CONNECTICUT DEPARTMENT OF TRANSPORTATION
Bureau of Policy and Planning
Intermodal Planning

WATERBURY AND NEW CANAAN BRANCH LINES NEEDS AND FEASIBILITY STUDY Project 170-2562

Phases I and II

Phase II Report

Date: May 2010

TABLE OF CONTENTS

Table of Contents i
1.0 Introduction 1-1
2.0 Screen 1: Identification of the Short List of Alternatives 2-1
2.1 Review of the Long List of Alternatives 2-1
2.2 Screen 1 Criteria and Results 2-14
2.3 Short List of Alternatives – Waterbury Branch 2-22
2.3.1 No Build Alternative 2-22
2.3.2 Transportation Systems Management Alternative (W-23 Shuttle Bus) 2-25
2.3.3 Increased Train Length (W-1) 2-27
2.3.4 Full Signalization (W-3) 2-28
2.3.5 Beacon Falls Passing Siding (W-10) 2-28
2.3.6 Four Passing Sidings (W-11) 2-49
2.3.7 Devon Alternative 2 (W-13) 2-49
2.3.8 Derby-Shelton Multi-Modal Alternative 1 (W-15) 2-50
2.3.9 Waterbury Multi-Modal Station (W-18) 2-61
2.3.10 Relocated Naugatuck Platform (W-19) 2-61
2.3.11 Express Bus (W-22) 2-62
2.4 Short List of Alternatives – New Canaan Branch 2-78
2.4.1 No Build Alternative 2-79
2.4.2 Transportation Systems Management Alternative 2-81
2.4.3 Springdale Siding (NC-1) 2-82
2.4.4 Full Signalization (NC-2) 2-82
2.4.5 Full Signalization + Siding + 2nd Platform at Springdale (NC-5) 2-87
2.4.6 Springdale Platform Extension (NC-13) 2-87
2.4.7 Talmadge Hill Pedestrian / Parking / Platform Improvements (NC-14) 2-87

2.4.8 New Canaan Station Platform Extension (NC-15) 2-88
3.0 Screen 2: Evaluation of the Short List of Alternatives 3-99
3.1 Screen 2 Criteria 3-99
3.2 Screen 2 Methodology and Results 3-101
4.0 Transit Oriented Development Options 4-1
4.1 Waterbury BRanch TOD 4-1
4.2 New Canaan Branch TOD 4-3
5.0 Innovative Technologies 5-1
5.1 Rail Vehicles 5-1
5.2 Track and Grade Crossings 5-2
5.3 Train Control 5-2
5.4 Customer Information and Convenience 5-2
6.0 Train Performance Model and Simulations 6-1
6.1 Train Performance Model and Simulations 6-1
6.2 Traction Power Model and Simulations 6-2
7.0 Recommendations 7-1
7.1 Waterbury Branch Recommendations 7-2
7.1.1 Waterbury Branch – Operational Recommendations 7-3
7.1.2 Waterbury Branch – Station Recommendations 7-4
7.1.3 Waterbury Branch – TSM Recommendation 7-4
7.2 New Canaan Branch Recommendations 7-4
7.2.1 New Canaan Branch – Operational Recommendations 7-5
7.2.2 New Canaan Branch – Station Recommendation 7-6

LIST OF FIGURES

Figure 1-1: Study Area 1-3
Figure 1-2: Waterbury Branch 1-5
Figure 1-3: New Canaan Branch 1-7
Figure 2-1: Waterbury Station Platform Extension 2-29
Figure 2-2: Naugatuck Station Platform Extension/Relocation 2-31
Figure 2-3: Beacon Falls Station Platform Extension 2-33

Figure 2-4: Seymour Station Platform Extension 2-35
Figure 2-5: Ansonia Station Platform Extension/Relocation 2-37
Figure 2-6: Derby-Shelton Station Platform Extension 2-39
Figure 2-7a-b: Beacon Falls Passing Siding – North Option 2-41
Figure 2-8a-b: Beacon Falls Passing Siding – South Option 2-45
Figure 2-9: Devon Station Alternative 2 2-51
Figure 2-10: Devon Station Alternative 2 Detail 2-53
Figure 2-11: Devon Station Alternative 2 Section 2-55
Figure 2-12: Derby-Shelton Multi-Modal Station Alternative 1 2-57
Figure 2-13: Derby-Shelton Multi-Modal Station Alternative 1 Section 2-59
Figure 2-14: Derby-Shelton Multi-Modal Station Parking Option A 2-63
Figure 2-15: Derby-Shelton Multi-Modal Station Parking Option B 2-65
Figure 2-16: Derby-Shelton Multi-Modal Station Parking Option C 2-67
Figure 2-17: Derby-Shelton Multi-Modal Station Parking Option D 2-69
Figure 2-18: Derby-Shelton Multi-Modal Station Parking Option E 2-71
Figure 2-19: Derby-Shelton Multi-Modal Station Parking Option F 2-73
Figure 2-20: Waterbury Multi-Modal Station 2-75
Figure 2-21a-b: Springdale Siding 2-83
Figure 2-22: Two-Platform Springdale Station 2-89
Figure 2-23: Two-Platform Springdale Station Section 2-91
Figure 2-24: Springdale Station Platform Extension 2-93
Figure 2-25: Two-Platform Talmadge Hill Station 2-95
Figure 2-26: New Canaan Station Platform Extension 2-97

APPENDICES

Appendix A Short List Conceptual Cost Estimates, May 2010 Revision
Appendix B Waterbury Passing Siding Drawings
Appendix C Full Express Bus Alternative Drawings
Appendix D Train Performance Model and Simulations Report (April 2010)
Traction Power Model and Simulations Report (April 2010)
Appendix E Short List Right-of-Way Calculations (March 2010)

Appendix F Environmental Rating of Alternatives Memorandum (February 2010)

Appendix G Waterbury Branch and New Canaan Branch Transit Oriented Development Reports (September 2009)

Appendix H Innovative Technologies Report (April 2010)

1.0 INTRODUCTION

The Connecticut Department of Transportation (CTDOT) in cooperation with the South West Regional Planning Agency (SWRPA), Greater Bridgeport Regional Planning Agency (GBRPA), Council of Governments of the Central Naugatuck Valley (COGCNV), and the Valley Council of Governments (VCOG), is preparing this needs and feasibility study for improvements to transit service along the New Canaan and Waterbury Branch corridors of the New Haven Line. The results of this study will identify potential service and infrastructure improvements for the 27-mile rail corridor between Milford and Waterbury, and the 7.9-mile rail corridor between Stamford and New Canaan. It will also provide decision-makers with the information necessary to determine how the CTDOT-owned New Canaan and Waterbury Branches fit into an overall statewide transportation strategy that balances needs and funding ability.

Metro-North Railroad operates service between New Haven and Grand Central Terminal (GCT) on the New Haven Line, Connecticut's busiest commuter rail line. Three branch lines feed into the New Haven Line: the New Canaan Branch, the Danbury Branch, and the Waterbury Branch (Figure 1-1). This study is focused on the Waterbury and New Canaan Branches; a separate feasibility study of the Danbury Branch is also underway.

The Waterbury Branch is the longest of the three branch lines, operating passenger service between Waterbury and Bridgeport with stops at Naugatuck, Beacon Falls, Seymour, Ansonia, and Derby-Shelton (Figure 1-2). The branch consists of an unsignalized single track with no passing sidings, making it impossible for northbound and southbound trains to pass one another along the branch and limiting the amount of service that can be provided. Freight trains also operate on the line.

The Waterbury Branch runs parallel to Connecticut Route 8, which is frequently congested during rush hour periods, especially in the vicinity of the Route 8/Interstate 95 (I-95) interchange. Improved transit service in the corridor could attract new ridership, which in turn might reduce vehicle trips and congestion on local roadways.

The New Canaan Branch is the shortest of the three branches and the only one that is electrified. Metro-North provides frequent peak-period passenger service from New Canaan to Stamford and GCT, with stops at Talmadge Hill, Springdale, and Glenbrook (Figure 1-3). Like the Waterbury Branch, the New Canaan line consists of a single track without any passing sidings. The signalization on the branch ends just before New Canaan Station, which limits the operations of trains on the northern end of the branch. Greater frequency of service and faster running times could potentially make the branch more attractive to commuters. Freight trains are also allowed, though they do not currently operate on the line.

This Phase II Report will review the preliminary alternatives for improvements along each branch and the two-tiered screening process that was used to narrow those alternatives into a set of recommended upgrades for each branch. This document will also summarize the September 2009 *Transit-Oriented Development Reports* produced for each branch that helped guide the evaluation of alternatives, as well as the *Innovative Technologies Report* (April 2010) that reviewed emerging tools and techniques potentially applicable along the two branches. Synopses of the *Train Performance Model and Simulations Report* (April 2010) and the *Traction Power Report* (April 2010), which present the results of the modeling effort to quantify the potential benefits of the various alternatives and simulate their effects on the existing rail network and traction power system, are also included. Finally, this report will provide a detailed explanation of the final recommendations of the Waterbury and New Canaan Branch Lines Needs and Feasibility Study.

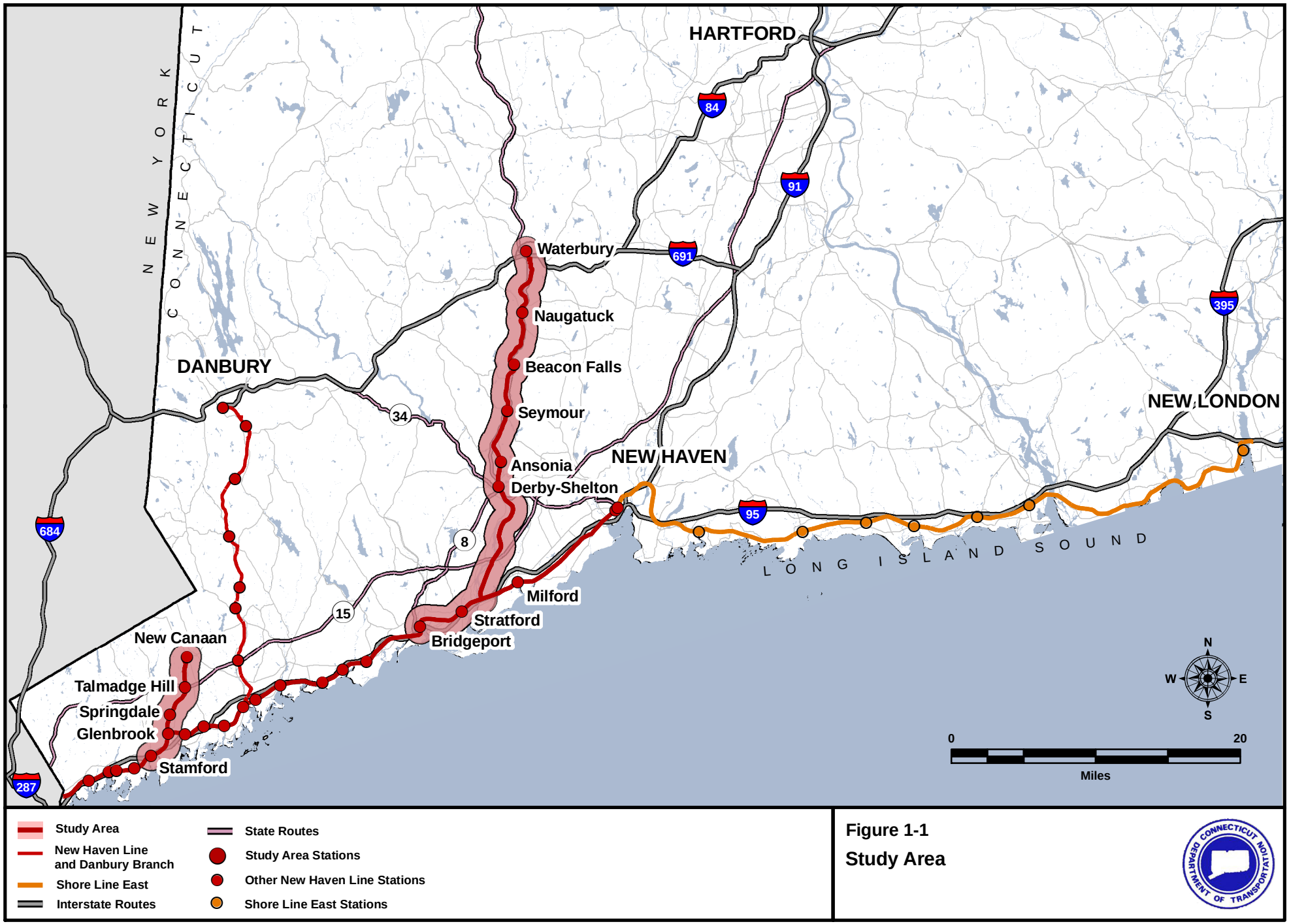
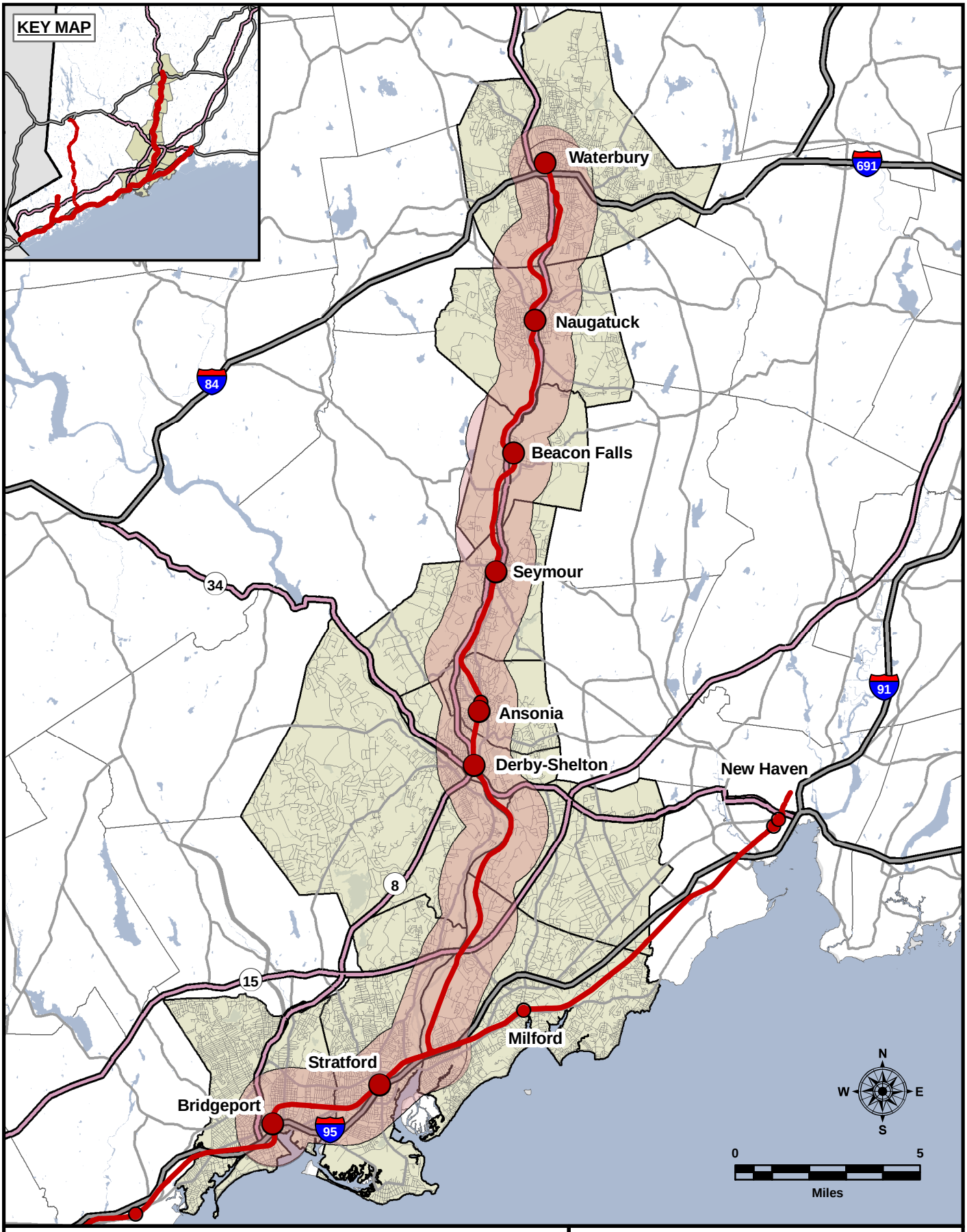


Figure 1-1

Study Area



Study Area

New Haven Line and Danbury Branch

Interstate Routes

State Routes

Study Area Stations

Other New Haven Line Stations

Figure 1-2
Waterbury Branch

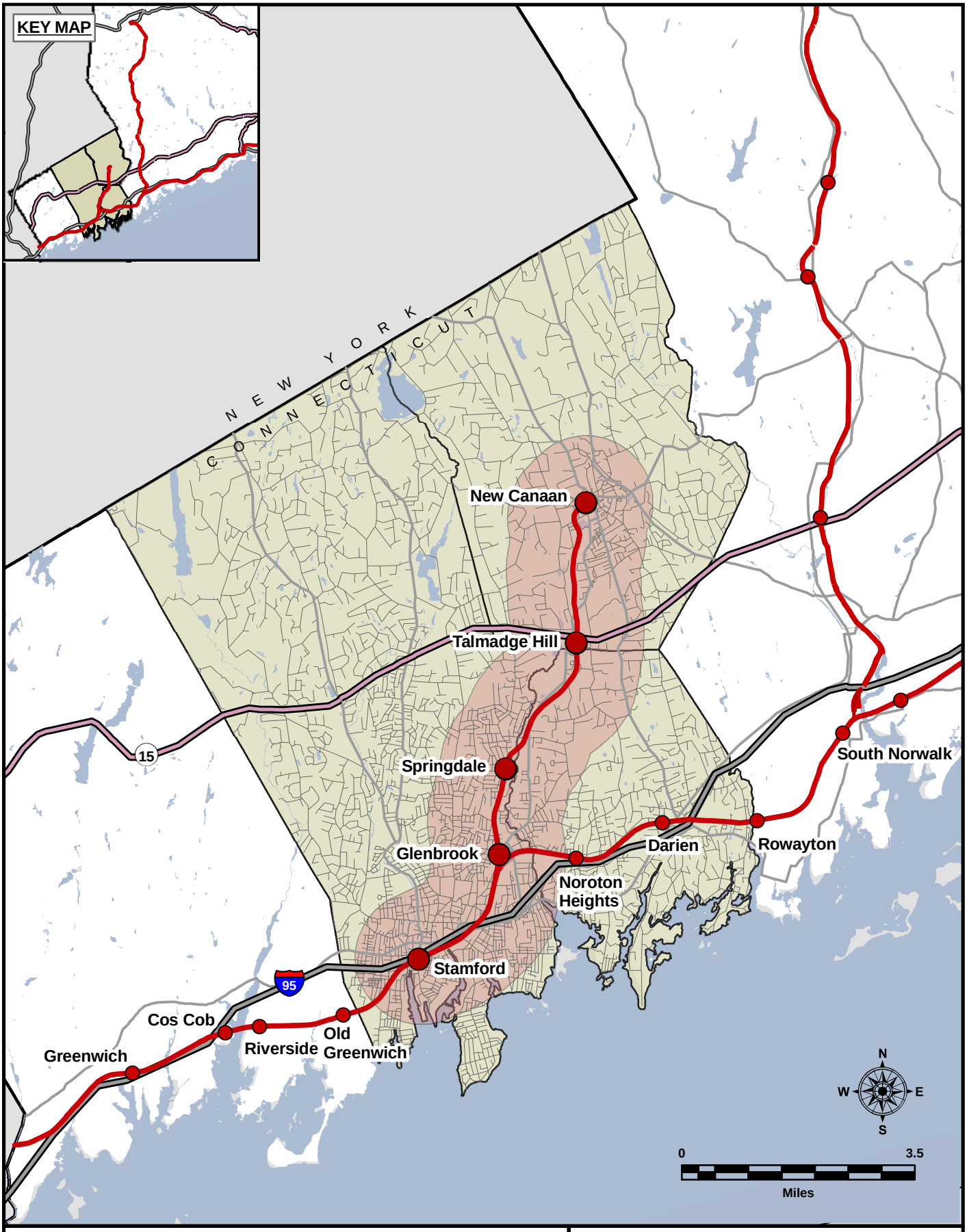


Figure 1-3
New Canaan Branch

2.0 SCREEN 1: IDENTIFICATION OF THE SHORT LIST OF ALTERNATIVES

As described in the January 2010 *Phase I Report* completed for the Waterbury and New Canaan Branch Lines Needs and Feasibility Study, the initial phase of the study resulted in a Long List of Alternatives that could potentially improve service along the two corridors. The first step of Phase II was to narrow, or "screen," the Long Lists compiled for each branch to a Short List of Alternatives, which would later be refined and subjected to a second screening process to identify those alternatives recommended for implementation or more extensive environmental study.

This chapter describes the first part of this two-step screening exercise ("Screen 1"), including a review of the Long List alternatives for each branch, the screening criteria used to evaluate these alternatives, and a description of each alternative that advanced to the Short List. The second part of this screening process ("Screen 2") is documented in Chapter 3 of this report.

2.1 REVIEW OF THE LONG LIST OF ALTERNATIVES

The Project Team compiled the initial set of preliminary alternatives for each corridor in coordination with various stakeholders. This Long List of Alternatives was meant to reflect the entire universe of feasible improvements, even those that might ultimately prove, upon further consideration, to be ineffective, unpopular, or unduly expensive. These alternatives were refined multiple times based on input received at the following meetings:

- Stakeholder Advisory Committee (SAC) meetings:
  - Bridgeport, October 7, 2008
  - Bridgeport, May 11, 2009
  - Planning charrette, CTDOT headquarters, January 22, 2009
- Follow-up stakeholder meetings:
  - Stamford, February 27, 2009 (morning)
  - Derby, February 27, 2009 (afternoon)
- Public information meetings:
  - Waterbury, June 16, 2009
  - Derby, June 17, 2009
  - Stamford, June 18, 2009

- Transit-Oriented Development (TOD) meetings:
  - Stamford, July 8, 2009
  - Waterbury, July 16, 2009
  - Derby, July 29, 2009

Tables 2-1 and 2-2 summarize the characteristics of the Long List alternatives and documents their performance against a uniform set of criteria. The ridership estimates provided in these tables represent daily transit boardings in the corridor in 2030 as measured by the Connecticut Statewide Travel Model using Metro-North ridership figures in 2001 as a baseline. Inputs into that model include CTDOT population and employment forecasts, the number and location of stops, travel time, and headway. For this early, broad level of analysis, parking and seating were assumed to be unconstrained.

RAILSIM Train Performance Calculator (TPC) runs were conducted to determine how various alternatives affected train frequency and travel times on each branch, taking into account conditions like curves, grades, track speeds, bridge locations, grade crossing locations, station locations, and siding locations. System wide impacts and the ability to fit within New Haven Line slot constraints were not yet evaluated at this stage.

Capital cost estimates, in 2008 dollars, are conceptual and presented for comparative purposes only. These cost estimates were refined several times over the course of the study as the alternatives themselves evolved based on stakeholder input and ongoing development by the Project Team. Calculations of the acreage of right-of-way acquisition required were also revised over the course of the study.

TABLE 2-1: SUMMARY OF LONG LIST ALTERNATIVES – WATERBURY BRANCH

Alternative	Environmental Impacts	Engineering/ Operational Complexity	Ridership[1]	ROW Acquisition Required (acres)[2]	Est. Cost ($M)[3]	Operational & Fleet Impacts	Change in Travel Time and/or Number of Trips	TOD Potential
Signal and Track Modification Alternatives								
W-1 (Increased Train Length)	Low	Low	12,930	0	$48	Low	No change in travel time or number of trips	Minimal change from existing
W-2 (Upgraded Track Speed)	Low	Low	12,930	0	$27	Low	63-67 second decrease in travel time	Minimal change from existing
W-3 (Full Signalization)	Low	Low	12,930	0	$128	Medium – requires extra trainsets and/or repositioning of equipment	Increase in peak and midday service possible (if combined with one or more passing sidings)	Medium – increased transit service at stations could increase pedestrian traffic
Electrification Alternatives								
W-4 (Full Electrification)	Low	Low	12,930	0	$320	High – requires new electric equipment	45-54 second decrease in one-way travel time	Minimal change from existing
W-5 (Partial Electrification)	Low	Low	12,930	0	$136	High – requires new electric equipment	3:34-3:48 minute increase in one-way travel time due to transfer at Derby-Shelton[4]	Medium – could increase pedestrian traffic at Derby-Shelton
W-6 (W-2 + W-4)	Low	Low	12,930	0	$350	High – requires new electric equipment	1:58-2:00 minute decrease in one-way travel time	Minimal change from existing

TABLE 2-1: SUMMARY OF LONG LIST ALTERNATIVES – WATERBURY BRANCH

Alternative	Environmental Impacts	Engineering/ Operational Complexity	Ridership[1]	ROW Acquisition Required (acres)[2]	Est. Cost ($M)[3]	Operational & Fleet Impacts	Change in Travel Time and/or Number of Trips	TOD Potential
W-7 (W-2 + W-5)	Low	Low	12,930	0	$151	High – requires new electric equipment	3:21-3:37 minute increase in one-way travel time due to transfer at Derby-Shelton[4]	Medium – could increase pedestrian traffic at Derby-Shelton
Double Track Alternatives[5]								
W-8 (Full Double Track)	Medium – numerous crossings of waterbodies, especially north of Derby	Low – provides maximum schedule flexibility and reliability	12,930	3.8	$612	Medium – requires extra trainsets and/or repositioning of equipment	Increase in morning/evening peak and midday service	Medium – increased transit service at stations could increase pedestrian traffic
W-9 (Partial Double Track)	Medium – numerous crossings of waterbodies	Low – provides second-best schedule flexibility and reliability	12,930	0.56	$133	Medium – requires extra trainsets and/or repositioning of equipment	Additional peak service possible	Medium – increased transit service at stations could increase pedestrian traffic
Passing Siding Alternatives								
W-10 (Beacon Falls Passing Siding)	Low	Low	12,930	0.3	$20	Medium – requires extra trainsets and/or repositioning of equipment	+ 1 morning peak southbound train + 1 midday round trip +1 evening round trip	Medium – increased transit service at stations could increase pedestrian traffic

TABLE 2-1: SUMMARY OF LONG LIST ALTERNATIVES – WATERBURY BRANCH

Alternative	Environmental Impacts	Engineering/ Operational Complexity	Ridership[1]	ROW Acquisition Required (acres)[2]	Est. Cost ($M)[3]	Operational & Fleet Impacts	Change in Travel Time and/or Number of Trips	TOD Potential
W-11 (Four Passing Sidings)	Low	Low	12,930	0.4	$64	Medium – requires extra trainsets and/or repositioning of equipment	Increase in morning/evening peak and midday service (note: to be simulated during Short List screening)	Medium – increased transit service at stations could increase pedestrian traffic
New Station Alternatives								
W-12 (Devon Alternative 1)	Medium – additional environmental study required to determine effects	High – major utility relocation required	14,737	Possible minor ROW acquisition required along New Haven Line	$134	Medium – one additional train set required in the AM peak, two in the PM peak	Hourly round trip shuttles between Waterbury and Devon	Low
W-13 (Devon Alternative 2)	Medium – additional environmental study required to determine effects	Low	14,737	Possible minor ROW acquisition required along New Haven Line	$73	Medium – one additional train set required in the AM peak, two in the PM peak	Hourly round trip shuttles between Waterbury and Devon	Low
W-14 (Wilbur Cross Parkway Station)	Medium – additional environmental study required to determine effects	Low	14,292	1-2 acres property acquisition required for parking facility	$41	Medium – reduces south end turn time by 3:40 minutes, resulting in minor negative impact on service reliability where turn times are tight	Adds 1:50 minutes each way	Low

TABLE 2-1: SUMMARY OF LONG LIST ALTERNATIVES – WATERBURY BRANCH

Alternative	Environmental Impacts	Engineering/ Operational Complexity	Ridership[1]	ROW Acquisition Required (acres)[2]	Est. Cost ($M)[3]	Operational & Fleet Impacts	Change in Travel Time and/or Number of Trips	TOD Potential
Existing Station Alternatives								
W-15 (Derby-Shelton Multi-Modal Alternative 1)	Low	Low	12,930	0	$3	Low	No change in travel time or number of trips	High
W-16 (Derby-Shelton Multi-Modal Alternative 2)	Low	Low	12,930	0	$13	Low	No change in travel time or number of trips	High
W-17 (Derby-Shelton Multi-Modal Alternative 3)	Medium – numerous crossings of waterbodies	Low	12,930	0	$143	Medium – requires extra trainsets and/or repositioning of equipment	Additional peak service possible	High
W-18 (Waterbury Multi-Modal Station)	Low	Low	12,930	0	$40	Low – expands storage capacity at northern end of branch, improving operational flexibility	No change in travel time or number of trips	High
W-19 (Relocated Naugatuck Platform)	Low	Low	12,930	Minimal ROW acquisition may be necessary for vertical circulation	$21	Low	No change in travel time or number of trips	High

TABLE 2-1: SUMMARY OF LONG LIST ALTERNATIVES – WATERBURY BRANCH

Alternative	Environmental Impacts	Engineering/ Operational Complexity	Ridership[1]	ROW Acquisition Required (acres)[2]	Est. Cost ($M)[3]	Operational & Fleet Impacts	Change in Travel Time and/or Number of Trips	TOD Potential
Other Modes								
W-20 (LRT)[5]	High – numerous crossings of waterbodies, especially north of Derby; 20 acres ROW acquisition in environmentally sensitive areas	High – requires creation of an entirely new transit system, with new infrastructure, vehicles, maintenance facility, and operating entity; ROW acquisition	12,611	20.31 + at least 10 acres for maintenance facility	$2,690	High – requires new, 11-vehicle fleet of rolling stock not currently in use by CTDOT, MNR, or local transit agencies	Substantial increase in service frequency, with 20-minute peak/ 30-minute off-peak headways	Medium – increased transit service at stations could increase pedestrian traffic
W-21 (BRT)	High – 11 acres ROW acquisition in environmentally sensitive areas	High – requires new infrastructure and vehicles; ROW acquisition	10,258	10.85	$583	Medium – requires dedicated fleet of 8 standard 40’ buses	Substantial increase in service frequency, with 20-minute peak/ 30-minute off-peak headways	Medium – increased transit service at stations could increase pedestrian traffic

TABLE 2-1: SUMMARY OF LONG LIST ALTERNATIVES – WATERBURY BRANCH

Alternative	Environmental Impacts	Engineering/ Operational Complexity	Ridership[1]	ROW Acquisition Required (acres)[2]	Est. Cost ($M)[3]	Operational & Fleet Impacts	Change in Travel Time and/or Number of Trips	TOD Potential
W-22 (Express Bus)	Low	Low	13,421	0	$17	Medium – requires dedicated fleet of 8 standard 40' buses	Substantial increase in service frequency: Route 1 (Waterbury-to-Bridgeport): 24-minute peak/30-minute off-peak headways Route 2 (Derby-to-Bridgeport): 13-minue peak headways (no off-peak service)	Low
W-23 (Shuttle Bus)	Low	Low	13,011	0	$10	Medium – requires dedicated fleet of 6 standard 40' buses	Increase in peak period service frequency at stations served by shuttle bus (19-minute peak headways)	Minimal change from existing

1 2030 daily boardings, as measured by Connecticut Statewide Travel Model travel demand forecasts

2 From initial ROW calculations completed for the Long List of Alternatives, as reported in the December 2009 *Waterbury Branch Long List Report*

3 From initial cost estimates developed for the Long List of Alternatives, as reported in the December 2009 *Waterbury Branch Long List Report*

4The new, five-minute cross-platform Derby-Shelton transfer that would increase travel time along the branch may be an improvement for passengers continuing *beyond* Bridgeport, where they currently undergo a less efficient drop-back transfer

5 For Double Track and LRT alternatives, the ROW is calculated using 15-foot offset from the second track

TABLE 2-2: SUMMARY OF LONG LIST ALTERNATIVES – NEW CANAAN BRANCH

Alternative	Environmental Impacts	Engineering/ Operational Complexity	Ridership[1]	ROW Acquisition Required (acres)[2]	Est. Capital Cost ($M)[3]	Operational & Fleet Impacts	Change in Travel Time and/or Number of Trips	TOD Potential
Signal and Track Modification Alternatives								
NC-1 (Springdale Siding)	Low	Low	3,465	0	$19	Medium – requires one additional trainset during morning peak and repositioning of equipment; no flexibility in schedule; requires rewrite of 2030 operating plan to provide optimal slots; reliability issues with siding	No change in peak direction travel time; adds 2 minutes reverse peak …… + 2 morning peak inbound trains + 1 morning reverse peak outbound train (-2 trains stopping at Springdale) + 2 evening peak outbound trains + 1 evening reverse peak inbound train (-3 trains stopping at Springdale)	Minimal change from existing
NC-2 (Full Signalization)	Low	Low	3,465	0	$8	Low – improves operations at New Canaan Station	No change in travel time or number of trips	Minimal change from existing

TABLE 2-2: SUMMARY OF LONG LIST ALTERNATIVES – NEW CANAAN BRANCH

Alternative	Environmental Impacts	Engineering/ Operational Complexity	Ridership[1]	ROW Acquisition Required (acres)[2]	Est. Capital Cost ($M)[3]	Operational & Fleet Impacts	Change in Travel Time and/or Number of Trips	TOD Potential
NC-3 (Full Signalization + 2nd Platform at New Canaan)	Low	Medium – capacity/ operational issues from removing bulk track; minor ROW acquisition	3,465	0.2	$11	Medium – one fewer trainset required in both morning and evening; however the evening operation whereby two revenue trainsets are combined into one non-revenue trip is no longer possible	No change in travel time ……. - 1 morning roundtrip - 1 evening roundtrip	Minimal change from existing
NC-4 (Full Signalization + Siding + 2nd Platform at New Canaan)	Low	Medium – capacity/ operational issues from removing bulk track; minor ROW acquisition	3,465	0.5	$34	Medium – requires one extra trainset during morning and evening peak and repositioning of equipment; more flexibility in schedule than NC-1 or NC-5; requires rewrite of 2030 operating plan to provide optimal slots; reliability issues with siding partially mitigated by 2nd platform at New Canaan	No change in travel time ……. + 2 morning peak inbound trains + 3 morning reverse peak outbound train (-2 trains stopping at Springdale) + 2 evening peak outbound trains + 3 evening reverse peak inbound trains (-3 trains stopping at Springdale)	Minimal change from existing

TABLE 2-2: SUMMARY OF LONG LIST ALTERNATIVES – NEW CANAAN BRANCH

Alternative	Environmental Impacts	Engineering/ Operational Complexity	Ridership[1]	ROW Acquisition Required (acres)[2]	Est. Capital Cost ($M)[3]	Operational & Fleet Impacts	Change in Travel Time and/or Number of Trips	TOD Potential
NC-5 (Full Signalization + Siding + 2nd Platform at Springdale)	Low	Low	3,465	0.3	$31	Medium – requires one extra trainset during morning and evening peak and repositioning of equipment; no flexibility in schedule; requires rewrite of 2030 operating plan to provide optimal slots; reliability issues with siding	No change in peak direction travel time; adds 2 minutes reverse peak …… + 2 morning peak inbound trains + 1 morning reverse peak outbound train + 2 evening peak outbound trains + 1 evening reverse peak inbound train	Minimal change from existing
NC-6 (Full Signalization + Siding + 2nd Platform at New Canaan AND Springdale)	Low	Medium – capacity/ operational issues from removing bulk track	3,465	0.5	$45	Medium – requires extra trainsets and repositioning of equipment; more flexibility in schedule than NC-1 or NC-5; requires rewrite of 2030 operating plan to provide optimal slots; reliability issues with siding partially mitigated by 2nd platform at New Canaan	No change in peak direction travel time; adds 2 minutes reverse peak …… + 2 morning peak inbound trains + 3 morning reverse peak outbound trains + 2 evening peak outbound trains + 3 evening reverse peak inbound trains	Minimal change from existing

TABLE 2-2: SUMMARY OF LONG LIST ALTERNATIVES – NEW CANAAN BRANCH

Alternative	Environmental Impacts	Engineering/ Operational Complexity	Ridership[1]	ROW Acquisition Required (acres)[2]	Est. Capital Cost ($M)[3]	Operational & Fleet Impacts	Change in Travel Time and/or Number of Trips	TOD Potential
NC-7 (Full Double Track)	Low	Medium	3,465	1.55	$198	Medium – requires extra trainsets and repositioning of equipment; most scheduling flexibility of all alternatives; no reliability issues	No change in travel time ……. + 1-3 morning peak inbound trains + 0-4 morning reverse peak outbound trains + 1-3 evening peak outbound trains + 1-4 evening reverse peak inbound trains	Minimal change from existing
Station Alternatives								
NC-8 East Main Street Station	Low	Low	3,527	Possible minor ROW acquisition required along New Haven Line; additional property required to construct parking facilities/joint development TOD	$23	Medium – subtracts 2 minutes from arrival/departure interval at Stamford	Slight increase in travel time (43-56 sec); no change in number of trips	High
NC-9 Glenbrook 1[4] (2nd platform)	Low	Low	3,465	0	$4	Low	No change in travel time or number of trips	Medium

TABLE 2-2: SUMMARY OF LONG LIST ALTERNATIVES – NEW CANAAN BRANCH

Alternative	Environmental Impacts	Engineering/ Operational Complexity	Ridership[1]	ROW Acquisition Required (acres)[2]	Est. Capital Cost ($M)[3]	Operational & Fleet Impacts	Change in Travel Time and/or Number of Trips	TOD Potential
NC-10 Glenbrook 2[4] (relocate station)	High – station relocation impacts adjacent residential neighborhood	Low	3,465	0	$5	Low	No change in travel time or number of trips	High
NC-11 Glenbrook 3[4] (TOD only)	Low	Low	3,465	0	$0	None	No change in travel time or number of trips	High
NC-12 Glenbrook 4[4] (eliminate station)	Low	Low	2,958	0	$2	Low	Slight decrease in travel time (approx. 45 sec); no change in number of trips	None – station would be eliminated
NC-13 Springdale Platform Extension	Low	Low	3,465	0	$2	Low	No change in travel time or number of trips	Medium
NC-14 Talmadge Hill Pedestrian/ Parking/Platform Improvements	Low	Low	3,465	0	$5	Low	No change in travel time or number of trips	Low
NC-15 New Canaan Station Platform Extension	Low	Low	3,465	0	$2.0	Low	No change in travel time or number of trips	Low

1 2030 daily boardings, as measured by Connecticut Statewide Travel Model travel demand forecasts

2 From initial ROW calculations completed for the Long List of Alternatives, as reported in the December 2009 *New Canaan Branch Long List Report*

3 From initial cost estimates developed for the Long List of Alternatives, as reported in the December 2009 *New Canaan Branch Long List Report*

4 TOD sites not included in Glenbrook Station ROW acquisition acreage

2.2 SCREEN 1 CRITERIA AND RESULTS

The initial screening, or "Screen 1," applied a uniform set of order-of-magnitude, pass/fail criteria to the Long List of Alternatives for each branch and retained only those alternatives that achieved the thresholds defined by the criteria. Each Long List alternative outlined above was evaluated against the following screening criteria:

- Environmental Constraints – Can the alternative avoid major impacts on environmental and community resources?
- Engineering and Operational Complexity – Can the alternative avoid extreme engineering challenges and negative impacts on existing infrastructure/transit service?
- Station Area Land Use – Does existing land use or do future land use plans support the transit improvements proposed in the alternative?
- Goals and Objectives – Does the project help meet the goals and objectives established for the project?
- Cost Efficiency – Is the cost of the alternative appropriate given the benefits it provides compared to similar alternatives?

Each alternative was given a score or "Pass" or "Fail" for each criterion. Based on those scores, and on input received at a Stakeholder Advisory Committee meeting on December 1, 2009 in Bridgeport, the Project Team reduced the Long List of Alternatives to a Short List of Alternatives. Alternatives that failed at least two of the pass/fail criteria were eliminated from further consideration, as they would likely cause serious impacts to the community or would degrade existing transit service. Where an alternative failed only one pass/fail criterion, the Project Team and SAC determined if that alternative merited further consideration during Phase II of the study.

Tables 2-3 and 2-4 display the results of this exercise. Alternatives highlighted in grey were retained for the Short List of Alternatives.

TABLE 2-3: SCREEN 1 RESULTS – WATERBURY BRANCH

Alternative	Screen 1 Criteria					Notes
	Environmental Constraints	Engineering/ Operational Complexity	Station Area Land Use	Meets Goals/ Objectives	Cost Efficiency	
Signal and Track Alternatives						
W-1 (Increased Train Length)	Pass	Pass	Pass	Pass	Pass	-Would increase branch capacity without adding new track or taking up additional schedule slots -Would add longer, high-level platforms at all stations, making boarding more efficient
W-2 (Upgraded Track Speed)	Pass	Pass	Pass	Pass	Fail	- Time savings minimal (63-67 seconds) relative to cost -Additional time savings would only be possible with a major reconfiguration and new right-of-way acquisition
W-3 (Full Signalization)	Pass	Pass	Pass	Pass	Pass	-Would allow more than one train to operate on the branch at any given time -Increase in peak period and midday service possible when combined with multiple passing sidings
Electrification Alternatives						
W-4 (Full Electrification)	Pass	Pass	Pass	Pass	Fail	-Geometric constraints limit the speed improvement that could be achieved by introducing EMU rolling stock on the branch, even when combined with upgraded track speeds - Maximum time savings minimal (2 minutes) relative to cost -Additional time savings would only be possible with a major reconfiguration and new right-of-way acquisition
W-5 (Partial Electrification)	Pass	Pass	Pass	Pass	Fail	
W-6 (W-2 + W-4)	Pass	Pass	Pass	Pass	Fail	
W-7 (W-2 + W-5)	Pass	Pass	Pass	Pass	Fail	

TABLE 2-3: SCREEN 1 RESULTS – WATERBURY BRANCH

Alternative	Screen 1 Criteria					Notes
	Environmental Constraints	Engineering/ Operational Complexity	Station Area Land Use	Meets Goals/ Objectives	Cost Efficiency	
Double Track Alternatives						
W-8 (Full Double Track)	Pass	Pass	Pass	Pass	Fail	-Improved schedule flexibility and reliability -Numerous crossings of waterbodies (especially north of Derby-Shelton) require new structures and environmental coordination -Service frequency benefit similar to that achieved by adding one or more passing sidings, at considerably higher cost
W-9 (Partial Double Track)	Pass	Pass	Pass	Pass	Fail	
Passing Siding Alternatives						
W-10 (Beacon Falls Passing Siding)	Pass	Pass	Pass	Pass	Pass	-Increased peak and midday service -Fewer impacts/lower cost than full double track
W-11 (Four Passing Sidings)	Pass	Pass	Pass	Pass	Pass	
New Station Alternatives						
W-12 (Devon Alternative 1)	Pass	Fail	Fail	Pass	Fail	-Devon Station would allow hourly round trip Devon-to-Waterbury shuttles in addition to existing peak period service to Bridgeport -Service would be improved considerably, with only one additional train set required in the AM and two in the PM -Major utility relocation required -Station area land use not conducive to TOD
W-13 (Devon Alternative 2)	Pass	Pass	Fail	Pass	Pass	-Devon Station would allow hourly round trip Devon-to-Waterbury shuttles in addition to existing peak period service to Bridgeport -Service would be improved considerably, with only one additional train set required in the AM and two in the PM -Station area land use not conducive to TOD

TABLE 2-3: SCREEN 1 RESULTS – WATERBURY BRANCH

Alternative	Screen 1 Criteria					Notes
	Environmental Constraints	Engineering/ Operational Complexity	Station Area Land Use	Meets Goals/ Objectives	Cost Efficiency	
W-14 (Wilbur Cross Parkway Station)	Pass	Fail	Fail	Fail	Fail	-Station would be accessed primarily by auto, increasing roadway congestion in the vicinity -Public comments indicate that even with a new Wilbur Cross Station, many potential riders from north of the branch would still continue to Bridgeport Station, where service is more frequent -Adds 1:50 minutes to one-way travel time, without providing any operational benefit -Site constrained by steep slopes
Existing Station Alternatives						
W-15 (Derby-Shelton Multi-Modal Alternative 1)	Pass	Pass	Pass	Pass	Pass	-Improved multi-modal connections with fewer impacts/lower cost than other Derby-Shelton multi-modal alternatives
W-16 (Derby-Shelton Multi-Modal Alternative 2)	Pass	Pass	Pass	Pass	Fail	-Similar benefit as Derby-Shelton Multi-Modal Alternative 1, but with higher cost and impacts
W-17 (Derby-Shelton Multi-Modal Alternative 3)	Pass	Pass	Pass	Pass	Fail	-Double track from Devon to Derby would require new structures over waterbodies and environmental coordination -Similar benefit as Derby-Shelton Multi-Modal Alternative 1, but with higher cost and impacts
W-18 (Waterbury Multi-Modal Station)	Pass	Pass	Pass	Pass	Pass	-Added storage capacity at northern end of branch -Improved multi-modal connections

TABLE 2-3: SCREEN 1 RESULTS – WATERBURY BRANCH

Alternative	Screen 1 Criteria					Notes
	Environmental Constraints	Engineering/ Operational Complexity	Station Area Land Use	Meets Goals/ Objectives	Cost Efficiency	
W-19 (Relocated Naugatuck Platform)	Pass	Pass	Pass	Pass	Pass	-Moving platform off curve allows longer, high-level platform -Consistent with planned station area development
Other Modes						
W-20 (LRT)	Fail	Fail	Pass	Pass	Fail	-Requires creation of an entirely new transit system, with new infrastructure, vehicles, maintenance facility, and operating entity -Requires ROW acquisitions to accommodate new guideway alongside existing rail, which will continue to be used for freight -Numerous crossings of waterbodies (especially north of Derby-Shelton) require new structures and extensive environmental coordination -High cost
W-21 (BRT)	Fail	Fail	Pass	Pass	Fail	-Requires new infrastructure and vehicles -Requires ROW acquisitions to accommodate new guideway alongside existing rail, which will continue to be used for freight -Traffic delays in street-running sections could increase schedule uncertainty
W-22 (Express Bus)	Pass	Pass	Fail	Pass	Pass	-Increased service frequency with minimal capital investment -Traffic delays could increase schedule uncertainty -Replacing rail with conventional bus service could hinder ongoing TOD efforts in station areas
W-23 (Shuttle Bus)	Pass	Pass	Pass	Pass	Pass	-Fills rail service gaps with supplemental transit service -Traffic delays could increase schedule uncertainty

TABLE 2-4: SCREEN 1 RESULTS – NEW CANAAN BRANCH

Alternative	Screen 1 Criteria					Notes
	Environmental Constraints	Engineering/ Operational Complexity	Station Area Land Use	Meets Goals/ Objectives	Cost Efficiency	
Signal and Track Alternatives						
NC-1 (Springdale Siding)	Pass	Pass	Pass	Pass	Pass	-Would add peak and reverse peak trips (two reverse peak trips without stop at Springdale Station)
NC-2 (Full Signalization)	Pass	Pass	Pass	Pass	Pass	-Would improve operations at New Canaan Station, reducing the time it takes to enter and leave the station
NC-3 (Full Signalization + 2nd Platform at New Canaan)	Pass	Fail	Pass	Fail	Pass	-Eliminating bulk track at New Canaan Station would decrease storage capacity and complicate operations -Eliminating bulk track without adding a passing siding would also degrade existing service (one AM peak round trip and one PM peak round trip between Stamford (or beyond) and New Canaan would be eliminated)
NC-4 (Full Signalization + Siding + 2nd Platform at New Canaan)	Pass	Fail	Pass	Fail	Pass	-Eliminating bulk track at New Canaan Station would decrease storage capacity and complicate operations -Constructing a 2nd platform at Springdale (Alternative NC-5) allows more trips while also allowing reverse peak stops at Springdale and without losing storage capacity along the branch
NC-5 (Full Signalization + Siding + 2nd Platform at Springdale)	Pass	Pass	Pass	Pass	Pass	-Would add morning and evening peak and reverse peak trips without losing storage capacity along the branch

TABLE 2-4: SCREEN 1 RESULTS – NEW CANAAN BRANCH

Alternative	Screen 1 Criteria					Notes
	Environmental Constraints	**Engineering/ Operational Complexity**	**Station Area Land Use**	**Meets Goals/ Objectives**	**Cost Efficiency**	
NC-6 (Full Signalization + Siding + 2nd Platform at New Canaan AND Springdale)	Pass	Fail	Pass	Fail	Pass	-Eliminating bulk track at New Canaan Station would decrease storage capacity and complicate operations
NC-7 (Full Double Track)	Pass	Pass	Pass	Pass	Fail	-Benefit similar to that achieved by adding Springdale passing siding, at considerably higher cost
Station Alternatives						
NC-8 East Main Street Station	Pass	Fail	Pass	Pass	Pass	-Transit-supportive land use policies and zoning in place and demand for station as evidenced by demographic and development trends -But a ***mainline*** station would allow higher frequency service and better access to the full CT rail network, especially east of Stamford -Creating a mainline station presents additional engineering/ operational complexities, and also falls outside the scope of this study ***→ To be studied separately***
NC-9 Glenbrook 1* (2nd platform)	Pass	Pass	Pass	Fail	Pass	-Platform length limited by grade crossings north/south of station -Adding second platform would provide no operational benefit -TOD element can be implemented independent of this study

TABLE 2-4: SCREEN 1 RESULTS – NEW CANAAN BRANCH

Alternative	Screen 1 Criteria					Notes
	Environmental Constraints	Engineering/ Operational Complexity	Station Area Land Use	Meets Goals/ Objectives	Cost Efficiency	
NC-10 Glenbrook 2* (relocate station)	Fail	Pass	Pass	Fail	Pass	-Major community impact with no operational benefit
NC-11 Glenbrook 3* (TOD only)	Pass	Pass	Pass	Fail	Pass	-Would provide no operational benefit -TOD can be implemented independent of this study
NC-12 Glenbrook 4* (eliminate station)	Pass	Pass	Fail	Fail	Pass	-Eliminating station would degrade existing service -Eliminating station would hinder TOD efforts already underway
NC-13 Springdale Platform Extension	Pass	Pass	Pass	Pass	Pass	-Would allow all cars to open doors, improving station boarding
NC-14 Talmadge Hill Pedestrian/ Parking/ Platform Improvements	Pass	Pass	Pass	Pass	Pass	-Would expand parking capacity and improve pedestrian facilities within the station property
NC-15 New Canaan Station Platform Extension	Pass	Pass	Pass	Pass	Pass	-Would allow all cars to open doors, improving station boarding

2.3 SHORT LIST OF ALTERNATIVES – WATERBURY BRANCH

The Waterbury Branch Short List of Alternatives included a No Build Alternative, a TSM Alternative, and nine build alternatives. The descriptions below detail the improvements and anticipated outcomes associated with each alternative. In some cases, these Short List alternative descriptions, estimated capital costs, and right-of-way requirements differ somewhat from their Long List counterparts (and from the information presented at the March 2010 Public Information Meetings), reflecting the ongoing refinement of alternatives based on input from the SAC and the public and the more extensive analysis required to define them in more detail. The cost estimates reported in this section are based on the final May 2010 revision, presented in Appendix A.

Eight build alternatives proposed improving commuter rail service on the Waterbury Branch and two involved either replacing or supplementing existing commuter rail with express bus service. While none of these alternatives addressed the extension of service north of Waterbury, which falls outside the scope of this study, the potential to extend transit service beyond Waterbury in the future would not be precluded by any of the alternatives identified below. Likewise, none of the alternatives described in this section would prevent future electrification or double tracking of the branch.

The eight commuter rail alternatives were developed to improve frequency and reliability of service for Waterbury Branch customers. Therefore, the descriptions below are limited to improvements that directly affect operations on the branch. Station improvements that improve the customer experience but have no operational implications—for instance, amenities like canopies, benches, bicycle storage, real-time train information—were reflected in the final study recommendations described in Chapter 7 but were not considered during the screening process because they to do not help differentiate alternatives in terms of service frequency and reliability. Amenity improvements, along with station upgrades related to Americans with Disabilities Act (ADA) compliance, will be developed in more detail during later Phases III through V of the project.

Similarly, these alternatives did not propose any specific transit oriented development (TOD) projects. While opportunities for TOD in the station areas factored into whether alternatives passed or failed the Land Use criterion during Screen 1, implementation of such projects would be up to local municipalities in coordination with CTDOT. Potential TOD opportunities along the branch were identified in a separate *Waterbury Branch Transit Oriented Development Report* in September 2009 and are summarized in Chapter 4.

2.3.1 No Build Alternative

The No Build Alternative establishes the base case condition for the Waterbury Branch if no substantive improvements were implemented. The impacts of the various build alternatives under consideration were compared to the No Build Alternative, helping to define the resulting benefit anticipated from the construction and financial investment for the recommended project(s). The No Build scenario for the Waterbury Branch reflects population and employment changes that are anticipated to occur independently of any transportation improvements. This alternative also assumes that other planned projects with committed funds will be constructed.

Existing Waterbury Branch Passenger Service Operations

Seven round trip shuttles are operated between Waterbury and Bridgeport (making connections with New Haven Line trains). Shuttles reverse direction at CP-255 west of Bridgeport. In some cases (particularly when a track is out of service west of CP-255), trains must pull east of CP-255 (opposite the Bridgeport station) on Track 1 or 2 to layover. Equipment for the first southbound shuttle train deadheads (i.e., operates in non-revenue service) west to CP-261 (Devon) from New Haven and then north to Waterbury using the northeast leg of the CP-261 wye. This equipment returns to New Haven after the last northbound shuttle.

An April 7, 2008 schedule change added a second train to serve the branch in the morning peak, which follows the first deadhead train from New Haven up to Waterbury and then departs Waterbury first (first-in-last-out at Waterbury) as Train 1923. This train proceeds directly to Stamford, where it discharges all passengers and goes out of revenue service. The rolling stock then proceeds to Port Chester, where it dwells for 10 minutes on Track 3 and then operates as Train 1323 to GCT.

The Waterbury Branch is unsignalized, limiting it to 59 mph under Federal Railroad Administration (FRA) rules, and there are no passing sidings. The most frequent service that can be operated under these conditions is every two hours in each direction, allowing 20 minute turns at Waterbury and 10 minutes between southbound and northbound trains at the beginning of the single track branch at CP-261 (Devon). In the peak periods, this frequency is already achieved in the current schedules, with headways of roughly every three hours during the off peak period.

Existing Waterbury Branch Freight Service Operations

Freight movements on the Waterbury Branch are provided by the Providence and Worcester (P&W) Railroad between Milford and Derby and the Pan Am Railway (Springfield Terminal Railway/Guilford/Boston & Maine) between Derby and Waterbury. Existing Pan Am Railway customers on the Waterbury Branch Line include:

- Albert Brothers
- Waterbury Republican
- Baer Supply
- Prime Source
- Tilcon

In May 2008 Pan Am Railway and Norfolk Southern Railway Company announced a newly formed company to create an improved rail route between Albany and Boston called the “Patriot Corridor.” This joint venture of Norfolk Southern and Pan Am is to be called "Pan Am Southern." Pan Am Southern includes the Waterbury Branch and Pan Am Railway’s track rights from Waterbury to Derby, where a connection is made with the Maybrook Line to points west. Future demand for freight service is anticipated to increase on the Waterbury Branch, further impacting passenger operations.

P&W currently operates an aggregate train on the Waterbury Branch. P&W has an 8:30PM northbound window every evening, during which they run the aggregate train from the New Haven Line mainline to Derby. The train returns southbound between 2:00AM and 4:00AM.

For all alternatives outlined in this report, it was conservatively assumed that Waterbury Branch freight service would double in the future.

Metro-North's 2030 Operating Plan

The 2030 Metro-North operating plan includes an additional three New Haven Line trains departing in the AM peak period from New Haven to GCT. The operating plan anticipates implementation of the hourly Acela train service and hourly Regional train service in each direction throughout the day. It also anticipates that Metro-North will operate at 3-minute headways on the New Haven Line between New Haven and CP 112 (where the New Haven Line diverges from the Harlem Line, north of Woodlawn Station in the Bronx), and at 2 ½-minute headways from CP 112 to GCT. The plan includes new stations on the New Haven Line at West Haven, Orange, Georgetown, and Fairfield-Metro.

Planned Transit Improvements

Positive Train Control. The Railroad Safety Enhancement Act of 2008 (RSEA), passed by the U.S. Congress in November 2008 (H.R. 2095), requires implementation of Positive Train Control (PTC) on all mainline Class I railroad, intercity rail passenger, and commuter rail passenger lines by December 31, 2015. PTC systems, which integrate command, control, communications, and information systems for regulating train movements with safety, security, and efficiency, can be used in conjunction with a signal system or as a stand-alone system. On-board computers have the ability to automatically enforce movement and continually update operating data systems with information on the location of other trains. While conventional signal systems use electrical circuits in track blocks to determine train location by block occupancy, PTC systems use Global Positioning System (GPS) or transponders augmented by odometers to determine train location.

Although not required on the Waterbury Branch given the current level of service, it is assumed that service on the branch will increase in the future and that PTC will eventually be introduced. PTC would be installed separate from the Waterbury and New Canaan Branch Lines Needs and Feasibility Study, although it could be timed to coincide with the implementation of study improvements like the signalization of the branch. Full signalization of the Waterbury Branch plus a signal system overlay using Amtrak's Advanced Civil Speed Enforcement System (ACSES) would satisfy PTC requirements if service were increased on the branch.

Planned Roadway Improvements

While there are no major roadway improvements planned or under construction in the Waterbury Branch corridor at this time, several studies are currently underway that may result in changes to the roadway network prior to the implementation of any Waterbury and New Canaan Branch Lines Needs and Feasibility Study improvements.

Route 8 Study (Interchanges 22-30) (State Project 124-164). CTDOT is conducting a study that will identify transportation deficiencies and define near- and long-term improvements for the corridor. The study began in October 2008.

Route 67/Route 42 Connector Road Study (State Project 124-163). VCOG is studying potential transportation improvements in the Seymour/Beacon Falls portion of the corridor, including the possibility of a connector road between Route 42 and Route 67. The goal of this study is to develop a solution to the transportation needs of this part of the Valley Region that is

compatible with the involved communities' *Vision of the Future*. Phase A of the study began late May 2008.

I-84/Route 8 Waterbury Interchange Needs and Deficiencies Study (State Project 151-301). CTDOT is evaluating the transportation needs along I-84 between Exits 18 and 23 and on CT-8 between Exits 30 and 35 in Waterbury. An implementation plan of near- and long-term roadway modifications will be proposed to improve roadway operations within the study area.

I-84 Environmental Impact Statement (EIS). CTDOT is preparing an EIS to evaluate the effects of adding a third general purpose lane on I-84 in each direction, from the New York State line (Exit 1) to Exit 19 in Waterbury.

Route 67 Traffic Study, Seymour. CTDOT is studying potential operational improvements at intersections in the portion of Route 67 just west of Route 8 in Seymour.

2.3.2 Transportation Systems Management Alternative (W-23 Shuttle Bus)

A TSM alternative consists of transportation improvements designed to achieve as many of the goals and objectives of a project as possible while keeping costs to a minimum. A TSM alternative is among those considered for all projects funded by the Federal Transit Administration (FTA).

For the Short List of Alternatives, it was determined that W-23 Shuttle Bus from the Long List of Alternatives was consistent with the purpose of a TSM alternative because it had the potential to enhance transit service without major capital investment. It was developed in response to commuters who indicated that they would be willing to utilize the Waterbury Branch if more evening service were provided. This alternative would *supplement* (not replace) peak-hour commuter rail service with limited stop express bus service. To improve the cost-effectiveness and frequency of service, the TSM Alternative would only serve Bridgeport, Derby-Shelton, and either Naugatuck or Waterbury. All other stations would continue to be served by the existing train schedule.

The alignment would begin at Bridgeport Station, continuing north along Water Street to Fairfield Avenue, where it would turn west and continue to CT-8. The alignment would then turn north onto CT-8. The alignment would follow CT-8 to CT-34 (Derby Main Street) where it would exit and serve Derby-Shelton Station.

After serving Derby-Shelton Station, the shuttle bus route would return onto CT-8 and continue up to Waterbury. At Waterbury, the alignment would exit CT-8 at Freight Street. From Freight Street, the alignment would turn south to Meadow Street to serve the existing Waterbury Station. Alternately, Naugatuck could serve as the northern terminus of the Shuttle Bus route, with buses exiting CT-8 at Exit 26 and turning left onto Maple Street to serve the rail station and downtown Naugatuck. On the return trip, the shuttle bus would return directly to Bridgeport via the same alignment, but without stopping at Derby-Shelton Station.

Operations Plan

The TSM Alternative is designed as a low-cost approach to increasing the number of peak-period connections between the New Haven Line and stations on the Waterbury Branch. The operations plan uses two strategies to meet these objectives:

- **Pulse transfers.** Buses in the evening peak would be scheduled to wait for outbound trains from New York to arrive before departing. Similarly, southbound buses operating in the morning peak would be scheduled to arrive shortly before arriving inbound trains, thus minimizing the total time passengers spend transferring between services.
- **Limited stop service.** Unlike the other alternatives, evening operations of the shuttle bus would only provide service from Bridgeport to Derby-Shelton Station and Naugatuck/Waterbury Station. Stops to intermediary stations and stops in the off-peak direction would be eliminated to decrease travel times, maximize the number of roundtrips each bus can make, and minimize the fleet requirements of the alternative.

Using this approach, it would be possible to serve 13 of the 20 trains arriving at Bridgeport in the evening peak hour. The combined bus and commuter rail schedule would provide an average headway of 19 minutes. Table 2-5 provides a sample schedule illustrating the operations plan under the TSM Alternative. This schedule is conceptual only and is intended to demonstrate the level of service that would be achieved by the alternative. If the TSM Alternative were advanced, the schedule would be developed by the appropriate transit service providers prior to implementation.

TABLE 2-5: SAMPLE SHUTTLE BUS PM PEAK HOUR SCHEDULE

Outbound Train Arrival at Bridgeport	Departure Times			Headway (min)
	Bridgeport	Derby-Shelton	Waterbury	
5:11 PM				
5:19 PM	5:19 PM	5:41 PM	6:06 PM	
5:29 PM				
5:38 PM	5:38 PM	6:00 PM	6:25 PM	19
5:43 PM				
5:49 PM	5:55 PM	6:18 PM	6:52 PM	17
6:06 PM	6:06 PM	6:28 PM	6:53 PM	11
6:13 PM	6:13 PM	6:35 PM	7:00 PM	7
6:22 PM				
6:28 PM	6:28 PM	6:50 PM	7:15 PM	15
6:44 PM				
6:55 PM	6:55 PM	7:17 PM	7:42 PM	27
7:09 PM				
7:17 PM	7:17 PM	7:39 PM	8:04 PM	22
7:31 PM				
7:43 PM	7:43 PM	8:05 PM	8:30 PM	26
8:06 PM	8:06 PM	8:28 PM	8:53 PM	23
8:19 PM	8:24 PM	8:45 PM	9:19 PM	17
8:38 PM	8:38 PM	9:00 PM	9:26 PM	14
9:00 PM	9:00 PM	9:22 PM	9:48 PM	22

Sources:

Metro-North New Haven Line schedule downloaded 1/28/09.

Google Maps travel times used to estimate travel times in mixed traffic conditions. 2030 travel times assume travel times will increase at same rate as employment growth in the Waterbury Branch travelshed.

It was assumed that there would be a morning peak service that would mirror the evening service, stopping at Derby-Shelton Station in the southbound direction and bypassing it in the off-peak direction. No midday service would be provided as part of this operations plan.

Stations and Facilities

Dedicated bus bays would be provided at each of the stations currently served by the Waterbury Branch. Additional parking spaces at Derby-Shelton Station and Waterbury Station might be required.

Vehicles

It was assumed that the TSM Alternative would use a standard 40-foot coach with capacity for 40 seated and 30 standing passengers. A total of six buses would be needed to operate the service: five for peak operations and one spare.

Capital and Operating Costs

The conceptual capital cost for constructing this alternative would be $6 million (2008 dollars).

Based on CT Transit-Hartford Division operations and maintenance costs per hour of revenue service in 2007, the conceptual annual operating cost for this alternative would be approximately $800,000.

2.3.3 Increased Train Length (W-1)

This alternative would maintain the existing Waterbury Branch service schedule, diesel rolling stock, and trackage but would increase the train length from the four-car consist typically used during peak periods today to a six- or eight-car peak-period consist. Extending train length would increase capacity between Waterbury and Bridgeport without requiring additional schedule slots on the New Haven Line, although it would do little to address service frequency, a key objective for the improvement of transit service in the corridor.

The alternative would involve lengthening platforms at all Waterbury Branch stations in order to accommodate the extended consist. The existing low-level platforms used at all branch stations except Waterbury would be replaced with high-level platforms to allow level boarding, which can decrease dwell time at stations. The new high-level platforms would be extended to 680 feet at all Waterbury Branch stations except Seymour and Ansonia. At Seymour Station, the maximum platform length that could be constructed without realigning the curves north and south of the station is 500 feet, which would allow five cars to open their doors at the station (passengers at the front or back of a longer train would walk through the train to the nearest open door to disembark). At Ansonia Station, the maximum platform length is 425 feet, which would allow four cars to open doors. Because the existing boarding area is on a curve just north of the Housatonic River floodgate, the platform location would be shifted northward to accommodate a high-level platform at the station, and minor realignment of the curves north and south of the platform also would be necessary. The existing platform at Naugatuck, also on a curve, would be shifted to the south as described below for Alternative W-19, Relocated Naugatuck Platform.

The Waterbury Station platform, which currently allows level boarding, would be extended from its existing length of approximately 112 feet to 680 feet. Figures 2-1 through 2-6 show the proposed platform lengths and locations along the branch.

The conceptual capital cost for constructing this alternative would be $20 million (2008 dollars). In addition to these capital improvements, increasing train length would also require Metro-North to reassign existing equipment or acquire additional equipment to run on the branch.

2.3.4 Full Signalization (W-3)

This alternative would implement a Centralized Traffic Control (CTC) system along the entire Waterbury Branch. The signal system, which would be controlled by rail traffic controllers at the existing GCT Dispatch Center, would allow two trains heading in the same direction to operate on the branch at the same time. Currently, the full 27-mile length of the branch is a single block, meaning that a second train cannot enter the branch from the mainline until the train ahead of it reaches Waterbury Station. This severely limits the number of morning and evening peak period trains that can operate on the branch. By signalizing the Waterbury Branch, the corridor could be divided into a series of blocks, where a second train could enter a new block once the train ahead of it pulled onto the next block. This would allow, for example, two trains traveling north from Bridgeport to depart closer together, rather than forcing the second train to wait for the first train to reach Waterbury before departing, which could reduce Waterbury Branch headways.

This improvement would produce the greatest benefit if combined with the addition of a fully interlocked (signalized) passing siding or sidings (Alternatives W-10 and W-11) where trains traveling in the same direction or in different directions could bypass one another. With fully signalized interlockings, trains could move between tracks without the time-consuming need for train crews to throw switches by hand.

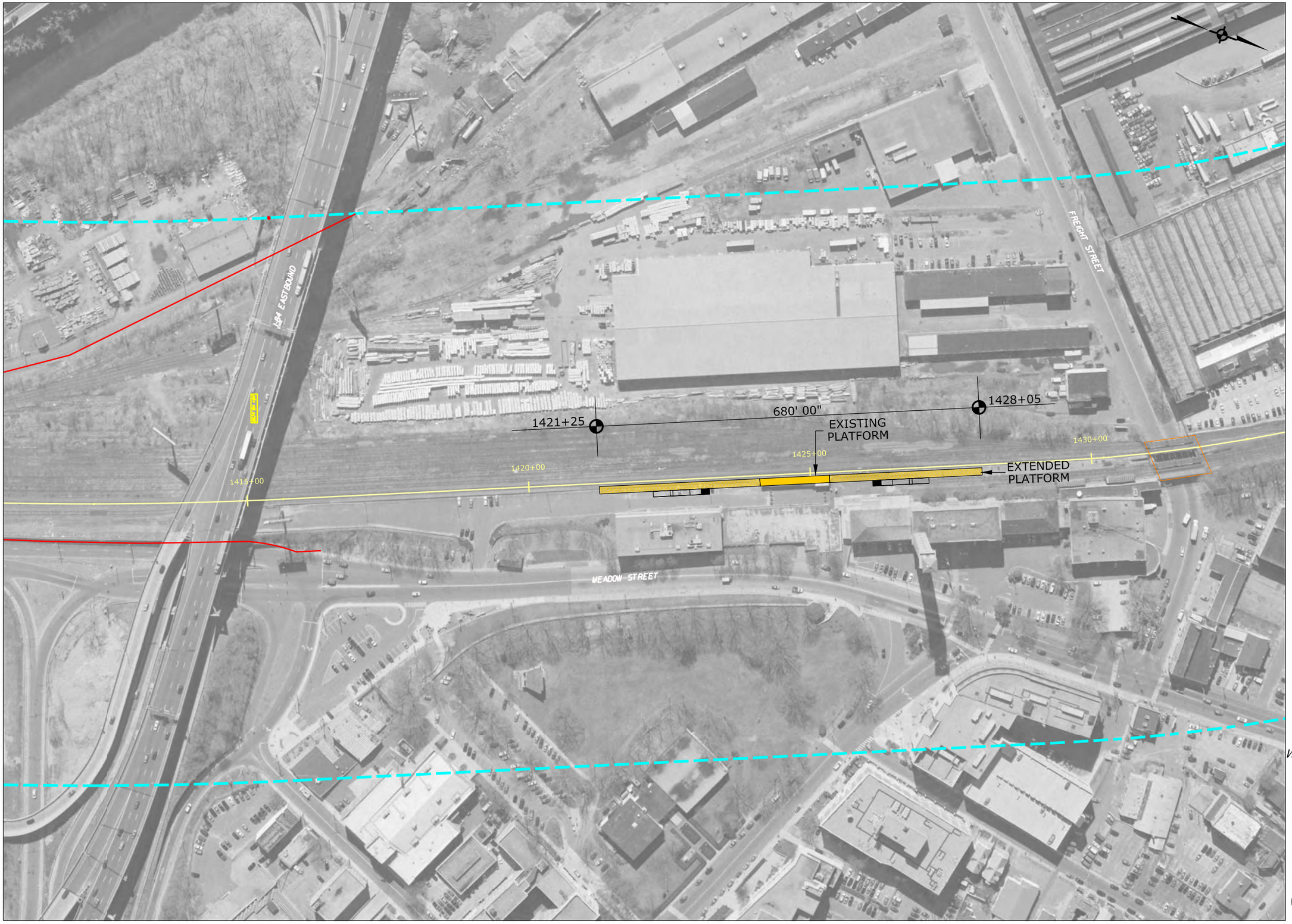
As discussed above, PTC is expected to be implemented on the branch eventually, independent of this study. However, if the full signalization of the branch is pursued, signalization and PTC could be installed concurrently.

The conceptual capital cost for constructing this alternative would be $128 million (2008 dollars).

2.3.5 Beacon Falls Passing Siding (W-10)

This alternative would add one passing siding on the Waterbury Branch in the Town of Beacon Falls, either north of the Beacon Falls Station between MP 18 and 20 (Figures 2-7a and b), or south of the station, beginning just north of the Seymour-Beacon Falls town line, between MP 15 and 17 (Figures 2-8a and b). Either passing siding would be of sufficient length that, with Centralized Traffic Control (CTC) on the line, trains could enter and leave the siding at 30 MPH.

A RAILSIM TPC run was performed to determine the capacity (minimum headway) improvement achieved by adding a single passing siding either north or south of Beacon Falls. With either passing siding, it would be possible to send one more non-revenue train northbound to Waterbury (for another early morning double berth), which would allow an extra southbound morning peak period train to operate. It also would be possible to support an extra midday round trip and an extra late afternoon/early evening round trip.



LEGEND

- EXISTING R.R. TRACK
- R.O.W.
- RAIL STUDY CORRIDOR
- XX — MILE POST MARKER
- R.R. STRUCTURES
- PLATFORM, EXISTING
- PLATFORM, PROPOSED
- WATERCOURSE
- CHANNEL ENCROACHMENT LINE
- R.R. STATION PARKING
- SIDING/NEW R.R. TRACK

Figure 3-1:
Waterbury Station
Platform Extension

CROSSING DATA

MILE — CROSSING STREET/FEATURE

6JG UG STAMFORD RD. OD

OPEN DECK

AG - AT GRADE
UG - UNDERGRADE
OH - OVERHEAD

SCALE IN FEET
0 80 160

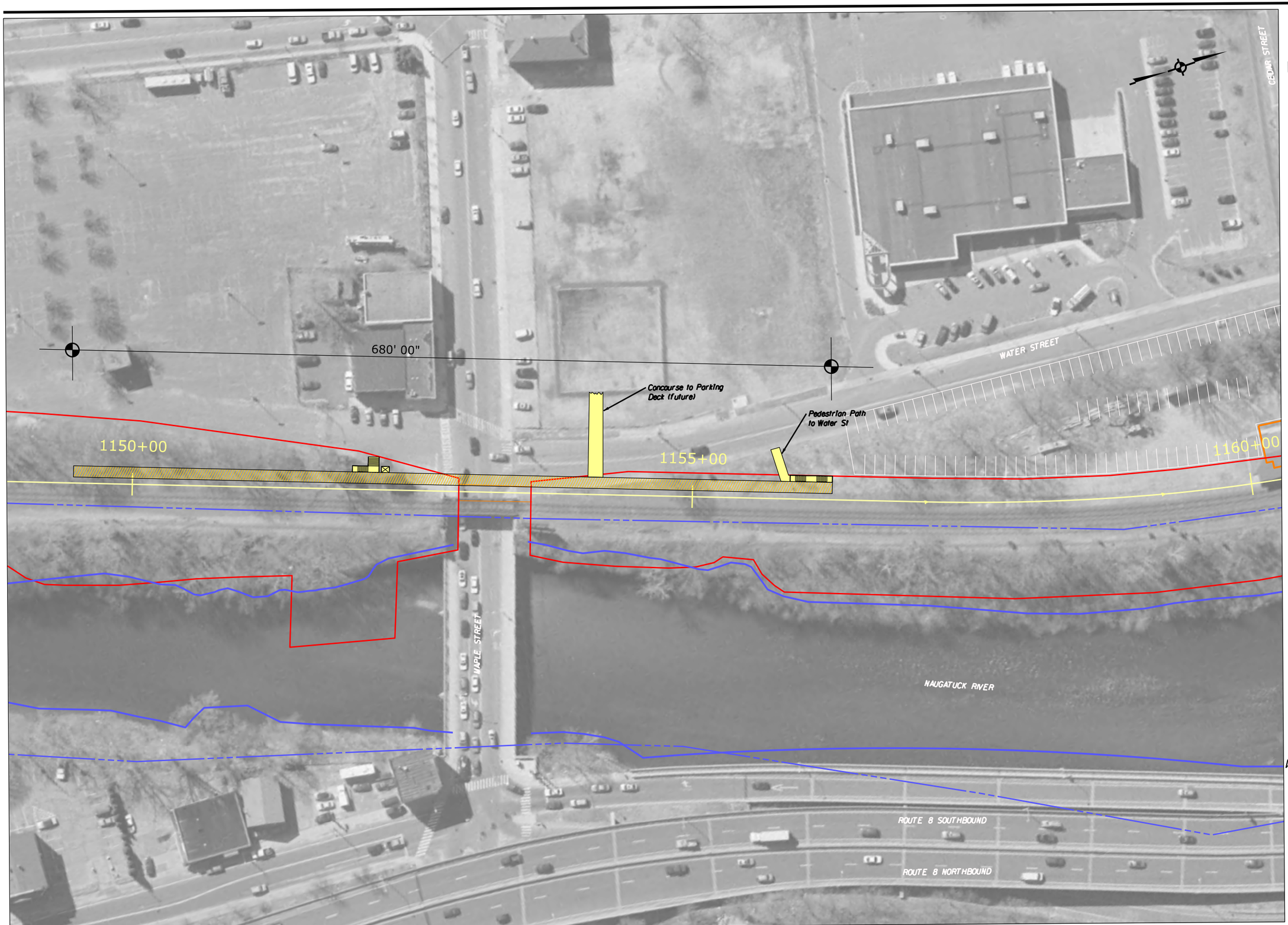
WATERBURY AND NEW CANAAN BRANCH LINES
NEEDS & FEASIBILITY STUDY
PROJECT NO. 170-2562

WATERBURY BRANCH LINE

EXTENDED WATERBURY STATION PLATFORM PROPOSED PLAN

CONNECTICUT DEPARTMENT OF TRANSPORTATION

PARSONS



LEGEND

- EXISTING R.R. TRACK
- R.O.W.
- RAIL STUDY CORRIDOR
- MILE POST MARKER (XX)
- R.R. STRUCTURES
- PLATFORM, EXISTING
- PLATFORM, PROPOSED
- WATERCOURSE
- CHANNEL ENCROACHMENT LINE
- R.R. STATION PARKING
- SIDING/NEW R.R. TRACK

Figure 2-2: Naugatuck Station Platform Extension/ Relocation

CROSSING DATA

MILE | CROSSING STREET/FEATURE

6.16 UG STAMFORD RD. OD

AG - AT GRADE
UG - UNDERGRADE
OH - OVERHEAD

OPEN DECK

SCALE IN FEET
0 40 80

WATERBURY AND NEW CANAAN BRANCH LINES
NEEDS & FEASIBILITY STUDY
PROJECT NO. 170-2562

WATERBURY BRANCH LINE

RELOCATED NAUGATUCK PLATFORM PROPOSED PLAN

CONNECTICUT DEPARTMENT OF TRANSPORTATION

PARSONS

LEGEND

- EXISTING R.R. TRACK
- R.O.W.
- RAIL STUDY CORRIDOR
- XX MILE POST MARKER
- R.R. STRUCTURES
- PLATFORM, EXISTING
- PLATFORM, PROPOSED
- WATERCOURSE
- CHANNEL ENCROACHMENT LINE
- R.R. STATION PARKING
- SIDING/NEW R.R. TRACK

Figure 2-3:
Beacon Falls
Station Platform
Extension

CROSSING DATA

MILE | CROSSING STREET/FEATURE

6J6 UG STAMFORD RD. OD

AG - AT GRADE
UG - UNDERGRADE
OH - OVERHEAD

OPEN DECK

SCALE IN FEET
0 40 80

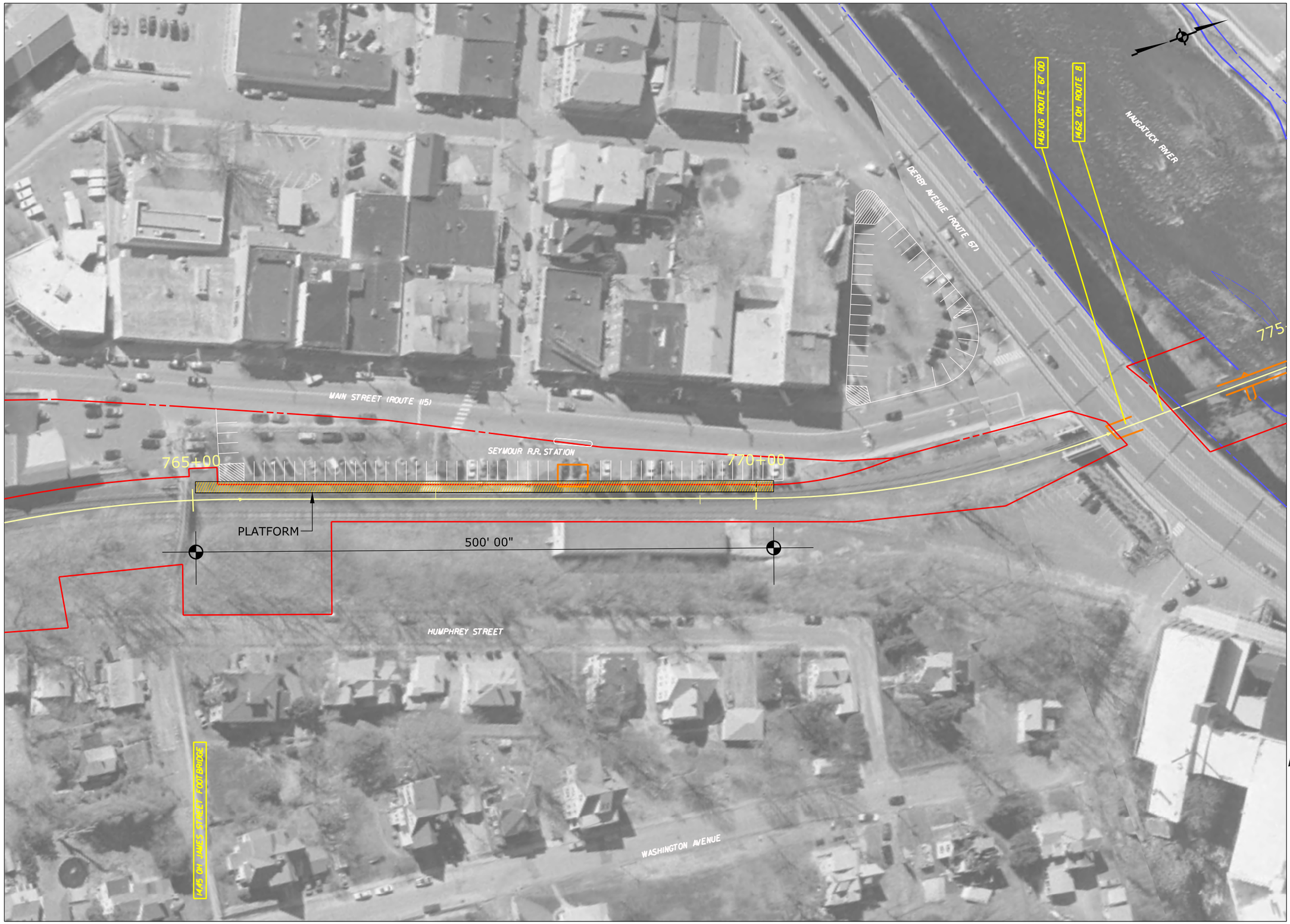
WATERBURY AND NEW CANAAN
BRANCH LINES
NEEDS & FEASIBILITY STUDY
PROJECT NO. 170-2562

WATERBURY BRANCH LINE

HIGH-LEVEL BEACON FALLS
STATION PLATFORM
PROPOSED PLAN

CONNECTICUT
DEPARTMENT OF TRANSPORTATION

PARSONS



LEGEND

- EXISTING R.R. TRACK
- R.O.W.
- RAIL STUDY CORRIDOR
- XX — MILE POST MARKER
- R.R. STRUCTURES
- PLATFORM, EXISTING
- PLATFORM, PROPOSED
- WATERCOURSE
- CHANNEL ENCROACHMENT LINE
- R.R. STATION PARKING

Figure 2-4:
Seymour Station
Platform Extension

CROSSING DATA

MILE — CROSSING STREET/FEATURE

6J6 UG STAMFORD RD. OD

OPEN DECK

AG - AT GRADE
UG - UNDERGRADE
OH - OVERHEAD

SCALE IN FEET
0 40 80

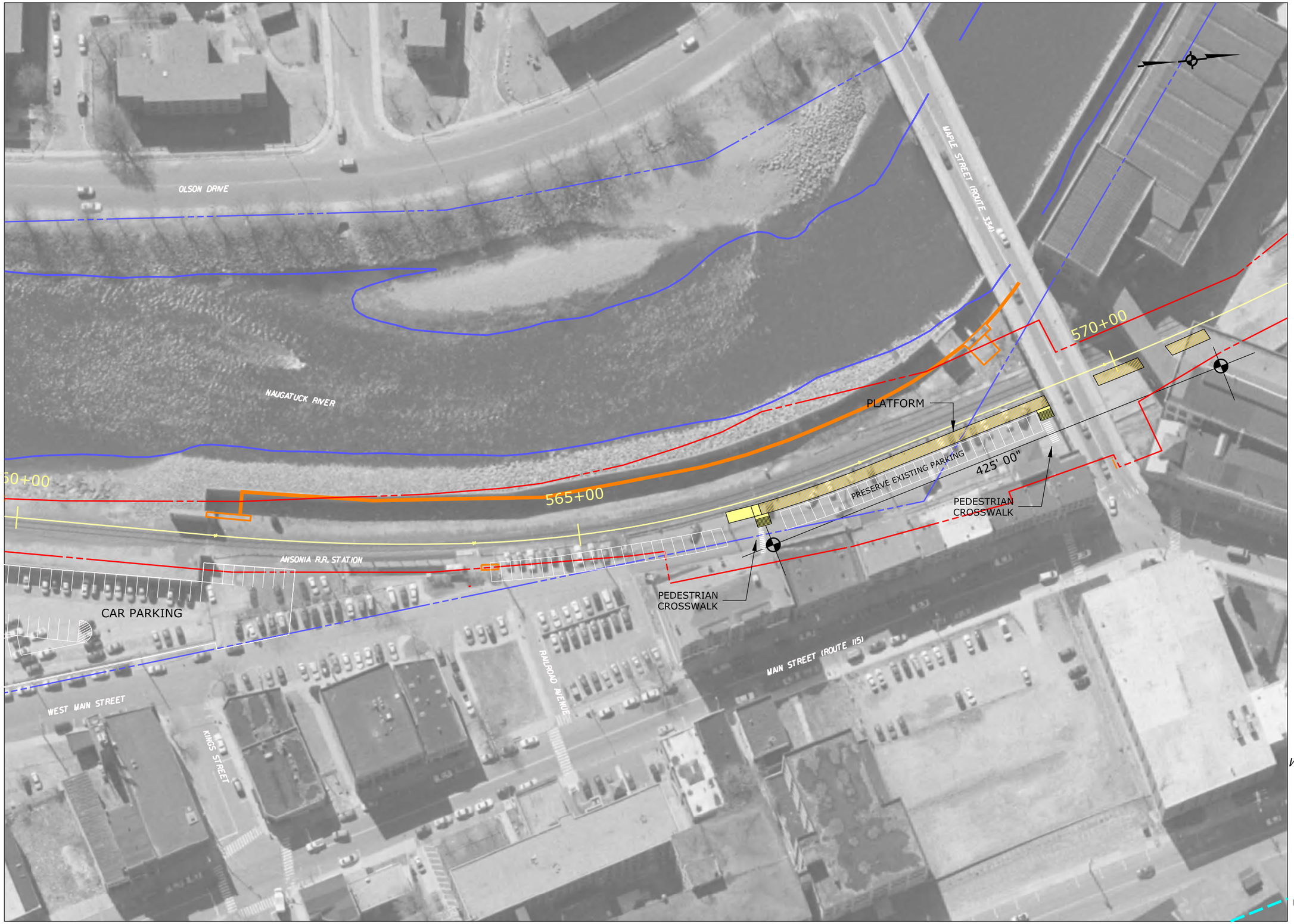
WATERBURY AND NEW CANAAN
BRANCH LINES
NEEDS & FEASIBILITY STUDY
PROJECT NO. 170-2562

WATERBURY BRANCH LINE

HIGH-LEVEL SEYMOUR
STATION PLATFORM
PROPOSED PLAN

CONNECTICUT
DEPARTMENT OF TRANSPORTATION

PARSONS



LEGEND

- EXISTING R.R. TRACK
- R.O.W.
- RAIL STUDY CORRIDOR
- XX — MILE POST MARKER
- R.R. STRUCTURES
- PLATFORM, EXISTING
- PLATFORM, PROPOSED
- WATERCOURSE
- CHANNEL ENCROACHMENT LINE
- R.R. STATION PARKING

Figure 2-5:
Ansonia Station
Platform Extension/
Relocation

CROSSING DATA

MILE — CROSSING STREET/FEATURE

6J6 UG STAMFORD RD. OD

AG - AT GRADE
UG - UNDERGRADE
OH - OVERHEAD

OPEN DECK

SCALE IN FEET
0 40 80

WATERBURY AND NEW CANAAN BRANCH LINES
NEEDS & FEASIBILITY STUDY
PROJECT NO. 170-2562

WATERBURY BRANCH LINE

RELOCATED ANSONIA PLATFORM PROPOSED PLAN

CONNECTICUT DEPARTMENT OF TRANSPORTATION

PARSONS