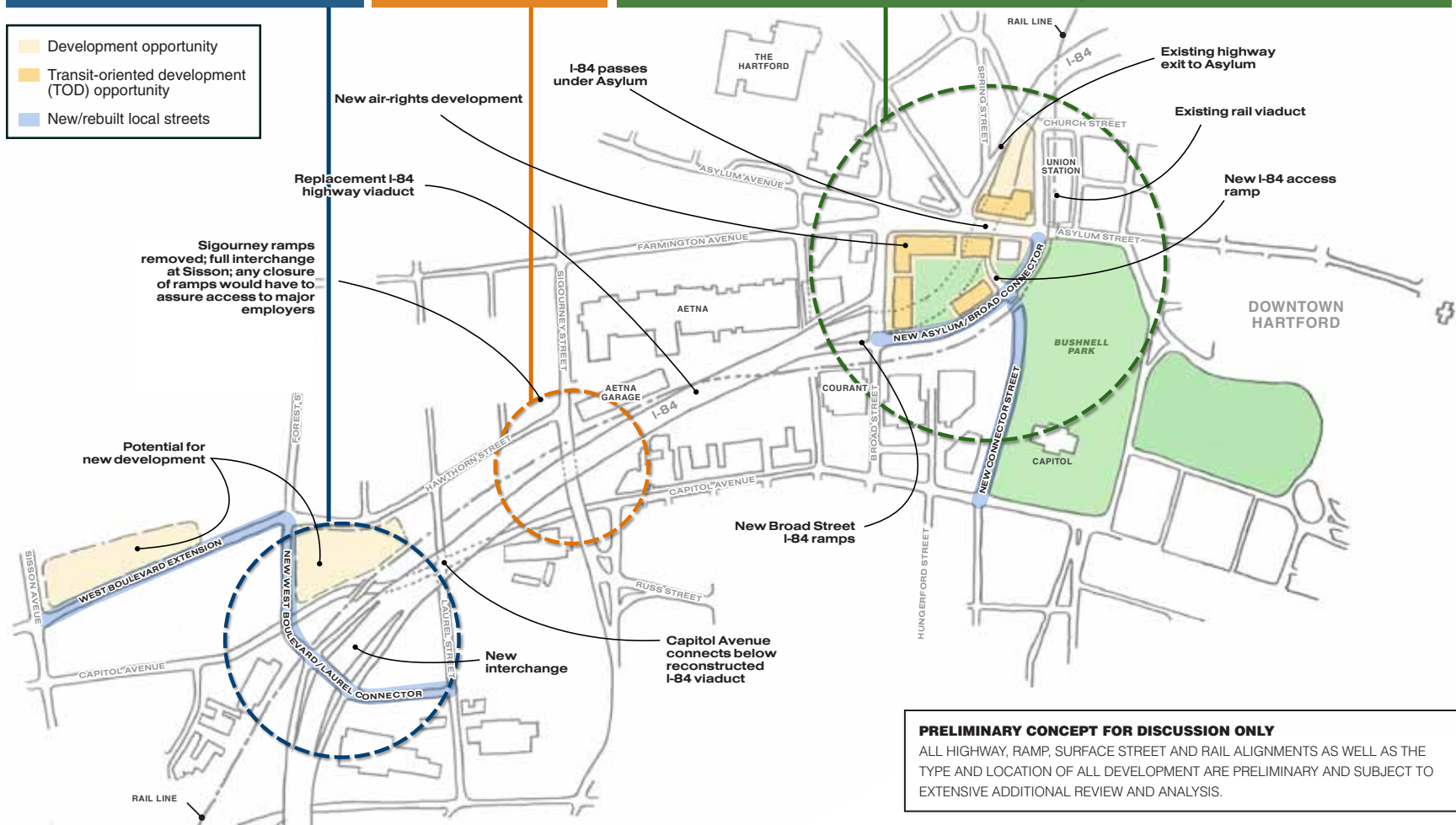
SIGOURNEY

- Rebuilt I-84 Viaduct continues to pass over Sigourney Street; Sigourney ramps removed—any closure of these ramps would need to assure access to major employers
- Highway function provided in rebuilt Viaduct structure between Broad Street and Sisson interchange

ASYLUM/BUSHNELL PARK

- Asylum Street view corridor partially reopened by removal of I-84 overhead structure: I-84 eastbound barrel relocated to below Asylum Street; rail viaduct continues to be a visual and physical barrier
- I-84 Highway access maintained—four ramps provide EB/WB connections
- 8 acres of new usable land created/freed for development and open space
- New Connector Street connects Capitol Avenue and Asylum Street
- New Connector Street links Broad Street and Asylum Street
- Character of Asylum and Broad Streets enhanced as pedestrian streets through new development at streetedge and streetscape improvements

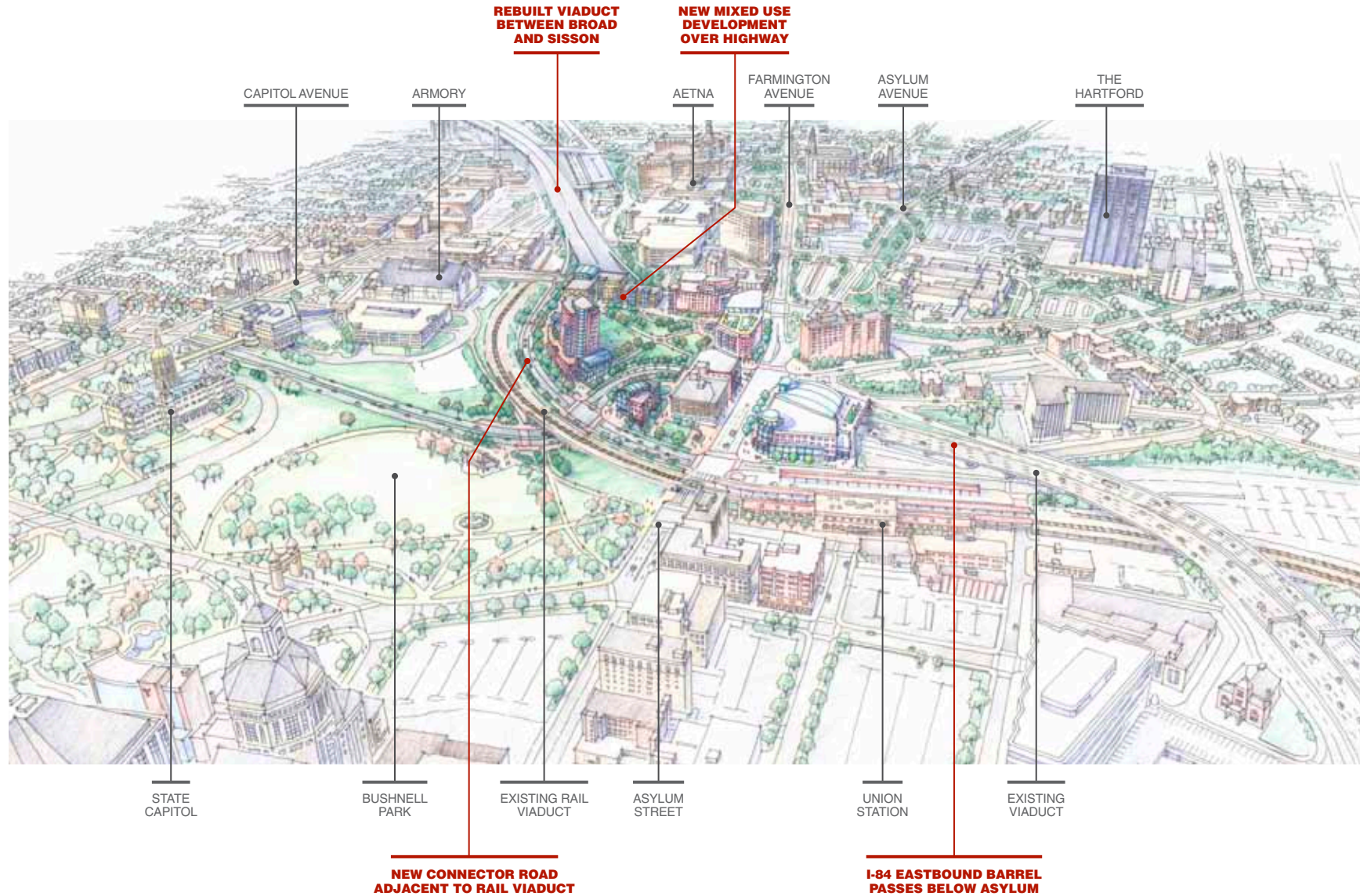
- Development opportunity
- Transit-oriented development (TOD) opportunity
- New/rebuilt local streets



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Alternative Concept 1

HIGHWAY REPLACED WITH ENHANCED VIADUCT STRUCTURE:
IMPROVED CONNECTIONS ACROSS HIGHWAY



Alternative Concept 1

HIGHWAY REPLACED WITH ENHANCED VIADUCT STRUCTURE:
IMPROVED CONNECTIONS ACROSS HIGHWAY

ASSESSMENT

Description	Urban Design Assessment	Transportation Assessment	Economic Development Assessment	Cost Factor
<p>Overview: Incorporates new development over the highway, linking downtown and Asylum Hill. An enhanced viaduct structure would replace the existing structure in the remainder of the corridor.</p> <p>Sisson Avenue: Reduce size of ramps; strengthen local street connections between ramps and downtown/corporate campuses.</p> <p>Sigourney: Remove Sigourney Street ramps; strengthen connections between Sisson ramps and downtown/corporate campuses through new and improved street connections.</p> <p>Asylum: Relocate eastbound highway barrel under Asylum; create new street linking Asylum/Union Station and Capitol. Rail Viaduct over Asylum remains as is.</p> <p>Capitol Avenue connects below the new highway viaduct.</p>	<p>FAIR/GOOD</p> <p>New development over the highway at Asylum and Broad brings new vitality to the area and strengthens connections between Asylum Hill, Union Station and downtown. Rail Viaduct over Asylum and along Bushnell Park continues to form a barrier between districts north and south of corridor.</p> <p>Lower noise levels than existing highway in Asylum/Broad Street area.</p> <p>Redesign of Sisson ramps modestly improves character of Capitol Avenue connection to downtown.</p> <p>More attractive, visually appealing viaduct design.</p> <p>Elimination of Sigourney ramps improves identity of street and pedestrian environment.</p>	<p>GOOD</p> <p>Maintains existing highway function. Redesign provides an opportunity to address safety and operational deficiencies.</p> <p>New street connection between, Capitol Avenue and Asylum Street/Union Station strengthens downtown street network.</p> <p>Better access to Union Station, streetscape enhancements, and improved local connections encourage multi-modal transportation, travel demand management, and/or a reduction in overall vehicle miles travelled.</p> <p><i>Note: Feasibility and adequacy of all highway ramp locations will require further analysis in subsequent phases of study.</i></p>	<p>GOOD</p> <p>Access to Markets</p> <ul style="list-style-type: none"> • Inter-Regional Access – Good • Intra-Regional Access – Good • Convenient Access to Anchors – Fair (Sigourney ramps removed) • Enhances Functionality of Other Forms of Transportation – Good (to the extent that streets and paths can be developed over the highway, the attractiveness of alternative modes will be enhanced) <p>Real Estate Development</p> <ul style="list-style-type: none"> • Union Station Multi-Modal Functionality – Good (Union Station is more visible from the north and will be better connected to the major employers to the north via infill development on top of the depressed highway) • TOD Potential – Good (increases the amount of developable land for transit-oriented development near the station) <p>Community Development</p> <ul style="list-style-type: none"> • Connections – Good (development on top of the highway at Asylum could connect the north and south side of the highway, which is very good; connections are not enhanced in the viaduct section of the highway) • Opportunities for Land Use Synergy – Good (development on top of the highway at Asylum could connect the north and south side of the highway, which is excellent; land use synergy is not enhanced in the Viaduct section of the corridor) 	<p>1.2</p>

Alternative Concept 2

VIADUCT REPLACED BY SURFACE ROADWAY; RAIL LINE RELOCATED TO NORTH SIDE OF I-84; CITY RECONNECTED ACROSS HIGHWAY

Alternative Concept 2 would replace the viaduct with an at-grade roadway through much of the corridor. This is made possible by relocation of the rail line to the north side of the I-84 corridor. Instead of crossing the I-84 corridor twice within the study area, the rail line remains on the north side of the highway throughout the corridor. Because of the existing steep gradient of Asylum Avenue, relocation of the rail line means it would now pass under Asylum, eliminating the rail viaduct as a physical and visual obstruction to the Asylum Avenue corridor. The eastbound barrel of I-84 that currently passes over Asylum would also be relocated to below street level further enhancing the visual continuity of the street. A new rail annex to Union Station would be developed across Spruce Street from the station to access the relocated rail line.

This alternative would incorporate major changes to the Asylum/Broad Street areas and along Bushnell Park. The rail viaduct is removed from the edge of the park. A New Park Boulevard would connect between Capitol Avenue and Asylum Street bringing new activity that enlivens this edge of Bushnell Park allowing it to be far better integrated with the downtown

area as a whole. A New Street would link the boulevard to Broad Street and could include highway access ramps.

New development and open space on the approximately 15-acre parcel of land between Asylum/Broad Street and the rail viaduct would bring new life and vitality to the area, improve its pedestrian character, and dramatically strengthen linkages across the highway corridor. Approximately 1,000,000-1,500,000 square feet of mixed-use, transit-oriented development could be located here. New open space within this area could accommodate a new pedestrian path from Asylum Hill to downtown and the Capitol complex.

Between Broad Street and the Sisson Avenue interchange, the highway would be constructed at grade and would parallel the rail line.

Redesign of the former Sisson Avenue interchange would result in a more compact format with better local street connections. West Boulevard would be extended over the highway and link directly to Capitol Avenue while also providing access to new highway ramps.

Alternative Concept 2

VIADUCT REPLACED WITH SURFACE ROADWAY; RAIL LINE RELOCATED TO NORTH SIDE OF I-84; CITY RECONNECTED ACROSS HIGHWAY

SISSON/WEST BOULEVARD

- New more compact interchange replaces Sisson interchange
- Usable land freed for development or open space including air-rights development over highway between Sigourney and Laurel Streets
- Enhanced local street connections
- Laurel Street passes over I-84
- New West Boulevard extension created east of Sisson Avenue; this new street connects over I-84 and connects to downtown/Frog Hollow via Capitol Avenue

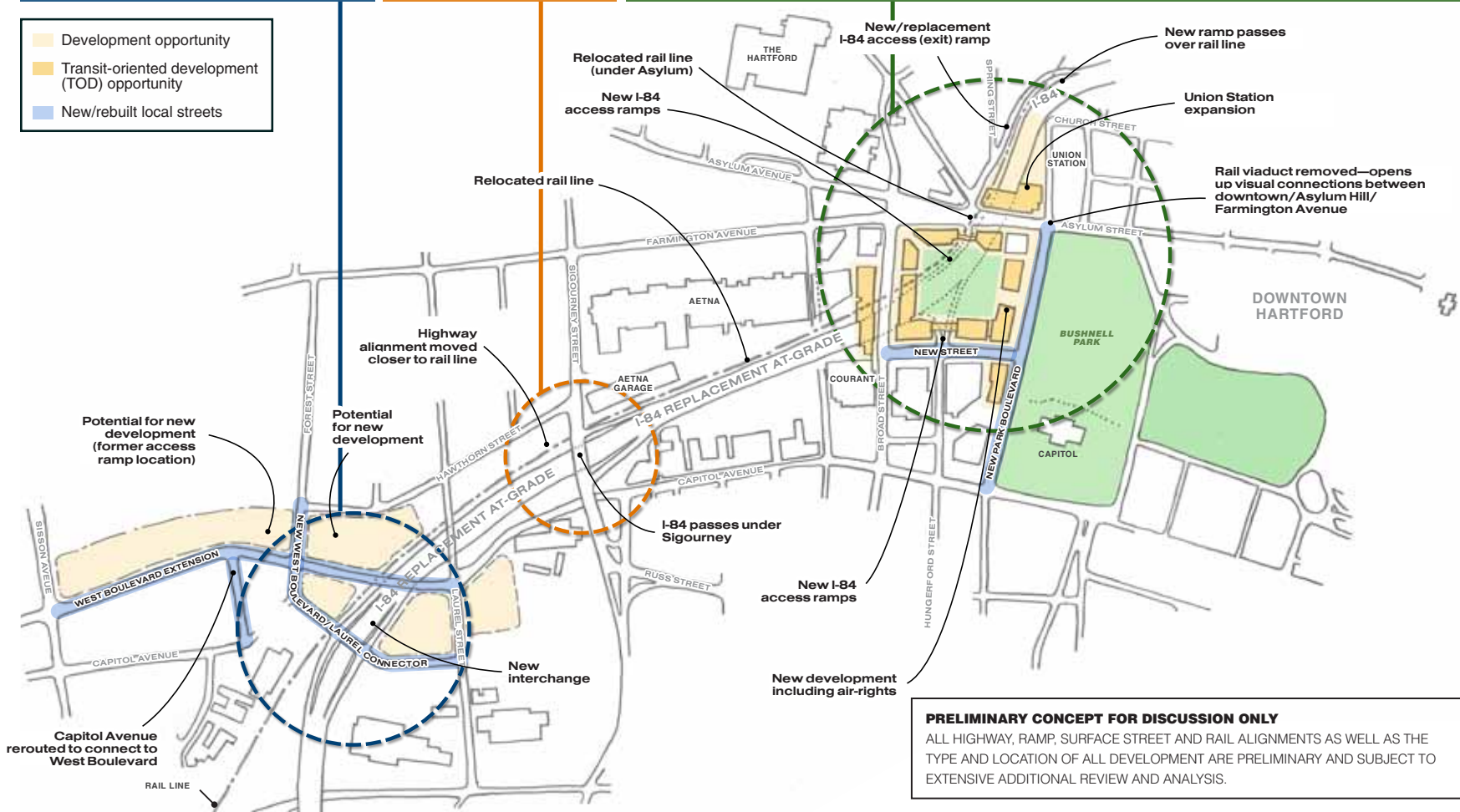
SIGOURNEY

- Highway that currently passes over Sigourney Street relocated to pass at grade below elevated street; existing highway ramp access from Sigourney maintained
- Highway located at grade between Broad Street and Sigourney; could be slightly depressed between Sigourney and Sisson interchange

ASYLUM/BUSHNELL PARK

- Asylum Street view corridor opened by removal of overhead structures: I-84 eastbound barrel relocated to below Asylum Street; relocated rail line passes below street
- I-84 Highway access maintained—four ramps provide EB/WB connections
- 15-20 acres of new usable land created/freed for development and open space
- Rail viaduct removed from Bushnell Park edge; rail corridor relocated to north side of I-84
- Union Station annex developed opposite station to provide rail station access; bus services remain in existing station
- New Park Boulevard strengthens local street grid, connects Capitol Avenue and Asylum Street and enhances access to the Park
- New Street created linking Broad Street and New Park Boulevard
- Character of Asylum and Broad Streets enhanced as pedestrian streets through new development at streetedge and streetscape improvements
- Church Street connection below I-84 is closed

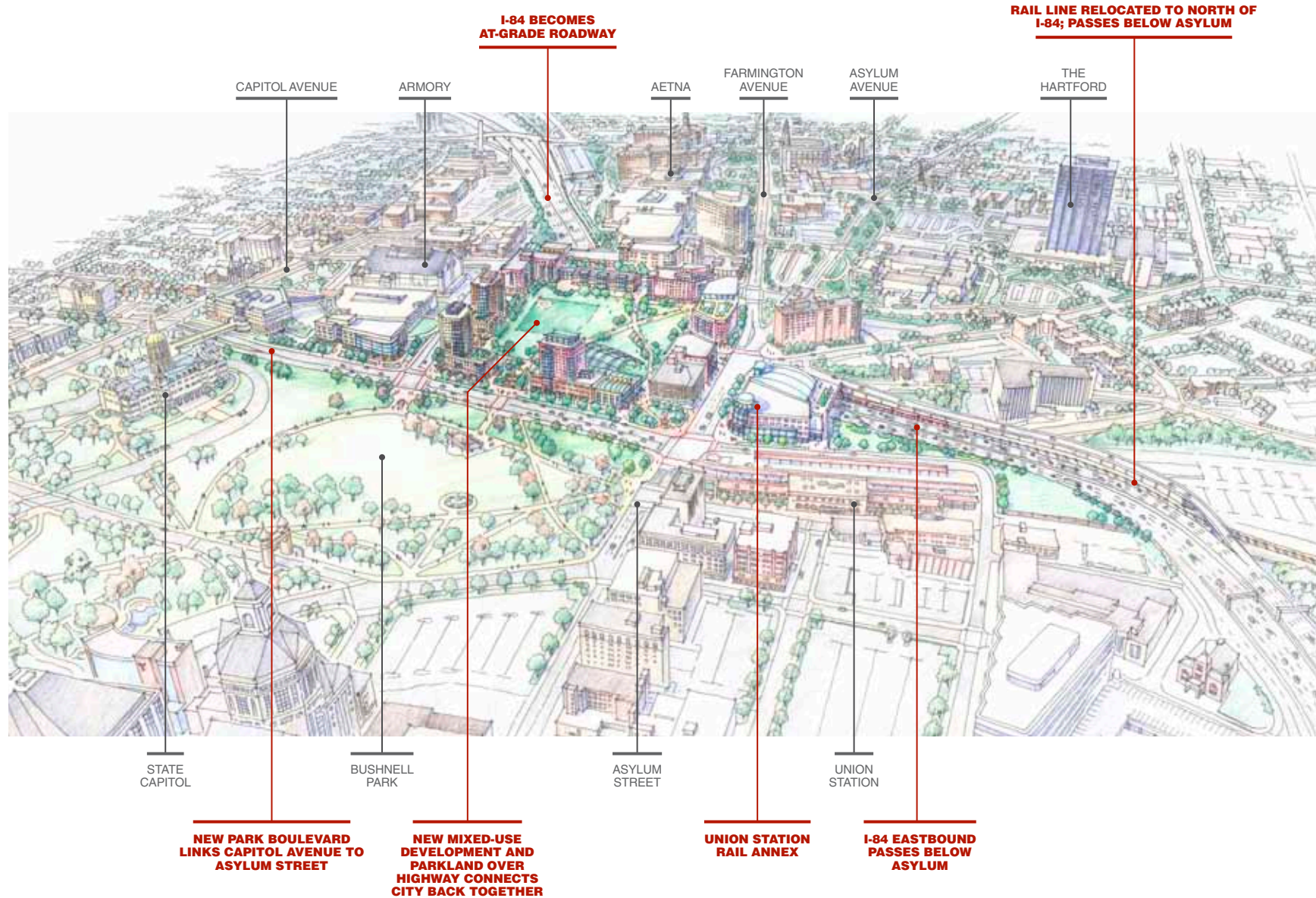
Development opportunity
 Transit-oriented development (TOD) opportunity
 New/rebuilt local streets



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Alternative Concept 2

VIADUCT REPLACED WITH SURFACE ROADWAY; RAIL LINE RELOCATED TO NORTH SIDE OF I-84; CITY RECONNECTED ACROSS HIGHWAY



Alternative Concept 2

VIADUCT REPLACED WITH SURFACE ROADWAY; RAIL LINE RELOCATED TO NORTH SIDE OF I-84; CITY RECONNECTED ACROSS HIGHWAY

ASSESSMENT

Description	Urban Design Assessment	Transportation Assessment	Economic Development Assessment	Cost Factor
<p>Overview: Incorporates new development over the highway, linking downtown and Asylum Hill. An at-grade highway would replace the viaduct in the remainder of the corridor; rail viaduct removed over Asylum and along Bushnell Park and relocated to north of I-84.</p> <p>Sisson Avenue: Reduce size of ramps; strengthen local street connections between ramps and downtown/corporate campus.</p> <p>Sigourney: Maintain Sigourney Street ramp access; strengthen connections between Sisson ramps and downtown/corporate campuses through new and improved street connections.</p> <p>Asylum: Relocate eastbound highway barrel under Asylum; create new street linking Asylum/ Union Station and Capitol. Rail viaduct is relocated to below Asylum and away from Bushnell Park.</p> <p>Capitol Avenue/West Boulevard Extension: Capitol Avenue extends from downtown, passes over the highway and connects to West Boulevard.</p> <p>Union Station: Expansion/ annex created to serve rail passengers.</p>	<p>GOOD/ VERY GOOD</p> <p>New development over the highway at Asylum and Broad brings new vitality to the area and strengthens connections between Asylum Hill, Union Station and downtown. Removal of rail viaduct over Asylum and along Bushnell Park significantly improves connections across highway and enhances access and character of Bushnell Park.</p> <p>Lower noise levels than existing highway in Asylum/Broad Street area and potentially between Sigourney Street and Laurel Street where highway may be depressed.</p> <p>Redesign of Sisson ramps and placement of Capitol Avenue over (not under) highway modestly improves character of Capitol Avenue connection to downtown.</p> <p>Sigourney passes over (not under) highway resulting in modest improvement to identity of street and pedestrian environment.</p> <p>New at-grade I-84 roadway between Broad Street and Sisson Avenue reduces the visibility of the highway. The potential to slightly depress the highway between Sigourney and Sisson could further reduce its visibility.</p>	<p>GOOD</p> <p>Maintains existing highway function. Redesign provides an opportunity to address safety and operational deficiencies.</p> <p>New street connection between, Capitol Avenue and Asylum Street/Union Station strengthens downtown street network.</p> <p>At grade highway between Broad Street and Sisson Avenue results in lower cost over viaduct alternative and also results in reduced long term maintenance costs.</p> <p>Better access to Union Station, streetscape enhancements, and improved local connections encourage multi-modal transportation, travel demand management, and/or reduction in overall vehicle miles travelled.</p> <p><i>Note: Feasibility and adequacy of all highway ramp locations will require further analysis in subsequent phases of study.</i></p>	<p>VERY GOOD</p> <p>Access to Markets</p> <ul style="list-style-type: none"> • Inter-Regional Access – Good • Intra-Regional Access – Very Good (more intelligible street grid and ramps system) • Convenient Access to Anchors – Good • Enhances Functionality of Other Forms of Transportation – Very Good (to the extent that streets and paths can be developed over the highway, the attractiveness of alternative modes will be enhanced) <p>Real Estate Development</p> <ul style="list-style-type: none"> • Union Station Multi-Modal Functionality – Very Good (Union Station is visible from the north and will be better connected to the major employers to the north via infill development on top of the depressed highway) • TOD Potential – Very Good (increases the amount of developable land near the station); removal of rail viaduct from edge of Bushnell Park enhances development opportunities, with potential to activate park <p>Community Development</p> <ul style="list-style-type: none"> • Connections – Very Good (development on top of the highway at Asylum could connect the north and south side of the highway, which is very good; connections are not significantly enhanced in the at-grade sections of the highway) • Opportunities for Land Use Synergy – Good (development on top of the highway at Asylum could connect the north and south side of the highway, which is excellent; land use synergy is not significantly enhanced in the at-grade section of the highway) 	<p>1.0</p>

Alternative Concept 3

VIADUCT REPLACED BY TUNNEL; RAIL LINE RELOCATED TO NORTH SIDE OF I-84; CITY RECONNECTED ACROSS HIGHWAY

Alternative Concept 3 would replace the viaduct with a tunnel throughout the corridor. This alternative would include relocation of the rail line to the north side of the I-84 corridor. Because of the existing steep gradient of Asylum Avenue, relocation of the rail line means it would now pass under the street, eliminating the rail viaduct as a physical and visual obstruction to the Asylum Avenue corridor. The eastbound barrel of I-84 that currently passes over Asylum would also be relocated to below street level further enhancing the visual continuity of the street. A new rail annex to Union Station would be developed across Spruce Street from the station to access the relocated rail line. Between Asylum Street and Broad Street the rail line would be located below these streets. West of Broad Street, the rail line would be located outside the tunnel and continue at grade, largely as it does today.

This alternative would incorporate major changes to the Asylum/Broad Street areas and along Bushnell Park. A New Park Boulevard would connect between Capitol Avenue and Asylum Street bringing new activity that enlivens this edge of Bushnell Park allowing it to be far better integrated with the downtown area as a whole. A New Street would link the boulevard to Broad Street and could include highway access ramps. In this portion of the I-84 corridor, Alternative 3 is similar to Alternative 2.

New development and open space on the approximately 15-acre parcel of land between Asylum/Broad Street and the rail viaduct would bring new life and vitality to the area, improve its pedestrian character, and dramatically strengthen linkages across the highway corridor. Approximately 1,000,000-1,500,000 square feet of mixed-use transit-oriented development could be located here and on adjacent land. New open space within this area could accommodate a new pedestrian path from Asylum Hill to downtown and the Capitol complex.

Between Broad Street and the Sisson Avenue interchange, the highway would be accommodated in a tunnel and would parallel the rail line. Land over the tunnel could accommodate new development or open space. Highway related noise would be significantly less than above grade highway alternatives.

Redesign of the former Sisson Avenue interchange would result in a more compact design with better local street connections. West Boulevard would be extended over the highway and link directly to Capitol Avenue while also providing access to new highway ramps.

Alternative Concept 3

VIADUCT REPLACED BY TUNNEL; RAIL LINE RELOCATED TO NORTH SIDE OF I-84; CITY RECONNECTED ACROSS HIGHWAY

SISSON/WEST BOULEVARD

- New more compact interchange replaces Sisson interchange
- Usable land freed for development or open space including air-rights development between Sigourney Street and Laurel Street
- Enhanced local street connections
- New West Boulevard extension created east of Sisson Avenue; this new street connects over I-84 and connects to downtown/Frog Hollow via Capitol Avenue

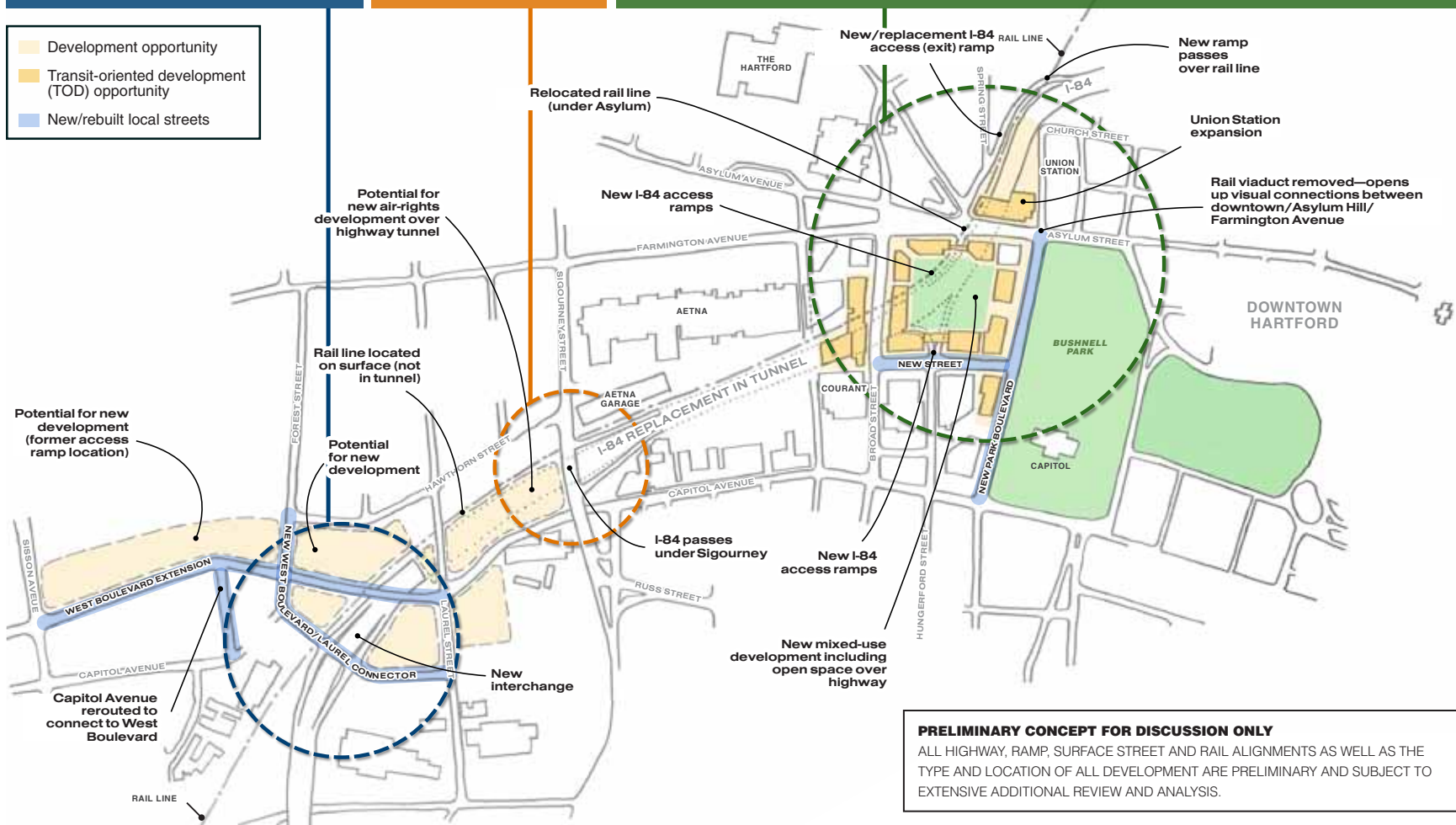
SIGOURNEY

- Highway that currently passes over Sigourney Street relocated to covered tunnel; existing highway ramp access from Sigourney maintained
- Highway located in covered tunnel between Broad Street and Sisson interchange

ASYLUM/BUSHNELL PARK

- Asylum Street view corridor opened by removal of overhead structures: I-84 eastbound barrel relocated to below Asylum Street; relocated rail line passes below street
- I-84 Highway access maintained—four ramps provide EB/WB connections
- 15-20 acres of new usable land created/freed for development and open space
- Rail viaduct removed from Bushnell park edge; rail corridor relocated to north side of I-84
- Union Station annex developed opposite station to provide rail station access; bus services remain in existing station
- New Park Boulevard strengthens local street grid, connects Capitol Avenue and Asylum Street and enhances access to the Park
- New Street created linking Broad Street and New Park Boulevard
- Character of Asylum and Broad Streets enhanced as pedestrian streets through new development at streetedge and streetscape improvements
- Church Street connection below I-84 is closed

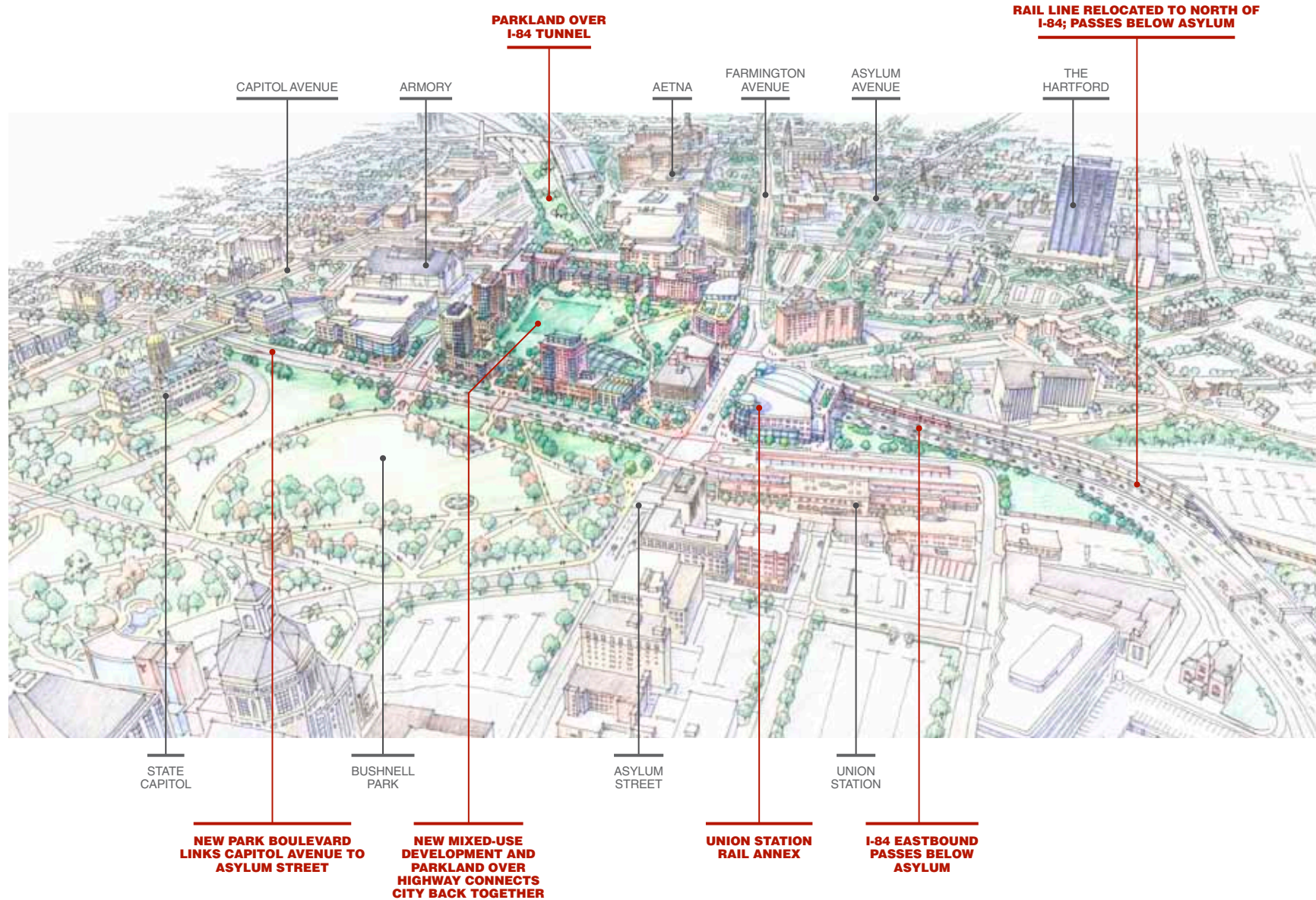
Development opportunity
 Transit-oriented development (TOD) opportunity
 New/rebuilt local streets



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Alternative Concept 3

VIADUCT REPLACED BY TUNNEL; RAIL LINE RELOCATED TO NORTH SIDE OF I-84;
CITY RECONNECTED ACROSS HIGHWAY



Alternative Concept 3

VIADUCT REPLACED BY TUNNEL; RAIL LINE RELOCATED TO NORTH SIDE OF I-84; CITY RECONNECTED ACROSS HIGHWAY

ASSESSMENT

Description	Urban Design Assessment	Transportation Assessment	Economic Development Assessment	Cost Factor
<p>Overview: Replaces the existing viaduct with a tunnel between Sisson and Asylum. New development would occur over the tunnel on land formerly occupied by the viaduct. Existing ramp locations could be maintained. Rail viaduct is removed over Asylum and along Bushnell Park and relocated to north of I-84.</p> <p>Sisson Avenue: Reduce size of ramps; transition from surface highway to tunnel.</p> <p>Sigourney: Maintain Sigourney Street ramp access, strengthen local network to provide connections to Sisson/Asylum and Capitol ramps.</p> <p>Asylum: Relocate eastbound highway barrel under Asylum; create new street linking Asylum/Union Station and Capitol. Rail viaduct relocated to below Asylum.</p> <p>Capitol Avenue/West Boulevard Extension: Capitol Avenue extends from downtown, passes over the highway and connects to West Boulevard.</p> <p>Union Station: Expansion/annex created to serve rail passengers.</p>	<p>VERY GOOD</p> <p>Elimination of viaduct provides flexibility to enhance surface street network and strengthen the character of all major corridors accessing downtown.</p> <p>New development over the highway at Asylum and Broad brings new vitality to the area and strengthens connections between Asylum Hill, Union Station and downtown. Removal of rail viaduct over Asylum and along Bushnell Park significantly improves connections across highway and enhances access and character of Bushnell Park.</p> <p>Elimination of viaduct at Sigourney Street enhances the street and opens up a visual connection between downtown/ Frog Hollow and Asylum Hill.</p> <p>Elimination of viaduct strengthens character of Capitol Avenue as a gateway to downtown; new development along former highway land along Capitol strengthens the connection.</p> <p>Noise impacts from highway would be significantly reduced when compared with above grade highway structures.</p>	<p>GOOD</p> <p>Tunnel maintains existing highway function. Redesign provides an opportunity to address safety and operational deficiencies. Below-grade alignment provides the flexibility to accommodate expanded capacity without compromising surrounding urban environment.</p> <p>New street connection between Capitol Avenue and Asylum Street/Union Station strengthens downtown street network.</p> <p>Better access to Union Station, streetscape enhancements, and improved local connections encourage multi-modal transportation, travel demand management, and/or a reduction in overall vehicle miles travelled.</p> <p><i>Note: Feasibility and adequacy of all highway ramp locations will require further analysis in subsequent phases of study.</i></p>	<p>VERY GOOD</p> <p>Access to Markets</p> <ul style="list-style-type: none"> • Inter-Regional Access – Good • Intra-Regional – Very Good (more intelligible street grid and ramp system) • Convenient Access to Anchors – Good • Enhances Functionality of Other Forms of Transportation – Very Good (to the extent that streets and paths can be developed over the highway the attractiveness of alternate modes will be enhanced) <p>Real Estate Development</p> <ul style="list-style-type: none"> • Union Station Multi-Modal Functionality – Very Good (Union Station is visible from the north and will be better connected to the major employers to the north via infill development on top of the depressed highway) • TOD Potential – Very Good (increased amount of developable land near the station); removal of rail viaduct from edge of Bushnell Park enhances development opportunities, with potential to activate park) <p>Community Development</p> <ul style="list-style-type: none"> • Connections – Very Good (development on top of the tunnel could connect the north and south side of the highway) • Opportunities for Land Use Synergy – Very Good (development on top of the tunnel could connect the north and south side of the highway) 	<p>3.0</p>



Comparative Assessment of Alternatives

This study offers a preliminary comparison of the Concept Alternatives in terms of urban design, transportation, economic development and cost factors. The purpose of this study is expressly not to identify a preferred alternative. A much more comprehensive analysis of options than is possible within the limited scope of this effort would be needed to address all the factors that are necessary to reach such a designation.

The comparative assessment offered here can be useful, however, in identifying promising opportunities and ap-

proaches that can be further evaluated as a more detailed evaluation of replacement options is prepared in subsequent study of replacement options. Cost factors compare each Alternative with the Baseline.

The analysis suggests that Alternative 3, the tunnel option, offers the most benefits. The cost of this alternative, however, is very high relative to other options. This is fully consistent with national experience with comparable urban highway tunnel projects.

	URBAN DESIGN	TRANSPORTATION	ECONOMIC DEVELOPMENT	COST FACTOR
Baseline	Poor	Good	Fair	1.0
Alternative 1	Fair/Good	Good	Good	1.2
Alternative 2	Good/Very Good	Good	Very Good	1.0
Alternative 3	Very Good	Good	Very Good	3.0

Alternative 2 offers nearly the same level of benefit as the tunnel option but at a considerably lower cost. Alternative 2 costs are considered to be comparable to the Baseline option but the benefits are much greater. The favorable costs associated with Alternative 2 are closely linked to its use of an at-grade highway form rather than a viaduct structure. It is important to note that this option requires relocation of the rail line within a portion of the corridor in order to be feasible. While such a relocation appears to offer benefits for both rail and highway projects, it would likely require that both projects be undertaken simultaneously rather than independently. The feasibility of this approach will require further detailed analysis but its promise is significant.

Alternative 1 offers more benefit than the Baseline but less than Alternatives 2 or 3. It is likely to be more costly than the Baseline as it incorporates most elements of the Baseline (including a viaduct form) but also includes significant changes to the key Asylum/Broad Street areas that are not addressed in the Baseline.

The Baseline option adequately addresses highway needs but rates poorly in terms of urban design and only fair in terms of economic development.

CREATING 15–20 ACRES OF NEW URBAN LAND: COMPARING HARTFORD TO OTHER COMMUNITIES

Examples of urban redevelopment projects of comparable size in other cities include the following:

- **Providence’s Capitol Center and Waterplace Park** (constructed adjacent to the city’s relocated inter-city and commuter rail station) have become important urban destinations for the city and region. The rail line passes below an open space that provides a link through the development, connecting the state Capitol to downtown Providence. Capitol Center includes a mix of office, residential, retail, restaurants and a destination open space.
- **Boston’s Prudential Center** is built over interstate I-90 and passenger rail lines, occupying land that was once a rail yard. Highway ramp structures are integrated with the surrounding urban environment. The Prudential Center complex incorporates a mix of office, residential, shopping, open space and recreational uses. The development serves to link the city’s Back Bay and South End neighborhoods. Nearby Back Bay Station incorporates inter-city rail, commuter rail, subway and bus services.



Urban design—comparing alternatives

The Baseline option offers limited urban design benefits. Alternative 1 provides noticeable improvements over the Baseline. New development over the highway along Asylum and Broad Streets, in conjunction with relocation of the highway Viaduct to below the street, would strengthen connections across the highway corridor. Approximately 350–500,000 square feet of development could be accommodated. Alternatives 2 and 3 offer dramatic opportunities to reconnect the city across the highway, while opening up 15–20 acres of urban land in close proximity to the Union Station transit hub. Development potential in the 1–1.5 million square foot range in conjunction with new open space could be incorporated. Much of this land is in public ownership. Some of this land is located over the highway but much of it would not involve air-rights development. Removal of the highway and rail Viaducts from the Asylum corridor would fully open the view corridor across the highway, further strengthening connections between Asylum Hill and downtown.

The diagrams on the previous page compare the land area available for development in Hartford around the Asylum and Broad corridors with major urban redevelopment projects over highway and rail infrastructure in Providence and Boston.

Transportation—comparing alternatives

A detailed technical assessment of the effectiveness of each alternative in addressing transportation needs goes well beyond the scope of this study. The alternatives are broadly

comparable in terms of highway operations—but cost and feasibility issues will be different depending on the choice of a viaduct, tunnel or at-grade model.

The alternatives show variations in highway ramp locations, which in many instances seek to broadly mirror current ramp sites, but no specific analysis has been done at this point to determine the adequacy of these locations to address current or future needs. As the next level of traffic analysis is undertaken in future studies, it most likely will result in a wider range of potential ramp and interchange locations. It will be critical, however, to explore ramp locations and geometries that reflect the *urban* characteristics of the surrounding city, and are located and designed in ways that are well integrated with the local street network, supporting a better-connected and more pedestrian and bike friendly environment. Ramps must also be sited to provide efficient access from the highway to the area’s large employment centers.

Construction staging requirements will also be complex and quite different for each alternative. Such requirements are a key factor in shaping project cost and will be of key importance in future study phases.

This report presents a range of alternative concepts for consideration, but it could equally be seen as offering a “toolkit” of options that could be mixed and matched. Thus, in moving toward to define the configuration of I-84 through the City of Hartford, individual elements presented here could be combined in a variety of ways.

Alternatives 2 and 3 involve relocation of a portion of the rail. This action has the potential to substantially improve the cohesiveness of the city's downtown while providing cost and operational efficiencies for development of rail and road infrastructure.

The local street network varies between alternatives. Generally, Alternatives 2 and 3 are most successful in strengthening the local network. Alternative 1 provides a meaningful level of improvement over the Baseline. The Baseline offers almost no improvement over the current condition and is rated as poor in this respect.

Alternatives 2 and 3 have the best potential to promote multi-modal transportation use, transportation demand management, and measures to reduce vehicle miles travelled. Alternative 1 offers an improvement over the Baseline.

Prior planning efforts have identified the I-84 Viaduct corridor between Bushnell Park and Forest Street as the alignment for the East Coast Greenway in Hartford. As alternatives for the Viaduct are developed further and a preferred approach identified, additional work will be needed to determine the best approach to locating the Greenway. Key factors will include the ultimate form of the highway and its relationship to the rail line. Whichever approach is ultimately selected, incorporation of the Greenway in this location will not only provide an

essential link in the ECG but also further enhance the accessibility of downtown Hartford and its connection to adjacent neighborhoods and surrounding towns.

Highway noise impacts related to Alternative 3 are notably better than the other alternatives. Alternatives 1 and 2 also offer improvements over the Baseline.

Economic Development—comparing alternatives

Each of the alternatives successfully preserves inter-regional access by maintaining Interstate functionality. In terms of Intra-Regional access, Alternatives 2 and 3 offer a more intelligible street network than exists today. Alternatives 2 and 3 are also superior to the Baseline and Alternative 1 in terms of enhancing the functionality of other forms of transportation. The new development and open space at Asylum will significantly improve pedestrian and bike links across the highway.

Alternatives 1, 2 and 3 offer real advantages to Union Station's functionality and transit-oriented development potential. All three concepts result in Union Station being better linked both visibly and physically to the neighborhoods to the north. All three concepts result in the creation of developable land adjacent to the Station. Alternatives 2 and 3 create the potential for 1,000,000 to 1,500,000 square feet of new development near the multi-modal station.

In terms of each alternative's impact on re-connecting neighborhoods, Alternatives 1, 2, and 3 are an improvement compared to the existing condition and Baseline Alternative. Alternatives 1, 2, and 3 improve connections at Asylum. Alternative 3 is the best for improving neighborhood connections and land use synergy as development on the tunnel could connect neighborhoods north and south of the Highway.

From an economic impact perspective, Alternatives 2 and 3 create very valuable land with significant development potential. One to one and a half million square feet of development in this part of the downtown would result in \$12 to \$18 million in annual City property tax revenue. Because it does not require the construction of a tunnel, Alternative 2 is superior from an investment return perspective. Alternative 1 with 350–500 thousand square feet of development would result in \$4 to \$6 million in annual City property tax revenue.

Cost Assessment

Only a very limited assessment of project cost was possible within the scope of this study. However, as some relative assessment of the cost of various project alternatives was desirable, the study team used a preliminary ConnDOT engineering analysis prepared between 1993-95 that is comparable to the Baseline alternative to estimate construction quantities and staging requirements. Using this as a starting point, the team used ConnDOT Estimating Guidelines published in January 2010 to develop an

overall estimate for design, construction and associated incidental costs and contingencies. Based on this assessment, the estimated cost of the Baseline is considered to be in the \$x.x–y.y range in 2010 dollars. *[Estimate currently being finalized.]*

Based on this assessment, cost factors were estimated for the other alternatives, reflecting their relative complexity and expense when compared with the Baseline. Alternative 1 is estimated as a factor of 1.2 times the baseline cost. Alternative 2 is estimated as a factor of 1.0 times the baseline cost. Alternative 3 is estimated as a factor of 3.0 times the baseline cost.

Next steps

The following represent key next steps:

- Continued review and discussion of study findings within the City of Hartford:
 - > Presentation of study findings and recommendations to the Planning and Zoning Commission
 - > Presentation of study findings and recommendations to the Hartford City Council
 - > Presentation and discussion of study findings and recommendations at a major public forum, a Community Summit, to be held in October 2010
- Presentation of study findings to CRCOG Policy Board
- Continued discussion of potential next steps between the City of Hartford, ConnDOT and CRCOG
- Coordination of study findings with ongoing planning and implementation efforts such as *One City, One Plan* (Hartford's Plan of Conservation and Development), and the Springfield/New Haven commuter rail initiative
- Development of an overall project implementation approach and associated timeline by ConnDOT and its study partners. Key near-term concerns will be identification of funding and scope of work for the next phase of project development, environmental assessments, and engineering analyses