

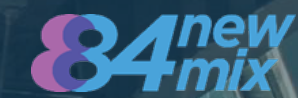
Interstate 84 / Route 8  
"MIXMASTER" INTERCHANGE

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# draft LEVEL 2 INITIAL ALTERNATIVES AND SCREENING REPORT

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August 2023





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## 1 Introduction

The Connecticut Department of Transportation (CTDOT) is conducting a Planning and Environmental Linkages (PEL) Study for the reconstruction of the Interstate 84 (I-84) / Route 8 Interchange (Mixmaster) (the Study) in the City of Waterbury (the City). CTDOT desires to establish a vision, or master plan, for the interchange that addresses and balances the regional importance of the Mixmaster for commuter traffic and motor freight users, while also improving multi-modal services, local connections and livability within the city of Waterbury to enhance and support social equity and economic vitality. The overarching goal of the PEL Study is to develop a clear and supported plan of action for addressing transportation deficiencies of the Mixmaster Interchange. The PEL Study Area is illustrated on **Figure 2-1**.

CTDOT is using a PEL approach for the future reconstruction of the Mixmaster to link planning to the National Environmental Policy Act (NEPA) review process. During the PEL Study, the Study Team (CTDOT and its consultants) will work with identified stakeholders (such as the public, City officials, and various agencies) to discern the transportation and community needs, incorporate early stakeholder involvement, and evaluate alternatives relative to transportation needs and key environmental and community resources. The PEL Study will be a resource for future NEPA documentation. It will aim to avoid the duplication of effort, streamline the environmental review process, and reduce delays in project implementation. A detailed outline of study activities can be found in the Study's *PEL Process Framework and Methodology*.

This *Level 2 Initial Alternatives and Screening Report* documents the methodology and results of the work performed by the Study Team, in cooperation with other PEL Study partners, during the second level of the alternative screening process. It presents the Initial Alternatives, those that passed the Level 1 screening process, as well as the screening results produced during the Level 2 analysis.

Previous PEL Study analyses and documents that were relied upon during the development of this report include the following:

- The *Analysis, Needs, and Deficiencies Report*;
- The draft *Preliminary Purpose and Need Statement*;
- The *PEL Process Alternative Screening Methodology* report; and
- The *Level 1 Conceptual Alternatives and Screening Report*

## 2 Alternatives Screening Methodology

The PEL Study alternatives development and evaluation process defined by the *PEL Process Alternative Screening Methodology* report, or ASM, can be visualized as a funnel that includes three levels of alternatives development, evaluation, and screening (see **Figure 2-2**). This three-tiered screening process assesses various strategies, corridor needs, and goals to produce a set of refined transportation alternative solutions at the PEL Study's conclusion.

Alternatives that do not satisfy the evaluation criteria of a given level will be eliminated from further study (screened out), while successful alternatives will be refined and moved to the next level of screening. As the study progresses, more data will become available, which will allow for more detailed analyses. The PEL Study screening process is outlined below:

- **Level 1** includes development of conceptual alternatives and an initial qualitative evaluation of fatal flaws. Evaluation criteria for this first level of screening derive from the PEL Study's draft Preliminary Purpose and Need. Not meeting the needs of the Study, as well as cost and feasibility criteria indicate that a conceptual alternative is fatally flawed and would be dismissed from further evaluation. The results of this screening level are documented in the *Level 1 Conceptual Alternatives and Screening Report*. The alternatives that pass the Level 1 screening will be called **Initial Alternatives** and advance to Level 2.
- **Level 2** is primarily a qualitative screening, with some quantitative analysis. It includes the continued development of the Initial Alternatives. The evaluation criteria at this level will incorporate additional needs and goals. Categories such as local mobility, multimodal travel, constructability, and potential impacts to community, natural, and human environments will be evaluated in this level. The Initial Alternatives that pass the Level 2 screening will be called **Preliminary Alternatives** and proceed to Level 3.
- **Level 3** will include the highest development of detail prior to NEPA and a primarily quantitative evaluation, with some qualitative elements, of the Preliminary Alternatives. The assessments at this level will further evaluate criteria identified as differentiators among the alternatives in Level 2. Additionally, a comprehensive assessment of traffic operations, including traffic simulations, and evaluation of capital and life-cycle costs will occur during Level 3.

Alternatives that remain after the final level of screening will be recognized as the **PEL Recommended Alternative(s)**, also referred to as a **Range of Reasonable Alternatives** that best address the transportation needs for the PEL Study Area. The Range of Reasonable Alternatives will be provided as the PEL Study's recommendations for further design development and advancement in future NEPA processes.

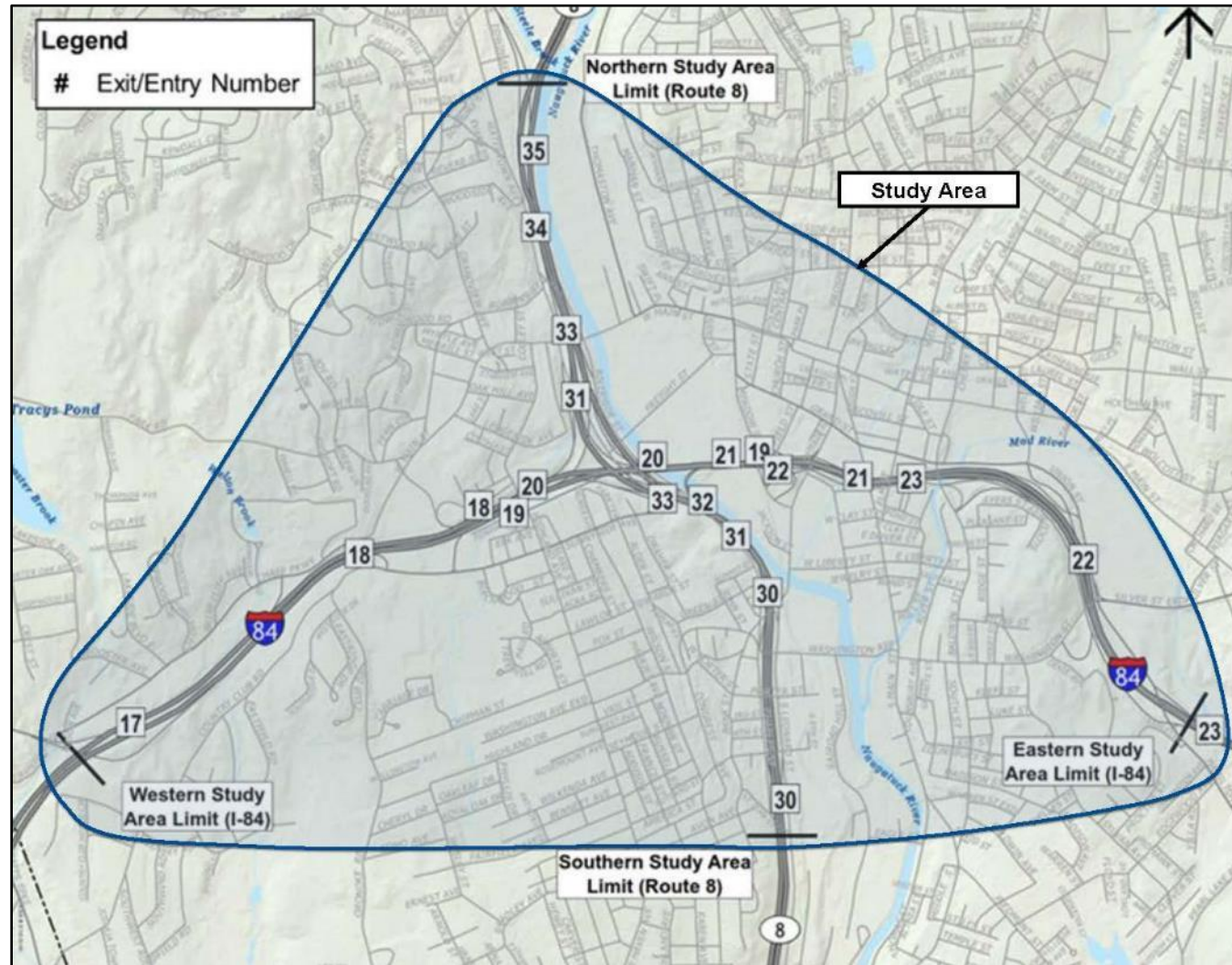


Figure 2-1 PEL Study Area

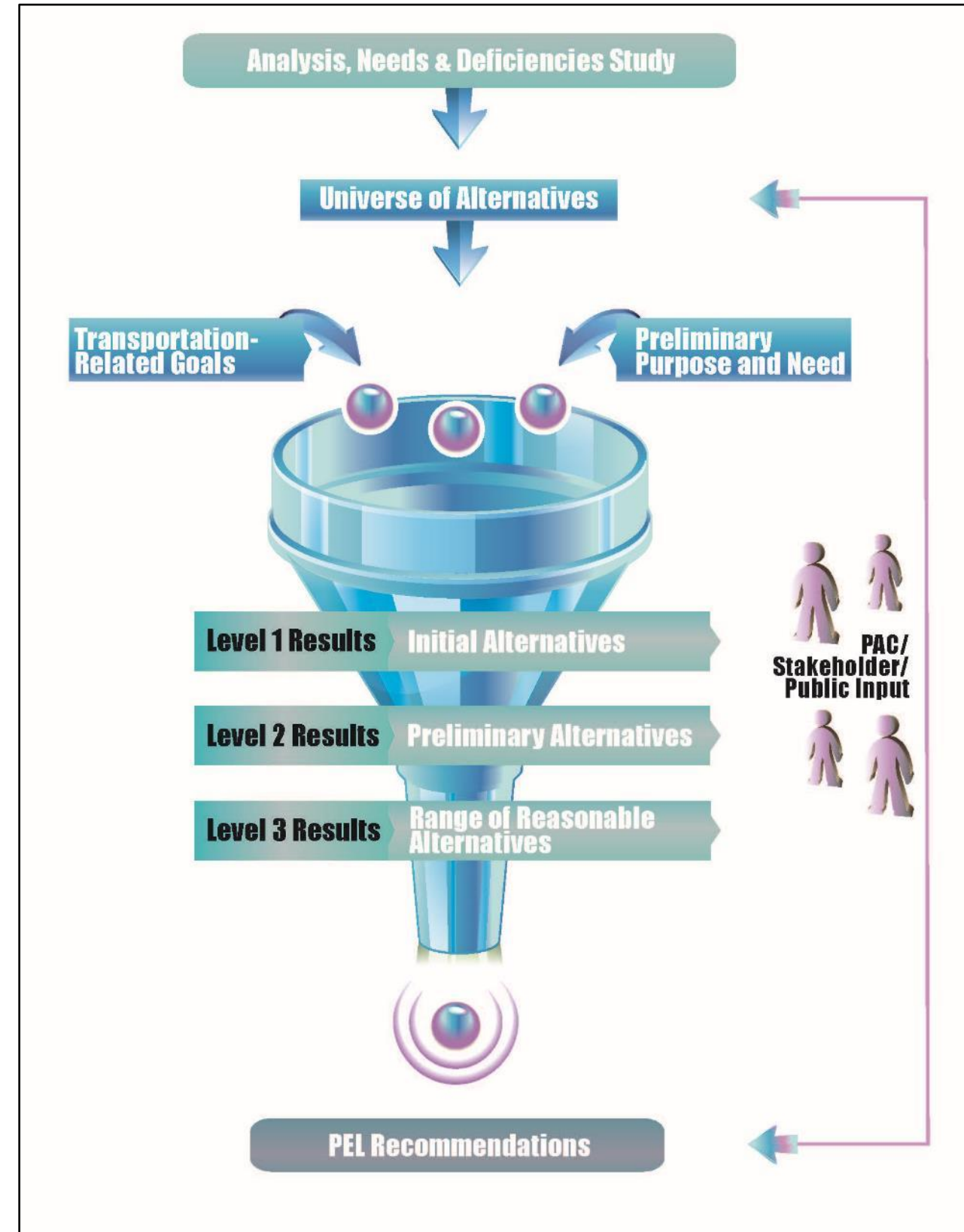


Figure 2-2 Alternatives Development and Evaluation Process



### 3 Initial Alternatives

The remaining possible solutions for the PEL Study Area's transportation deficiencies, having passed the Level 1 Screening, are referred to as "Initial Alternatives" during the Level 2 Screening.

The Universe of Alternatives (the Universe) identified three general categories of alternatives which included alternate travel modes, rehabilitation alternatives, and replacement alternatives. Of the three general categories identified in the Universe, only alternatives identified in the replacement category remain for evaluation in the Level 2 screening. Additionally, the No-Build Alternative was retained for this level of screening as it represents a baseline condition for the PEL Study, per NEPA requirements. Instead of being dismissed for infeasibility, the No-Build Alternative is to be carried forward to serve as a comparison benchmark for other alternatives to be evaluated against during the PEL Study process.

The following are the Initial Alternatives and No-Build Alternative that advanced to the Level 2 screening. At the conclusion of Level 1 Screening, these Initial Alternatives, except for the No-Build Alternative, were determined to not have any apparent fatal flaws and meet the Level 1 criteria developed from the draft Preliminary Purpose and Need.

- No-Build Alternative
- Interchange Shifted East,
- Combined System Connections,
- Modern Crossover Interchange,
- Modern Crossover Interchange with Route 8 Split to the South,
- Keeping Route 8 Stacked
- Naugatuck River Shift,
- Partial System Crossover Interchange,
- Half Diverging Diamond Interchange, and
- South City Bypass

### 4 Level 2 Evaluation and Screening Approach

The purpose of Level 2 screening is to assess and screen the No-Build and Initial Alternatives' ability to meet the goals and objectives identified by the Study Team and informed by stakeholder / public input. This chapter describes how the evaluation criteria were developed, the methodology of the screening approach and process, and the results.

#### Fatal Flaw Evaluation

Based on design advancement, alternatives were re-evaluated to identify potential fatal flaws with the additional information available. These Initial Alternatives are still in the early planning stages because of the limited engineering analysis that has been performed during their development; however, the alternatives have been developed to a higher level of detail, approximately 10% complete, for the Level 2 Screening, as compared to the 5% design completion in Level 1. The distinction is made at this level of screening because additional engineering analysis and design (if it were to be performed) may determine that an Initial Alternative is ultimately not a viable solution. Alternatives that were determined to be fatally flawed did not receive a full analysis against the four evaluation criteria groups due to their inability to meet the purpose of the Study.

The evaluation criteria utilized for this Level 2 screening are described in the following sections.

#### 4.1 LEVEL 2 EVALUATION CRITERIA

##### Evaluation Criteria and Goal Groups

The Level 2 evaluation predominantly focuses on the goals and objectives of the Study; these goals have been categorized into four broad groups. These categories, listed in no particular order, include:

1. Transportation
2. Environmental / Community
3. Cost
4. Constructability

Within each broad group, study-level goals and objectives were identified using CTDOT's program level goals and objectives and the feedback that was

received through outreach. Evaluation criteria for the identified goals and objectives were then developed. These study specific goals and objectives are detailed within the *Preliminary Purpose and Need Statement*.

Evaluation criteria have been identified through outreach with the Study's stakeholders, the PAC, the public, regional, state, and federal agencies, and applicable tribal nations. The criteria that each Initial Alternative was evaluated against are described in this section and are further detailed in Attachment C.

#### Transportation

Evaluations performed with regard to the Transportation category relate to the Preliminary Purpose and Need in terms of structural, geometric, and operational goals. This evaluation is primarily qualitative, and it includes some quantitative analysis. The Initial Alternatives' characteristics that relate to the Study's goals and objectives for connectivity and mobility, such as pedestrian and bicycle accommodations associated with roadways, are also analyzed within this broad category. The goals and objectives included in this broad group are presented below:

##### Improve System Performance

Evaluates how effectively the alternative supports the existing and future traffic volumes, as well as improve the functionality of the interchange by incorporating modern design standards, and innovative strategies.

##### Improve Safety

Evaluates how effectively the alternative reduces potential crashes in critical areas along the mainlines and where the interchanges connect with the local road network.

##### Enhance Mobility and Connectivity of I-84 and Route 8

Evaluates how effectively the alternative increases and enhances the connections to / from the mainlines (I-84 and Route 8) as well as maintain and enhance the roadway connections with the city of Waterbury, between Route 8 and I-84, and connections to other modes of travel.

Evaluates how effectively the alternative enhances the local transportation network without precluding access to major natural and built features such as the Naugatuck River and downtown Waterbury, also referred to as the Central Business District (CBD).



## Environmental / Community

The city of Waterbury is home to historically underserved and Environmental Justice (EJ) communities. Additionally, the city of Waterbury is host to various natural resources including watercourses, wetlands, and protected species, as well as an abundance of historical resources. As the Mixmaster Interchange traverses, provides access to, and directly and indirectly affects many of these sensitive populations and resources, it is important that this study considers potential effects outside of the transportation system. In this evaluation category, the Study Team considered and examined the goals and qualitatively assessed the anticipated benefits and adverse effects to this community and its resources. The following are the criteria used to qualitatively evaluate the Environmental / Community goals and objectives group.

### Support Economic Development and Revitalization

Evaluates how effectively the alternative supports development and revitalization opportunities within the downtown area and surrounding neighborhoods as identified through ongoing funded projects and the City of Waterbury's 2015-2025 Plan of Conservation and Development.

### Avoid / Minimize Impacts to the Human and Natural Environment

Evaluates how effectively the alternative minimizes direct impacts to cultural, archeological, natural, and community resources, including impacts to EJ and limited English proficient (LEP) communities.<sup>1,2</sup>

## Cost

Cost considerations involved an assessment of the assumed cost of the reconstructed structures. It is important that funding could be made available for the Initial Alternatives. Due to the limited amount of design information, maintenance and life-cycle costs were not included in this evaluation. More detailed cost considerations will be made in future phases.

### Feasible Cost

Evaluates the alternative assumed costs and opportunities for phased funding.

<sup>1</sup> Executive Order (EO) 12898, *Federal Actions that Address Environmental Justice in Minority Populations and Low-Income Populations*

## Constructability

Constructability is not only a measure of construction complexity; it is also an indicator of disruption to the traveling public. Highly constructible alternatives are desirable and generally less disruptive to the public. The following is the qualitative criterion that will be used to evaluate constructability.

### Minimize Construction Impacts

Evaluates how effectively the alternative minimizes construction impacts through assessing the potential for offline construction, complexity of construction phasing, and construction impacts to the traveling public during future maintenance requirements.

## 4.2 LEVEL 2 EVALUATION PROCESS OF INITIAL ALTERNATIVES

## Transportation Analysis

Traffic (operational) and structural conditions were forecasted for the year 2045 and analyzed to identify the future conditions of the Study Area. The results of the analyses represent a future "no build" scenario, also known as the No-Build Alternative, that was used as a benchmark condition for comparing and scoring the Initial Alternatives. Detailed information with regard to the traffic, structural, and geometric analyses performed can be found in the *Analysis, Needs, and Deficiencies Report*.

The structural, geometric, and operational conditions of the No-Build Alternative, which were identified to be deficiencies within the Study Area, were compared with the Initial Alternatives to determine if the Study goals of improving the transportation system could be met. Engineering assumptions were based on the engineering strategies and industry design standards utilized within each Initial Alternative. A complete list of the conditions utilized for the Transportation Analysis is provided in Attachment A.

## Environmental / Community Analysis

The Study Team assessed potential direct impacts of the alternatives to the community and to the natural and human environment. Connecticut and

<sup>2</sup> Executive Order (EO) 14096, *Revitalizing our Nation's Commitment to Environmental Justice for All*

City of Waterbury Geographic Information System (GIS) data were used to establish baseline environmental conditions in the PEL Study Area. The impacts were predominantly assessed using the general footprint of each Initial Alternative and determining if the resources were intersected by the footprint. Each alternative footprint was overlaid with the identified environmental constraints of the Study Area and instances of direct impacts were tallied for each measure. Impact areas were not measured during these evaluations.

## Cost Analysis

The cost of construction was qualitatively assessed based on structural assumptions and the estimated proportion of new infrastructure. More detailed cost estimates will be developed in Level 3 when additional design is performed.

## Constructability Analysis

Highly constructible alternatives are built offline, provide space for construction operations, minimize complexity, and include structures wide enough to accommodate potential traffic shifts during future maintenance activities. These criteria were evaluated based on engineering judgement and a comparison to the lessons learned through the construction experience of the Ongoing Mixmaster Rehabilitation Project and CTDOT's mission, vision, and values.

## 4.3 LEVEL 2 SCREENING METHODOLOGY

### Overview

The Level 2 screening evaluated the Initial Alternatives that passed the fatal flaw screening based on the draft Preliminary Purpose and Need in Level 1. The Level 2 screening included qualitative (with some quantitative) criteria which were used to evaluate and screen the Initial Alternatives against the identified goals and objectives detailed in the draft *Preliminary Purpose and Need Statement*. Alternatives were evaluated on how well each achieved the desired outcomes of the Study. The No-Build Alternative functioned as the baseline condition.

## Rating and Scoring

The Initial Alternatives were rated on how well they were able to achieve the study goals using the scale presented in **Table 4-1**.

Table 4-1 Qualitative Rating System

Rating	Evaluation
▲	Meets Goal; Positive effects
●	Neutral / Moderate effects
▼	Negative / Adverse effects

After ratings were assigned for each measure, scores for each alternative were tallied according to the number values presented in **Table 4-2**.

Table 4-2 Numerical Score System

Rating	Numerical Score
▲	2
●	1
▼	0

## Measures

The Level 2 **Qualitative Rating System** was used to score each Initial alternative against the measures derived from the Study's goals and objectives. Measures where alternatives ranked the same and no differentiation could be made in the scoring were not included in the overall scoring. The full screening table, with information regarding measures that were not included in the final scoring calculations, are provided in Attachment C. The measures utilized to evaluate and score the Initial Alternatives are the following:

### Transportation

1. Unstacks Existing Route 8 Structures.
2. Eliminates all Route 8 fracture critical structures.
3. Provides for a single wider bridge substructure rather than two narrow / separate bridge substructures.
4. Meets a skew rating of "good".
5. Meets shoulder width design standards.

6. Meets sight distance design standards.
7. Meets ramp design standards (acceleration and deceleration lane length).
8. Meets vertical clearance design standards.
9. Eliminates left-hand system ramps.
10. Reduces left-hand service ramps.
11. Reduces vehicle/vehicle conflict points (weaving areas) on the highway.
12. Reduces potential of severity for predicted crashes on arterial connections and Mixmaster intersections with the local roadway.
13. Improves Access / Mobility to / from Route 8 to local road network.
14. Improves Access / Mobility to / from I-84 to local road network.
15. Improves Mobility of local road network layout for connectivity between points east / west of CBD.
16. Reduces barriers for north / south pedestrian and bicyclist travel (connection of facilities) across I-84.
17. Reduces barriers for east / west pedestrian and bicyclist travel (connection of facilities) across Route 8.
18. Allows for motorized and nonmotorized connections to the Naugatuck River (western or eastern bank) at minimum one side of river in the vicinity of Jackson Street.
19. Allows for motorized and nonmotorized connections to the Naugatuck River Greenway.
20. Improves Bicyclist / pedestrian access / connection to rail / transit facilities.

### Environmental / Community

21. Consistent with funded City of Waterbury projects.
22. Results in potential direct impact of highway footprint in CBD (including the Freight Street District).
23. Potential direct impacts to publicly owned parks / open space.
24. Potential direct impacts to EJ communities.
25. Potential direct impacts to LEP communities.

26. Potential direct impacts to parcels (rights-of-way (ROW)).
27. Potential direct impacts to noise-sensitive receptors.
28. Potential direct impacts to wetland systems.
29. Potential direct impacts to surface waters.
30. Potential direct impacts to regulated floodplains / floodways.
31. Potential direct impacts to farmland soils.
32. Potential direct impacts to state and federally listed threatened and endangered species.

### Cost

33. Financial resources can reasonably be made available.

### Constructability

34. Minimizes construction complexity.
35. Minimizes disruption to traffic during construction phase.
36. Facilitates future maintenance operations.

## Screening

The Initial Alternatives were individually evaluated to determine which potential solutions could be most capable of achieving the Study goals and objectives. Since the Level 2 analysis was primarily a qualitative screening, the ratings given to each alternative were based on assumptions. These assumptions influence the results of the analysis; therefore, any changes in a particular assumption could affect the outcome of the screening. The assumptions used for this screening level are presented in **Level 2 Evaluation and Screening Assumptions**

Table 4-3 and are detailed in Attachment B.

The No-Build Alternative was considered to be the baseline condition for this analysis; therefore, all Initial Alternatives were scored in comparison to the No-Build Alternative and existing environmental constraints.

### Weighting

To ensure scoring was consistent with the Study goals, the Study Team developed and allocated weighting to the four groups of study goals. If the scores for each of the measures were simply tallied and totaled for an overall score, the environmental and cost measures would have been severely

undervalued due to their comparatively low number of measures (12 and 1 respectively). Additionally, if each group had equal weighting, the cost and constructability measures would have skewed the results, thereby misaligning the desired outcomes (goals and objectives) emphasized by the community of Waterbury and the CTDOT. The team gave higher weighting to the Transportation and Environmental / Community goal groups to better align with the public input and CTDOT objectives. Therefore, the Study Team developed corresponding weights to each of the four goal groups. The goal groups and weights are as follows:

- 1) Transportation: 40 points
- 2) Environmental / Community: 40 points
- 3) Cost: 10 points

### Level 2 Evaluation and Screening Assumptions

Table 4-3 Level 2 Evaluation and Screening Assumptions

Alternatives Evaluated		Transportation	Environmental / Community	Cost	Constructability
No-Build Alternative		Assumed standard operations and maintenance of existing structures for the No-build Alternative.  Assumes other regional projects identified in the Metropolitan Long-Range Plan would be implemented.	Potential direct impacts to environmental (built and natural) resources were based on the anticipated footprints of the Initial Alternatives and evaluated <i>new</i> impacts to resources.	Conceptual ROW and other costs were assumed to increase as the roadway or structure width / length increased.	Construction complexity and disruption to traffic during construction could not be evaluated for the No-build Alternative due to no new construction occurring.
Initial Alternatives	Interchange Shifted East	Alternatives that include the rehabilitation of certain structures of the mainline were assumed to not improve applicable design standards such as vertical clearances and shoulder widths.	Impacts were generally assumed to be minimal (numerical score of 2) if additional ROW was not anticipated for all environmental measures.	Costs for alternatives that include the rehabilitation of major interchange structures (i.e., Route 8) were assumed to be less substantial than those that reconstruct both I-84 and Route 8 structures.  Maintenance and lifecycle costs were not included in cost assumptions.	Alternatives that moved the interchange away from its current alignment were assumed to be more easily constructable.  Alternatives that keep major interchange structures stacked were assumed to require moderately complex construction methodology.  Alternatives that do not widen the major interchange structures were assumed to impact the traveling public more substantially than alternatives that provide additional structure width.  Alternatives that have similar layouts to the No-Build Alternative were assumed to require complex maintenance operations.
	Combined System Connections				
	Modern Crossover Interchange				
	Modern Crossover Interchange with Route 8 Split to the South	Alternatives that include an additional crossing of the Naugatuck River at the local level were assumed to improve mobility and access for both motorized and non-motorized travel.	If additional ROW was anticipated, residents and/or businesses were assumed to be relocated.		
	Keeping Route 8 Stacked	Evaluation of the structural and mobility improvements were proportional to the alignment changes from the baseline conditions.	If capacity was to be added, noise impacts were assumed.		
	Naugatuck River Shift				
	Partial System Crossover Interchange	Evaluation of the potential safety improvements were assumed to be proportionate to the improved design standards that contribute to crash rate. If an alternative addressed geometric and operational-based criteria, then the likelihood of crash severity was presumed to be reduced.	EJ and LEP impacts were based on ROW impacts to parcels located within an EJ or LEP Area defined by US Census Block Groups.		
	Half Diverging Diamond Interchange				
South City Bypass		Potential direct impacts to surface waters were limited to crossings of the Naugatuck River at the core of the interchange in comparison to the number of existing crossings.			

See Attachment B for additional details on the screening assumptions.

#### 4) Constructability: 10 points

The Level 2 Screening resulted in certain Initial Alternatives advancing as Preliminary Alternatives due to their ability to meet the Study needs and goals and objectives to a satisfactory level.

#### Scoring Process

The scoring process for the Initial Alternatives is as follows:

- 1) For each Initial Alternative that was rated, the total numerical score for each goal category (Transportation, Environmental / Community, Cost, and Constructability) was tallied to give each Initial Alternative an unaltered numerical score (summation).

- 2) The total numerical scores were then divided by the maximum attainable numerical score in the respective goal groups to calculate percentage scores.
- 3) The percentage scores were multiplied by the weighted points (allocated on a 100-point scale) assigned to each goal group, rounded up to the nearest whole number, then summed to calculate the total/final weighted score for each Initial Alternative.
- 4) Alternatives that scored markedly highest, while also meeting an overwhelming majority of the rated goals, are proposed to advance to the next screening level as Preliminary Alternatives.



## 5 Level 2 Screening Results

This section presents the detail of the screening results for the Initial Alternatives. Of the Alternatives evaluated during the Level 2 screening process, apart from the No-Build Alternative, three (3) Alternatives are proposed to advance to the Level 3 evaluation and screening level as Preliminary Alternatives due to their ability to meet a majority of goals and objectives, as informed through public outreach. For an Alternative to have advanced, it must have met the weighted scoring threshold of 70 points. Listed from the most beneficial to least beneficial, these alternatives include:

1. Modern Crossover Interchange
2. Naugatuck River Shift
3. Keeping Route 8 Stacked

This section presents the results of the Level 2 screening process and provides the rationale as to why Initial Alternatives were either eliminated or advanced as Preliminary Alternatives for further study in Level 3. **Table 5-1** presents the Level 2 screening results as a matrix which documents the Initial Alternative ratings for each Level 2 criteria and the overall scoring. Detailed scoring for each alternative is provided in Attachment C.

### 5.1 INITIAL ALTERNATIVES NOT ADVANCING---ELIMINATED FROM FURTHER EVALUATION

The following alternatives are eliminated from further analysis and dismissed from the PEL Study due to their inability to meet the intended outcomes of the Study in a satisfactory way or were determined to be fatally flawed after the advance of design to 10% completion:

- Interchange Shifted East,
- Combined System Connections,
- Modern Crossover Interchange with Route 8 Split to the South,
- Partial System Crossover Interchange,
- Half Diverging Diamond Interchange, and
- South City Bypass.

Attachment C provides detailed explanations of each alternative.

#### Interchange Shifted East

This alternative is proposed to be eliminated from further evaluation due to its potential adverse impacts to the environment and community resulting from moving the core of the interchange to the vicinity of the Freight Street District. Interchange Shifted East scored relatively high in the transportation category (76%), through the potential improvement of the system's performance, but could not meet a majority of the Environment / Community evaluation criteria, scoring a 29%. Additionally, the Cost and Constructability scores were considered to be moderate at 50% and 67% respectively. With an overall weighted score of 54, this alternative is proposed to be dismissed from further evaluation.

#### Combined System Connections

This alternative is proposed to be eliminated from further evaluation due to its lack of improvements to the mobility and connectivity of the city. Additionally, it scored poorly for the Environmental / Community group, scoring a 46%. The additional roadways within the city would intensify perceived disconnection / barriers and would reduce access to key areas, thereby contradicting an important goal of the Study. The low score of the Environmental / Community group was severe enough to impact the overall weighted score, such that Combined System Connections is proposed to be eliminated from further evaluation. With an overall weighted score of 61, this alternative is proposed to be dismissed from further evaluation.

#### Modern Crossover Interchange with Route 8 Split to the South

This alternative is proposed to be eliminated from further evaluation due to its inability to meet the goals of the Study to a reasonable threshold. Despite being similar to the Modern Crossover Interchange Alternative that is proposed to advance, Modern Crossover Interchange with Route 8 Split to the South meets only a marginal amount of the outline goals of the study, receiving a score of 62% and 67% for the Transportation and Environmental / Community categories, respectively. The scores for both the Cost and Constructability groups were 50%. With an overall weighted score of 61, this alternative is proposed to be dismissed from further evaluation.

#### Partial System Crossover Interchange

This alternative is fatally flawed and is proposed to be eliminated. Design advancements identified a fatal flaw within this alternative as it pertains to

capacity. Partial System Crossover Interchange requires the use of the local road network to complete the eastbound to northbound and northbound to westbound system connections to / from I-84 and Route 8. These indirect connections would result in an increase in traffic that would overload the local road network at levels that would result in increased traffic volumes and that would overload the local road network, resulting in poor traffic operations and inadequate level of service. Due to the identification of this fatal flaw, Partial System Crossover Interchange did not receive a score for the goal-based evaluation and is proposed to be eliminated from further evaluation.

#### Half Diverging Diamond Interchange

This alternative is fatally flawed and is proposed to be eliminated. Design advancements identified a fatal flaw as it pertains to capacity. Similar to Partial System Crossover Interchange, the Half Diverging Diamond Interchange alternative would not provide adequate capacity due to the indirect system connections that this alternative requires. The heavy traffic volume on the eastbound to northbound and northbound to westbound system movements in addition to the substandard geometric conditions, would result in poor traffic operations and inadequate level of service (LOS). Due to the identification of this fatal flaw, Half Diverging Diamond Interchange did not receive a score for the goal-based evaluation and is proposed to be eliminated from further evaluation.

#### South City Bypass

This alternative received the lowest overall total weighted score for the Level 2 screening evaluation, primarily for the Environmental / Community impacts associated with this alternative, receiving a score of 13%. The screening identified extensive impacts due to the construction of an entirely new highway facility through an existing utility corridor. The South City Bypass, which would allow through-traffic to bypass the downtown area, not only results in substantially more natural and human resources impacts, but the potential cost of a new highway facility was determined to be unreasonable for available financial resources. With an overall weighted score of 37, this alternative is proposed to be eliminated from further evaluation.

Table 5-1 Level 2 Scoring Matrix

		No-Build	Interchange Shifted East	Combined System Connections	Modern Crossover Interchange	Mod Crossover Interchange with Route 8 Split to S	Keeping Route 8 Stacked	Naugatuck River Shift	South City Bypass		
Category	Measure	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating		
Transportation	1 Unstacks Existing Route 8 Structures.	●	▲	▲	▲	▲	●	▲	▲		
	2 Eliminates all Route 8 fracture critical structures.	●	▲	▲	▲	▲	●	▲	▲		
	3 Provides for a single wider bridge substructure rather than two narrow / separate bridge substructures.	▲	▲	▲	▲	●	●	▲	●		
	4 Meets a skew rating of "good".	●	▼	▼	▼	▼	▼	▼	▲		
	5 Meets shoulder width design standards.	▼	▲	▲	▲	▲	●*	▲	▲		
	6 Meets sight distance design standards.	▼	▲	▲	▲	▲	●*	▲	▲		
	7 Meets ramp design standards (acceleration and deceleration lane length).	▼	▲	▲	▲	▲	●*	▲	▲		
	8 Meets vertical clearance design standards.	▼	▲	▲	▲	▲	●*	▲	▲		
	9 Eliminates left-hand system ramps.	▼	▲	▲	▲	●	●	▲	▲		
	10 Reduces left-hand service ramps.**	▼	▲	▲	●	●	●	●	▼		
	11 Reduces vehicle/vehicle conflict points (weaving areas) on the highway. ***	▼	●	●	●	●	●	●	▼		
	12 Reduces potential of severity for predicted crashes on arterial connections and Mixmaster intersections with the local roadway.	▼	▲	▲	▲	▲	▲	▲	▼		
	13 Improves Access / Mobility to / from Route 8 to local road network.	●	▼	▼	▲	▲	▲	▲	●		
	14 Improves Access / Mobility to / from I-84 to local road network.	●	▼	▼	▲	▲	▲	▲	●		
	15 Improves Mobility of local road network layout for connectivity between points east / west of CBD.	●	▲	▲	▲	▲	●	▲	●		
	16 Reduces barriers for north / south pedestrian and bicyclist travel across I-84.	●	▼	▲	●	●	▲	●	▼		
	17 Reduces barriers for east / west pedestrian and bicyclist travel across Route 8.	●	▲	▲	●	▼	▲	▲	▼		
	18 Allows for motorized and nonmotorized connections to the Naugatuck River.	▲	▲	▲	▲	▼	▲	▲	▲		
	19 Allows for motorized and nonmotorized connections to the Naugatuck River Greenway.	▲	●	●	●	▼	●	●	●		
	20 Improves Bicyclist / pedestrian access / connection to rail / transit facilities.	●	▲	▲	▲	●	▲	▲	●		
Environmental / Community	21 Consistent with funded City of Waterbury projects.	▲	▼	▼	▲	▼	▲	▲	▼		
	22 Results in potential direct impact of highway footprint in CBD (including the FSD).	▲	▼	▼	▲	▲	●	●	▲		
	23 Potential direct impacts to publicly owned parks / open space.	▲	●	▲	▲	▲	▲	▲	●		
	24 Potential direct impacts to EJ communities.	▲	▼	●	▲	▲	▲	●	▼		
	25 Potential direct impacts to LEP communities.	▲	●	●	▲	▲	▲	▲	▼		
	26 Potential direct impacts to parcels (rights-of-way (ROW)).	▲	▼	▼	●	●	●	●	▼		
	27 Potential direct impacts to noise-sensitive receptors.	▲	●	●	●	●	●	●	▼		
	28 Potential direct impacts to wetland systems.	▲	●	●	●	●	●	●	▼		
	29 Potential direct impacts to surface waters.	▲	▼	●	●	●	●	●	▼		
	30 Potential direct impacts to regulated floodplains / floodways.	▲	▼	●	●	●	●	●	▼		
	31 Potential direct impacts to farmland soils.	▲	●	●	▲	●	▲	▲	▼		
	32 Potential direct impacts to state and federally listed threatened and endangered species.	▲	▲	▲	▲	▲	▲	▲	▼		
Cost	33 Financial resources can reasonably be made available*	▲	●	●	●	●	●*	●	▼		
Constructability	34 Minimizes construction complexity.	N / A	▲	●	●	●	●	●	●		
	35 Minimizes disruption to traffic during construction phase.	N / A	●	●	●	●	●	●	▲		
	36 Facilitates future maintenance operations.	▼	●	●	●	●	●	▼	●		
<p>*Due to the Keeping Route 8 Stacked alternative being comprised of the rehabilitation of existing infrastructure, this measure's score included partial points. See Attachment C for details.</p> <p>**Alternatives that include a left-hand system ramp to Freight Street Received a half point score (0.5) due to maintaining this critical connection. See Attachment C for details.</p> <p>*** Scoring for the reduction of vehicle / vehicle conflict points were proportionate to the total number of potential weaving areas. Partial points were available for a maximum score of 2 points. See Attachment C for details</p>		Raw Score (sum)	41.00	42.33	47.33	55.67	44.67	50.17	54.67	31.88	
		<b>Percentage (%) of Total Points Received for Each Alternative by Goal Category</b>									
		Transportation	38%	76%	81%	82%	62%	72%	84%	62%	
		Environmental / Community	100%	29%	46%	79%	67%	75%	71%	13%	
		Cost	100%	50%	50%	50%	50%	75%	50%	0%	
		Constructability	0%	67%	50%	50%	50%	33%	50%	67%	
		<b>Weighted Score for Each Alternative by Goal Category (rounded up)</b>									
		Transportation	15.0	30.3	32.3	32.7	24.7	28.7	33.7	24.9	
		Environmental / Community	40.0	11.7	18.3	31.7	26.7	30.0	28.3	5.0	
		Cost	10.0	5.0	5.0	5.0	5.0	7.5	5.0	0.0	
Constructability	0.0	6.7	5.0	5.0	5.0	3.3	5.0	6.7			
<b>Total Weighted Score (rounded to nearest whole number)</b>		● 65	▼ 54	● 61	▲ 74	● 61	▲ 70	▲ 72	▼ 37		
					Advancing			Advancing	Advancing		

## 5.2 INITIAL ALTERNATIVES ADVANCING AS PRELIMINARY ALTERNATIVES

The following Initial Alternatives are proposed to advance for further analysis within the PEL Study due to their ability to meet the intended outcomes in a satisfactory way. These advancing alternatives received an overall score of 70 points or more:

- Modern Crossover Interchange
- Naugatuck River Shift
- Keeping Route 8 Stacked

Apart from the No-Build Alternative, these alternatives were retained because they were determined to be practical, in terms of cost and feasibility, and generally supported the Preliminary Purpose and Need and the Goals and Objectives. They will be advanced as Preliminary Alternatives to Level 3 of the PEL Study Alternatives Screening Methodology process for further development and evaluation.

### No-Build Alternative

The No-Build Alternative was retained for this level of screening as it represents a baseline condition for the PEL Study. Instead of being dismissed for infeasibility, the No-Build Alternative is to be carried forward to serve as a comparison for other alternatives to be evaluated alongside during the PEL Study evaluation process.

### Modern Crossover Interchange

The Modern Crossover Interchange alternative addresses the Study goals to the greatest extent of the evaluated Initial Alternatives, scoring the highest in the Level 2 screening. This alternative markedly meets a majority of the goals identified for the Transportation and Environmental / Community groups, scoring 82% and 79%, respectively.

The Modern Crossover Interchange alternative increases mobility and connectivity across the interchange by reducing the barriers to the north for motorized and nonmotorized users. This alternative also avoids severe direct impacts to the human and natural resources evaluated during this screening level, receiving the highest overall weighted score of 74. As a result, the Modern Crossover Interchange alternative is proposed to advance to the Level 3 screening.

### Naugatuck River Shift

The Naugatuck River Shift alternative addresses the Study goals to the second greatest extent of the evaluated Initial Alternatives in the Level 2 screening. Similar to the Modern Crossover Interchange and Keeping Route 8 Stacked alternatives, this alternative also meets an overwhelming majority of the goals identified for the Transportation and Environmental / Community groups. The Naugatuck River Shift alternative scored an 84% for the Transportation group and a 71% for the Environmental / Community goal group. Despite the proposed impacts to the Naugatuck River, which would result in shifting the river to a more favorable alignment while maintaining hydraulic capacity, the direct impacts of the proposed structures traversing the Naugatuck River were determined to not adversely impact the overall score of the Environmental / Community goal group which also included the evaluation of the potential direct impacts to the natural and human environment.

The Naugatuck River Shift alternative increases mobility and connectivity across the interchange and avoid severe direct impacts to the human and natural resources evaluated during this screening level, receiving an overall weighted score of 72. As a result, the Naugatuck River Shift alternative is proposed to advance to the Level 3 screening.

### Keeping Route 8 Stacked

The Keeping Route 8 Stacked alternative addresses the Study goals to the third greatest extent of the evaluated Initial Alternatives in the Level 2 screening. Similar to the Modern Crossover Interchange and the Naugatuck River Shift alternatives, this alternative also meets a majority of the goals identified for the Transportation and Environmental / Community groups, scoring 72% and 75%, respectively. The Keeping Route 8 Stacked alternative also meets the Cost goal to the greatest extent in comparison to the other alternatives.

The Keeping Route 8 Stacked alternative utilizes existing infrastructure which results in a potentially more cost effective alternative when evaluated at this level of screening. Note, however, that additional evaluation, including life cycle costing (costs that includes maintenance, activities), will be conducted in the most detail in the subsequent screening level. Additionally, of the advancing alternatives, the Keeping Route 8 Stacked alternative scored the lowest for the Constructability category, receiving 33%. This is as a result of maintaining the existing Route 8 stacked structures which result in added constructability complexity. With an overall weighted score of 70, the Keeping Route 8 Stacked alternative is proposed to advance to the Level 3 screening.

## 6 Complementary Features

Complementary features are certain aspects of alternatives that support the study goals and are compatible with the advancing alternatives. These complementary features have been identified based on the ability of these features to be used as a component in alternatives as a "mix-and-match" scenario. These complementary features will be more specifically evaluated in the Level 3 Screening.

The following complementary features have been identified:

- Alternate Travel Modes: Alternate Travel Modes considered include transit, rail, bicycle, and pedestrian, among others. Alternate travel modes are considered as a complementary feature to be used along with other alternatives. Each option in the Range of Reasonable Alternatives is expected to include multimodal aspects and enhancements to be evaluated in the Level 3 Screening.
- Local Road Improvements: Local Road Improvements are being considered as a feature of all the Initial Alternatives. The local road improvements are not uniform amongst the alternatives, and the improvements will be dependent on the alternative itself. Examples of local road improvements that may occur are frontage road systems and additional Naugatuck River crossings. Road improvements could also include multimodal considerations like safe routes, complete streets, and sidewalk / bicycle lane enhancements.
- Tunnel / Cap: The "capping" of portions of the highway mainlines has been identified as a complementary feature. The capping would make portions of the mainlines below grade and would put a cap of land overtop of the highway. There may be a potential for development on top of these caps, which could also help improve bike and pedestrian connections.





## Attachments

Attachment A: Baseline Conditions Summary

Attachment B: Level 2 Screening Assumptions and Thresholds

Attachment C: Detailed Scoring of the Initial Alternatives

## Attachment A: Baseline Conditions Summary

# Interstate 84 / Route 8 Interchange (Mixmaster) Baseline Condition Summary

## Overview

This Baseline Conditions Summary outlines the structural, geometric, and operational conditions of the No-Build Alternative that were identified to be deficiencies within the Study Area. These conditions were used as a comparison to the Initial Alternatives to determine if the Study goals of improving the highway transportation system could be met. Engineering assumptions were based on the engineering judgement and industry design standards utilized within each Initial Alternative to meet the goals of the Study. Also enclosed within this Baseline Conditions Summary are the assumed cost and constructability conditions for the No-build Alternative.

The highway design requirements listed within this memorandum are derived from the American Association of State Highway and Transportation Officials (AASHTO) Green Book and the Connecticut Department of Transportation (CTDOT) Highway Design Manual. A detailed description of the design requirements and deficient conditions of the Mixmaster are provided in the *Analysis, Needs, and Deficiencies Report*. The major transportation deficiencies as they pertain to structural, geometric, and operational conditions are presented at the end of this summary in **Table 1** and **Table 2**

## General Site Conditions

The I-84 bridge is a stacked viaduct with eastbound travel directly over westbound travel configured perpendicular to the Naugatuck River and are stacked from approximately Route 8 Southbound (SB) to Bank Street. Route 8 is also a stacked viaduct south of the interchange, with northbound travel directly over southbound travel. The mainlines generally follow the western bank of the Naugatuck River and are stacked approximately from Summit Street to Sunnyside Avenue. The Metro North Railroad runs parallel to the Naugatuck River to the east. The Mixmaster interchange is an elevated full-system diamond interchange that was designed to fit within the topographical site constraints. There is a high ridge line along the west side of the Naugatuck River (approximately 150–200-foot elevation difference from the area near Highland Avenue to the Naugatuck River) which creates steep slopes. The Naugatuck River runs north/south directly through the core of the interchange parallel to Riverside Street.

Eight system ramps connect I-84 and Route 8 resulting in sixteen entrances and exits. Of these there are four left-hand exits and five left-hand entrances. There are five service ramp interchanges providing access to I-84 and four service ramp interchanges that provide access to Route 8. Additionally, there are three overpasses and four underpasses that cross I-84 and one overpass and three underpasses that cross Route 8.

## Baseline Condition Summary

### *Structural Deficiencies:*

There are 62 bridges evaluated in the Study Area. Notably, the decks of the stacked I-84 mainline bridge over the Naugatuck River are in poor physical condition, and ongoing degradation of the top deck is a safety concern for motorists. Weighted by deck area, more than 60 % of the studied bridges are scheduled for



rehabilitation before the year 2045. The programmed rehabilitation projects are not intended to improve the studied bridge's functional adequacy or eliminate fatigue prone details. Therefore, existing structural and functional deficiencies, including fracture critical spans, will remain unchanged in 2045. The poor condition of the decks on the stacked I-84 mainline bridges over the Naugatuck River are notable deficiencies among the studied bridges.

*Geometric Deficiencies:*

Geometric deficiencies identified along I-84 and Route 8 include design speeds, substandard horizontal and vertical curvatures, stopping sight distances, and inadequate shoulder widths. Many of these geometric deficiencies are also found in the system and service ramps associated with the interchange. These deficiencies can cause increased congestion and unsafe driving conditions.

*Operational Deficiencies:*

Operational deficiencies identified along I-84 and Route 8 include left-hand exit ramps, left-hand entrance ramps, inadequate interchange spacing, above average crash rates, short weave/ merging distances, and substandard roadway capacity. Freeway level of service (LOS) was studied for the year 2017 and also projected for the year 2045 using traffic simulation tools. For the baseline condition, the future projections were utilized for comparative assessment. I-84 was identified to have thirteen deficient LOS segments and Route 8 was identified to have three deficient segments forecasted for the 2045 design year. There were eight segments of I-84 Eastbound (EB), and six segments of I-84 Westbound (WB) identified to have deficient interchange spacing. There were five segments of Route 8 Northbound (NB), and six segments of Route 8 SB identified to have deficient interchange spacing. These deficiencies contribute to the congestion and unsafe driving conditions experienced within the Study Area.

*Constructability:*

In the No-Build / Baseline condition scenario, necessary rehabilitation efforts would need to occur to keep the I-84 bridge over then Naugatuck River functional. This would constitute a full replacement of the I-84 decks and rehabilitating the substructures of the bridges. No geometric deficiencies would be addressed, and many structural concerns would remain. These future rehabilitation/maintenance activities would have significant impacts on the traveling public as they would occur in the current stacked configuration. Traffic disruption is estimated to last greater than 4 years when undertaking these activities. These rehabilitation activities would extend the lifespan of the interchange until 2045; however, the bridge would remain on its original substructure and would require additional maintenance and rehabilitation efforts until its replacement.

*Cost:*

The anticipated activities listed above would have an estimated cost of around \$1 billion USD (2017). Due to inflation, these costs would be about \$2.1-\$2.5 billion USD in 2045. This alternative would require a significant investment and would not provide substantial improvements to geometric or operational deficiencies.

Table 1 - I-84 Deficiencies

Design Criteria	Eastbound (EB)															Westbound (WB)									
	Mainline	System Ramps		Service Ramps											Mainline	System Ramps		Service Ramp							
		to NB Exit 20	to SB Exit 19	Exit 17 On Ramp (On/R)	Exit 18 Off Ramp (Off/R)	Exit 18 On/R (Chase Pkwy)	Exit 18 On/R (Highland Ave)	Exit 19 Off/R	Exit 21 On/R	Exit 21 Off/R	Exit 22 Off/R	Exit 23 Off/R	McMahon St On/R	Baldwin St On/R		Washington Ave Off/R	to NB Exit 20	To SB Exit 19	Exit 22 Off/R	Exit 22 On/R	Exit 21 Off/R	Exit 21 On/R (Right)	Exit 21 On/R (Left)	Exit 18 On/R	Exit 18 Off/R
STRUCTURAL	NBIS Rating	X	N/A	N/A	N/A	N/A	N/A	N/A	X	N/A	N/A	N/A	N/A	N/A	N/A	X	X	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Deck Condition	X	N/A	N/A	N/A	N/A	N/A	N/A	X	N/A	N/A	N/A	N/A	N/A	N/A	X		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Fracture Critical <sup>1</sup>	X	N/A	N/A	N/A	N/A	N/A	N/A				N/A	N/A	N/A	N/A	X		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GEOMETRIC	Travel Lane Widths																								
	Shoulder Widths	X	X				X		X	X	X		X	X		X	X	X	X	X	X	X	X	X	
	Horizontal Alignment (curvature and grades)	X		X	X	X			X	X	X		X	X		X	X	X	X	X	X	X	X		
	Vertical Alignments (curvature, grades, and clearance)	X	X	X	X	X	X	X	X	X	X		X			X	X	X	X	X	X	X	X	X	X
	Stopping Sight Distance	X					X									X									
	Minimum Design Speed	X	X	X	X					X	X					X	X	X			X				
	Auxiliary lane length	N/A			X											N/A									
OPERATIONAL	Left-hand Ramp	N/A	X	X											N/A	X	X					X			
	Interchange Spacing <sup>2</sup>	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X			X	X		X	
	Level of Service <sup>2</sup>	X	X												X	X									
	Crash Rate	X	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	X	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 2 - Route 8 Deficiencies

Design Criteria	Northbound (NB)										Southbound (SB)									
	Mainline	System Ramps		Service Ramps						Mainline	System Ramps		Service Ramps							
		to WB Exit 33	to EB Exit 31	Exit 30 Off/R	Exit 30 On/R	Exit 32 Off/R	Exit 32 On/R	Exit 34 On/R	Exit 35 Off/R		To WB Exit 33	To EB Exit 31	Exit 35 On/R	Exit 34 Off/R	Exit 32 Off/R	Exit 32 On/R	Exit 30 Off/R	Exit 30 On/R		
STRUCTURAL	NBIS Rating		X		N/A				N/A	N/A			N/A	X	N/A		N/A	N/A		N/A
	Deck Condition				N/A				N/A	N/A			N/A	X	N/A		N/A	N/A		N/A
	Fracture Critical <sup>1</sup>	X			N/A				N/A	N/A	X	N/A	N/A		N/A		N/A	N/A		N/A
GEOMETRIC	Travel Lane Widths																		X	
	Shoulder Widths	X	X	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X
	Horizontal Alignment (curvature and grades)	X		X											X	X			X	
	Vertical Alignments (curvature, grades, and clearance)	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X
	Stopping Sight Distance			X		X													X	
	Minimum Design Speed		X	X	X	X	X	X						X	X			X	X	X
	Auxiliary lane length	N/A			X			X					N/A							
OPERATIONAL	Left-hand Ramp	N/A	X							X	N/A		X	X	X	X	X	X	X	
	Interchange Spacing <sup>2</sup>	X	X	X		X	X	X			X	X	X	X	X	X	X	X	X	
	Level of Service	X		X							X									
	Crash Rate		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			N/A	N/A	N/A	N/A	N/A	N/A	N/A	

<sup>1</sup>Scoring for fracture critical structures was evaluated specific to the stacked I-84 and Route 8 structures.

<sup>2</sup>The Exits with a deficiency identified for interchange spacing refer to exits that are included in a segment of the mainline that has deficient interchange spacing. Example: Route 8 NB Exit 30 on-ramp to Exit 31 off-ramp has deficient spacing, so both the Exit 30 on-ramp and Exit 31 off-ramp will be marked with the "X" symbol.

## Attachment B: Level 2 Screening Assumptions and Rating Thresholds

## Level 2 Evaluation Assumptions Thresholds, and Ratings

### Background Information

The Level 2 evaluation predominantly focuses on the goals and objectives of the study; these goals have been categorized into four broad groups. These categories, listed in no particular order, include:

1. Transportation
2. Environmental / Community
3. Cost
4. Constructability

Within each broad group, study-level goals and objectives were identified using CTDOT’s program-level goals and objectives and the feedback that was received through outreach. Evaluation criteria for meeting the identified goals and objectives were then developed. These study specific goals and objectives are detailed within the *Preliminary Purpose and Need Statement*.

Evaluation criteria have been identified through outreach with the Study’s stakeholders, the Project Advisory Committee, the public, regional, state, and federal agencies, and applicable tribal nations. The Initial Alternatives were individually evaluated to determine which potential solutions could be most capable of achieving the Study goals and objectives. Since the Level 2 analysis was primarily a qualitative screening, the ratings given to each alternative were based on assumptions. These assumptions influence the results of the analysis, therefore any changes in an assumption made, could affect the outcome of the screening exercise. These assumptions and thresholds for the evaluation criteria are described by goal group. Measures where alternatives scored the same and no differentiation could be made in the scoring were not included in the overall scoring. These measures are marked by the (-) symbol in the "#" cells of the following tables. The Initial Alternatives were rated on how well they were able to achieve the study goals using the scale presented in **Table 1**.

Table 1 Qualitative Rating System

Rating	Evaluation
▲	Meets Goal; Positive effects
●	Neutral / Moderate effects
▼	Negative / Adverse effects

After ratings were assigned for each measure, scores for each alternative were tallied according to the number values presented in **Table 2** or otherwise stated within **Table 3** through **Table 6**.

Table 2 Numerical Score System

Rating	Numerical Score
▲	2
●	1
▼	0



Transportation Goal Group

Traffic (operational) and structural conditions were forecasted for the year 2045 and analyzed to identify the future conditions of the Study Area. The results of the analyses represent a future "no build" scenario, also known as the No-Build Alternative, that was used as a benchmark condition for comparing and scoring the Initial Alternatives. The structural, geometric, and operational conditions of the No-Build Alternative, which were identified to be deficiencies within the Study Area, were compared with the Initial Alternatives to determine if the Study goals of improving the transportation system could be met. Engineering assumptions were based on the engineering strategies and industry design standards utilized within each Initial Alternative. The Transportation Goal Group was a primarily qualitative evaluation with some quantitative assessments. The evaluations that required quantitative evaluation are detailed within the assumption / source portion of the table.

Table 3 Transportation Goal Group Assumptions, Thresholds, and Ratings

Transportation Goal Group			
#	Measure	Assumption / Source	Thresholds / Rating
	Attains State of Good Repair (SOGR)	Evaluated using the Federal Highway Administration (FHWA) (NBIS) rating system. A SOGR is when the bridge structure receives an overall score rated $\geq 5$ is classified as Fair (on a scale of 1-9). Scoring is based off bridge structures at the core of the interchange	<ul style="list-style-type: none"> <li>▲ Attains SOGR</li> <li>● Does not attain SOGR</li> <li>▼ N/A.</li> </ul>
-	Replace the I-84 concrete bridge decks	Deck condition is rated by Item 58 (Deck) of National Bridge Inspection Standards (NBIS) condition ratings. If rating is $\geq 7$ , the deck is classified as Good; if it is $\leq 4$ , the classification is Poor; Decks rated 5 or 6 are classified as Fair.	<ul style="list-style-type: none"> <li>▲ Concrete decks attain SOGR</li> <li>● Alternative does not replace I-84 decks and meets SOGR</li> <li>▼ Alternative does not replace I-84 decks and does not meet SOGR</li> </ul>
-	Unstacks Existing I-84 structures	Unstacked I-84 structures are preferred. Unstacks the mainline bridge structures (meets goal); Bridge Structures remain stacked (does not meet goal).	<ul style="list-style-type: none"> <li>▲ I-84 is unstacked</li> <li>● I-84 remains stacked</li> <li>▼ N/A.</li> </ul>
1	Unstacks existing Route 8 structures	Unstacked Route 8 structures are preferred. Unstacks the mainline bridge structures (meets goal); Bridge Structures remain stacked (does not meet goal).	<ul style="list-style-type: none"> <li>▲ Route 8 is unstacked</li> <li>● Route 8 remains stacked</li> <li>▼ N/A</li> </ul>
-	Eliminates all I-84 fracture critical structures	Fracture critical structures were evaluated for the mainline structure of I-84.	<ul style="list-style-type: none"> <li>▲ All fracture critical structures on I-84 are eliminated</li> <li>● Fracture critical structures on I-84 are not eliminated</li> <li>▼ N/A</li> </ul>
2	Eliminates all Route 8 fracture critical structures.	Fracture critical structures were evaluated for the mainline structure of Route 8.	<ul style="list-style-type: none"> <li>▲ All fracture critical structures on Route 8 are eliminated</li> <li>● Fracture critical structures on Route 8 are not eliminated</li> <li>▼ N/A</li> </ul>
3	Provides for a single wider bridge substructure rather than two narrow / separate bridge substructures	The ability for bridge structures to be built on a single, wider bridge structures is preferred. Single wider bridge (meets goal); Two narrow-separate bridges (Poor)	<ul style="list-style-type: none"> <li>▲ Allows for a single, wide bridge structure</li> <li>● Requires two separate narrow bridge structures</li> <li>▼ N/A</li> </ul>
4	Meets a skew rating of "good"	Skew ratings are evaluated for the mainline bridge structures. Skew $< 35$ degrees (Good) a "good" rating meets goal; Skew = 36-59 degrees (Satisfactory); Skew $\geq 60$ degrees (Poor)	<ul style="list-style-type: none"> <li>▲ The skew of the alignment is <math>&lt; 35</math> degrees</li> <li>● The skew of the alignment is <math>\geq 35</math> degrees</li> <li>▼ N/A</li> </ul>
-	Meets horizontal alignment (curves) design standards	Ratings are based on the ability of the alternative to meet current horizontal alignment design standards for the interchange derived from the CTDOT Highway Design Manual and the American Association of State Highway and Transportation Officials (AASHTO) Green Book.	<ul style="list-style-type: none"> <li>▲ Corrects substandard conditions</li> <li>● Corrects some substandard conditions</li> <li>▼ No substandard conditions corrected</li> </ul>
5	Meets shoulder width design standards		

Attachment B: Level 2 Evaluation Assumptions, Thresholds, and Ratings

6	Meets sight distance design standards	Alternatives that include the rehabilitation of certain structures of the I-84 and Route 8 mainline were assumed to not improve applicable design standards such as vertical clearances and shoulder widths.	
-	Meets vertical alignment (curvature and grades) design standards		
7	Meets ramp design standards (acceleration and deceleration lane length)		
8	Meets vertical clearance design standards		
-	Minimize turning restrictions or out-of-direction travel (Local Road)		
-	Geometry accommodates truck turning movements (Local Road)		
-	Meets horizontal alignment (curves) design standards (Local Road)		
-	Meets sight distance design standards (Local Road)		
-	Meets vertical alignment (curvature and grades) design standards (Local Road)		
9	Eliminates left-hand system ramps	Ratings are based on the ability of the alternative to eliminate left-hand system ramps in the interchange.	<ul style="list-style-type: none"> <li>▲ All left-hand system ramps eliminated</li> <li>● Some left-hand system ramps eliminated</li> <li>▼ No left-hand system ramps eliminated, or additional added</li> </ul>
10	Reduces left-hand service ramps	Ratings are based on the ability of the alternative to reduce the number of left-hand service ramps in the interchange system by at least one or more. All alternatives with the Freight Street service interchange will maintain left hand service ramps, so 0.5 points will be awarded for those alternatives.	<ul style="list-style-type: none"> <li>▲ All left-hand service ramps eliminated</li> <li>● 1-5 left-hand service ramps eliminated</li> <li>▼ 0 left-hand service ramps eliminated</li> </ul>
-	Increases average interchange spacing	Ratings are based on the ability to increase the average interchange spacing for interchanges that are closely spaced. This was performed by calculating the number of service interchanges per mile (number of interchanges per/mile is reduced).	<ul style="list-style-type: none"> <li>▲ Substantial increase in interchange spacing provided</li> <li>● moderate increase in interchange spacing provided for substandard interchanges</li> <li>▼ No increase in interchange spacing provided</li> </ul>
11	Reduces vehicle/vehicle conflict points (weaving areas) on the highway	Weave segments consist of successive ramp merge and diverge points with the mainline. If not adequately sized, weaving segments can contribute to congestion and may create safety hazards. Scoring required quantitative evaluation to provide a proportional rating. Ratings are based on the following criteria: 1 point is total % of weaves eliminated, the other point is the % removed from each direction (i.e., if 1/3 of weaves were removed from I-84 EB, the total score for I-84 EB would be 1/3*0.25, or 1/12); No-build = 0 due to no reduction in weaving areas	<ul style="list-style-type: none"> <li>▲ All weave sections eliminated</li> <li>● Some weave sections eliminated</li> <li>▼ No reduction in weave areas</li> </ul>
12	Reduce potential of severity for predicted crashes on arterial connections and Mixmaster intersections with the local roadway	Evaluation of the potential safety improvements were assumed to be proportionate to the improved design standards that contribute to crash rate. If an alternative addressed geometric and operational-based criteria, then the likelihood of crash severity was reduced.	<ul style="list-style-type: none"> <li>▲ Substantial reduction in potential crashes</li> <li>● Moderate reduction in potential crashes</li> <li>▼ Increase in potential crashes</li> </ul>
-	Reduce the potential for crashes between vehicles and pedestrian / bicyclist safety at arterial connections and intersections with the local road		<ul style="list-style-type: none"> <li>▲ Substantial reduction in potential crashes</li> <li>● Moderate reduction in potential crashes</li> <li>▼ Increase in potential crashes</li> </ul>

Attachment B: Level 2 Evaluation Assumptions, Thresholds, and Ratings

13	Improve access / mobility to / from Route 8 to local road network	Ratings are based on the ability for the alternative to improve access to the Central Business District (CBD) from Route 8. The SB off-ramp to West Main Street is a five-legged intersection that will be extremely congested in the No-Build Alternative. Therefore, implementation of the Freight Street interchange in place of this exit improves access to downtown. Some alternatives lack the Freight Street interchange, which reduces access to downtown.	<ul style="list-style-type: none"> <li>▲ Freight Street Interchange provided</li> <li>● Similar access to the No-Build Alternative</li> <li>▼ Reduced service ramps and no Freight Street Interchange</li> </ul>
14	Improve access / mobility to / from I 84 to local road network	Evaluates ramp proximity. The baseline condition for the evaluation of this measure is similar access to / from I-84 when compared with the No-Build Alternative. The complex weave at Exit 21 EB currently reduces ease of access to downtown. Removal of service ramps at the interchange core reduces access. Ratings are based on the ability for the alternative to improve access to the CBD from Interstate 84.	<ul style="list-style-type: none"> <li>▲ Similar access, and the complex weave at I-84 EB exit 21 is eliminated</li> <li>● Similar access</li> <li>▼ Reduced access</li> </ul>
15	Improves Mobility of local road network layout for connectivity between points east / west of CBD	The Naugatuck River is a natural barrier within the city. West Main Street is one of four roadways to cross the Naugatuck River, and the only bi-directional east-west arterial that connects western Waterbury to downtown in the vicinity of the interchange. Alternatives that propose an additional crossing of the Naugatuck River are assumed to provide better connectivity and mobility east / west of the CBD.	<ul style="list-style-type: none"> <li>▲ Increased number of connections</li> <li>● Same number of connections</li> <li>▼ Reduced number of connections</li> </ul>
16	Reduces barriers for north / south pedestrian and bicyclist travel (connection of facilities) across I-84	It is assumed that the addition of a north / south connection increases bicycle and pedestrian travel. New connections and any other local road improvements are assumed to provide space for improved bike/ped facilities. Existing conditions = 9 connections	<ul style="list-style-type: none"> <li>▲ Increased number of connections</li> <li>● Same number of connections</li> <li>▼ Reduced number of connections</li> </ul>
17	Reduces barriers for east / west pedestrian and bicyclist travel (connection of facilities) across Route 8	It is assumed that the addition of an east / west connection increases bicycle and pedestrian travel. New connections are assumed to provide space for improved bike/ped facilities. Existing conditions = 3 connections (Does not include the elevated walkway from Wilson Street to Freight Street)	<ul style="list-style-type: none"> <li>▲ Increased connections</li> <li>● Same number of connections</li> <li>▼ Reduced connections</li> </ul>
18	Allows for motorized and nonmotorized connections to the Naugatuck River (western or eastern bank) at minimum one side of river in the vicinity of Jackson Street	A connection could be made on either the western or eastern riverbank. At minimum one side of river should be provided in the vicinity of Jackson Street. Ratings are based on the ability of the alternative to allow for connections to be made to, and not preclude access to the Naugatuck River, not necessarily provide access. Assumes that alternatives that split the alignment of Route 8 to both banks of the river reduces connection opportunities to the river.	<ul style="list-style-type: none"> <li>▲ Access is same as existing</li> <li>● Access moderately reduced</li> <li>▼ Reduced connection, both riverbanks impacted</li> </ul>
19	Allows for motorized and nonmotorized connections to the Naugatuck River Greenway	Proposed continuation of the Naugatuck River Greenway (NRG) will follow along the banks of the river near the proposed New Mix project, currently both banks of the river are being explored as options for the NRG.	<ul style="list-style-type: none"> <li>▲ NRG can be routed as proposed, and connection opportunities are provided</li> <li>● NRG alignment will need to be modified, but allows for connection opportunities</li> <li>▼ NRG requires major deviation and has limited connection opportunities</li> </ul>
20	Improves Bicyclist / pedestrian access / connection to rail / transit facilities	Alternatives with east/west frontage roads and alternatives that provide additional crossings of the Naugatuck River are assumed to provide increased connectivity. This analysis assumes that an additional crossing of the Naugatuck River will provide increased space and facilities for bicycles and pedestrians.	<ul style="list-style-type: none"> <li>▲ Increase connection opportunities</li> <li>● Same number of connection opportunities</li> <li>▼ Reduced connection opportunities</li> </ul>

## Environmental / Community Goal Group

Potential direct impacts to environmental (built and natural) resources were based on the anticipated footprints of the Initial Alternatives and evaluated new impacts to resources. For all environmental measures, if additional right of way (ROW) was not anticipated impacts were generally assumed to be minimal (▲)

Table 4 Environmental / Community Goal Group Assumptions, Thresholds, and Ratings

Environmental/Community Goal Group			
#	Measure	Assumption / Source	Thresholds / Rating
21	Consistent with funded City of Waterbury projects	Ratings are based on an alternative's consistency with funded City of Waterbury projects. An alternative must not preclude a funded City of Waterbury project.	▲ Consistent with City projects. ● Moderately impacts City projects ▼ Precludes a funded City project.
22	Results in potential direct impact of highway footprint in CBD (including the Freight Street District)	Ratings are based on whether the alternative footprint encroaches on land zoned as Central Business District (CBD), this includes the Freight Street District and qualitatively assessed alternatives consistency with City of Waterbury's Plan of Conservation and Development.	▲ Minimal impacts to the CBD ● Moderate impacts to the CBD ▼ Substantial impacts to the CBD
-	Potential direct impacts to public facilities	Impacts are based on whether the alternative footprints encroach onto parcels containing public facilities. Public facilities include public schools, public libraries, hospitals, the town hall, and the train station.	▲ 0 parcel impacts ● 1-3 parcel impacts ▼ 4+ parcel impacts
23	Potential direct impacts to publicly owned parks / open space	Impacts are based on whether the alternative footprints encroach onto publicly owned parks and open space parcels.	▲ 0 parcel impacts ● 1-3 parcel impacts ▼ 4+ parcel impacts
24	Potential direct impacts to EJ communities	Environmental Justice (EJ) impacts were based on ROW impacts to parcels located within an EJ Area defined by US Census Block Groups. EJ communities are Census Block groups in which both the poverty threshold (>30% of the population lives under 200% of the federal poverty level) and the minority threshold (>32% of the population) are met.	▲ 0-15 parcel impacts ● 16-30 parcel impacts ▼ 31+ parcel impacts
25	Potential direct impacts to LEP communities	Limited English Proficiency (LEP) impacts were based on ROW impacts to parcels located within an LEP Area defined by US Census Block Groups. LEP areas are Census Block groups were identified that meet the "safe harbor" threshold (5% or 1,000 individuals, whichever is less, of the population to be served that "speaks English less than well").	▲ 0-15 parcel impacts ● 16-30 parcel impacts ▼ 31+ parcel impacts
26	Potential direct impacts to parcels (rights-of-way (ROW))	Parcels were identified using GIS data downloaded from the City of Waterbury as well as the Assessor Map for the City of Waterbury. Ratings are based on whether an alternative footprint encroaches onto a private owned parcel.	▲ 0-15 parcel impacts ● 16-30 parcel impacts ▼ 31+ parcel impacts
27	Potential direct impacts to noise-sensitive receptors	Ratings are based on the potential impact to parcels containing "sensitive receptors". If additional ROW or capacity was anticipated in an area near a sensitive receptor, a noise increase was assumed. Sensitive receptors are properties that fall under land uses for activities A or B based on the FHWA Noise Abatement Criteria.	▲ Minimal to no increase of ROW in sensitive receptor areas ● Moderate increase of ROW in sensitive receptor areas ▼ Significant increase of ROW in sensitive receptor areas
-	Potential direct impacts to Historic Properties	Ratings are based on the number of direct parcel impacts of properties listed on the National Register of Historic Places and Connecticut Register of Historic Properties.	▲ 0 parcel impacts ● 1-3 parcel impacts ▼ 4+ parcel impacts
-	Potential direct impacts to culturally significant resources/areas and known archaeological sites	Ratings are based on the number of direct parcel impacts of culturally significant resources or areas. Culturally significant resources/areas are defined as: Hospitals, Major Retail Centers, Public Schools, Colleges, and locally important places/landmarks such as the Palace Theater.	▲ 0 parcel impacts ● 1-3 parcel impacts ▼ 4+ parcel impacts
28	Potential direct impacts to wetland systems	Wetland systems were identified from the National Wetland Inventory. Wetland areas were defined by GIS data (individual shapefiles). Ratings are based on whether the alternatives footprint would directly impact any wetland area.	▲ 0 direct impacts to wetland areas ● 1-5 direct impacts to wetland areas ▼ 6+ direct impacts to wetland areas
29	Potential direct impacts to surface waters	All alternatives will result in surface water impacts, the focus for this scoring is limited to the new bridge crossings of the Naugatuck River at the core of the interchange.	▲ 1-5 additional crossings of surface waters ● 6-10 additional crossings of surface waters ▼ 11+ additional crossings of surface waters



Attachment B: Level 2 Evaluation Assumptions, Thresholds, and Ratings

30	Potential direct impacts to floodplains / floodways	Ratings for floodplain impacts evaluated new crossings at the core of the interchange located within mapped floodplain. Additional crossings result in more 100-year floodplain/floodway impact. Impacts were based on Federal Emergency Management Agency (FEMA) Floodplain Mapping.	<ul style="list-style-type: none"> <li>▲ 1-5 crossings of floodplains or floodway areas</li> <li>● 6-10 crossings of floodplains or floodway areas</li> <li>▼ 11+ crossings of floodplains or floodway areas</li> </ul>
31	Potential direct impacts to farmland soils	Farmland soils are considered to be either Prime Farmland Soils, Statewide Important Farmland Soils, and Locally Important Farmland Soils based on Connecticut Department of Energy and Environmental Protection (CTDEEP) mapping. Farmland soil areas were identified using CTDEEP GIS shapefile data. Ratings are based on whether alternative footprints encroach on farmland soils and were identified using net impacts (new alignment impacts - removed existing alignment within farmland soil = net impact).	<ul style="list-style-type: none"> <li>▲ 0 net farmland soil impacts</li> <li>● 1-5 net farmland soil impacts</li> <li>▼ 6+ net farmland soil impacts</li> </ul>
32	Potential direct impacts to state and federally listed threatened and endangered species	Impacts evaluated CTDEEP Natural Diversity Database Areas (NDDDB) mapping and considered the impact of new infrastructure located within NDDDB areas not currently intersected by the highway interchange, as all alternatives will have impacts in NDDDB areas already intersected by the Mixmaster.	<ul style="list-style-type: none"> <li>▲ 0 additional NDDDB areas impacted</li> <li>● 1-3 additional NDDDB areas impacted</li> <li>▼ 4+ additional NDDDB areas impacted</li> </ul>
-	Potential direct impacts to potentially contaminated / hazardous sites	Contaminated sites in the context of this PEL Study are properties that are listed on the EPA's Toxic Release Inventory, the EPA's Superfund Enterprise Management System database, brownfield sites listed in the CTDEEP brownfield inventory, and sites that have received Environmental Use Restrictions (EUR) by the state of Connecticut. Impacts were identified by whether alternative footprints would encroach on parcels containing these properties, all alternatives will impact two of these sites (the same sites for all alternatives).	<ul style="list-style-type: none"> <li>▲ 0 parcel impacts</li> <li>● 1-2 parcel impacts</li> <li>▼ 2+ parcel impacts</li> </ul>

Cost Goal Group

The cost of construction was qualitatively assessed based on structural assumptions and the estimated proportion of new infrastructure.

Table 5 Cost Goal Group Assumptions, Thresholds, and Ratings

Cost Goal Group			
#	Measure	Assumption / Source	Thresholds / Rating
33	Financial resources can reasonably be made available	Ratings are qualitative and based on the feasibility of the overall construction cost of the alternative, and whether financial resources can be made available. Conceptual ROW and other costs were assumed to increase as the roadway or structure width / length increased. Costs for alternatives that include the rehabilitation of major interchange structures (i.e., Route 8) were assumed to be less substantial than those that reconstruct both I-84 and Route 8 structures. Maintenance and lifecycle costs were not included in cost assumptions.	<ul style="list-style-type: none"> <li>▲ Cost of the alternative is assumed minimal</li> <li>● Cost of the alternative is assumed moderate</li> <li>▼ Cost of the alternative is assumed substantial</li> </ul>

## Constructability Goal Group

Highly constructable alternatives are built offline, provide space for construction operations, minimize complexity, and include structures wide enough to accommodate potential traffic shifts during future maintenance activities. These criteria were evaluated based on engineering judgement and a comparison to the lessons learned through the construction experience of the Ongoing Mixmaster Rehabilitation Project and CTDOT's mission, vision, and values. Construction complexity and disruption to traffic during construction could not be evaluated for the No-Build Alternative due to no new construction occurring.

Table 6 Constructability Goal Group Assumptions, Thresholds, and Ratings

Constructability Goal Group			
#	Measure	Assumption / Source	Thresholds / Rating
34	Minimizes construction complexity	Opportunity for offline construction is assumed to minimize the complexity of construction. Alternatives that keep major interchange structures stacked were assumed to require moderately complex construction methodology. Ratings are based on the overall complexity of the construction	<ul style="list-style-type: none"> <li>▲ Minimal construction complexity</li> <li>● Moderate construction complexity</li> <li>▼ Substantial construction complexity</li> </ul>
35	Minimizes disruption to traffic during construction phase	Offline construction is assumed to minimize traffic disruptions. Alternatives that do not widen the major interchange structures were assumed to impact the traveling public more substantially than alternatives that provide additional structure width. Ratings are based on the projected impacts to traveling during the construction.	<ul style="list-style-type: none"> <li>▲ Minimal traffic disruptions are expected</li> <li>● Moderate traffic disruptions expected</li> <li>▼ Substantial traffic disruptions expected</li> </ul>
36	Structure facilitates future maintenance activities	Alternatives that have similar layouts to the No-Build Alternative were assumed to require substantially complex maintenance operations. Stacked bridge structures are assumed to create more challenging conditions for maintenance activities. Ratings are based on whether the configuration of the interchange would facilitate future maintenance activities.	<ul style="list-style-type: none"> <li>▲ Minimally complex</li> <li>● Moderately complex</li> <li>▼ Substantially complex</li> </ul>

Attachment C: Detailed Scoring of the No-Build Alternative and Initial Alternatives

No-Build Alternative

Interchange Shifted East

Combined System Connections

Modern Crossover Interchange

Modern Crossover Interchange with Route 8 Split to the South

Keeping Route 8 Stacked

Naugatuck River Shift

South City Bypass

## LEVEL 2 EVALUATION DETAILED SUMMARY

**Alternative:** No-Build Alternative (Baseline Condition)

**Weighted Score:** 65

**Level 2 Result:** Advancing for NEPA evaluation purposes

### Background Information

A detailed description of the No-Build Alternative, also described as the Baseline Condition, is included in **Attachment A**.

The following sections outline the ratings and scores received for each goal category.

### Evaluation Overview

Measures where alternatives scored the same and no differentiation could be made in the scoring were not included in the overall scoring. These measures are marked by the (--) symbol in the “score” cells of the following tables:

#### Transportation Goal Category:

Transportation Evaluation				
	Transportation Measures	Notes	Rating	Score
-	Attains State of Good Repair (SOGR) (NBIS Rating)	No, would not achieve SOGR rating from the NBIS for all I-84 and Route 8 Structures.	●	--
-	Replace the I-84 concrete bridge decks	Concrete decks on I-84 are not replaced.	▼	--
-	Unstacks existing I-84 structures	I-84 would remain in a stacked condition.	●	--
1	Unstacks existing Route 8 structures	Route 8 would remain in a stacked condition.	●	1
-	Eliminates all Route I-84 fracture critical structures.	I-84 fracture critical structures remain.	●	--
2	Eliminates all Route 8 fracture critical structures.	Route 8 fracture critical structures remain.	●	1
3	Provides for a single wider bridge substructure rather than two narrow / separate bridge substructures	Structures would remain on a single, wider substructure due to the stacked conditions.	▲	2
4	Meets a skew rating of “good”	Skew rating would not change with the no-build alternative.	●	1
-	Meets horizontal alignment (curves) design standards	The geometric conditions along the highway will not be improved resulting in poor conditions and the inability to meet design standards.	▼	--
5	Meets shoulder width design standards		▼	0
6	Meets sight distance design standards		▼	0
-	Meets vertical alignment (curvature and grades) design standards		▼	--
7	Meets ramp design standards (acceleration and deceleration lane length)		▼	0



Attachment C: Level 2 Evaluation Detailed Summary  
No-Build Alternative

8	Meets vertical clearance design standards		▼	0
-	Minimize turning restrictions or out-of-direction travel (Local Road)	The geometric conditions along the local road network will not be improved resulting in poor conditions and the inability to meet design standards.	▼	--
-	Geometry accommodates truck turning movements (Local Road)		▼	--
-	Meets horizontal alignment (curves) design standards (Local Road)		▼	--
-	Meets sight distance design standards (Local Road)		▼	--
-	Meets vertical alignment (curvature and grades) design standards (Local Road)		▼	--
9	Eliminates left-hand system ramps		No reduction in left-hand system ramps (4 LH Exit; 5 LH Entrance ramps remain).	▼
10	Reduces left-hand service ramps	No reduction in left-hand service ramps (RTE 8 SB LH Entrance remains).	▼	0
-	Increases average interchange spacing (number of interchanges per/mile is reduced)	Average interchange spacing is not increased.	▼	--
11	Reduces vehicle/vehicle conflict points (weaving areas) on the highway	No reduction in vehicle conflict points (weaving areas) on the mainlines.	▼	0
12	Reduce potential of severity for predicted crashes on arterial connections and Mixmaster intersections with the local roadway	No improvements are proposed where the mainline connected with the local roadway.	▼	0
-	Reduce the potential for crashes between vehicles and pedestrian / bicyclist safety at arterial connections and intersections with the local road	No local roadway network improvements are proposed, no improvements to arterial connections results in no increase in safety for bicycles / pedestrians.	▼	--
13	Improve access / mobility to / from Route 8 to local road network	Ramps provide moderate access to downtown Waterbury. Access would remain the same.	●	1
14	Improve access / mobility to / from I 84 to local road network	Ramps provide moderate access to downtown Waterbury. Access would remain the same.	●	1
15	Improves Mobility of local road network layout for connectivity between points east / west of CBD	No additional Naugatuck River crossings are created, connectivity east/west of the CBD assumed to be the same	●	1
16	Reduces barriers for north / south pedestrian and bicyclist travel (connection of facilities) across I-84	Nine crossings of I-84 are provided	●	1
17	Reduces barriers for east / west pedestrian and bicyclist travel (connection of facilities) across Route 8	Three crossings provided	●	1
18	Allows for motorized and nonmotorized connections to the Naugatuck River (western or eastern bank) at minimum one side of river in the vicinity of Jackson Street	Current conditions allow ample room for connections to the Naugatuck River to be made via future infrastructure.	▲	2

Attachment C: Level 2 Evaluation Detailed Summary  
No-Build Alternative

19	Allows for motorized and nonmotorized connections to the Naugatuck River Greenway	Current conditions allow for the NRG to be routed as planned with ample room for connections to be made.	▲	2
20	Improves Bicyclist / pedestrian access / connection to rail / transit facilities	No improvements will be made to bike/ped facilities in this alternative, connectivity assumed to be the same	●	1
Total Score				15

Environmental / Community Goal Category

Environment/Community Evaluation				
#	Environmental/Community Measures	Notes	Rating	Score
21	Consistency with funded City of Waterbury projects	Would not interfere with any funded City of Waterbury projects.	▲	2
22	Results in potential direct impact of highway footprint in CBD (including the Freight Street District)	No impacts to the Central Business District.	▲	2
-	Potential direct impacts to public facilities	No impacts parcels containing a public facility.	▲	--
23	Potential direct impacts to publicly owned parks / open space	No direct impacts to any public parks or open space.	▲	2
24	Potential direct impacts to EJ communities	No parcel impacts associated with the No-Build alternative, highway footprint remains the same as existing conditions.	▲	2
25	Potential direct impacts to LEP communities		▲	2
26	Potential direct impacts to parcels (rights-of-way (ROW))		▲	2
27	Potential direct impacts to noise-sensitive receptors	No new noise impacts expected as capacity is not increased.	▲	2
-	Potential direct impacts to State or National Register of Historic Places Properties	No impacts to sites listed on the State and National Register of Historic Places Properties.	▲	--
-	Potential direct impacts to culturally significant resources/areas and known archaeological sites (not listed on the NRHP)	No impacts to culturally significant resources / areas or known archeological sites.	▲	--
28	Potential direct impacts to wetland systems	No direct impacts to any wetlands.	▲	2
29	Potential direct impacts to surface waters	No direct impacts to any surface waters.	▲	2
30	Potential direct impacts to floodplains / floodways	No direct impacts to the 100-year floodplain.	▲	2
31	Potential direct impacts to farmland soils	No direct impacts to any farmland soils.	▲	2
32	Potential direct impacts to state and federally listed threatened and endangered species	No impacts to any listed endangered species.	▲	2
-	Potential direct impacts to impact to potentially contaminated / hazardous sites	No direct impacts to any potentially contaminated or hazardous sites.	▲	--
Total Score				24

Cost Goal Category

Cost Evaluation				
#	Measure	Notes	Rating	Score
33	Financial resources can reasonably be made available	The cost of this alternative would only include costs associated with standard future maintenance activities, these would be significantly lower than other alternatives.	▲	2
Total Score				2

Constructability Goal Category

Constructability Evaluation				
#	Measure	Notes	Rating	Score
34	Minimizes construction complexity	Does not apply to the No-Build Alternative due to new infrastructure not being built.	N/A	N/A
35	Minimizes disruption to traffic during construction phase	Does not apply to the No-Build Alternative due to new infrastructure not being built.	N/A	N/A
36	Structure facilitates future maintenance activities	Complex and disruptive future maintenance activities due to the structures remaining stacked with narrow shoulders.	▼	0
Total Score				0

Level 2 Evaluation Scoring Results

Goal Group	Points Scored	Maximum points available	% of Points Received	Weight	Weighted Score
Transportation	15	40	38%	0.40	15
Environment / Community	24	24	100%	0.40	40
Cost	2	2	100%	0.10	10
Constructability	0	6	0%	0.10	0
Total					65

Advancing for NEPA evaluation purposes

## LEVEL 2 EVALUATION DETAILED SUMMARY

**Alternative:** Interchange Shifted East

**Weighted Score:** 54

**Level 2 Result:** Not Advancing

### Background Information

This Interchange Shifted East alternative would replace the Mixmaster with a full system interchange where Route 8 would be relocated half a mile to the east and Interstate 84 would be located just south of its existing alignment. This alternative would provide all system movements as direct, combined movements. A new frontage road network with north/south and east/west directions of travel is also proposed. This Initial Alternative would run through the future Freight Street District, thereby impacting future redevelopment opportunities; however, this would provide numerous opportunities for offline construction. This alternative would also result in two new crossings of the Naugatuck River where Route 8 would be relocated to the east.

The following sections outline and summarize the ratings and scores received for each goal category.

### Evaluation Overview

Measures where alternatives scored the same and no differentiation could be made in the scoring were not included in the overall scoring. These measures are marked by the (--) symbol in the “score” cells of the following tables. Weighted scores are rounded to the nearest whole number.

#### Transportation Goal Category:

Transportation Evaluation				
#	Measure	Evaluation	Rating	Score
-	Attains SOGR (NBIS Rating)	Yes, for all I-84 and Route 8 structures	▲	--
-	Replaces I-84 concrete bridge decks	Yes, new concrete bridge decks for I-84	▲	--
-	Unstacks existing I-84 structures	Yes, the new alignment of I-84 would be constructed in an unstacked configuration	▲	--
1	Unstacks existing Route 8 structures	Yes, the new alignment of Route 8 would be constructed in an unstacked configuration	▲	2
-	Eliminates all I-84 fracture critical structures	Yes, all I-84 fracture critical structures would be eliminated	▲	--
2	Eliminates all Route 8 fracture critical structures	Yes, all Route 8 fracture critical structures would be eliminated	▲	2
3	Provides for a single wider bridge substructure rather than two narrow / separate bridge substructures	I-84 and Route 8 would be constructed on a single, wider substructure.	▲	2
4	Meets a skew rating of “good”	Not achieved due to the proposed alignment of the mainlines over the Naugatuck River assumed to be >35°	▼	0



Attachment C: Level 2 Evaluation Detailed Summary  
Interchange Shifted East

Transportation Evaluation				
#	Measure	Evaluation	Rating	Score
-	Meets horizontal alignment (curves) design standards	New structures for I-84 and Route 8 assumes the ability to meet design standard (True for all measures evaluating highway design standards)	▲	--
5	Meets shoulder width design standards		▲	2
6	Meets sight distance design standards		▲	2
-	Meets vertical alignment (curvature and grades) design standards		▲	--
7	Meets ramp design standards (acceleration and deceleration lane length)		▲	2
8	Meets vertical clearance design standards		▲	2
-	Minimizes turning restrictions or out-of-direction travel (Local Road)	Local road improvements assumes ability to meet design standards (True for all local road design standards)	▲	--
-	Geometry accommodates truck turning movements (Local Road)		▲	--
-	Meets horizontal alignment (curves) design standards (Local Road)		▲	--
-	Meets sight distance design standards (Local Road)		▲	--
-	Meets vertical alignment (curvature and grades) design standards (Local Road)		▲	--
9	Eliminates left-hand system ramps	All left-hand system ramps are eliminated	▲	2
10	Reduces left-hand service ramps	All left hand service ramps are eliminated	▲	2
-	Increases average interchange spacing (number of interchanges per/mile is reduced)	Average interchange spacing is increased	▲	--
11	Reduces vehicle/vehicle conflict points (weaving areas) on the highway	The number of weaving areas is reduced, resulting in fewer conflict points	●	1.33
12	Reduces potential of severity for predicted crashes on arterial connections and Mixmaster intersections with the local roadway	Local roadway network connections to the mainlines are proposed to be improved and assumes reduced severity for predicted crashes.	▲	2
-	Reduces the potential for crashes between vehicles and pedestrian / bicyclist safety at arterial connections and intersections with the local road	Proposed local road improvements include multimodal enhancements and assumes fewer crashes between passive and active transportation	▲	--
13	Improves access / mobility to / from Route 8 to local road network	All Route 8 service ramps at the core of the interchange are removed	▼	0
14	Improves access / mobility to / from I-84 to local road network	All I-84 service ramps at the core of the interchange are removed	▼	0

Attachment C: Level 2 Evaluation Detailed Summary  
Interchange Shifted East

Transportation Evaluation				
#	Measure	Evaluation	Rating	Score
15	Improves Mobility of local road network layout for connectivity between points east / west of CBD	Addition of frontage road system would provide increased connection opportunities for east/west travel	▲	2
16	Reduces barriers for north/south pedestrian and bicyclist travel across I-84	Decrease in connection opportunities – less than existing conditions (8 Crossings)	▼	0
17	Reduces barriers for east / west pedestrian and bicyclist travel across Route 8	The proposed east/west frontage roads are assumed to provide space for sidewalks and bike lanes (5 crossings)	▲	2
18	Allows for motorized and nonmotorized connections to the Naugatuck River (western or eastern bank) at minimum one side of river in the vicinity of Jackson Street	The proposed alignment does not preclude access to the Naugatuck River	▲	2
19	Allows for motorized and nonmotorized connections to the Naugatuck River Greenway	NRG can follow the proposed alignment, however it may need to navigate under more structures. Opportunity for NRG to be routed to the western bank of the Naugatuck River is feasible	●	1
20	Improves bicyclist / pedestrian access / connection to rail / transit facilities	The addition of east/west frontage roads increases active transportation routes to transit facilities	▲	2
Total Score				30.33


The I-84 and Route 8 mainlines would be reconstructed in an unstacked configuration that would allow substructure units to support both bounds of the mainlines with common foundations and would result in the elimination of any fracture critical structures. The new construction would satisfy modern highway design standards for alignment (both horizontal and vertical), shoulder width, sight distances, ramp lengths, and truck accommodations. These improvements would result in improved system performance in many aspects. In this alternative all system movements are provided as right-hand direct connections. The elimination of the system ramps at the core of the interchange would increase average interchange spacing, resulting in less conflict points that increases safety through the reduction of potential of severity for predicted crashes. While eliminating the service ramps would increase interchange spacing, it would reduce direct access to downtown Waterbury from the mainline. New frontage roads would provide access to downtown instead and would also increase the connectivity east/west of the Naugatuck River and provide increased space for new bicycle and pedestrian infrastructure. Improvements to the local roadway network where it meets with the highway system, coupled with multimodal enhancements would result in increased bicycle and pedestrian safety as well. The proposed alignment allows for the NRG to follow its proposed route; however, it may face additional routing obstacles due to the new structures.

Environmental / Community Goal Category

Environment / Community Evaluation				
#	Measure	Notes	Rating	Score
21	Consistency with funded City of Waterbury projects	Proposed alignment would interfere with City of Waterbury projects (most significantly the Freight Street District Redevelopment)	▼	0
22	Results in potential direct impact of highway footprint in CBD (including the Freight Street District)	Proposed alignment would have substantial impacts to the Freight Street District	▼	0
-	Potential direct impacts to public facilities	No impacts to any parcels containing a public facility	▲	--
23	Potential direct impacts to publicly owned parks / open space	The proposed alignment would encroach on Chase Park	●	1
24	Potential direct impacts to EJ communities	31+ parcels (approx. 35) located within an EJ area are directly impacted	▼	0
25	Potential direct impacts to LEP communities	16-30 parcels (Approx. 25) located within an LEP area are directly impacted	●	1
26	Potential direct impacts to parcels (rights-of-way (ROW))	31+ parcels (approx. 37) directly impacted by the proposed alignment	▼	0
27	Potential direct impacts to noise-sensitive receptors	Moderate increase of ROW in noise sensitive receptors, with impacts occurring at the new Exit 18 interchange	●	1
-	Potential direct impacts to State or National Register of Historic Places Properties	No direct impacts to sites listed on the State and National Register of Historic Places Properties	▲	--
-	Potential direct impacts to culturally significant resources/area and known archaeological sites (not listed on NRHP)	1-3 (approx. 1) potential impacts to a known archaeological site	●	--
28	Potential direct impacts to wetland systems	1-5 (approx. 1) wetland area will be potentially impacted due to the new Exit 18 interchange	●	1
29	Potential direct impacts to surface waters	11+ (approx. 15) bridge crossings across the Naugatuck River	▼	0
30	Potential direct impacts to floodplains / floodways	11+ (approx. 15) bridge crossings within mapped floodplain or floodway at interchange core	▼	0
31	Potential direct impacts to farmland soils	1-5 (approx. 2) net impacts to farmland soils	●	1
32	Potential direct impacts to state and federally listed threatened and endangered species	Alternative does not impact any NDDDB areas that are not already intersected by the interchange	▲	2
-	Potential direct impacts to impact to potentially contaminated / hazardous sites	1-5 (approx. 3) impacts to potentially contaminated / hazardous sites	●	--
Total Score				7




This alternative would not avoid substantial impacts to the environmental and community resources located within Waterbury. The proposed alignment would result in impacts to City of Waterbury projects and the CBD. Most notably, the proposed alignment would require a large portion of the land in the Freight Street District to be acquired for highway ROW. This would not support economic development efforts being undertaken by the City and would interfere with City of Waterbury projects. There would be no impacts to public facilities, however the proposed alignment would encroach on Chase Park. The shifting of the interchange would also result in extensive parcel impacts due to the ROW needed for the highway. Many of these parcel impacts would result in adverse impacts in areas identified as Environmental Justice and Limited English Proficiency communities. The alignment of the proposed Eastbound Exit 18 interchange would result in ROW impacts resulting in noise impacts. This alternative is expected to include natural resource impacts, receiving moderate to substantial rating for the impacts to surface water, floodplain, wetland, and farmland soil impacts.

### Cost Goal Category

Cost Evaluation				
#	Measure	Notes	Rating	Score
33	Financial resources can reasonably be made available	The estimated costs for this alternative are considered to be moderate		1
Total Score				1

The estimated cost of this alternative is comparable to the other full interchange reconstruction Initial Alternatives and is deemed to be moderate. It is anticipated that the necessary funding to complete this project would be available from Federal, State, and local sources, with available grant funding potentially being available. Maintenance and lifecycle costs were not included in cost assumptions.

### Constructability Goal Category

Constructability Evaluation				
#	Measure	Notes	Rating	Score
34	Minimizes construction complexity	This alternative provides numerous opportunities for offline construction due to the new alignment of both mainlines		2
35	Minimizes disruption to traffic during construction phase	Traffic impacts will occur, offline construction allows for some traffic impacts to be avoided		1
36	Facilitates future maintenance activities	Normal traffic disruptions are to be expected during future maintenance activities		1
Total Score				4

This alternative can be constructed partially offline where the alignments of the I-84 and Route 8 mainlines are proposed to be relocated. Shifting the interchange a half mile east would reduce the disruptions to the traveling public and allow for easier construction phasing. Certain traffic impacts will be unavoidable; however, the alternative will be able to use temporary detours and phased construction to reduce these



Attachment C: Level 2 Evaluation Detailed Summary  
Interchange Shifted East

impacts. Since this is a full interchange reconstruction alternative, the new infrastructure would be wide enough to facilitate future maintenance activities better than existing. Overall, constructability of this alternative was rated moderate. Conceptualization of construction phases will be required to inform more detailed comparisons of constructability for advancing alternatives.

Level 2 Evaluation Scoring Results

Goal Group	Points Scored	Maximum points available	% of Points Received	Weight	Weighted Score
Transportation	30.33	40	76%	0.40	30.3
Environment / Community	7	24	29%	0.40	11.7
Cost	1	2	50%	0.10	5
Constructability	4	6	67%	0.10	6.7
				Total	54

Not Advancing

## LEVEL 2 EVALUATION DETAILED SUMMARY

**Alternative:** Combined System Connections

**Weighted Score:** 61

**Level 2 Result:** Not Advancing

### Background Information

The Combined System Connections alternative would replace the Mixmaster with a full system interchange with several combined system movements, all of which would be provided as direct connections. Near the interchange core, I-84 would be built just south of the existing alignment and Route 8 would be constructed on the east bank of the Naugatuck River. Due to the new alignment of Route 8, the alternative would result in two new crossings of the Naugatuck River south of I-84 and near the northern portion of the Freight Street District. There would be a new river crossing at Sunnyside Avenue providing increased east/west connectivity. The proposed service ramps east of the Naugatuck River would connect with improved frontage roads which supports more efficient traffic flow into, through, and out of the downtown.

The following sections outline and summarize the ratings and scores received for each goal category.










### Evaluation Overview

Measures where alternatives scored the same and no differentiation could be made in the scoring were not included in the overall scoring. These measures are marked by the (--) symbol in the “score” cells of the following tables. Weighted scores are rounded to the nearest whole number.

#### Transportation Goal Category:

Transportation Evaluation				
#	Measure	Evaluation	Rating	Score
-	Attains SOGR (NBIS Rating)	Yes, for all I-84 and Route 8 structures	▲	--
-	Replaces I-84 concrete bridge decks	Yes, new concrete bridge decks for I-84	▲	--
-	Unstacks existing I-84 structures	Yes, the new alignment of I-84 would be constructed in an unstacked configuration	▲	--
1	Unstacks existing Route 8 structures	Yes, the new alignment of Route 8 would be constructed in an unstacked configuration	▲	2
-	Eliminates all I-84 fracture critical structures	Yes, all I-84 fracture critical structures would be eliminated	▲	--
2	Eliminates all Route 8 fracture critical structures	Yes, all Route 8 fracture critical structures would be eliminated	▲	2
3	Provides for a single wider bridge substructure rather than two narrow / separate bridge substructures	I-84 and Route 8 would be constructed on a single, wider substructure.	▲	2

Attachment C: Level 2 Evaluation Detailed Summary  
Combined System Connections

Transportation Evaluation					
#	Measure	Evaluation	Rating	Score	
4	Meets a skew rating of “good”	Not achieved due to the proposed alignment of the mainlines over the Naugatuck River assumed to be >35°		0	
-	Meets horizontal alignment (curves) design standards	New structures for I-84 and Route 8 assumes the ability to meet design standard. (True for all measures evaluating highway design standards.)		--	
5	Meets shoulder width design standards			2	
6	Meets sight distance design standards			2	
-	Meets vertical alignment (curvature and grades) design standards			--	
7	Meets ramp design standards (acceleration and deceleration lane length)			2	
8	Meets vertical clearance design standards			2	
-	Minimizes turning restrictions or out-of-direction travel (Local Road)		Local road improvements assumes ability to meet design standards. (True for all local road design standards)		--
-	Geometry accommodates truck turning movements (Local Road)				--
-	Meets horizontal alignment (curves) design standards (Local Road)			--	
-	Meets sight distance design standards (Local Road)			--	
-	Meets vertical alignment (curvature and grades) design standards (Local Road)			--	
9	Eliminates left-hand system ramps	All left-hand system ramps are eliminated		2	
10	Reduces left-hand service ramps reduced	All left hand service ramps are eliminated		2	
-	Increases average interchange spacing (number of interchanges per/mile is reduced)	Average interchnage spacing is increased		--	
11	Reduces vehicle/vehicle conflict points (weaving areas) on the highway	The number of weaving areas is reduced, resulting in fewer conflict points		1.33	
12	Reduces potential of severity for predicted crashes on arterial connections and Mixmaster intersections with the local roadway	Local roadway network connections to the mainlines are proposed to be improved and assumes reduced severity for predicted crashes.		2	
-	Reduces the potential for crashes between vehicles and pedestrian / bicyclist safety at arterial connections and intersections with the local road	Proposed local road improvements include multimodal enhancements and assumes fewer crashes between passive and active transportaiton		--	

Attachment C: Level 2 Evaluation Detailed Summary  
Combined System Connections

Transportation Evaluation				
#	Measure	Evaluation	Rating	Score
13	Improves access / mobility to / from Route 8 to local road network	All Route 8 service ramps at the core of the interchange are removed	▼	0
14	Improves access / mobility to / from I-84 to local road network	All I-84 service ramps at the core of the interchange are removed	▼	0
15	Improves Mobility of local road network layout for connectivity between points east / west of CBD	Addition of Sunnyside Avenue connector would provide increased connection opportunities for east/west travel	▲	2
16	Reduces barriers for north/south pedestrian and bicyclist travel across I-84	Increase in connection opportunities – more than existing conditions (10)	▲	2
17	Reduces barriers for east / west pedestrian and bicyclist travel across Route 8	Sunnyside Avenue connector is assumed to provide space for sidewalks and bike lanes	▲	2
18	Allows for motorized and nonmotorized connections to the Naugatuck River (western or eastern bank) at minimum one side of river in the vicinity of Jackson Street	The proposed alignment does not preclude access to the Naugatuck River	▲	2
19	Allows for motorized and nonmotorized connections to the Naugatuck River Greenway	NRG would likely need to be partially rerouted, however there are many opportunities for connections	●	1
20	Improves bicyclists / pedestrian access / connections to rail / transit facilities	The addition of Sunnyside Avenue connector increases active transportation routes to transit facilities	▲	2
Total Score				32.33

The I-84 and Route 8 mainlines would be reconstructed in an unstacked configuration that would allow substructure units to support both bounds of the mainlines with common foundations and would result in the elimination of any fracture critical structures. In this alternative all system movements are provided as direct right-hand connections. This alternative would satisfy modern highway design standards and would result in improved system performance of the interchange. The average interchange spacing would be increased due to the elimination of all of the service ramps near the core of the interchange, resulting in less conflict points and increased safety. Improvements to the local roadway network where it meets with the highway system, coupled with multimodal enhancements would result in increased bicycle and pedestrian safety as well. Direct access to downtown Waterbury from the mainlines would be slightly reduced, however downtown access would be provided by new frontage road systems. These frontage roads would also provide better east/west connectivity, would provide increased space for new bicycle and pedestrian

facilities, and better access to transit facilities. The NRG would most likely need to be rerouted due to the impacts on both banks of the river, however there would be opportunities for connections to be made.

Environmental / Community Goal Category

Environment / Community Evaluation				
#	Measure	Notes	Rating	Score
21	Consistency with funded City of Waterbury projects	Proposed alignment would interfere with City of Waterbury projects (most significantly the Freight Street District Redevelopment)	▼	0
22	Results in potential direct impact of highway footprint in CBD (including the Freight Street District)	Proposed alignment would have substantial impacts to the Freight Street District	▼	0
-	Potential direct impacts to public facilities	No impacts to any parcels containing a public facility	▲	--
23	Potential direct impacts to publicly owned parks / open space	No direct impacts to any public parks or open space	▲	2
24	Potential direct impacts to EJ communities	16-30 parcels (approx. 30) located within an EJ area are directly impacted	●	1
25	Potential direct impacts to LEP communities	16-30 parcels (Approx. 25) located within an LEP area are directly impacted	●	1
26	Potential direct impacts to parcels (rights-of-way (ROW))	31+ parcels (approx. 37) directly impacted by the proposed alignment	▼	0
27	Potential direct impacts to noise-sensitive receptors	Moderate increase of ROW in noise sensitive receptors, with impacts occurring at the new Exit 18 interchange	●	1
-	Potential direct impacts to State or National Register of Historic Places Properties	No direct impacts to sites listed on the State and National Register of Historic Places Properties	▲	--
-	Potential direct impacts to culturally significant resources/area and known archaeological sites (not listed on NRHP)	1-3 (approx. 1) potential impacts to a known archaeological site	●	--
28	Potential direct impacts to wetland systems	1-5 (approx. 1) potential impacts to wetland areas	●	1
29	Potential direct impacts to surface waters	6-10 (approx. 9) bridge crossings of the Naugatuck River	●	1



Attachment C: Level 2 Evaluation Detailed Summary  
Combined System Connections

Environment / Community Evaluation				
#	Measure	Notes	Rating	Score
30	Potential direct impacts to floodplains / floodways	6-10 (approx. 9) bridge crossings within mapped floodplain or floodway at interchange core	●	1
31	Potential direct impacts to farmland soils	1-5 (approx. 2) net impacts to farmland soils	●	1
32	Potential direct impacts to state and federally listed threatened and endangered species	Alternative does not impact any NDDDB areas that are not already intersected by the interchange	▲	2
-	Potential direct impacts to impact to potentially contaminated / hazardous sites	1-5 (approx. 2) impacts to potentially contaminated / hazardous sites	●	--
Total Score				11




This alternative would not avoid substantial impacts to the environmental and community resources located within Waterbury. The Combined System Connections alternative would encroach on the CBD and Freight Street District substantially and would interfere with City of Waterbury projects identified within the project limits. This alternative would not impact and public facilities or any parks or open space. ROW impacts would occur near the core of the interchange as well as near the proposed alignment for the new I-84 Eastbound Exit 18 interchange, and these impacts are considered to be substantial. Many of these parcel impacts would result in impacts in areas identified as Environmental Justice and Limited English Proficiency communities. Noise impacts are anticipated to occur near Exit 18 interchange due to the proposed relocation of the Exit 18 interchange. Impacts to natural resources are expected and anticipated to include impacts to wetlands, surface waters, floodplains, and farmland soils.

Cost Goal Category

Cost Evaluation				
#	Measure	Notes	Rating	Score
33	Financial resources can reasonably be made available	The estimated costs for this alternative are considered to be moderate	●	1
Total Score				1

The estimated cost of this alternative is comparable to the other full interchange reconstruction Initial Alternatives and is deemed to be moderate. It is anticipated that the necessary funding to complete this project would be available from Federal, State, and local sources, with available grant funding potentially being available. Maintenance and lifecycle costs were not included in cost assumptions.

Constructability Goal Category

Constructability Evaluation				
#	Measure	Notes	Rating	Score
34	Minimizes construction complexity	I-84 would be able to be constructed partially offline due to the alignment south of its existing conditions, Route 8 would be able to be partially constructed offline due to its new alignment on the east bank		1
35	Minimizes disruption to traffic during construction phase	Traffic impacts will occur, offline construction allows for some traffic impacts to be avoided		1
36	Facilitates future maintenance activities	Normal traffic disruptions are to be expected during future maintenance activities		1
Total Score				3

This alternative can be constructed partially offline where the alignments of the I-84 and Route 8 mainlines are proposed to be relocated. Shifting the interchange a half-mile east would reduce the disruptions to the travelling public and allow for easier construction phasing. However, this alternative's construction would need to be phased to minimize traffic impacts to the travelling public. These impacts to the travelling public would be unavoidable, however, through project phasing and temporary traffic detours, impacts could be reduced. Since this is a full interchange reconstruction alternative, the new infrastructure would be wide enough to facilitate future maintenance activities better than existing Overall, constructability rated moderate overall. Additional traffic modeling is necessary to determine potential disruptions to provide detailed differentiation amongst advancing alternatives.

Level 2 Evaluation Scoring Results

Goal Group	Points Scored	Maximum points available	% of Points Received	Weight	Weighted Score
Transportation	32.33	40	81%	0.40	32.3
Environment / Community	11	24	46%	0.40	18.3
Cost	1	2	50%	0.10	5
Constructability	3	6	50%	0.10	5
Total					61

Not Advancing

## LEVEL 2 EVALUATION DETAILED SUMMARY

**Alternative:** Modern Crossover Interchange

**Weighted Score:** 74

**Level 2 Result:** Advancing

### Background Information

The Modern Crossover Interchange alternative would replace the Mixmaster with a full system interchange, using elevated structures which “cross-over” (or under) one another to make connections for the system movements. The system movements provided with this alternative would be direct connections, with some using combined ramps. Near the interchange core, Interstate 84 would be located just south of the existing alignment near the interchange core, while Route 8 would be located east of the existing alignment, and east of the Naugatuck River, just south of I-84. Route 8 would remain on the west side of the Naugatuck River north of I-84. This would result in two additional river crossings where Route 8 would be relocated. New east/west frontage roads are also proposed with this alternative.

The following sections outline and summarize the ratings and scores received for each goal category.

### Evaluation Overview

Measures where alternatives scored the same and no differentiation could be made in the scoring were not included in the overall scoring. These measures are marked by the (--) symbol in the “score” cells of the following tables. Weighted scores are rounded to the nearest whole number.

#### Transportation Goal Category:

Transportation Evaluation				
#	Measure	Evaluation	Rating	Score
-	Attains SOGR (NBIS Rating)	Yes, for all I-84 and Route 8 structures	▲	--
-	Replaces I-84 concrete bridge decks	Yes, new concrete bridge decks for I-84	▲	--
-	Unstacks existing I-84 structures	Yes, the new alignment of I-84 would be constructed in an unstacked configuration	▲	--
1	Unstacks existing Route 8 structures	Yes, the new alignment of Route 8 would be constructed in an unstacked configuration	▲	2
-	Eliminates all I-84 fracture critical structures	Yes, all I-84 fracture critical structures would be eliminated	▲	--
2	Eliminates all Route 8 fracture critical structures	Yes, all Route 8 fracture critical structures would be eliminated	▲	2
3	Provides for a single wider bridge substructure rather than two narrow / separate bridge substructures	I-84 and Route 8 would be constructed on a single, wider substructure	▲	2
4	Meets a skew rating of “good”	Not achieved due to the proposed alignment of the mainlines over the Naugatuck River assumed to be >35°	▼	0

Attachment C: Level 2 Evaluation Detailed Summary  
Modern Crossover Interchange

Transportation Evaluation				
#	Measure	Evaluation	Rating	Score
-	Meets horizontal alignment (curves) design standards	New structures for I-84 and Route 8 assumes the ability to meet design standard. (True for all measures evaluating highway design standards.)	▲	--
5	Meets shoulder width design standards		▲	2
6	Meets sight distance design standards		▲	2
-	Meets vertical alignment (curvature and grades) design standards		▲	--
7	Meets ramp design standards (acceleration and deceleration lane length)		▲	2
8	Meets vertical clearance design standards		▲	2
-	Minimizes turning restrictions or out-of-direction travel (Local Road)	Local road improvements assumes ability to meet design standards. (True for all local road design standards)	▲	--
-	Geometry accommodates truck turning movements (Local Road)		▲	--
-	Meets horizontal alignment (curves) design standards (Local Road)		▲	--
-	Meets sight distance design standards (Local Road)		▲	--
-	Meets vertical alignment (curvature and grades) design standards (Local Road)		▲	--
9	Eliminates left-hand system ramps	All left-hand system ramps are eliminated	▲	2
10	Reduces left-hand service ramps reduced	Freight Street interchange would use left-hand service ramps	●	0.5
-	Increases average interchange spacing (number of interchanges per/mile is reduced)	Average interchange spacing is increased	▲	--
11	Reduces vehicle/vehicle conflict points (weaving areas) on the highway	The number of weaving areas is reduced, resulting in fewer conflict points	●	1.17
12	Reduces potential of severity for predicted crashes on arterial connections and Mixmaster intersections with the local roadway	Local roadway network connections to the mainlines are proposed to be improved and assumes reduced severity for predicted crashes.	▲	2
-	Reduces the potential for crashes between vehicles and pedestrian / bicyclist safety at arterial connections and intersections with the local road	Proposed local road improvements include multimodal enhancements and assumes fewer crashes between passive and active transportation.	▲	--
13	Improves access / mobility to / from Route 8 to local road network	The proposed addition of the Freight Street interchange would provide better direct access to downtown Waterbury from Route 8 northbound and southbound.	▲	2

Attachment C: Level 2 Evaluation Detailed Summary  
Modern Crossover Interchange

Transportation Evaluation				
#	Measure	Evaluation	Rating	Score
14	Improves access / mobility to / from I-84 to local road network	Similar direct access to downtown Waterbury provided and increases ease of access to / from I-84 by eliminating the complex weave present at Exit 21.	▲	2
15	Improves Mobility of local road network layout for connectivity between points east / west of CBD	Addition of the Sunnyside Avenue bridge across the Naugatuck River would provide increased connection opportunities for east/west travel.	▲	2
16	Reduces barriers for north/south pedestrian and bicyclist travel across I-84	No change in connection opportunities - same as existing conditions (9)	●	1
17	Reduces barriers for east / west pedestrian and bicyclist travel across Route 8	Same amount of connection opportunities as existing conditions	●	1
18	Allows for motorized and nonmotorized connections to the Naugatuck River (western or eastern bank) at minimum one side of river in the vicinity of Jackson Street	The proposed alignment does not preclude access to the Naugatuck River	▲	2
19	Allows for motorized and nonmotorized connections to the Naugatuck River Greenway	NRG can follow the proposed alignment, however it may need to navigate under more structures. Opportunity for NRG to be routed to the western bank of the Naugatuck River is feasible.	●	1
20	Improves bicyclists / pedestrian access / connections to rail / transit facilities	The addition of east/west frontage roads increases active transportation routes to transit facilities.	▲	2
Total Score				32.67

The I-84 and Route 8 mainlines would be reconstructed in an unstacked configuration that would allow substructure units to support both bounds of the mainlines with common foundations and would result in the elimination of any fracture critical structures. The new construction would satisfy modern highway design standards for alignment (both horizontal and vertical), shoulder width, sight distances, ramp lengths, and truck accommodations. In this alternative all system movements are provided as right-hand direct connections. The proposed layout indicates that it would not be feasible to eliminate all left-hand service ramps, however, their use would be limited to a new interchange with Route 8 and Freight Street where they are required design elements. The new Freight Street interchange will improve access for Downtown Waterbury from/to Route 8. The average interchange spacing would be increased due to the elimination of most of the service ramps near the core of the interchange, resulting in less conflict points and increased safety. Improvements to the local roadway network where it meets with the highway system, coupled with multimodal enhancements, would result in increased bicycle and pedestrian safety as well. New frontage roads would provide increased connectivity east/west of the Naugatuck River and would also provide



additional space for new bicycle and pedestrian infrastructure. The alignment also allows for the NRG to follow its proposed route; however, it may face additional routing obstacles due to the new structures. The NRG could also be rerouted to the western bank of the Naugatuck River in the vicinity of Riverside Street across from Riverside Cemetery.

Environmental / Community Goal Category

Environment / Community Evaluation				
#	Measure	Notes	Rating	Score
21	Consistency with funded City of Waterbury projects	Alternative is consistent with and does not preclude any funded City projects	▲	2
22	Results in potential direct impact of highway footprint in CBD (including the Freight Street District)	About the same amount of available space in the CBD, minor Freight Street District encroachment	▲	2
-	Potential direct impacts to public facilities	No impacts to any parcels containing a public facility	▲	--
23	Potential direct impacts to publicly owned parks / open space	No direct impacts to any public parks or open space	▲	2
24	Potential direct impacts to EJ communities	0-15 parcels (Approx. 15) located within an EJ area are directly impacted	▲	2
25	Potential direct impacts to LEP communities	0-15 parcels (Approx. 10) located within an LEP area are directly impacted	▲	2
26	Potential direct impacts to parcels (rights-of-way (ROW))	16-30 parcels (Approx. 23) directly impacted by the proposed alignment	●	1
27	Potential direct impacts to noise-sensitive receptors	Moderate increase of ROW in noise sensitive receptors, with impacts occurring at the new Exit 18 interchange	●	1
-	Potential direct impacts to State or National Register of Historic Places Properties	No direct impacts to sites listed on the State and National Register of Historic Places Properties	▲	--
-	Potential direct impacts to culturally significant resources/area and known archaeological sites (not listed on NRHP)	1-3 (approx. 1) potential impacts to a known archaeological site	●	--
28	Potential direct impacts to wetland systems	1-5 (approx. 1) wetland area will be potentially impacted due to the new Exit 18 interchange	●	1

Attachment C: Level 2 Evaluation Detailed Summary  
Modern Crossover Interchange

Environment / Community Evaluation				
#	Measure	Notes	Rating	Score
29	Potential direct impacts to surface waters	6-10 (approx. 8) bridge crossings of the Naugatuck River	●	1
30	Potential direct impacts to floodplains / floodways	6-10 (approx. 8) bridge crossings within mapped floodplain or floodway at interchange core	●	1
31	Potential direct impacts to farmland soils	0 net impacts to farmland soils	▲	2
32	Potential direct impacts to state and federally listed threatened and endangered species	Alternative does not impact any NDDDB areas that are not already intersected by the interchange	▲	2
-	Potential direct impacts to impact to potentially contaminated / hazardous sites	1-5 (approx. 2) impacts to potentially contaminated / hazardous sites	●	--
Total Score				19




This alternative would avoid substantial impacts to the environmental and community resources located within Waterbury. The Modern Crossover Interchange minimizes impacts to the CBD by constructing the interchange slightly to the south of its existing alignment and is compatible with the planned City of Waterbury projects identified to be within the project limits. This alternative would not impact any public facilities nor any public parks or open space. ROW impacts would occur near the core of the interchange as well as near the proposed alignment for the new I-84 Eastbound Exit 18 interchange, however they are considered to be moderate. Noise impacts are anticipated to occur near Exit 18 interchange due to the added capacity. There are minimal impacts expected to natural resources, with minor impacts to wetlands and surface waters expected.

Cost Goal Category

Cost Evaluation				
#	Measure	Notes	Rating	Score
33	Financial resources can reasonably be made available	The estimated costs for this alternative are considered to be moderate	●	1
Total Score				1

The estimated cost of this alternative is comparable to the other full interchange reconstruction Initial Alternatives and is deemed to be moderate. It is anticipated that the necessary funding to complete this project would be available from Federal, State, and local sources, with available grant funding potentially being available. Maintenance and lifecycle costs were not included in cost assumptions.

Constructability Goal Category

Constructability Evaluation				
#	Measure	Notes	Rating	Score
34	Minimizes construction complexity	I-84 would be able to be constructed partially offline due to the alignment south of its existing conditions, Route 8 would be able to be partially constructed offline due to its new alignment on the east bank.		1
35	Minimizes disruption to traffic during construction phase	Traffic impacts will occur, offline construction allows for some traffic impacts to be avoided.		1
36	Facilitates future maintenance activities	Normal traffic disruptions are to be expected during future maintenance activities		1
Total Score				3

This alternative can be constructed partially offline where the alignments of the I-84 and Route 8 mainlines are proposed to be relocated. However, this alternative's construction would need to be phased to minimize traffic impacts to the travelling public. These impacts to the travelling public would be unavoidable, however, through project phasing and temporary traffic detours, impacts could be reduced. Since this is a full interchange reconstruction alternative, the new infrastructure would be wide enough to facilitate future maintenance activities better than existing. Overall, constructability rated moderate overall. Additional traffic modeling is necessary to determine potential disruptions to provide detailed differentiation amongst advancing alternatives.

Level 2 Evaluation Scoring Results

Goal Group	Points Scored	Maximum points available	% of Points Received	Weight	Weighted Score
Transportation	32.67	40	82%	0.40	32.7
Environment / Community	19	24	79%	0.40	31.7
Cost	1	2	50%	0.10	5
Constructability	3	6	50%	0.10	5
				Total	74

Advancing

## LEVEL 2 EVALUATION DETAILED SUMMARY

**Alternative:** Modern Crossover Interchange with Route 8 Split to the South

**Weighted Score:** 62

**Level 2 Result:** Not Advancing

### Background Information

This alternative includes a bifurcation (split-alignment) of Route 8 just south of Interstate 84. Route 8 southbound would remain in its existing alignment, while Route 8 northbound would be rerouted to the east bank of the Naugatuck River near the interchange core. Interstate 84 would be located just south of its existing alignment and both of the mainlines would be unstacked. The system movements provided with this alternative would be direct connections, with some using combined ramps.

The following sections outline and summarize the ratings and scores received for each goal category.

### Evaluation Overview

Measures where alternatives scored the same and no differentiation could be made in the scoring were not included in the overall scoring. These measures are marked by the (--) symbol in the “score” cells of the following tables. Weighted scores are rounded to the nearest whole number.

#### Transportation Goal Category:

Transportation Evaluation				
#	Measure	Evaluation	Rating	Score
-	Attains SOGR (NBIS Rating)	Yes, for all I-84 and Route 8 structures	▲	--
-	Replaces I-84 concrete bridge decks	Yes, new concrete bridge decks for I-84	▲	--
-	Unstacks existing I-84 structures	Yes, the new alignment of I-84 would be constructed in an unstacked configuration	▲	--
1	Unstacks existing Route 8 structures	Yes, the new alignment of Route 8 would be constructed in an unstacked configuration	▲	2
-	Eliminates all I-84 fracture critical structures	Yes, all I-84 fracture critical structures would be eliminated	▲	--
2	Eliminates all Route 8 fracture critical structures	Yes, all Route 8 fracture critical structures would be eliminated	▲	2
3	Provides for a single wider bridge substructure rather than two narrow / separate bridge substructures	Route 8 would be in split alignment for each bound on either side of the Naugatuck River while I-84 would be constructed on a single, wider bridge substructure	●	1
4	Meets a skew rating of “good”	Not achieved due to the proposed alignment of the mainlines over the Naugatuck River assumed to be >35°	▼	0
-	Meets horizontal alignment (curves) design standards	New structures for I-84 and Route 8 assumes the ability to meet design standard. (True for	▲	--
5	Meets shoulder width design standards		▲	2

Attachment C: Level 2 Evaluation Detailed Summary  
Modern Crossover Interchange with Route 8 Split to the South

Transportation Evaluation				
#	Measure	Evaluation	Rating	Score
6	Meets sight distance design standards	all measures evaluating highway design standards.)	▲	2
-	Meets vertical alignment (curvature and grades) design standards		▲	--
7	Meets ramp design standards (acceleration and deceleration lane length)		▲	2
8	Meets vertical clearance design standards		▲	2
-	Minimizes turning restrictions or out-of-direction travel (Local Road)	Local road improvements assumes ability to meet design standards. (True for all local road design standards)	▲	--
-	Geometry accommodates truck turning movements (Local Road)		▲	--
-	Meets horizontal alignment (curves) design standards (Local Road)		▲	--
-	Meets sight distance design standards (Local Road)		▲	--
-	Meets vertical alignment (curvature and grades) design standards (Local Road)		▲	--
9	Eliminates left-hand system ramps	Some but not all left-hand system ramps are eliminated	●	1
10	Reduces left-hand service ramps reduced	Freight Street interchange would use left-hand service ramps	●	0.5
-	Increases average interchange spacing (number of interchanges per/mile is reduced)	Average interchange spacing is increased	▲	--
11	Reduces vehicle/vehicle conflict points (weaving areas) on the highway	The number of weaving areas is reduced, resulting in fewer conflict points	●	1.17
12	Reduces potential of severity for predicted crashes on arterial connections and Mixmaster intersections with the local roadway	Local roadway network connections to the mainlines are proposed to be improved and assumes reduced severity for predicted crashes.	▲	2
-	Reduces the potential for crashes between vehicles and pedestrian / bicyclist safety at arterial connections and intersections with the local road	Proposed local road improvements include multimodal enhancements and assumes fewer crashes between passive and active transportation.	▲	--
13	Improves access / mobility to / from Route 8 to local road network	The proposed addition of the Freight Street interchange would provide better access to downtown Waterbury from Route 8 northbound and southbound.	▲	2
14	Improves access / mobility to / from I-84 to local road network	Similar direct access to downtown Waterbury provided and increases ease of access to / from I-84 by eliminating the complex weave present at Exit 21	▲	2



Attachment C: Level 2 Evaluation Detailed Summary  
Modern Crossover Interchange with Route 8 Split to the South

Transportation Evaluation				
#	Measure	Evaluation	Rating	Score
15	Improves Mobility of local road network layout for connectivity between points east / west of CBD	No changes in connection opportunities for east / west travel on the local road network	●	1
16	Reduces barriers for north/south pedestrian and bicyclist travel across I-84	No change in connection opportunities - same as existing conditions (9)	●	1
17	Reduces barriers for east / west pedestrian and bicyclist travel across Route 8	Split alignment results in additional barriers for east / west travel	▼	0
18	Allows for motorized and nonmotorized connections to the Naugatuck River (western or eastern bank) at minimum one side of river in the vicinity of Jackson Street	Split alignment results in reduced connection opportunities to both east and west riverbanks	▼	0
19	Allows for motorized and nonmotorized connections to the Naugatuck River Greenway	Split alignment is assumed to cause NRG to need to be rerouted	▼	0
20	Improves bicyclists / pedestrian access / connections to rail / transit facilities	Same number of connections as existing conditions	●	1
Total Score				24.67

The I-84 and Route 8 mainlines would be reconstructed in an unstacked configuration that would allow substructure units to support both bounds of the mainlines with common foundations and would result in the elimination of any fracture critical structures. Modern highway design standards are achieved with this alternative; however, the proposed layout indicates that it would not be feasible to eliminate all of the left-hand system and service ramps. While the left-hand ramps would not be entirely eliminated, it would implement a new interchange at Freight Street where the left-hand service ramps would provide increased access to downtown Waterbury. The average interchange spacing would be increased due to the elimination of some of the service ramps near the core of the interchange, resulting in less conflict points and increased safety. Improvements to the local roadway network where it meets with the highway system, coupled with multimodal enhancements would result in increased bicycle and pedestrian safety as well.

There would be new one-way frontage roads improving traffic flow into, through, and out of the city. The split alignment of Route 8 would also inhibit the original route of the NRG and would make additional connections to the river more challenging.

Attachment C: Level 2 Evaluation Detailed Summary  
Modern Crossover Interchange with Route 8 Split to the South

Environmental / Community Goal Category

Environment / Community Evaluation				
#	Measure	Notes	Rating	Score
21	Consistency with funded City of Waterbury projects	ROW would impact funded City projects	▼	0
22	Results in potential direct impact of highway footprint in CBD (including the Freight Street District)	About the same amount of available space in the CBD	▲	2
-	Potential direct impacts to public facilities	No impacts to any parcels containing a public facility	▲	--
23	Potential direct impacts to publicly owned parks / open space	No direct impacts to any public parks or open space	▲	2
24	Potential direct impacts to EJ communities	0-15 parcels (approx. 14) located within an EJ area are directly impacted	▲	2
25	Potential direct impacts to LEP communities	0-15 parcels (Approx. 6) located within an LEP area are directly impacted	▲	2
26	Potential direct impacts to parcels (rights-of-way (ROW))	16-30 parcels (approx. 22) directly impacted by the proposed alignment	●	1
27	Potential direct impacts to noise-sensitive receptors	Moderate increase of ROW in noise sensitive receptors with impacts occurring at the new Exit 18 interchange	●	1
-	Potential direct impacts to State or National Register of Historic Places Properties	No direct impacts to sites listed on the State and National Register of Historic Places Properties	▲	--
-	Potential direct impacts to culturally significant resources/area and known archaeological sites (not listed on NRHP)	1-3 (approx. 1) potential impacts to a known archaeological site	●	--
28	Potential direct impacts to wetland systems	1-5 (approx. 1) wetland area will be potentially impacted	●	1
29	Potential direct impacts to surface waters	6-10 (approx. 7) bridge crossings of the Naugatuck River	●	1
30	Potential direct impacts to floodplains / floodways	6-10 (approx. 7) bridge crossings within mapped floodplain or floodway at interchange core	●	1
31	Potential direct impacts to farmland soils	1-5 (approx. 1) net impacts to farmland soils	●	1
32	Potential direct impacts to state and federally listed threatened and endangered species	Alternative does not impact any NDDDB areas that are not already intersected by the interchange	▲	2
-	Potential direct impacts to impact to potentially contaminated / hazardous sites	1-5 (approx. 2) impacts to potentially contaminated / hazardous sites	●	--
Total Score				16

This alternative would have moderate impacts to the environmental and community resources located within Waterbury. The Modern Crossover Interchange with Route 8 Split to the South alternative would

not encroach on or impact the CBD, however it would potentially impact identified City of Waterbury projects. No impacts to public parks, open space, or public facilities are anticipated. ROW impacts would occur near the core of the interchange; however, these impacts are considered to be moderate. Noise impacts are anticipated to occur near Exit 18 interchange due to the proposed relocation of the Exit 18 interchange. There are anticipated impacts to natural resources, with minimal to moderate impacts to wetlands, surface waters, floodplains, and farmland soils expected.

### Cost Goal Category

Cost Evaluation				
#	Measure	Notes	Rating	Score
33	Financial resources can reasonably be made available	The estimated costs for this alternative are considered to be moderate	●	1
Total Score				1

The estimated cost of this alternative is comparable to the other full interchange reconstruction Initial Alternatives and is deemed to be moderate. It is anticipated that the necessary funding to complete this project would be available from Federal, State, and local sources, with available grant funding potentially being available. Maintenance and lifecycle costs were not included in cost assumptions.

### Constructability Goal Category

Constructability Evaluation				
#	Measure	Notes	Rating	Score
34	Minimizes construction complexity	I-84 would be able to be constructed partially offline due to the alignment south of its existing conditions, Route 8 would be able to be partially constructed offline due to its new partial alignment on the east bank	●	1
35	Minimizes disruption to traffic during construction phase	Traffic impacts will occur, offline construction allows for some traffic impacts to be avoided.	●	1
36	Facilitates future maintenance activities	Normal traffic disruptions are to be expected during future maintenance activities	●	1
Total Score				3

This alternative can be constructed partially offline where the I-84 and Route 8 mainlines are proposed to be relocated. Phasing will need to occur in order to minimize traffic impacts to the travelling public. These impacts would be unavoidable; however, the phasing would help to reduce these impacts. Since this is a full interchange reconstruction alternative, the new infrastructure would be wide enough to facilitate future maintenance activities better than existing, however, constructability rated moderate overall. Additional traffic modeling is necessary to determine potential disruptions to provide detailed differentiation amongst the remaining alternatives.

Attachment C: Level 2 Evaluation Detailed Summary  
 Modern Crossover Interchange with Route 8 Split to the South

Level 2 Evaluation Scoring Results

Goal Group	Points Scored	Maximum points available	% of Points Received	Weight	Weighted Score
Transportation	24.67	40	64%	0.40	24.7
Environment / Community	16	24	67%	0.40	26.7
Cost	1	2	50%	0.10	5
Constructability	3	6	50%	0.10	5
				Total	61

Not Advancing

## LEVEL 2 EVALUATION DETAILED SUMMARY

**Alternative:** Keeping Route 8 Stacked

**Weighted Score:** 70

**Level 2 Result:** Advancing

### Background Information

The Keeping Route 8 Stacked Alternative would replace the Mixmaster with a full system interchange, including an unstacked Interstate 84 mainline constructed just south of its existing alignment near the interchange core. The stacked Route 8 structures would remain in their existing alignment and would not be replaced at the time of the Interstate 84 reconstruction, but instead would remain in service for approximately 20 years. New system ramps would be constructed to connect the Interstate 84 and Route 8 mainlines; these ramps would all provide direct system movements. This alternative would include a new east/west frontage road system and would modify the existing north/south frontage road system. There would also be an addition of a new service interchange at Freight Street.

The following sections outline and summarize the ratings and scores received for each goal category.

### Evaluation Overview

Measures where alternatives scored the same and no differentiation could be made in the scoring were not included in the overall scoring. These measures are marked by the (--) symbol in the “score” cells of the following tables. Weighted scores are rounded to the nearest whole number.

#### Transportation Goal Category:

Transportation Evaluation				
#	Measure	Evaluation	Rating	Score
-	Attains SOGR (NBIS Rating)	Yes, for all I-84 and Route 8 structures	▲	--
-	Replaces I-84 concrete bridge decks	Yes, new concrete bridge decks for I-84	▲	--
-	Unstacks existing I-84 structures	Yes, the new alignment of I-84 would be constructed in an unstacked configuration	▲	--
1	Unstacks existing Route 8 structures	Route 8 structure would remain stacked	●	1
-	Eliminates all I-84 fracture critical structures	Yes, all I-84 fracture critical structures would be eliminated	▲	--
2	Eliminates all Route 8 fracture critical structures	Same as existing conditions	●	1
3	Provides for a single wider bridge substructure rather than two narrow / separate bridge substructures	Route 8 would be rehabilitated while I-84 would be reconstructed on a single, wider bridge substructure.	●	1
4	Meets a skew rating of “good”	Not achieved due to the proposed alignment of the mainlines over the Naugatuck River assumed to be >35°	▼	0
-	Meets horizontal alignment (curves) design standards	Due to the amount of work being completed throughout the interchange on this	▲	--



Attachment C: Level 2 Evaluation Detailed Summary  
Keeping Route 8 Stacked

Transportation Evaluation					
#	Measure	Evaluation	Rating	Score	
5	Meets shoulder width design standards	alternative, it was determined that partial scoring should be utilized. The partial scoring is based on vehicle miles of roadway improved. I-84 mainline is the dominant feature at the interchange with three (3) through lanes on each bound. On Route 8, slightly more than half of the roadway on both bounds through the Study Area will be improved. It is at the existing bridges which are to remain in service where there should be deductions on these measures for this alternative.		1.5	
6	Meets sight distance design standards			1.5	
-	Meets vertical alignment (curvature and grades) design standards			--	
7	Meets ramp design standards (acceleration and deceleration lane length)			1.5	
8	Meets vertical clearance design standards			1.5	
-	Minimizes turning restrictions or out-of-direction travel (Local Road)		Local road improvements assumes ability to meet design standards. (True for all local road design standards)		--
-	Geometry accommodates truck turning movements (Local Road)				--
-	Meets horizontal alignment (curves) design standards (Local Road)				--
-	Meets sight distance design standards (Local Road)			--	
-	Meets vertical alignment (curvature and grades) design standards (Local Road)			--	
9	Eliminates left-hand system ramps	Some but not all left-hand system ramps are eliminated		1	
10	Reduces left-hand service ramps reduced	Freight Street interchange would use left-hand service ramps		0.5	
-	Increases average interchange spacing (number of interchanges per/mile is reduced)	Average interchange spacing is increased		--	
11	Reduces vehicle/vehicle conflict points (weaving areas) on the highway	The number of weaving areas is reduced, resulting in fewer conflict points		1.17	
12	Reduces potential of severity for predicted crashes on arterial connections and Mixmaster intersections with the local roadway	Local roadway network connections to the mainlines are proposed to be improved and assumes reduced severity for predicted crashes.		2	
-	Reduces the potential for crashes between vehicles and pedestrian / bicyclist safety at arterial connections and intersections with the local road	Proposed local road improvements include multimodal enhancements and assumes fewer crashes between passive and active transportation.		--	
13	Improves access / mobility to / from Route 8 to local road network	The proposed addition of the Freight Street interchange would provide better access to downtown Waterbury from Route 8 northbound and southbound.		2	

Attachment C: Level 2 Evaluation Detailed Summary  
Keeping Route 8 Stacked


Transportation Evaluation				
#	Measure	Evaluation	Rating	Score
14	Improves access / mobility to / from I-84 to local road network	Similar direct access to downtown Waterbury provided and increases ease of access to / from I-84 by eliminating the complex weave present at Exit 21	▲	2
15	Improves Mobility of local road network layout for connectivity between points east / west of CBD	Addition of the Sunnyside Avenue bridge across the Naugatuck River would provide increased connection opportunities for east/west travel.	▲	2
16	Reduces barriers for north/south pedestrian and bicyclist travel across I-84	Increase in connection opportunities – more than existing conditions (10)	▲	2
17	Reduces barriers for east / west pedestrian and bicyclist travel across Route 8	Increase in connection opportunities – more than existing conditions (4)	▲	2
18	Allows for motorized and nonmotorized connections to the Naugatuck River (western or eastern bank) at minimum one side of river in the vicinity of Jackson Street	The proposed alignment does not preclude access to the Naugatuck River	▲	2
19	Allows for motorized and nonmotorized connections to the Naugatuck River	NRG can follow the proposed alignment, however it may need to navigate under more structures and connections.	●	1
20	Improves bicyclists / pedestrian access / connections to rail / transit facilities	The addition of the Sunnyside connector increases active transportation routes to transit facilities.	▲	2
Total Score				28.67

The I-84 mainlines would be reconstructed in an unstacked configuration that would allow substructure units to support both bounds of the mainlines with common foundations and would result in the elimination of any fracture critical structures. The Route 8 mainlines would not be reconstructed at the time of the I-84 reconstruction and would remain in service in a stacked configuration for an additional 20 years. New system ramps would be constructed to establish connections to the new I-84 alignment and the existing Route 8 alignment. This alternative would greatly reduce the number of left-hand system ramps; however, one left-hand entrance from I-84 Westbound to Route 8 Southbound would remain. A new service interchange would be implemented at Freight Street where the left-hand service ramps would provide increased access to downtown Waterbury. Not all design standards would be met for Route 8 because of the constraints imposed by the structures that will remain; however, since I-84 is the dominant feature exhibiting the transportation deficiencies, system performance is scored moderately for this alternative. Average interchange spacing would be increased due to the elimination of some of the service ramps near the core of the interchange, resulting in less conflict points and increased safety. Improvements to the local roadway network where it meets with the highway system, coupled with multimodal enhancements would result in increased bicycle and pedestrian safety as well. The NRG would follow the proposed alignment, however it may need to navigate under more structures and connections. New frontage roads would

increase east/west connectivity for both vehicles and bicycle and pedestrian infrastructure and provide increased access to transit facilities.


Environmental / Community Goal Category

Environment / Community Evaluation				
#	Measure	Notes	Rating	Score
21	Consistency with funded City of Waterbury projects	Alternative is consistent with and does not preclude any funded City projects	▲	2
22	Results in potential direct impact of highway footprint in CBD (including the Freight Street District)	About the same amount of available space in the CBD, minor Freight Street District encroachment	●	1
-	Potential direct impacts to public facilities	No impacts to any parcels containing a public facility	▲	--
23	Potential direct impacts to publicly owned parks / open space	No direct impacts to any public parks or open space	▲	2
24	Potential direct impacts to EJ communities	0-15 parcels (Approx. 15) located within an EJ area are directly impacted	▲	2
25	Potential direct impacts to LEP communities	0-15 parcels (Approx. 12) located within an LEP area are directly impacted	▲	2
26	Potential direct impacts to parcels (rights-of-way (ROW))	16-30 parcels (Approx. 24) directly impacted by the proposed alignment	●	1
27	Potential direct impacts to noise-sensitive receptors	Moderate increase of ROW in noise sensitive receptors, with impacts occurring at the new Exit 18 interchange	●	1
-	Potential direct impacts to State or National Register of Historic Places Properties	No direct impacts to sites listed on the State and National Register of Historic Places Properties	▲	--
-	Potential direct impacts to culturally significant resources/area and known archaeological sites (not listed on NRHP)	1-3 (approx. 1) potential impacts to a known archaeological site	●	--
28	Potential direct impacts to wetland systems	1-5 (approx. 1) wetland area will be potentially impacted due to the new Exit 18 interchange	●	1
29	Potential direct impacts to surface waters	6-10 (approx. 6) bridge crossings of the Naugatuck River	●	1
30	Potential direct impacts to floodplains / floodways	6-10 (approx. 6) bridge crossings within mapped floodplain or floodway at interchange core	●	1
31	Potential direct impacts to farmland soils	0 net impacts to farmland soils	▲	2
32	Potential direct impacts to state and federally listed threatened and endangered species	Alternative does not impact any NDDB areas that are not already intersected by the interchange	▲	2

Environment / Community Evaluation				
#	Measure	Notes	Rating	Score
-	Potential direct impacts to impact to potentially contaminated / hazardous sites	1-5 (approx. 2) impacts to potentially contaminated / hazardous sites		--
Total Score				18




This alternative would avoid substantial impacts to the environmental and community resources located within Waterbury. This alternative would have some minor impacts to the CBD located in the Freight Street District but minimizes these impacts due to the alignment being located slightly to the south of its existing location and would not interfere with any planned City of Waterbury projects. There would be no impacts to parks or open space, nor any public facilities. There would be ROW impacts near the core of the interchange as well as near the new I-84 Eastbound Exit 18 interchange, however they are considered to be moderate. Due to the ROW impacts at the new Eastbound Exit 18 interchange, noise impacts are considered to be moderate. Minimal impacts to natural resources are expected, with minor impacts to wetlands and surface waters, and floodplains expected.

**Cost Goal Category**

Cost Evaluation				
#	Measure	Notes	Rating	Score
33	Financial resources can reasonably be made available	This alternative would reduce the initial project costs due to Route 8 not being reconstructed		1.5
Total Score				1.5

Because this alternative would not replace the existing Route 8 mainlines, it would be able to defer a substantial portion of the initial project cost to the year 2065. This would cut around \$600 million from the initial project costs, making it easier to fund in 2045. While the eventual Route 8 replacement could potentially make this alternative slightly more expensive in present day dollars due to inflation and other inefficiencies from splitting the project into two major phases, a future life cycle cost analysis may show some amount of life cycle savings. It is anticipated that the necessary funding to complete this project would be available from Federal, State, and local sources, with available grant funding potentially being available. Maintenance and lifecycle costs were not included in cost assumptions.

Constructability Goal Category

Constructability Evaluation				
#	Measure	Notes	Rating	Score
34	Minimizes construction complexity	I-84 would be able to be constructed partially offline due to the alignment south of its existing conditions, Route 8 would not be completely reconstructed		1
35	Minimizes disruption to traffic during construction phase	Traffic impacts will occur, offline construction allows for some traffic impacts to be avoided.		1
36	Facilitates future maintenance activities	Route 8 remaining stacked will increase the complexity of future maintenance activities		0
Total Score				2

This alternative can be constructed partially offline where the alignment of the I-84 mainline is proposed to be relocated. However, this alternative’s construction would need to be phased to minimize traffic impacts to the traveling public. These impacts to the traveling public would be unavoidable, however, through project phasing and temporary traffic detours, impacts could be reduced. The width of the reconstructed I-84 mainlines would facilitate future maintenance, however the Route 8 mainlines would not be reconstructed. This means the Route 8 mainlines would not be widened and would remain stacked, creating more challenging conditions for future maintenance activities compared to other full reconstruction alternatives. Overall, constructability rated moderate overall. Additional traffic modeling is necessary to determine potential disruptions to provide detailed differentiation amongst advancing alternatives.

Level 2 Evaluation Scoring Results

Goal Group	Points Scored	Maximum points available	% of Points Received	Weight	Weighted Score
Transportation	28.67	40	72%	0.40	28.7
Environment / Community	18	24	75%	0.40	30
Cost	1.5	2	75%	0.10	7.5
Constructability	2	6	33%	0.10	3.3
				Total	70

Advancing

## LEVEL 2 EVALUATION DETAILED SUMMARY

**Alternative:** Naugatuck River Shift

**Weighted Score:** 72

**Level 2 Result:** Advancing

### Background Information

The Naugatuck River Shift alternative would replace the Mixmaster with a full system interchange that would be built in an unstacked configuration, providing direct system connections using some combined ramps. Interstate 84 would be located just south of the existing alignment near the interchange core and Route 8 would be reconstructed on the west bank of the Naugatuck River. To accommodate the unstacked Route 8 configuration, the Naugatuck River would be partially shifted to a more favorable alignment. A new east/west frontage road system would be implemented with this alternative. A new interchange would be constructed at Freight Street providing increased downtown access to downtown Waterbury.

The following sections outline and summarize the ratings and scores received for each goal category.

### Evaluation Overview

Measures where alternatives scored the same and no differentiation could be made in the scoring were not included in the overall scoring. These measures are marked by the (--) symbol in the “score” cells of the following tables. Weighted scores are rounded to the nearest whole number.

Transportation Goal Category:

Transportation Evaluation				
#	Measure	Evaluation	Rating	Score
-	Attains SOGR (NBIS Rating)	Yes, for all I-84 and Route 8 structures	▲	--
-	Replaces I-84 concrete bridge decks	Yes, new concrete bridge decks for I-84	▲	--
-	Unstacks existing I-84 structures	Yes, the new alignment of I-84 would be constructed in an unstacked configuration	▲	--
1	Unstacks existing Route 8 structures	Yes, the new alignment of Route 8 would be constructed in an unstacked configuration	▲	2
-	Eliminates all I-84 fracture critical structures	Yes, all I-84 fracture critical structures would be eliminated	▲	--
2	Eliminates all Route 8 fracture critical structures	Yes, all Route 8 fracture critical structures would be eliminated	▲	2
3	Provides for a single wider bridge substructure rather than two narrow / separate bridge substructures	I-84 and Route 8 would be constructed on a single, wider bridge substructure	▲	2
4	Meets a skew rating of “good”	Not achieved due to the proposed alignment of the mainlines over the Naugatuck River assumed to be >35°	▼	0
-	Meets horizontal alignment (curves) design standards	New structures for I-84 and Route 8 assumes the ability to meet design standard. (True for	▲	--



Attachment C: Level 2 Evaluation Detailed Summary  
Naugatuck River Shift

Transportation Evaluation				
#	Measure	Evaluation	Rating	Score
5	Meets shoulder width design standards	all measures evaluating highway design standards.)		2
6	Meets sight distance design standards			2
-	Meets vertical alignment (curvature and grades) design standards			--
7	Meets ramp design standards (acceleration and deceleration lane length)			2
8	Meets vertical clearance design standards			2
-	Minimizes turning restrictions or out-of-direction travel (Local Road)	Local road improvements assumes ability to meet design standards. (True for all local road design standards)		--
-	Geometry accommodates truck turning movements (Local Road)			--
-	Meets horizontal alignment (curves) design standards (Local Road)			--
-	Meets sight distance design standards (Local Road)			--
-	Meets vertical alignment (curvature and grades) design standards (Local Road)			--
9	Eliminates left-hand system ramps	All left-hand system ramps are eliminated		2
10	Reduces left-hand service ramps reduced	Freight Street interchange would use left-hand service ramps		0.5
-	Increases average interchange spacing (number of interchanges per/mile is reduced)	Average interchange spacing is increased		--
11	Reduces vehicle/vehicle conflict points (weaving areas) on the highway	The number of weaving areas is reduced, resulting in fewer conflict points		1.17
12	Reduces potential of severity for predicted crashes on arterial connections and Mixmaster intersections with the local roadway	Local roadway network connections to the mainlines are proposed to be improved and assumes reduced severity for predicted crashes.		2
-	Reduces the potential for crashes between vehicles and pedestrian / bicyclist safety at arterial connections and intersections with the local road	Proposed local road improvements include multimodal enhancements and assumes fewer crashes between passive and active transportaiton.		--
13	Improves access / mobility to / from Route 8 to local road network	The proposed addition of the Freight Street interchange would provide better access to downtown Waterbury from Route 8 northbound and southbound.		2
14	Improves access / mobility to / from I-84 to local road network	Similar direct access to downtown Waterbury provided and increases ease of access to / from I-84 by eliminating the complex weave present at Exit 21		2

Transportation Evaluation				
#	Measure	Evaluation	Rating	Score
15	Improves Mobility of local road network layout for connectivity between points east / west of CBD	Addition of the Sunnyside Avenue bridge across the Naugatuck River would provide increased connection opportunities for east/west travel.	▲	2
16	Reduces barriers for north/south pedestrian and bicyclist travel across I-84	No change in connection opportunities - same as existing conditions (9)	●	1
17	Reduces barriers for east / west pedestrian and bicyclist travel across Route 8	Increase in connection opportunities – more than existing conditions (4)	▲	2
18	Allows for motorized and nonmotorized connections to the Naugatuck River (western or eastern bank) at minimum one side of river in the vicinity of Jackson Street	The proposed alignment does not preclude access to the Naugatuck River	▲	2
19	Allows for motorized and nonmotorized connections to the Naugatuck River Greenway	NRG can follow the proposed alignment, however it will be have to navigate many more connections and travel under more structures	●	1
20	Improves bicyclists / pedestrian access / connections to rail / transit facilities	The addition of the Sunnyside Avenue connector increases active transportation routes to transit facilities.	▲	2
Total Score				33.67

The I-84 and Route 8 mainlines would be reconstructed in an unstacked configuration that would allow substructure units to support both bounds of the mainlines with common foundations and would result in the elimination of any fracture critical structures. All left-hand system ramps would be eliminated entirely and replaced with direct right-hand connections with this alternative. Not all left-hand service ramps would be eliminated, as the Freight Street interchange would use left-hand service ramps to provide better access to downtown Waterbury. These enhancements would result in improved system performance of the interchange. Modern highway design standards are achieved with this alternative. The average interchange spacing would be increased due to the elimination of some of the service ramps near the core of the interchange, resulting in less conflict points and increased safety. Improvements to the local roadway network where it meets with the highway system, coupled with multimodal enhancements would result in increased bicycle and pedestrian safety as well. New frontage roads would provide increased connectivity east/west of the Naugatuck River and would also provide additional space for new bicycle and pedestrian infrastructure. The alignment also allows for the NRG to follow its proposed route; however, it may face additional routing obstacles due to the new structures and the new alignment of the Naugatuck River.

Environmental / Community Goal Category

Environment / Community Evaluation				
#	Measure	Notes	Rating	Score
21	Consistency with funded City of Waterbury projects	Alternative is consistent with and does not preclude any funded City projects	▲	2
22	Results in potential direct impact of highway footprint in CBD (including the Freight Street District)	Minor encroachment on the Freight Street District	●	1
-	Potential direct impacts to public facilities	No impacts to any parcels containing a public facility	▲	--
23	Potential direct impacts to publicly owned parks / open space	No direct impacts to any public parks or open space	▲	2
24	Potential direct impacts to EJ communities	16-30 parcels (approx. 16) located within an EJ area are directly impacted	●	1
25	Potential direct impacts to LEP communities	0-15 parcels (Approx. 13) located within an LEP area are directly impacted	▲	2
26	Potential direct impacts to parcels (rights-of-way (ROW))	16-30 parcels (approx. 24) directly impacted by the proposed alignment	●	1
27	Potential direct impacts to noise-sensitive receptors	Moderate increase of ROW in noise sensitive receptors, with impacts occurring at the new Exit 18 interchange	●	1
-	Potential direct impacts to State or National Register of Historic Places Properties	No direct impacts to sites listed on the State and National Register of Historic Places Properties	▲	--
-	Potential direct impacts to culturally significant resources/area and known archaeological sites (not listed on NRHP)	1-3 (approx. 1) potential impacts to a known archaeological site	●	--
28	Potential direct impacts to wetland systems	1-5 (approx. 1) wetland area will be potentially impacted due to the new Exit 18 interchange	●	1
29	Potential direct impacts to surface waters	6-10 (approx. 6) bridge crossings of the Naugatuck River	●	1
30	Potential direct impacts to floodplains / floodways	6-10 (approx. 6) bridge crossings within mapped floodplain or floodway at interchange core	●	1

Environment / Community Evaluation				
#	Measure	Notes	Rating	Score
31	Potential direct impacts to farmland soils	0 net impacts to farmland soils	▲	2
32	Potential direct impacts to state and federally listed threatened and endangered species	Alternative does not impact any NDDB areas that are not already intersected by the interchange	▲	2
-	Potential direct impacts to impact to potentially contaminated / hazardous sites	1-5 (approx. 2) impacts to potentially contaminated / hazardous sites	●	--
Total Score				17

This alternative would avoid substantial impacts to the environmental and community resources located within Waterbury. This alternative would have minor impacts to the Freight Street District within the CBD; however, these impacts are minimized due to the alignment being located slightly to the south of its existing location. The impacts are not expected to interfere with any planned City of Waterbury projects within the project limits. This alternative would not impact any public facilities or any parks or open space. ROW impacts would occur near the core of the interchange as well as near the proposed alignment for the new I-84 Eastbound Exit 18 interchange, however they are considered to be moderate. Noise impacts are anticipated to occur near Exit 18 interchange due to the ROW impacts. This alternative involves the realignment of the Naugatuck River while maintaining hydraulic capacity. Despite the impacts required for the river shift, the direct impacts of the proposed structures traversing the Naugatuck River were determined to not adversely impact the overall score of the Environmental / Community goal group which also included the evaluation of the potential direct impacts to the natural and human environment.

### Cost Goal Category



Cost Evaluation				
#	Measure	Notes	Rating	Score
33	Financial resources can reasonably be made available	The estimated costs for this alternative are considered to be moderate	●	1
Total Score				1

The estimated cost of this alternative is comparable to the other full interchange reconstruction Initial Alternatives and is deemed to be moderate. It is anticipated that the necessary funding to complete this project would be available from Federal, State, and local sources, with available grant funding potentially being available. Maintenance and lifecycle costs were not included in cost assumptions.

### Constructability Goal Category

Constructability Evaluation				
#	Measure	Notes	Rating	Score
34	Minimizes construction complexity	I-84 would be able to be constructed partially offline due to the alignment south of its existing conditions	●	1

Attachment C: Level 2 Evaluation Detailed Summary  
Naugatuck River Shift

Constructability Evaluation				
#	Measure	Notes	Rating	Score
35	Minimizes disruption to traffic during construction phase	Traffic impacts will occur, offline construction allows for some traffic impacts to be avoided.		1
36	Facilitates future maintenance activities	Normal traffic disruptions are to be expected during future maintenance activities		1
Total Score				3

This alternative can be constructed partially offline where the I-84 and Route 8 mainlines are proposed to be relocated. Phasing will need to occur in order to minimize traffic impacts to the travelling public. These impacts would be unavoidable; however, the phasing would help to reduce these impacts. Since this is a full interchange reconstruction alternative, the new infrastructure would be wide enough to facilitate future maintenance activities better than existing, however, constructability rated moderate overall. Additional complexity may occur because of the realignment of the Naugatuck River, however more detailed hydrology/phasing studies will need to be performed to understand the full impacts.

Level 2 Evaluation Scoring Results

Goal Group	Points Scored	Maximum points available	% of Points Received	Weight	Weighted Score
Transportation	33.67	40	84%	0.40	33.7
Environment / Community	17	24	71%	0.40	28.3
Cost	1	2	50%	0.10	5
Constructability	3	6	50%	0.10	5
Total					72

Advancing

## LEVEL 2 EVALUATION DETAILED SUMMARY

**Alternative:** South City Bypass

**Weighted Score:** 37

**Level 2 Result:** Not Advancing

### Background Information

The South City Bypass alternative would replace the Mixmaster with a full system interchange that would relocate the Interstate 84 alignment between Exits 17 and 25 to an existing utility corridor approximately two and a half miles south of the existing interchange. The new alignment of Interstate 84 would result in approximately five miles of newly constructed highway, while the alignment of Route 8 would remain the same and the Route 8 structure would be reconstructed, likely in an unstacked configuration. The new interchange would provide all system movements as direct connections. The relocation of the interchange would allow for the upper deck of the existing Interstate 84 structure to be eliminated and would turn the bypassed section of Interstate 84 into a bidirectional business loop that would provide access to Downtown Waterbury. Frontage road systems are not proposed with this alternative and the existing system and service ramp alignments along Route 8 and existing Interstate 84 are likely to remain in order to maintain access to downtown Waterbury.

The following sections outline and summarize the ratings and scores received for each goal category.

### Evaluation Overview


















Measures where alternatives scored the same and no differentiation could be made in the scoring were not included in the overall scoring. These measures are marked by the (--) symbol in the “score” cells of the following tables. Weighted scores are rounded to the nearest whole number.

#### Transportation Goal Category:

Transportation Evaluation				
#	Measure	Evaluation	Rating	Score
-	Attains SOGR (NBIS Rating)	Yes, for all I-84 and Route 8 structures	▲	--
-	Replaces I-84 concrete bridge decks	Yes, new concrete bridge decks for I-84	▲	--
-	Unstacks existing I-84 structures	Yes, the new alignment of I-84, and the existing I-84 alignment would be constructed in an unstacked configuration	▲	--
1	Unstacks existing Route 8 structures	Yes, Route 8 structures would be unstacked	▲	2
-	Eliminates all I-84 fracture critical structures	Yes, all I-84 fracture critical structures would be eliminated	▲	--
2	Eliminates all Route 8 fracture critical structures	Yes, all Route 8 fracture critical structures are eliminated	▲	2



Attachment C: Level 2 Evaluation Detailed Summary  
South City Bypass

Transportation Evaluation					
#	Measure	Evaluation	Rating	Score	
3	Provides for a single wider bridge substructure rather than two narrow / separate bridge substructures	The new I-84 bridge structures would be constructed on a single, wider bridge substructure. The alignment of Route 8 structures and existing I-84 (the proposed business loop) would likely remain or be narrower than existing		1	
4	Meets a skew rating of "good"	Yes, a "good" rating is achieved for the skews of bridge spans as they are assumed to be <35 degrees		2	
-	Meets horizontal alignment (curves) design standards	New or reconstructed structures for I-84 and Route 8 assumes the ability to meet design standard. (True for all measures evaluating highway design standards.)		--	
5	Meets shoulder width design standards			2	
6	Meets sight distance design standards			2	
-	Meets vertical alignment (curvature and grades) design standards			--	
7	Meets ramp design standards (acceleration and deceleration lane length)			2	
8	Meets vertical clearance design standards			2	
-	Minimizes turning restrictions or out-of-direction travel (Local Road)		Local road improvements assumes ability to meet design standards. (True for all local road design standards)		--
-	Geometry accommodates truck turning movements (Local Road)				--
-	Meets horizontal alignment (curves) design standards (Local Road)			--	
-	Meets sight distance design standards (Local Road)			--	
-	Meets vertical alignment (curvature and grades) design standards (Local Road)			--	
9	Eliminates left-hand system ramps	All left hand system ramps are eliminated			2
10	Reduces left-hand service ramps reduced	All existing left-hand service ramps will remain as a part of the business loop		0	
-	Increases average interchange spacing (number of interchanges per/mile is reduced)	Average interchange spacing is increased		--	
11	Reduces vehicle/vehicle conflict points (weaving areas) on the highway	The number of weaving areas is reduced		.88	
12	Reduces potential of severity for predicted crashes on arterial connections and Mixmaster intersections with the local roadway	The existing local roadway connections to the mainlines are not proposed to be improved.		0	

Attachment C: Level 2 Evaluation Detailed Summary  
South City Bypass

Transportation Evaluation				
#	Measure	Evaluation	Rating	Score
-	Reduces the potential for crashes between vehicles and pedestrian / bicyclist safety at arterial connections and intersections with the local road	Existing arterial connections and intersections with the local road will remain due to the bypass, the business loop will likely have lower travel speeds while the additional service ramps provided south of existing I-84 would draw some traffic away from the interchange core, reducing the potential for crashes	▲	--
13	Improves access / mobility to / from Route 8 to local road network	Access to downtown Waterbury is assumed to be similar to existing conditions because of the business loop	●	1
14	Improves access / mobility to / from I-84 to local road network	Access to downtown Waterbury is assumed to be similar to existing conditions because if the business loop	●	1
15	Improves Mobility of local road network layout for connectivity between points east / west of CBD	Local roadway network layout is assumed to be the same as existing conditions	●	1
16	Reduces barriers for north/south pedestrian and bicyclist travel across I-84	Same number of connection opportunities in Waterbury, the additional new highway construction south of the city creates new barrier with reduced connections	▼	0
17	Reduces barriers for east / west pedestrian and bicyclist travel across Route 8	Same number of connection opportunities in Waterbury, the additional highway south of the city creates new barriers with reduced connections	▼	0
18	Allows for motorized and nonmotorized connections to the Naugatuck River (western or eastern bank) at minimum one side of river in the vicinity of Jackson Street	Access to the Naugatuck River is presumed to be the same as existing conditions	▲	2
19	Allows for motorized and nonmotorized connections to the Naugatuck River	NRG can follow existing alignment in Downtown Waterbury but may need to be reevaluated at the new interchange	●	1
20	Improves bicyclists / pedestrian access / connections to rail / transit facilities	No Sunnyside Avenue connection, same number of connections provided from local road network is assumed	●	1
Total Score				24.88









The newly constructed bypass portion of I-84 would satisfy modern geometric highway design standards and would improve the overall traffic operations at the new interchange. All left-hand system ramps would be eliminated from the existing interchange and all system ramps in the newly constructed interchange

would be built as direct right-hand connections. Average interchange spacing would be increased due to these changes made near the core of the interchange, resulting in less conflict points and increased safety. While this alternative would provide new highway mainlines and a new interchange which would address many of the deficiencies of the existing interchange, the existing structures for I-84 and Route 8 would need to remain in some capacity to accommodate traffic in and out of downtown Waterbury. The existing structures would likely be reconstructed, resulting in many of the geometric and operational deficiencies to remain, such as the left-hand service ramps and some of the short weaving distances. This alternative would not address connectivity or mobility as no improvements are proposed for the local roadway network. The physical barriers of the mainlines in downtown Waterbury would remain with new physical barriers being created south of downtown where the new interchange is constructed. There are no proposed multimodal improvements associated with this alternative and no additional north/south or east/west connections or frontage roads would be created at the local road network. This alternative would allow the NRG to follow its proposed alignment in downtown Waterbury, however it may face obstacles where the new interchange would be constructed.

Environmental / Community Goal Category


Environment / Community Evaluation				
#	Measure	Notes	Rating	Score
21	Consistency with funded City of Waterbury projects	Proposed alignment would interfere with City of Waterbury projects (most substantially the Naugatuck / Waterbury Industrial Park development)	▼	0
22	Results in potential direct impact of highway footprint in CBD (including the Freight Street District)	There are no anticipated impacts to the CBD	▲	2
-	Potential direct impacts to public facilities	No impacts to any parcels containing a public facility		--
23	Potential direct impacts to publicly owned parks / open space	Direct impacts to the Hop Brook Lake recreation area	●	1
24	Potential direct impacts to EJ communities	31+ parcels (Approx. 94) located within an EJ area are directly impacted	▼	0
25	Potential direct impacts to LEP communities	31+ parcels (Approx. 94) located within an LEP area are directly impacted	▼	0
26	Potential direct impacts to parcels (rights-of-way (ROW))	31+ parcels (Approx. 134) directly impacted	▼	0
27	Potential direct impacts to noise-sensitive receptors	There would be extensive noise impacts due to the newly constructed highway mainlines	▼	0

Attachment C: Level 2 Evaluation Detailed Summary  
South City Bypass

Environment / Community Evaluation				
#	Measure	Notes	Rating	Score
-	Potential direct impacts to State or National Register of Historic Places Properties	No direct impacts to sites listed on the State and National Register of Historic Places Properties		--
-	Potential direct impacts to culturally significant resources/area and known archaeological sites (not listed on NRHP)	1-3 (approx. 1) potential impacts to a known archaeological site		--
28	Potential direct impacts to wetland systems	6+ wetland area will be potentially impacted		0
29	Potential direct impacts to surface waters	15+ bridge crossings of the Naugatuck River		0
30	Potential direct impacts to floodplains / floodways	15+ bridge crossings within mapped floodplain or floodway at interchange core		0
31	Potential direct impacts to farmland soils	6+net impacts to farmland soils		0
32	Potential direct impacts to state and federally listed threatened and endangered species	This alternative would impact the NDDDB area that encompasses the Hop Brook Lake area		0
-	Potential direct impacts to impact to potentially contaminated / hazardous sites	1-5 (approx. 1) impacts to potentially contaminated / hazardous sites, at the former Yankee Gas site		--
Total Score				3




This alternative would result in substantial impacts to the environmental and community resources located within Waterbury. There are direct impacts anticipated for more than 100 parcels with many of these impacts located in areas identified as Environmental Justice and Limited English Proficiency communities. Some of these ROW impacts would impact future city of Waterbury projects focused on the Naugatuck/Waterbury Industrial Park, which is located directly under the proposed alignment of the bypass. With the construction of the new mainlines occurring in primarily residential zoning areas near many neighborhoods, additional noise impacts in these areas are expected. Similar noise impacts would be expected at the Hop Brook Lake recreation area. This alternative would also have the greatest impacts on natural resources, directly impacting multiple wetland systems and farmland areas. Additional surface water impacts are expected due to the construction of the new bridges at the location of the new interchange. Additionally, this is the only alternative that would impact the NDDDB area located in the Hop Brook Lake area.

Cost Goal Category

Cost Evaluation				
#	Measure	Notes	Rating	Score
33	Financial resources can reasonably be made available	The estimated costs for this alternative are considered to be substantial		0
Total Score				0

The cost of this Initial Alternative would be far greater than the cost of any of the other Initial Alternatives and is deemed to be substantial. The cost of the additional infrastructure components (tunnel, excavation costs) coupled with the costs of the maintenance activities that would need to occur on the existing Route 8 and I-84 structures would create a cost that would be unreasonable when compared with the costs of the other Initial Alternatives.

Constructability Goal Category

Constructability Evaluation				
#	Measure	Notes	Rating	Score
34	Minimizes construction complexity	Proposed alignment would provide ability for offline construction, infrastructure necessary would add complexity to construction		1
35	Minimizes disruption to traffic during construction phase	Due to the ability for primarily offline construction, traffic impacts are assumed to be lower than other Initial Alternatives		2
36	Facilitates future maintenance activities	Normal traffic disruptions are to be expected during future maintenance activities		1
Total Score				4

While the South City Bypass alternative would allow for a great deal of offline construction which would result in less traffic disruptions than most of the Initial Alternatives, the complexity of the construction is considered moderate due to the additional infrastructure components of this alternative. In this alternative there would be extensive excavation and grading needed for the new mainlines. Long bridge structures would also be required due to the topography. Since this is a full interchange reconstruction alternative, the new infrastructure would be wide enough to facilitate future maintenance activities better than existing.

Level 2 Evaluation Scoring Results

Goal Group	Points Scored	Maximum points available	% of Points Received	Weight	Weighted Score
Transportation	24.88	40	62%	0.40	24.9
Environment / Community	3	24	13%	0.40	5
Cost	0	2	0%	0.10	0
Constructability	4	6	67%	0.10	6.7
				Total	37

Not Advancing