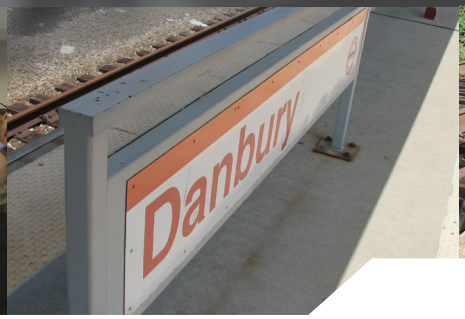
FTA ALTERNATIVES ANALYSIS
DRAFT/FINAL ENVIRONMENTAL IMPACT STATEMENT

DANBURY BRANCH IMPROVEMENT PROGRAM TASK 5

ENVIRONMENTAL TECHNICAL MEMORANDUM IMPACTS ANALYSIS

STATE PROJECT 302-008


SECTION 8: FLOODPLAINS AND FLOODWAYS

OCTOBER 2011

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METHODOLOGY

Project impacts on floodplains and floodways were evaluated by comparing the conceptual layouts of the improvements for the build alternatives with Federal Emergency Management Agency (FEMA) GIS mapping depicting 100-year floodplains and floodways and with Connecticut Department of Energy and Environmental Protection (DEEP) GIS mapping of Stream Channel Encroachment Lines (SCELs). At the outset of this study, the most recent FEMA GIS mapping available for the project corridor was from either 2002 or 2008, depending on county. This data was used to describe existing floodplain and floodway resources within the project corridor as described in Technical Memorandum 1. As of May 2011, FEMA released new Flood Insurance Rate Map (FIRM) GIS data for Fairfield County, which includes the southern portion of the project corridor. To date, a new FEMA GIS data coverage has not been issued for Litchfield County, which encompasses the northern portion of the project corridor. The new FEMA data for Fairfield County reflects changes in mapped floodplain and floodway boundaries that have been authorized by FEMA after consideration of Letters of Map Change (LOMCs) that have been submitted by individuals, towns, and other entities to FEMA. The new FEMA GIS mapping was compared to the earlier FEMA mapping that was used to document existing conditions. This comparison revealed that there have been no LOMCs resulting in changes to floodplain or floodway boundaries within the immediate project corridor in Fairfield County. Thus, the data used to document existing floodplain resources for Technical Memorandum 1 is still applicable and reflects the 2011 data for the corridor.

To assess project impacts, improvement concept plans were overlaid with the mapping to estimate direct impacts for construction activities located within the boundaries of 100-year floodplains and floodways. Direct permanent impacts to 100-year floodplains, floodways, and SCELS could result from excavation and/or placement of structures and fill within these resources and alteration of land/soil conditions or stream channels. Temporary impacts during the construction period could result from vegetation clearing, construction vehicle access roads, and preparation of material laydown areas and equipment staging areas. Indirect impacts, which are off-site or delayed effects, could include hydrologic changes in water flows or patterns which cause flooding effects or scour of channels.

Where direct impacts are quantifiable, impacts are expressed in square feet and acres. Since adding fill within flood zones can cause adverse flooding effects, conceptual engineering analysis provided very preliminary estimates of fill volumes, again based on early concepts for the improvements. Some improvements would involve both excavation and fill, such that the net changes (displacement) were estimated to be zero or negligible.

IMPACTS

For each alternative, the potential for direct and indirect impacts is attributed to the construction of the following major project elements:

- New or improved (existing) passenger stations

- Rail reconstruction
- Structures and bridges
- Traction power system – electrification
- Track reconfigurations, sidings and connections
- Storage and maintenance yards

Impacts to 100-year floodplains, floodways and SCELs from each alternative are discussed below. Five hundred (500) year floodplains, which are areas that have a one-five hundredth chance (0.02%) of being inundated in a given year, are not subject to stringent development regulations. Therefore, impacts to 500-year floodplains are not discussed in this Technical Memorandum or in the DEIS.

Estimated impacts from the specific improvements included in the three build alternatives -- Alternatives C, D, and E – are listed by type and location in Tables 1, 2, and 3, respectively. The improvements with potential direct impacts are described in more detail below.

For the impact analyses presented herein, it is assumed that proper Best Management Practices (BMPs) will be designed and implemented for all project improvements. All construction will be subject to CTDOT's *Standard Specifications for Roads, Bridges, and Incidental Construction* (Form 816). Drainage systems at new stations and at existing stations where expanded surface parking and other upgrades are planned will be designed in conformance with CTDOT's Drainage Manual as well as with the FEMA National Flood Insurance Program (NFIP). This will ensure that site runoff does not cause adverse flooding or indirect scour effects on adjacent or downstream lands.

Stormwater management designs at stations will adhere to the Connecticut DEEP *Connecticut Stormwater Quality Manual* (2004) and will apply to the construction period (temporary) as well as to finished condition (permanent). Low impact development and other innovative techniques such as the use of pervious pavements and rain gardens will be considered by designers during detailed project design to minimize potential stormwater and flooding impacts. The design of all rail infrastructure improvements, such as track reconfigurations, bridge and structural work, electrification, and yard work, will also comply with the FEMA NFIP requirements which will further help to reduce the potential for offsite flooding impacts associated with drainage and stormwater runoff.

Additionally, the United States Army Corps of Engineers (USACE) requirements and limitations for replacement of existing stream, river, and brook crossings (not including crossings of drainage ditches or waters with no definable channel) shall be adhered to during project design. The goal is to meet the USACE criteria wherever structures along the corridor are proposed for replacement. The design of replacement structures would also comply with the Connecticut Department of Energy and Environmental Protection (DEEP) Inland Fisheries Division, Habitat Conservation and Enhancement Program's "Stream Crossing Guidelines" dated February 26, 2008.

Note that none of the bridge structures proposed for replacement along the corridor are culverts. Replacing a bridge with a culvert is good practice from the point of view of constructability and

maintaining train operations. However, culverts are only feasible for shorter spans with an adequate waterway opening. At the present conceptual design phase, bridges are proposed to be replaced with bridges but other options would be considered in future engineering work which would include the analysis of the span and waterway hydraulics.

It should also be noted that site-specific plans, surveys and mapping have not yet been produced for the project at this stage of planning. As the selected improvements are defined, detailed site-specific plans would be prepared and used to fully determine the potential effects from flooding. Future detailed studies would be conducted at all of the project improvement sites to better understand the hydrology and drainage patterns and guide the engineering design of the improvement. In the event that future detailed studies point to severe adverse flooding effects from an improvement, avoidance measures would first be considered. Such measures might include reducing the size of an improvement, modifying its layout and/or construction phasing, or choosing not to implement it.

Any improvement selected for advancement that is located within 100-year floodplains or floodways would be subject to Connecticut's Flood Management Statutes. The extent of possible flooding effects would be examined through more detailed hydrologic studies prior to moving forward with the proposed improvement. Every effort will be made by project engineers to minimize impacts to the greatest extent possible and unavoidable impacts will be mitigated. Flood Management Certification from the Connecticut DEEP would be required for any work in the floodway or 100-year floodplains. A SCEL permit from DEEP would be required for any work within SCELs. Mitigation measures for adverse effects would likely include creating compensatory flood storage and preparing (FEMA) map revisions. If for some reason mitigation is not feasible at a given location and FEMA regulations are not capable of being met, an exemption would be sought. The public would be afforded the opportunity to comment on the proposed exemption during the permit application process.

All of the above measures would be applied to all construction activities associated with the Danbury Branch Improvement Program and would help to minimize potential impacts to floodplains, floodways, and associated water resources.

Alternative A - No Build

No improvements would be made to stations, tracks, or other rail infrastructure with the No Build Alternative. Therefore, the No Build Alternative would not directly or indirectly impact floodplains, floodways, or SCELs, as no new construction would take place as part of this alternative.

Alternative B - Transportation System Management (TSM)

Alternative B is the Transportation System Management (TSM) Alternative. The Federal Transit Administration defines TSM as "everything that can be done without new construction or vehicle procurement." For the Danbury Branch, this alternative would add two weekday rail shuttle trains in the morning and evening between South Norwalk and Wilton and provide hourly service during the midday from South Norwalk to Danbury. More frequent rail service would

also be provided on weekends. Each station would have enhanced local bus and transit service options. There would also be new connecting express bus service between the existing Danbury rail station and select locations in Brookfield and New Milford (in relatively close proximity to what would have been the Brookfield and New Milford rail station sites noted in Alternative D).

The TSM Alternative would not directly or indirectly impact floodplains, floodways, or SCELs, as no new construction would take place as part of this alternative.

Alternative C - South Norwalk to Danbury Improvements

Alternative C would provide infrastructure and service improvements between South Norwalk and Danbury on the existing Branch. Improvements would include upgrading track to 60 mile per hour maximum speed; expanding parking and improving access at stations; upgrading 15 bridges from an older open deck structure to modern ballast deck bridges; upgrading the rail yard and providing a new maintenance facility at Danbury Yard; and electrifying the rail line. New rolling stock would be added to allow for expanded service or for the electric trains.

Impacts to 100-year floodplains and floodways from the improvements planned in Alternative C are shown in Table 1 and described below. Total direct permanent impacts are estimated to affect approximately 1.8 acres of 100-year floodplains and 2.2 acres of floodway. Based on conceptual design plans for the improvements included in Alternative C, the associated net fill volumes are estimated to be approximately 7,000 CY in the 100-year floodplain and 6,600 CY in floodways.

Passenger Stations (Existing Station Upgrades)

Under this alternative, upgrades are planned at five of the seven existing stations located along the Danbury Branch rail corridor. Construction at the Branchville Station would be located within mapped 100-year floodplains, floodways, and SCELs and the expansion at Redding is partially located within a mapped floodway. Due to the present location of these stations within or directly adjacent to these resources, it is not feasible to provide the needed expansions without causing impacts. Relocating the stations – if sites could be found along the rail line which avoided impacts -- would not meet the purpose and need of the project.

> **Branchville Station (Ridgefield)** (refer to Figure 1 in Appendix A)**:** The existing Branchville Station is entirely within the mapped floodway, 100-year floodplains, and SCEL of the Norwalk River. The river runs through the station area in an engineered channel. Although the constructed channel contains the river flows and helps control flooding at the site, FEMA GIS mapping still depicts a very broad floodway and 100-year floodplain. All of the planned station upgrades are thus within these regulated zones. The major station upgrades include:
>
> - Revised access to existing station parking by relocating Portland Avenue to the south. This would require the construction of a new Portland Avenue Bridge over the Norwalk River.
> - Depot Road would be reconstructed with a new bridge over the Norwalk River.

- Station parking would be expanded to the south and property would be acquired for additional parking across the river on the east side of Route 7.
- A new pedestrian bridge would be constructed across the Norwalk River which would provide access between the new Route 7 parking lot and the station.

The finished grade of the new parking lots would be slightly higher than the existing parking lot, possibly two feet higher. The new pedestrian bridge and the new Portland Avenue and Depot Road bridges over the Norwalk River would add new structural elements into the floodplain and floodway. The bridges would span the river channel and would not include piers in the water, based on design concepts. The combined permanent impacts of these upgrades, based on conceptual design, would amount to approximately 0.6 acres within 100-year floodplains and 2.0 acres within the floodway. Rough estimates of fill volumes for the station improvements indicate approximately 2,070 CY of fill to be placed in the 100-year floodplain and 5,840 cubic yards (CY) of fill to be placed in the floodway. Temporary impacts beyond the permanent impact areas would occur for bridge construction and would affect approximately 2,600 square feet (SF) (0.06 ac) in the floodplain and 7,400 SF (0.17 ac) in the floodway. Temporary impact areas would be stabilized and planted to establish vegetative cover wherever possible.. All of this work falls within the SCEL.

Given the extent of impacts within FEMA and SCEL zones, detailed hydrologic studies to confirm or redefine the boundaries of today's floodway and 100-year floodplains would be needed at this site, in coordination with FEMA and DEEP, before any permitting activities could be pursued. The redefined boundaries may result in a reduction in the amount of regulated area, especially given the highly developed nature of the areas upstream and downstream of the station site, and due to the Norwalk River being channelized through this area. This may result in a reduction of impacts and securing permits may be feasible. Mitigation of floodplain impacts would be required at this station site.

Redding Station (refer to Figure 2 in Appendix A)**:** The planned surface parking expansion at the Redding Station is located within a mapped floodway associated with the Hawley Pond Brook. Approximately 5,670 SF (0.13 acres) of floodway would be directly and permanently impacted by the enlarged parking area based on the concept plans. The finished grade of the parking lot would be up to two feet higher than existing conditions, indicating a net fill volume of 420 CY. In addition, some currently vegetated (pervious) surfaces would be replaced by paved (impervious) surface, which could marginally increase runoff from the site and thus raise the risk of flooding effects on adjacent or downstream properties. All impacts would be permanent; there would be no additional temporary impacts. There are no affected SCELs at this site.

Structures and Bridges

There are improvements involving undergrade and overhead bridges included with Alternative C.

Undergrade (UG) bridges (railroad goes over a road or water): There are 18 UG bridges where work is planned in Alternative C. Seven of these are over roadways and 11 are over waterways.

The UG bridges over roadways include a new bridge at MP 0 in Norwalk over Washington and South Main Streets and six replacement bridges at Norwalk MP 0.1, Norwalk MP 0.2, Wilton MP 11.01, Redding MP 14.16, Redding MP 14.8, and Bethel MP 19.64. The anticipated work zones required for these improvements are not located within floodplains, floodways, or SCELS. At Wilton MP 11.01 (rail bridge over Old Mill Road) the 100-year floodplain of the Norwalk River is close to the west side of the bridge and at Bethel MP 19.64 (rail bridge over Grassy Plains Road), the floodway and 100-year floodplain of Sympaug Pond Brook are close to the north side of the bridge. Project engineers will avoid encroachment on these regulated areas during bridge design and construction to the extent possible.

Of the 11 UG bridges over water, one is over a small stream with no mapped FEMA zones or SCELS; this is the bridge in Norwalk at MP 5.12. Another of the bridges over a small stream is within a mapped SCEL of the Norwalk River but has no mapped FEMA zones; this is the bridge in Norwalk at MP 6.43. Both of these bridges are replacement bridges on existing alignments and are anticipated to be replaced using the existing bridge abutments, with the non-intrusive construction methods described below for replacement bridges on the existing rail alignment. There would be no work within regulated FEMA zones and no anticipated changes to the stream channels or flooding conditions from the work at these two bridges.

The other nine UG bridges over water are located within mapped floodways, 100-year floodplains, and/or SCELS and are at the following locations:

- Norwalk (MP 3.2) over Norwalk River
- Norwalk (MP 6.64) over Norwalk River
- Wilton (MP 8.7) over Norwalk River
- Wilton (MP 9.42) over Norwalk River
- Wilton (MP 11.55) over Norwalk River
- Wilton (MP 12.17) at Factory Pond (Norwalk River)
- Redding (MP 16.4) over Umpawaug Pond Brook
- Redding (MP 17.1) over Saugatuck River
- Bethel (MP 21.41) over Sympaug Brook

Seven of these UG bridges over water -- all but MP 3.2 and MP 6.64 -- are replacement bridges on the existing rail alignment. For this type of bridge replacement, existing abutments are anticipated to be used to support the new (replacement) decks unless further engineering studies determine that they are not suitable. Under the scenario where existing abutments would be used, the existing bridge decks would be removed and the new bridge deck would be lifted into place onto the existing abutments. This method of bridge replacement, if determined to be a viable approach after detailed field and hydraulic studies, would not require disturbance of vegetated banks or change

embankment conditions. Upon completion of construction, the ground would be stabilized and restored to previous right-of-way conditions. There would be no effect on flooding conditions under this scenario. However, Flood Management Certification from the DEEP would be required because work activities would occur within the mapped boundaries of FEMA flood zones. The bridges over the Norwalk River (including Factory Pond) would all require a SCEL permit from DEEP; there are no SCELs associated with the other three bridges.

While the Wilton MP 11.55 bridge over the Norwalk River is a bridge replacement on existing alignment and would use existing abutments to the extent possible, it is different from the other UG bridges over water in that it has two existing piers in the river. The proposed replacement structure would be a long (161 feet) single span that does not require piers in the river. During bridge replacement, the two existing piers would either be removed or cut just below the water line. The work to remove or cut the piers would result in temporary work in the floodway. Temporary impacts on adjacent floodplains may be expected at this bridge due to the more complex construction requirements of the pier removal activities. While these activities would be contained within the disturbed rail ROW to the extent possible, portions of the ROW on both sides of the bridge are within mapped 100-year floodplains, so impacts may be unavoidable. Temporary disturbance areas would be restored to previous conditions after construction; no changes in terrain or fill quantities within the floodplain would be anticipated. The removal of the existing piers would eliminate obstructions from the floodway, which is considered to be a beneficial effect in terms of flood management. The bridge pier removal would be based on detailed hydraulic and engineering studies and would be reviewed by DEEP as part of the Flood Management Certification process. These processes would minimize direct impacts and prevent adverse indirect effects such as channel scour to the maximum extent possible.

The Norwalk bridges over the Norwalk River at MP 3.2 and MP 6.64 are not simple bridge replacements on existing alignments. The bridge at MP 3.2 over the Norwalk River would be a new bridge on a new track alignment and the bridge at MP 6.64 over the Norwalk River would occur on a slight alignment shift associated with the proposed track realignment Curve 6B. Based on concept designs, these bridges have been estimated to have direct impacts within floodplains, floodways, and SCELS.

Bridge at MP 3.2 over the Norwalk River (refer to Figure 3 in Appendix A)**:** This would be a new long-span bridge on a new track alignment south of the current alignment (and existing bridge) and associated with the proposed track Curves 3A and 3B. To minimize encroachment on the floodway, the bridge concept is a 160-foot long single span structure with no piers or work in the water.

Installation of the new bridge abutments and wingwalls would occur on the high terraces above the river channel. However, not all of the work would avoid the floodway, floodplains, and SCEL boundaries. There would be clearing of vegetation and temporary work between the face of the proposed abutment and the river. Based on concept design, construction of the footing and abutments for

the new bridge would result in temporary impacts possibly 12-15 feet from the ends of the bridge span toward the river, with permanent impacts (abutments) within approximately 8 feet of the end of span. The abutments would be about 28 feet wide, perpendicular to the tracks, from which would extend approximately 15-foot long wingwalls placed nearly parallel to the river channel.

Since the new bridge would not be constructed without the new track alignment of Curves 6A and 6B, the impacts from the bridge were estimated in combination with the curves. The permanent impacts from the bridge structures, abutments, wingwalls, grading, and new rail bed were estimated to be approximately 5,520 SF (0.13 ac) in the 100-year floodplains and 2,410 SF (0.06 ac) in the floodway and SCEL. While the new bridge structures in the floodplains would reduce flood storage capacity, the new track curves at this location require cutting into slopes (removal of material), thereby increasing flood storage. Therefore, at this conceptual design phase, net fill within floodplains for these improvements is anticipated to be negligible. Permanent floodway fill impacts, based on the design concept, are estimated at approximately 90 CY.

Additional temporary impacts to floodplains may be expected during construction. Protective measures would include the following:

- No equipment or material storage would be allowed within designated floodways or 100-year floodplains. It would be the contractor's responsibility to identify and locate an appropriate and approved storage/stockpile area through direct coordination with CTDOT.
- Extensive BMPs for blasting and rock excavation
- Temporary sheeting between excavation areas and the river for bank stabilization, and
- Comprehensive site specific erosion, sedimentation, and site stabilization controls that meet the requirements of the 2002 Erosion and Sedimentation Control manual.

These measures would be designed and implemented to minimize adverse temporary effects to the river bank and water quality from construction. After rail traffic is operational on the new bridge, the existing bridge – which has no piers or supports in the river - would be removed and the former rail alignment on both sides of the river would be stabilized and planted to establish vegetative cover consistent with the right-of-way wherever possible.

Bridge MP 6.64 over the Norwalk River (refer to Figure 4 in Appendix A)**:**
This bridge is associated with the realignment of Curve 6B, which is offset to the east from the existing alignment by three feet near the southeast corner of the bridge. A new 60-foot single-span structure over the Norwalk River and its associated floodway is proposed at this location to accommodate the new alignment. The new bridge would be approximately five feet longer than the existing bridge. The conceptual design calls for the proposed bridge replacement

to be constructed from the rail (e.g. rail-mounted equipment) to the extent possible. Existing abutments would be used if hydraulic and other pending engineering studies determine this to be possible. The use of existing abutments would retain the existing river opening and would minimize any potential temporary construction impacts to flood zones that could arise if construction of a new abutment(s) is required.

As indicated above, the impact zone on the southeast side of the bridge may extend approximately three feet beyond the existing disturbed ROW to accommodate the alignment shift and tie into the Curve 6B. This area would be permanently stabilized as railroad embankment. This area is located within mapped 100-year floodplains and floodway of the Norwalk River. The permanent impact from the combined bridge work and Curve 6B based on concept design amounts to 400 SF (0.01 ac) in the floodplains and 590 SF (0.01 ac) in the floodway. Fill volumes would be approximately 260 CY in each zone. All of the work would be within a SCEL.

At this conceptual design stage, no work is anticipated to be conducted in the water of the Norwalk River or between the face of existing bridge abutments and the river. However, site-specific detailed hydraulic and engineering studies to be conducted later during the project development process may determine that more significant work is required at this location in order to construct the bridge. Regardless, every effort will be made to minimize excavation and fill within flood zones.

Relevant to these and all bridges over water within FEMA zones, if bridge abutments require major repairs or replacement as determined by future engineering and hydraulic studies, or if areas beyond the existing disturbed ROW (not currently anticipated) are required for some aspect of construction, direct and indirect impacts to floodways and/or 100-year floodplains are possible. In the past, a rail-mounted snooper has been used to access the sides and undersides of bridges along the Danbury Branch for minor repairs, to avoid disturbance of stream and river banks and to avoid direct impacts to water resources. Where possible, this method would be used for repairs to any bridge abutments or piers. However, more substantial repairs or outright replacement of bridge substructures could involve soils/rock excavation, filling, and equipment access around the bridge structures. Where the ROW falls within mapped floodways and 100-year floodplains, these activities could result in potential temporary and permanent impacts to floodplains.

If the need for more intrusive construction measures becomes apparent during future site investigations and engineering studies, then every effort will be made to minimize impacts to 100-year floodplains and floodways through careful consideration of construction staging, innovative construction methods, and locating temporary material laydown areas and construction access ways outside of wetlands, floodways, 100-year floodplains, SCEL, and aquifer protection areas to the extent possible. For these bridge

replacements and all other project activities, the goal of the engineers would be to develop a design so that the project would:

- Not promote development within floodplains
- Not pose any hazard to human life, health or property due to a base flood event
- Not increase flow velocity of depth
- Not adversely affect flood storage capacity or flood control value of the floodplain
- Not encroach in the regulatory floodway and would not increase flood levels during the 100-year or 10-year flood events
- Not adversely impact the passage of fish or other aquatic life
- Incorporate measures to minimize the potential for accumulation of debris on the substructure and superstructure
- Be designed according to the criteria and guidelines published in the DOT Drainage Manual.

Overhead (OH) bridges: Improvements planned to the Route 7 overhead bridge in Wilton (MP 7.87) are within 50 feet of the Norwalk River but are not located within a mapped floodway, 100-year floodplain, or SCEL. Construction areas, including staging areas, would be located outside of the river channel and to the extent possible east of Route 7 (away from the river) and outside flood zones.

Traction Power System - Electrification

Facilities associated with the planned Traction Power System (facilities for electrification) extend from approximately MP 1.1 in Norwalk to MP 23.9 in Danbury. Facilities include electrical substations, the smaller remote terminal units (RTUs), and catenary and support structures.

Substations and remote terminal units (RTUs): Substations and RTUs that would be required as part of this electrification system are generally situated in small trackside areas along the railroad right-of-way (ROW). They are small box-like structures resting on a gravel bed and therefore cause very minor areas of impervious surface and minimal runoff. All potential contaminants associated with the electrical components are well contained within the constructed housings. Underground conduits and cables connecting the new substations and RTUs with the catenary system would occur within the previously disturbed/maintained railroad ROW.

Neither of the two RTUs in Alternative C (Norwalk and Bethel) would be situated in 100-year floodplains, floodways or SCELs; their construction would not impact flood zones or flooding conditions. Two of the five electrical substations are situated within 100-year floodplains and floodways: Norwalk and Redding. The estimated impacts based on conceptual design are the following:

Norwalk Substation (refer to Figure 5 in Appendix A): A small area (540 SF) of the permanent impact footprint of this substation would be within the mapped 100-year floodplain of the Norwalk River. The portion of the site within the

floodplains, which is currently a parking lot, is the gravel bed around the substation housing. It may be slightly raised compared to the existing condition, possibly up to two feet. Given the large size of the Norwalk River floodplain and the small potential net fill of 60 CY, no adverse flooding effects would be expected. Temporary impact areas beyond the permanent impact zones would be used for site preparation and construction access. An area of approximately 3,570 SF (0.08 ac) of floodplains would be temporarily affected; however, no changes in grade or net fill would occur in this area. There would be no work within the adjacent SCEL.

Redding Substation (refer to Figure 2 in Appendix A): Construction of the Redding Substation would cause temporary impacts within the 100-year floodplain of Hawley Pond Brook, associated with site preparation and construction access. This area of approximately 1,200 SF (0.03 ac) would be returned to existing grades, stabilized, and planted to restore it to pre-construction vegetated conditions. No loss of flood storage would occur. There are no SCELs associated with this site.

Catenary and support structures: Electrification proposed under Alternative C would require the installation of catenary and support structures at regular intervals along the corridor from Norwalk to Danbury – similar to what was proposed for the Danbury Branch Signalization & Pole Line Project (State Project No. 0302-0007; Federal Project No. CT90-X300): also known as the Centralized Traffic Control (CTC) Project. Detailed design plans were developed for that study as were draft permit applications (Gannett Fleming 2008). The placement and dimensions of the catenary structures from Norwalk to Danbury under the proposed Danbury Branch Improvement Program Alternative C are assumed to be identical to the signal structures described in the CTC Project. The construction methodology is also presumed to be similar, with pole installation by track-mounted equipment, and minor hand-work required around each pole foundation in order to remove spoils. The numerous small areas of disturbance associated with the installation of each pole would be stabilized and restored to conditions consistent with the right-of-way.

Based on GIS analysis of the Alternative C catenary pole locations, there are an estimated 98 new catenary poles that would be located in 100-year floodplains, affecting an area of approximately 1,960 square feet (0.04 acres). There would be 31 new poles within mapped floodways, affecting an area of approximately 620 square feet (0.01 acres). The affected areas are along the existing tracks, within the ROW, where the existing rail bed falls within the FEMA mapping. Within these ROW areas there are existing signage, signal poles, and other rail-related infrastructure. The construction of these catenary poles involves drilling (excavation). Erosion and sedimentation controls would be used as appropriate during pole installation to prevent disturbed soils from migrating into adjacent waters and wetlands. Spoils from drilled holes are removed from the ROW and rip-rap or gravel is placed around the finished foundations to stabilize each site.

A small volume of fill would be added within the affected floodplains and/or floodways corresponding to the portion of the poles above the ground and below the flood elevation. However, existing (unused) catenary poles along the line would be removed, which would remove some fill volume within the affected floodplains and floodways. The pole removal is estimated to approximately offset the addition of poles so that overall, the proposed catenary structures would not be expected to result in lost flood storage volume or otherwise cause adverse flooding effects.

Track Reconfigurations, Sidings and Connections

There are many track reconfigurations planned under Alternative C to improve rail operations and/or speed. There are 23 curve reconfigurations (each of which may involve more than one curve) plus a branch connection with the New Haven mainline in South Norwalk. This branch connection improvement is referenced as CP241. There are no passing or storage sidings planned with Alternative C.

Track curve reconfigurations: The track curve reconfigurations are locations where existing curves would be redesigned to flatten out sharp curves; this would allow greater train speeds. Each reconfiguration involves changes to one or more curves. The amount of the proposed flattening or shift of the track (to the inside of the curve) varies from approximately one foot to 40 feet for different curves. Where a proposed shift is only one or two feet from the existing track, no changes to the existing rail bed are anticipated. This is because the rails can simply be moved within the existing track bed. Where a proposed shift is three feet or greater from the existing track, new fill would be placed alongside the existing rail bed on the side of the track shift (east or west of the existing track) to support the track in its new location. In these cases, the toe of slope for the new rail bed embankment would extend beyond its current location by the same distance as the track shift (since the rail and the rail bed are shifting together). Hence, the direct impact zone for each curve with a shift of three feet or more would be approximately the same width as the proposed track shift. For example, if a particular curve shift is 16 feet east of the current track (centerline) at its farthest point; the estimated direct impact zone on lands adjacent to the rail bed is 16 foot wide at its greatest width. The shape of each direct impact zone is like a crescent, with the broadest impact zone in the middle of the curve; the impact zone narrows down where the ends of curve connect to the existing track. Impacts to mapped floodways and 100-year floodplains in these curve footprints would be permanent impacts. Curve reconfiguration work is anticipated to be conducted from the existing rail (e.g. from rail-mounted equipment) and within the existing disturbed rail bed to the greatest extent possible.

Where the proposed track realignment totally diverges from the existing alignment, the new alignment footprint is 30 feet wide centered on the track. Direct impacts to floodways and 100-year floodplains within the new alignment envelope would be permanent. All efforts would be made to construct the new alignments from areas within the permanent impact footprint. Sections of former track (not part of the new curves) would be removed. The ground surface within the former track footprint would be stabilized and planted to establish vegetative cover consistent with the right-of-way wherever possible.

Approximately eight of the curve reconfigurations in Alternative C would likely require excavation and/or fill in regulated flood zones, listed below. The proposed track offset and the individual impacts are shown in Table 1. In cases where two or more curves are lumped together as one improvement, it means that the curves are interdependent in their construction (one curve would not be constructed without the others in the group).

Unless noted, impacts would occur within 100-year floodplains and floodways and SCELs. The affected flood zones in Norwalk and Wilton are associated with the Norwalk River. The affected floodplains at Curves 15B and 15C in Redding are associated with Umpawaug Pond Brook. In all cases, the tracks lie within and/or directly adjacent to these flood zones so that even small realignments would cause impacts. These impacts would be necessary if the increased train speeds (purpose of the realignments) are to be realized.

Norwalk
- Curves 0E, 1A, & 1B (floodplains only)
- Curves 2B, 3A, 3B & 3C (includes Norwalk Bridge at MP 3.2)

Wilton
- Curve 6B (includes Wilton Bridge at MP 6.64)
- Curves 7E & 8
- 9C (floodplains only)
- Curve 10B & 11A
- Curve 12B

Redding
- Curve 15B and Curve 15C (floodplains only)

The estimated impacts from these curve reconfigurations cause most of the Alternative C area impacts within 100-year floodplains: approximately 1.1 acres of the approximately 1.8 acres affected by Alternative C. The associated net fill in the floodplains from the curves is roughly estimated to be 4,880 CY of the approximately 7,000 CY of fill from Alternative C. The curves have a lesser impact to floodways, causing approximately 0.08 acres of the Alternative C total of approximately 2.2 acres, and 372 CY of net fill of the Alternative C total of approximately 6,600 CY. A portion of these impacts would be mitigated by the removal of some segments of rail bed and track within the same floodplains, floodways, and SCEL boundaries. However, many of the rail bed sections with only moderate track realignments would likely become slightly wider and thus cause additional fill.

Additional branch connection at CP 241: This improvement would not be located in or affect 100-year floodplains, floodways, or SCELs.

Storage and Maintenance Yards

The proposed work at the Danbury Yard is not located within any 100-year floodplains, floodways, or SCELS; therefore, no impacts would occur.

Alternative D - Extension from Danbury to New Milford

Alternative D would extend existing Danbury Branch passenger service 14.7 miles from Danbury to New Milford. This includes replacing the existing freight track by constructing new track along the same alignment to accommodate speeds up to 60 miles per hour, adding new stations and parking facilities at Danbury North, Brookfield and New Milford, and adding new rolling stock. A new maintenance facility and storage yard would also be built in the vicinity of New Milford.

Potential impacts to 100-year floodplains and floodways from the Alternative D improvements have been estimated (see Table 2) and are described below. Total potential permanent surface area impacts are 0.15 acres of 100-year floodplains and 0.01 acres of floodway. Fill volume impacts are estimated to be approximately 650 CY in floodplains and less than one CY in floodways.

Rail Reconstruction

Replacing the existing track from Danbury to New Milford would provide a higher quality of rail on new ties. The track in most locations is centered within level ground stabilized by ballast and gravel. The replacement work would be done in short segments by rail-mounted equipment, take place in level areas of gravel and ballast fill, and would be stabilized as soon as the replacement section is in place. Therefore this work is not anticipated to have any effects on flooding. However, since portions of the existing rail line fall within mapped 100-year floodplains and floodways, the rail reconstruction would require Flood Management Certification from DEEP.

Passenger Stations (New)

Improvements from Danbury to New Milford under Alternative D would involve the construction of two new passenger stations: Brookfield and New Milford. Both new stations would involve the construction of passing sidings, 300-foot long high-level platforms with canopies, new passenger waiting shelters, and new surface parking lots with a capacity of approximately 100 vehicles. None of the work at either station is within mapped 100-year floodplains, floodways, or SCELs based on concept design plans and therefore no impacts to these resources are anticipated.

Structures and Bridges

There are six undergrade bridge replacements included with Alternative D. All of the overhead bridge replacements would only be required with the electrification option and are reported in association with the improvements for *Traction Power System – Electrification*.

Undergrade (UG) bridges (railroad goes over a road or water): Four of the UG bridge replacements are over roads, on existing alignments, and not located within 100-year floodplains, floodways, or SCELs. The other two UG bridges are over the Still River where 100-year floodplains (both bridges) and a floodway (New Milford MP 35.1 only) occur:

- Danbury (MP 26.6) – bridge over the Still River

- New Milford (MP 35.1) – bridge over the Still River

Both of these are replacement bridges on existing alignment. Similar to the description of replacement bridges on existing alignment for UG bridges in Alternative C, the existing bridge abutments would be used to support the new (replacement) bridge decks and construction is anticipated to take place from previously disturbed rail ROW to the greatest extent possible. Under this non-intrusive scenario, the existing bridge decks would be removed and the new bridge deck would be lifted into place onto the existing abutments. This method of bridge replacement, if determined to be a viable approach after detailed field and hydraulic studies are conducted, would not require disturbance of vegetated banks or change in embankment conditions. Temporary impacts to 100-year floodplains are possible during the construction period, however, since portions of the previously rail ROW are located within floodplains; these would be minimized to the extent possible by the protective measures discussed under the UG bridges section in Alternative C. There are no SCELS in the vicinity of either bridge. Upon completion of construction, the ground would be stabilized and restored to previous right-of-way conditions.

While the landside work for replacement of the Danbury bridge at MP 26.6 is anticipated to be non-intrusive as described above, this bridge has existing and proposed piers in the water so its replacement would require work in the Still River floodway as described below:

> **MP 26.6 over Still River:** Preliminary design concepts for the bridge at MP 26.6 include a 2-span bridge with one pier that would be located in the water and the mapped floodway of the Still River. The conceptual pier dimensions of 30 x 10 feet would result in a permanent floodway impact of 300 square feet (0.007 acres). Additional temporary impacts in the water are expected during construction, associated with the installation of the pier. The existing 3-span bridge (to be replaced) would be removed; its two piers would likely be cut off below water line. While the new pier would represent a small volume of fill within the floodway, the removal of portions (or all) of the two existing piers would fully offset this effect, so no net fill or flooding effects would be expected from this work. The design of the bridge piers would be based on detailed hydraulic and engineering studies and would be reviewed by DEEP as part of the Flood Management Certification process. These processes would minimize direct impacts and prevent adverse indirect effects such as channel scour to the maximum extent possible.

For these and all bridges over water, detailed hydraulic and engineering studies would be conducted during future phases of the design development process and may indicate a need for major repair, rehabilitation, or replacement of existing bridge abutments. In that case, more intrusive construction methods may be required which could impact 100-year floodplains associated with the Still River. Potential direct impacts would be minimized to the greatest extent possible through future design efforts, consideration of non-intrusive construction methods, and protective measures during construction (see the introduction to the **Impacts** section and in the UG bridges section in Alternative C). Regardless of the intensity of construction, Flood Management Certification would be required at both bridge sites given their location within regulated FEMA zones.

Traction Power System - Electrification

Electrification is an option under Alternative D, extending from approximately MP 23.9 in Danbury to MP 39 in New Milford. Facilities required for electrification include electrical substations and catenary and support structures. There are no RTUs in this alternative. In addition, seven overhead bridges would need to be raised to provide enough clearance for the catenary wires to pass under them. This would not be necessary for the diesel (non-electrified) option of Alternative D.

Substations: The two substations to support electrification under Alternative D, at Brookfield and New Milford, are not located within mapped 100-year floodplains, floodways, or SCELs based on concept design plans; therefore, no impacts to these resources are anticipated from substation construction.

Catenary and support structures: Under the electrified version of Alternative D, the conceptual design layout indicates there would be 60 new catenary poles located in 100-year floodplains, affecting an area of approximately 1,200 square feet (0.03 acres). There are four poles that would be located within mapped floodways, affecting an area of approximately 80 square feet (0.002 acres). A small volume would be added within the affected floodplains and floodways corresponding to the portion of the poles above the ground and below the flood elevation. The fill volume would be very small in comparison to the very great size of the Still River and Housatonic River watersheds where the poles are located. As such, adverse flooding effects are not anticipated from the installation of catenary for the electrification option.

Bridge raisings: Five of the seven overhead bridges that need to be raised for electrification in Alternative D are located well outside of floodways, floodplains, and SCELS. The sixth bridge, the Pumpkin Hill Road bridge at MP 33.9 in New Milford, is close to the 100-year floodplain of the Still River which lies close to the west side of the tracks. Based on concept plans, permanent and temporary impacts to the floodplains can be avoided during the reconstruction of this bridge. During future design of this bridge raising, project engineers will attempt to avoid encroachment on these regulated areas to the extent possible. There are no potential impacts to floodways and no mapped SCEL in this vicinity.

The seventh bridge is the Erickson Road bridge in New Milford at MP 34.74 (refer to Figure 6 in Appendix A). The reconstruction of this bridge to elevate it on fill is anticipated to impact the 100-year floodplains of the Still River which surround Erickson Road near the west end of the bridge. Based on concept design, permanent impacts from the elevated roadway and embankments have a footprint of approximately 2,800 SF (0.12 ac) and a fill volume of approximately 650 CY. Additional temporary impacts to floodplains along the sides of the roadway for construction access are estimated at 2,600 SF (0.06 ac); these areas would be stabilized and restored to existing grades, so there would be no associated fill. There are no impacts to floodways and no mapped SCEL in this vicinity. If future hydraulic studies determine that the net fill could cause flooding effects, mitigation would be required as part of the Flood Management Certification process.

Track Reconfigurations, Storage Sidings and Connections

There are five track curve reconfigurations planned under Alternative D to improve rail operations and/or speed. Crossover connections at the Danbury Yard and at MP 26.96, approximately 2.6 miles north of Danbury Yard, are planned for operational improvements. One storage siding is planned to be located in Danbury and Brookfield at MP 27.24 - 27.58. Based on GIS analysis, none of these improvements would occur within or cause impacts to floodplains, floodways, and SCELs.

Storage and Maintenance Yards

No portions of the planned New Milford Storage and Maintenance Yard are anticipated to be located within 100-year floodplains, floodways, or SCELs of the nearby Housatonic River. As such, its construction would not affect these resources nor cause adverse effects on flooding.

Alternative E - Improvements from South Norwalk to Wilton

Alternative E is being considered at the direction of the State of Connecticut's Transportation Strategy Board. It would provide partial electrification of the Danbury Branch, from South Norwalk to Wilton, a distance of 7.5 miles. Parking and access improvements would be made at Merritt 7 station, and there would be minor modifications to track and structures along this section. Alternative E would provide for partial electrification of the Danbury Branch from approximately MP 1.1 to MP 7.5. Impacts from this alternative are therefore a subset of the impacts described above for Alternative C.

Impacts to 100-year floodplains and floodways from the planned improvements in Alternative E are shown in Table 3 and described below. Total potential surface area impacts are estimated to be approximately 0.5 acres of 100-year floodplains with 830 CY of associated fill, and approximately 0.08 acres of floodway with 350 CY of associated fill.

Passenger Stations (Existing Station Upgrades)

No impacts to floodplains, floodways, or SCELs are anticipated from the upgrades to the Merritt 7 Station, which is the only improved station under this alternative.

Structures and Bridges

There are undergrade bridge replacements but no overhead bridge replacements proposed by Alternative E.

Undergrade (UG) bridges (railroad goes over a road or water): There are seven UG bridges where work is planned in Alternative E; they are a subset of the UG bridges included in Alternative C. Three are over roadways and would not occur within floodplains, floodways, or SCELS; these include the new bridge at MP 0 in Norwalk over Washington and South Main Streets and two replacement bridges at Norwalk MP 0.1 and Norwalk MP 0.2. Four of the UG bridges are over water, at the following locations:

- Norwalk (MP 3.2) over Norwalk River
- Norwalk (MP 5.12) over tributary to Norwalk River
- Norwalk (MP 6.43) over Norwalk River
- Norwalk (MP 6.64) over Norwalk River

Norwalk MP 5.12 is over a small stream with no mapped FEMA zones or SCELS. The Norwalk bridge at MP 6.43 is over a small stream within a mapped SCEL of the Norwalk River but not within any mapped FEMA zones. Both of these bridges are replacement bridges on existing alignments and are anticipated to be replaced using the existing bridge abutments, with the non-intrusive construction methods described below for replacement bridges on the existing rail alignment. There would be no work within regulated FEMA zones and no anticipated changes to the stream channels or flooding conditions from the work at these two bridges.

Norwalk MP 3.2 is a new bridge on a new track alignment and Norwalk MP 6.64 is on a slight curve realignment, so both of these are estimated to cause permanent impacts. The work at these bridges is detailed under Alternative C; impacts based on conceptual design are briefly summarized below.

Bridge at MP 3.2 over the Norwalk River (refer to Figure 3 in Appendix A)**:** This would be a new long-span bridge on a new track alignment associated with Curves 3A and 3B. To minimize encroachment on the floodway in this location, the bridge concept is a 160-foot long single span structure with no piers or work in the water. However, not all of the work would avoid the floodway, floodplains, and SCEL boundaries.

Permanent impacts from the bridge structures, abutments, wingwalls, grading, and new rail bed (track curves) would amount to approximately 5,520 SF (0.13 ac) in the floodplains and 2,410 SF (0.06 ac) in the floodway and SCEL. No net fill is anticipated within floodplains for this improvement but net fill in the floodway based on the design concept is approximately 90 CY.

Bridge at MP 6.64 over the Norwalk River (refer to Figure 4 in Appendix A)**:** This bridge is associated with the realignment of Curve 6B, which is offset to the east from the existing alignment by three feet at its farthest point. A new 60-foot single-span deck is proposed to be placed on the existing abutments to the extent possible. Permanent impacts may occur on the southeast end of the new bridge where the curve is realigned approximately three feet beyond the existing disturbed ROW. The impact area would be permanently stabilized as railroad embankment. The permanent impacts from the bridge and curve would amount to 400 SF (0.01 ac) in floodplains and 590 SF (0.01 ac) in the floodway. Fill volumes would be approximately 260 CY in each zone. All of the work would be within a SCEL.

As described for all bridges over water in Alternatives C and D, detailed hydraulic and engineering studies would be conducted during future phases of the design development process and may indicate a need for major repair, rehabilitation, or replacement of existing

bridge abutments. In that case, more intrusive construction methods may be required which could impact 100-year floodplains associated with the Norwalk River. Potential direct impacts would be minimized to the greatest extent possible through future design efforts, consideration of non-intrusive construction methods, and protective measures during construction (see the introduction to the **Impacts** section and in the section about the UG Bridges over water in Alternative C). Regardless of the intensity of construction, Flood Management Certification would be required at both bridge sites given their location within regulated FEMA zones. In addition, a SCEL permit from DEEP will be required.

Traction Power System - Electrification

For Alternative E, electrification facilities would extend from approximately MP 1.1 in Norwalk to MP 7.5 in Wilton. Facilities include one RTU in Norwalk, one electrical substation in Wilton, and catenary and support structures.

Substations and remote terminal units (RTUs): The Norwalk RTU and the Wilton substation are located on uplands outside of 100-year floodplains, floodways, and SCELs. Their construction would not impact these resources or flood conditions. [Note: the Norwalk substation included in Alternative C is not required under Alternative E.]

Catenary and support structures: Within Alternative E, there are approximately 28 catenary poles located in 100-year floodplains, affecting an area of 560 square feet (0.01 acres). There are seven poles potentially located within mapped floodways, affecting an area of approximately 140 square feet (0.003 acres). Existing (unused) catenary poles along the line would be removed in this section, which would approximately offset the addition of poles. Overall, the proposed catenary structures are not anticipated to cause adverse flooding effects.

Track Reconfigurations, Sidings and Connections

For Alternative E, there are approximately seven curve reconfigurations plus a reconfiguration to improve the branch connection with the New Haven mainline in South Norwalk. This branch connection improvement appears as CP241 under the Track Reconfigurations in Table 3. There are no passing or storage sidings planned with Alternative E.

Track curve reconfigurations: Permanent impacts to 100-year floodplains and floodways would occur from three of the planned curve reconfigurations. The track offsets and the potential impacts are estimated in Table 3. All of these impacts are associated with the flood zones along the Norwalk River. Unless noted below, impacts occur within 100-year floodplains and floodways and SCELs.

<u>Norwalk</u>
- Curves 0E, 1A, & 1B (floodplains only)
- Curves 2B, 3A, 3B & 3C (includes Norwalk Bridge at MP 3.2)

<u>Wilton</u>
- Curve 6B (includes Wilton Bridge at MP 6.64)

These improvements account for nearly all of the Alternative E floodplain and floodway impacts and all of the net fill impacts in both zones. As noted under Alternative C, which includes these same reconfigurations, impacts to these flood zones are unavoidable if the intended speed improvements are to be realized, due to the proximity of the river and the flood zones to the tracks.

Additional branch connection at CP 241: No impacts to floodplains, floodways, or SCELs are anticipated from the additional branch connection at CP 241.

EXECUTIVE ORDER ON FLOODPLAINS

Improvements planned with the selected project are subject to Executive Order (EO) 11988, as amended, which requires all federal agencies to avoid construction within the 100-year floodplain unless no other practical alternative exists. The intent of the EO is to protect beneficial natural floodplain resources as well as ensure that flood events do not cause harm to humans and the built environment.

Where possible, every effort has been made to avoid impacts to floodplains from the Danbury Branch improvements. Alignment and design modifications to all improvements in floodplain areas were evaluated. Several electrical facilities were relocated to avoid floodplains. The major parking lot expansion at Merritt 7 in Alternative C and the two new stations in Alternative D have been planned on sites outside of floodplains. Bridge replacements over water would utilize existing abutments to the extent possible, to avoid excavation and fill activities in flood zones. Most of the rail and bridge improvement work is anticipated to be accomplished from the tracks and from the maintained (already disturbed) right-of-way of tracks or roadways. The traction power system elements required for electrification, as well as the communication and signal system, are proposed on previously disturbed ground and net fill from their construction would be negligible. Rail storage and maintenance yards are proposed adjacent to or on existing railway properties that lie outside of flood zones.

The impacts to floodplains from several existing station site upgrades and track reconfigurations (curves) result from improvements which have been proposed in order to maintain and enhance the viability of the existing commuter rail service. The purpose and need of these improvements includes serving more commuters, which is not deemed possible without these station improvements and track upgrades. Relocating passenger stations to new sites and deferring any work on bridges or track in order to avoid work in flood zones are not practical or feasible actions. As such, there are no practicable alternatives but to encroach upon 100-year floodplains and floodways in some cases. Impact avoidance, minimization, and mitigation measures will be implemented to protect the natural and human environments.

MITIGATION

Application for Flood Management Certification from the Connecticut DEEP would be required for any of the proposed work in the floodway or 100-year floodplains. Work affecting SCELs would additionally require a SCEL permit from DEEP. During the permitting process,

mitigation requirements would be determined based on the results of detailed hydrologic and/or hydraulic studies.

If adverse effects cannot be avoided through layout, design and/or construction methodology modifications, mitigation options would be evaluated. Mitigation measures for adverse effects would likely include creating compensatory flood storage and preparing (FEMA) map revisions. If for some reason mitigation is not feasible at a given location and FEMA regulations are not capable of being met, an exemption may be sought by the CTDOT. The public would be afforded the opportunity to comment on the proposed exemption during the permit application process.

Table 1: Alternative C Impacts to 100-Year Floodplains and Floodways

Improvement Type	Location	Study Milepost (MP)		Work Description	Within 100-Year Floodplain or Floodway	Permanent Floodplain Impact			Permanent Floodway Impact		
		From	To			Square Feet (sf)	Acres (ac)	Volume (cubic yds)	Square Feet (sf)	Acres (ac)	Volume (cubic yds)
Existing Stations (Upgrades)											
Merritt 7	Norwalk	3.6	3.6	New 200-space parking lot on new property w. of Glover Ave; pedestrian bridge over tracks from new parking to platform; replace low-level platform with high-level platform; new canopy, ramps, bike lockers.	No	0	0	0	0	0	0
Cannondale	Wilton	8.85	8.85	Extend high-level platform; expand parking lot by 50 spaces to a total of 190; provide bike lockers.	No	0	0	0	0	0	0
Branchville	Ridgefield	12.65	12.65	Revise access to parking by relocating Portland Ave to south on new bridge over Norwalk River; reconstruct Depot Rd with new bridge over river (eliminates at-grade xing); expand parking to south and acquire property for addit parking across river along Rt 7. Pedestrian bridge over river from new parking to station. Provide bike lockers.	Yes	28,000	0.60	2,070	78,890	2.00	5,840
Redding	Redding	17.1	17.1	Concept plan shows expanded parking lot by 100 spaces for total 180 spaces; reconfigure drop-off area; provide bike lockers. If parking is scaled back by removing one row on south side, 75 added spaces are provided rather than 100 (adequate for demand) - Impacts are based on 75 added spaces. No platform work.	Yes	0	0	0	5,670	0.13	420
Bethel	Bethel	21	21	Expand parking lot by 160 for total 350 spaces; provide bike lockers. No platform work.	No	0	0	0	0	0	0
Undergrade Bridges (Rail goes over Road or Water)											
Washington & South Main St.	Norwalk	0.0	0.0	New (additional) single track truss bridge 240' span on added parallel track alignment. Includes concrete retaining walls on spread footings. Form liners used to simulate stone blocks on face of concrete walls.	No	0	0	0	0	0	0
Marshall St.	Norwalk	0.1	0.1	Replace historic bridge with 120' span ballast deck structure on existing alignment and raise to provide clearance.	No	0	0	0	0	0	0
Ann St.	Norwalk	0.2	0.2	Replace with 57' long span ballast deck structure on existing alignment.	No	0	0	0	0	0	0
Norwalk River	Norwalk	3.2	3.2	New 160' long ballast deck span bridge on totally new alignment of Curves 3A and 3B. Bridge ends skewed and alignment nearly parallel to the river to minimize impacts. No work in river channel.	Yes	Impacts included with Track Configuration Curves 3A and 3B					
Small stream	Norwalk	5.12	5.12	Replace 15' span ballast deck on existing alignment.	No	0	0	0	0	0	0
Small stream	Norwalk	6.43	6.43	Replace 40' long span ballast deck on existing alignment.	No	0	0	0	0	0	0
Norwalk River	Wilton	6.64	6.64	Replace with ballast deck type, 65' span structure on revised alignment of Curve 6B. North side of span on existing alignment; south side offset 3' easterly from existing alignment. Temporary impacts for 50'x100' construction staging/laydown to be located near bridge.	Yes	Impacts included with Track Configuration Curve 6B					
Norwalk River	Wilton	8.7	8.7	Replace with ballast deck type, 86' span structure on existing alignment.	Yes	0	0	0	0	0	0
Norwalk River	Wilton	9.42	9.42	Replace with ballast deck type, 86' span structure on existing alignment.	Yes	0	0	0	0	0	0
Old Mill Rd.	Wilton	11.01	11.01	Replace with ballast deck type, 32' span structure on existing realignment.	No	0	0	0	0	0	0

Improvement Type	Location	Study Milepost (MP)		Work Description	Within 100-Year Floodplain or	Permanent Floodplain Impact			Permanent Floodway Impact		
Norwalk River	Wilton	11.55	11.55	Replace with ballast deck type, 161' single-span structure on existing alignment. No new structures (no piers) in water but two existing piers at this crossing would be removed or cut below water line.	Yes	0	0	0	0	0	0
Factory Pond	Wilton	12.17	12.17	Replace with ballast deck type, 49' span structure on existing alignment.	Yes	0	0	0	0	0	0
Old Redding Rd.	Redding	14.16	14.16	Replace with ballast deck type, 28' span structure on existing alignment.	No	0	0	0	0	0	0
Simpaug Tpke.	Redding	14.8	14.8	Replace with ballast deck type, 60' span structure on Curve 14D (realignment). Curve 14D located up to 14' west of existing centerline.	No	0	0	0	0	0	0
Umpawaug Pond Brook	Redding	16.4	16.4	Replace with ballast deck type, 49' span structure on existing alignment.	Yes	0	0	0	0	0	0
Saugatuck River	Redding	17.1	17.1	Replace with ballast deck type, 41' span structure on existing alignment.	Yes	0	0	0	0	0	0
Grassy Plains Rd. (Rt. 53)	Bethel	19.64	19.64	Replace with ballast deck type, 29' span structure on existing alignment.	No	0	0	0	0	0	0
Sympaug Brook	Bethel	21.4	21.4	Replace with ballast deck type, 22' span structure on existing alignment.	Yes	0	0	0	0	0	0
Overhead Bridges (Rail goes under Road)											
Route 7	Wilton	7.87	7.87	Replace with longer span 50' structure to accommodate track realignment Curve 7E.	No	0	0	0	0	0	0
Traction Power System - Electrification											
Catenary and support structures	Norwalk to Danbury	1.1	23.9	New catenary poles located within 12 feet of track centerline approximately 20 SF permanent impact each.	Yes - 98 poles in floodplains, 31 poles in floodway	1,960	0.04	No net fill	620	0.01	No net fill
RTU (CP401)	Norwalk	0.63	0.63	New facility (metal enclosure on concrete walls or columns) surrounded by crushed stone.	No	0	0	0	0	0	0
Substation (SUB-41D)	Norwalk	1.62	1.62	New facility (metal enclosure on concrete walls or columns) surrounded by crushed stone.	Yes	540	0.01	60	0	0	0
Substation (SUB-170D)	Wilton	7.25	7.25	New facility (metal enclosure on concrete walls or columns) surrounded by crushed stone.	No	0	0	0	0	0	0
Substation (SUB-305D)	Ridgefield	13	13	New facility (metal enclosure on concrete walls or columns) surrounded by crushed stone.	No	0	0	0	0	0	0
Substation (SUB-RED)	Redding	17.2	17.2	New facility (metal enclosure on concrete walls or columns) surrounded by crushed stone.	Yes (Temp Impacts)	0	0	0	0	0	0
RTU (CP421)	Bethel	20.22	20.22	New facility (metal enclosure on concrete walls or columns) surrounded by crushed stone.	No	0	0	0	0	0	0
Substation (SUB-560D)	Danbury	23.3	23.3	New facility (metal enclosure on concrete walls or columns) surrounded by crushed stone.	No	0	0	0	0	0	0
Track Reconfigurations											
CP 241	Norwalk	0	0.3	New parallel 2nd track and extension of existing Norwalk passing siding in urban developed setting. Requires property acquisitions on North Main Street. No impacts to adjacent undisturbed areas.	No	0	0	0	0	0	0
Curves 0E, 1A & 1B	Norwalk	1	1.7	Major realignment of track to west away from Norwalk River. Property acquisitions.	Yes	15,310	0.35	570	0	0	0
Curves 2B, 3A, 3B & 3C (incl. Bridge MP 3.2)	Norwalk	2.7	4	Curve 2B is offset only 2'. 3A & 3B have large off-sets (new alignments assoc with Bridge 3.2).	Yes - bridge requires fill; curve requires cut	5,520	0.13	No net fill	2,410	0.06	90
Curve 3D	Norwalk	3.82	3.96	Curve 3D is offset by 4' from existing centerline.	No	0	0	0	0	0	0
Curve 4C	Wilton	4.8	4.97	Curve 4C is offset by 6' from existing centerline.	No	0	0	0	0	0	0
Curve 5	Wilton	5.75	5.83	Curve shift is only 1' - no work outside disturbed ROW	No	0	0	0	0	0	0
Curve 6A	Wilton	6.07	6.24	Curve shift is only 2' - no work outside disturbed ROW	No	0	0	0	0	0	0

Improvement Type	Location	Study Milepost (MP)		Work Description	Within 100-Year Floodplain or	Permanent Floodplain Impact			Permanent Floodway Impact		
Curve 6B (incl. Bridge MP 6.64)	Wilton	6.53	6.68	Curve shift for Curve 6B is 3' - includes replacement Bridge 6.64 on this curve.	Yes	400	0.01	260	590	0.01	260
Curves 7E & 8	Wilton	7.71	8.47	7E curve shift is 8' off centerline. Curve 8 is only 1' shift.	Yes	10	0.0002	0	60	0.001	2
Curve 9C	Wilton	9.53	9.84	Curve 9C has shift up to 42' west of existing track (ROW acquisition).	Yes	12,400	0.28	600	0	0	0
Curves 10B & 11A	Wilton	11	11.47	Shifts up to 25' off existing - ROW required. Curve 11A includes retaining wall to minimize encroachment on forested floodplain of Norwalk River.	No	0	0	0	0	0	0
Curve 12A	Wilton	12.21	12.33	Curve 12 A shift is 12' to the east.	No	0	0	0	0	0	0
Curve 12B	Ridgefield	12.42	12.57	12B max curve shift is 8' off centerline to East.	Yes	2,870	0.07	110	430	0.01	20
Curve 13B	Redding	13.25	13.4	12B max curve shift is 12' off centerline to East. Includes retaining wall to minimize excavation of abutting slope and keep work within existing ROW.	No	0	0	0	0	0	0
Curve 13C	Redding	13.46	13.59	12B max curve shift is 8' off centerline to West.	No	0	0	0	0	0	0
Curve 13D	Redding	13.63	13.7	Curve shift is only 1' - no work outside disturbed ROW	No	0	0	0	0	0	0
Curve 14A	Redding	13.97	14.1	Curve 14 A shift is 13' to the east.Includes retaining wall to minimize excavation of abutting slope and keep work within existing ROW.	No	0	0	0	0	0	0
Curves 14B, 14C, 14D & 15A	Redding	14.24	15.14	14B shifts 13' to the west; 14C is 36' west and includes retaining wall to avoid parallel private drive and keep work within existing ROW. 14D is 14' to east with new bridge over Simpaug Tpk. Curve 15A shift is 2'.	No	0	0	0	0	0	0
Curves 15B & 15C	Redding	15.26	15.77	15B shifts 14' to West; 15C shifts 23' to West.	Yes	13,310	0.31	3,340	0	0	0
Curves 16A & 16B	Redding	16.58	16.89	16A shifts 22' to East. 16B is less than 1'.	No	0	0	0	0	0	0
Curve 17A	Redding	17.25	17.45	17A shifts 6' to West.	No	0	0	0	0	0	0
Curve 17B	Redding	17.57	17.72	17B shifts 11' to East.	No	0	0	0	0	0	0
Curve 17C	Redding	17.83	18.01	17C shifts 15' to West	No	0	0	0	0	0	0
Curve 19A	Bethel	19.07	19.18	19A shifts 4' to West	No	0	0	0	0	0	0
Rail Storage and Maintenance Yards											
Danbury Yard	Danbury	23	24	Realign existing and add tracks to provide 8 storage tracks with paved service aisles between every other track; 3,000 SF single-story building; 3,000 SF outdoor storage. Property acquisition required within existing urban setting. No impacts to adjacent undisturbed areas.	No	0	0	0	0	0	0
TOTAL						80,320	1.81	7,010	88,670	2.23	6,632

Table 2: Alternative D Impacts to 100-Year Floodplains and Floodways

Improvement Type	Location	Study Milepost (MP)		Work Description	Within 100-Year Floodplain or Floodway	Permanent Floodplain Impact			Permanent Floodway Impact		
		From	To			Square Feet (sf)	Acres (ac)	Volume (cubic yds)	Square Feet (sf)	Acres (ac)	(cubic yds)
Rail Reconstruction											
Reconstruct Track	Danbury to New Milford	23.9	39.16	Replace existing tracks with higher quality of rail on new ties. Work accomplished by rail-mounted equipment within existing gravel/ballast ROW.	No	0	0	0	0	0	0
Proposed Stations											
Brookfield Station	Brookfield	31.5	31.5	New 300' long high level platform with canopy, shelter, ramps, bike lockers; 100-space parking lot and drop-off area; sidewalk from staton to Rt 202 on north side of Rt 25. Property acquisition required.	No	0	0	0	0	0	0
Brookfield Passing Siding at Station	Brookfield	31.46	31.96	Parallel siding for overwidth freight to be located east of the commuter rail track at the new station.	No	0	0	0	0	0	0
New Milford Station	New Milford	38.35	38.35	New 300' long high level platform with canopy, shelter, ramps, bike lockers; 110-space parking lot and drop-off area. Property acquisition required.	No	0	0	0	0	0	0
New Milford Passing Siding at Station	New Milford	38.0	38.46	Parallel siding for overwidth freight to be located west of the commuter rail track at the new station.	No	0	0	0	0	0	0
Undergrade Bridges (Rail goes over Road or Water)											
Still River	Danbury	26.6	26.6	Replace with 207' two-span ballast deck on existing alignment. One new pier of approximately 30' x10' in Still River. Existing two piers to be removed or cut below water line.	Yes	0	0	0	300	0.007	No net fill.
Junction Rd. (Rt. 133)	Brookfield	29.47	29.47	Replace with 45' single span ballast deck on existing alignment.	No	0	0	0	0	0	0
Farm Pass	Brookfield	29.9	29.9	Replace or fill (close bridge).	No	0	0	0	0	0	0
Old Middle Rd.	Brookfield	33.07	33.07	Replace with 33' single span ballast deck on existing alignment.	No	0	0	0	0	0	0
Still River	New Milford	35.1	35.1	Replace with 102' single span ballast deck on existing alignment.	Yes	0	0	0	0	0	0
Housatonic Ave.	New Milford	38.62	38.62	Replace with 39' single span ballast deck on existing alignment.	No	0	0	0	0	0	0
Traction Power System - Electrification											
Catenary and support structures	Danbury to New Milford	23.9	39.0 +/-	New catenary poles located within 12 feet of track centerline approximately 20 SF permanent impact each.	Yes - 60 poles in floodplains, 4 poles in floodway	1,200	0.03	Negligible	80	0.002	Negligible
Raise Bridge - White St.	Danbury	24.33	24.33	Replace with 49' single-span multi-girder bridge on existing alignment to allow greater vertical clearance.	No	0	0	0	0	0	0
Raise Bridge - I-84	Danbury	26.2	26.2	Replace existing I-84 Eastbound bridge to provide clearance for catenary; 292' five-span steel multigirder bridge.	No	0	0	0	0	0	0
Raise Bridge - I-84	Danbury	26.2	26.2	Replace existing I-84 Westbound bridge to provide clearance for catenary; 292' five-span steel multigirder bridge.	No	0	0	0	0	0	0
Substation (SUB-BRK)	Brookfield	29.5	29.5	New facility (metal enclosure on concrete walls or columns) surrounded by crushed stone.	No	0	0	0	0	0	0
Raise Bridge - Silvermine Rd.	Brookfield	30.2	30.2	Raise to provide vertical clearance for catenary.	No	0	0	0	0	0	0
Raise Bridge - Whisconier Rd. (Rt. 25)	Brookfield	31.26	31.26	Raise to provide vertical clearance for catenary.	No	0	0	0	0	0	0

Improvement Type	Location	Study Milepost (MP)		Work Description	Within 100-Year Floodplain or	Permanent Floodplain Impact			Permanent Floodway Impact		
Raise Bridge - Old Pumpkin Hill Rd.	New Milford	33.9	33.9	Raise to provide vertical clearance for catenary.	Close on west side	0	0	0	0	0	0
Raise Bridge - Erickson Rd.	New Milford	34.74	34.74	Raise to provide vertical clearance for catenary.	Yes	2,800	0.12	650	0	0	0
Substation	New Milford	39.0 +/-	39.0 +/-	New facility (metal enclosure on concrete walls or columns) surrounded by crushed stone.	No	0	0	0	0	0	0
Track Reconfigurations											
Curve 1A	Brookfield	28.22	28.43	Curve 1A shifts track 16' to West	Close on west side	0	0	0	0	0	0
Curve 1B	Brookfield	28.72	28.82	Curve shift is only 2' to the West	No	0	0	0	0	0	0
Curve 6A	New Milford	33.2	33.35	Curve 6A shifts track 3' to the West	No	0	0	0	0	0	0
Curve 8A	New Milford	33.53	35.6	Curve shift is only 1' to the East	No	0	0	0	0	0	0
Curve 9A	New Milford	35.96	36.12	Curve shift is less than 1'	No	0	0	0	0	0	0
Storage Sidings											
Storage Siding	Danbury/ Brookfield	27.24	27.58	Parallel storage siding east of existing track, within large railroad ROW.	No	0	0	0	0	0	0
Rail Storage and Maintenance Yards											
New Milford Yard	New Milford	39.0 +/-	39.0 +/-	8 storage tracks with paved service aisles between every other track; 3,000 SF single-story building; 3,000 SF outdoor storage. Property acquisition required of prior industrial property.	No	0	0	0	0	0	0
						4,000	0.15	650	380	0.01	0.00

Table 3: Alternative E Impacts to 100-Year Floodplains and Floodways

Improvement Type	Location	Study Milepost (MP)		Work Description	Within 100-Year Floodplain or Floodway	Permanent Floodplain Impact			Permanent Floodway Impact		
		From	To			Square Feet (sf)	Acres (ac)	Volume (cubic yds)	Square Feet (sf)	Acres (ac)	Volume (cubic yds)
Existing Stations (Upgrades)											
Merritt 7	Norwalk	3.6	3.6	New 200-space parking lot on new property w. of Glover Ave; pedestrian bridge over tracks from new parking to platform; replace low-level platform with high-level platform; new canopy, ramps, bike lockers.	No	0	0	0	0	0	0
Undergrade Bridges (Rail goes over Road or Water)											
Washington & South Main St.	Norwalk	0.0	0.0	New (additional) single track truss bridge 240' span on added parallel track alignment. Includes concrete retaining walls on spread footings. Form liners used to simulate stone blocks on face of concrete walls.	No	0	0	0	0	0	0
Marshall St.	Norwalk	0.1	0.1	Replace historic bridge with 120' span ballast deck structure on existing alignment and raise to provide clearance.	No	0	0	0	0	0	0
Ann St.	Norwalk	0.2	0.2	Replace with 57' long span ballast deck structure on existing alignment.	No	0	0	0	0	0	0
Norwalk River	Norwalk	3.2	3.2	New 160' long ballast deck span bridge on totally new alignment of Curves 3A and 3B. Bridge ends skewed and alignment nearly parallel to the river to minimize impacts. No work in river channel.	Yes	Impacts included with Track Configuration Curves 3A and 3B					
Small stream	Norwalk	5.12	5.12	Replace 15' span ballast deck on existing alignment.	No	0	0	0	0	0	0
Small stream	Norwalk	6.43	6.43	Replace 40' long span ballast deck on existing alignment.	No	0	0	0	0	0	0
Norwalk River	Wilton	6.64	6.64	Replace with ballast deck type, 65' span structure on revised alignment of Curve 6B. North side of span on existing alignment; south side offset 3' easterly from existing alignment. Temporary impacts for 50'x100' construction staging/laydown to be located near bridge.	Yes	Impacts included with Track Configuration Curve 6B					
Traction Power System - Electrification											
Catenary and support structures	Norwalk to Danbury	1.1	7.5	New catenary poles located within 12 feet of track centerline; approximately 20 SF permanent impact each.	Yes - 28 poles in floodplains, 7 poles in floodway	560	0.01	No net fill	140	0.003	No net fill
RTU (CP401)	Norwalk	0.63	0.63	New facility (metal enclosure on concrete walls or columns) surrounded by crushed stone.	No	0	0	0	0	0	0
Substation (SUB-170D)	Wilton	7.25	7.25	New facility (metal enclosure on concrete walls or columns) surrounded by crushed stone.	No	0	0	0	0	0	0
Track Reconfigurations											
CP 241	Norwalk	0	0.3	New parallel 2nd track and extension of existing Norwalk passing siding in urban developed setting. Requires property acquisitions on North Main Street. No impacts to adjacent undisturbed areas.	No	0	0	0	0	0	0
Curves 0E, 1A & 1B	Norwalk	1	1.7	Major realignment of track to west away from Norwalk River. Property acquisitions.	Yes	**15,310**	0.35	**570**	0	0	0
Curves 2B, 3A, 3B & 3C (incl. Bridge MP 3.2)	Norwalk	2.7	4	Curve 2B is offset only 2'. 3A & 3B have large off-sets (new alignments assoc with Bridge 3.2).	Yes - bridge requires fill; curve requires cut	**5,520**	0.13	No net fill	**2,410**	0.06	**90**
Curve 3D	Norwalk	3.82	3.96	Curve 3D is offset by 4' from existing centerline.	No	0	0	0	0	0	0
Curve 4C	Wilton	4.8	4.97	Curve 4C is offset by 6' from existing centerline.	No	0	0	0	0	0	0
Curve 5	Wilton	5.75	5.83	Curve shift is only 1' - no work outside disturbed ROW	No	0	0	0	0	0	0
Curve 6A	Wilton	6.07	6.24	Curve shift is only 2' - no work outside disturbed ROW	No	0	0	0	0	0	0
Curve 6B (incl. Bridge MP 6.64)	Wilton	6.53	6.68	Curve shift for Curve 6B is 3' - includes replacement Bridge 6.64 on this curve.	Yes	**400**	0.01	**260**	**590**	0.01	**260**
TOTAL						21,790	0.51	830	3,140	0.08	350

APPENDIX A

FIGURES: FLOODPLAINS AND FLOODWAY IMPACTS AT FACILITY SITES

Danbury Commuter Rail Electrification Study

Floodway, 100-year Floodplains & SCEL Impacts

Legend

- Water Channel
- Stream Channel Enchroachment Line
- 100 Year Flood Zone
- Floodway
- Existing Track Centerline
- Existing Disturbed Rail Bed
- New Rail Bed
- Bridge Span (above ground or water)
- Permanent Impact - Structure or Parking
- Permanent Impact - Grading & Fill
- Potential Temporary Impact Areas

0 125

Feet

1 inch = 125 feet

Figure 1
Branchville Station

Original in Color - FHI - 10/21/2011

Danbury Commuter Rail Electrification Study

Floodway, 100-year Floodplains & SCEL Impacts

Legend

- Water Channel
- Stream Channel Enchroachment Line
- 100 Year Flood Zone
- Floodway
- Existing Track Centerline
- Existing Disturbed Rail Bed
- Proposed Track Centerline
- New Rail Bed
- Permanent Impact - Structure or Parking
- Permanent Impact - Grading & Fill
- Potential Temporary Impact Areas

0 125

Feet

1 inch = 125 feet

Figure 2
Redding Station
&
Redding Substation MP 17.2

Original in Color - FHI - 10/21/2011

Danbury Commuter Rail Electrification Study

Floodway, 100-year Floodplains & SCEL Impacts

Legend

- Water Channel
- Stream Channel Enchroachment Line
- 100 Year Flood Zone
- Floodway
- Existing Track Centerline
- Existing Disturbed Rail Bed
- Proposed Track Centerline
- New Rail Bed
- Bridge Span (above ground or water)
- Permanent Impact - Structure or Parking
- Permanent Impact - Grading & Fill
- Potential Temporary Impact Areas

0 50

Feet

1 inch = 50 feet

Figure 3
Norwalk Bridge
MP 3.2
on Curves 3A, 3B, 3C

Original in Color - FHI - 10/21/2011

Danbury Commuter Rail Electrification Study

Floodway, 100-year Floodplains & SCEL Impacts

Legend

- Water Channel
- Stream Channel Enchroachment Line
- 100 Year Flood Zone
- Floodway
- Existing Track Centerline
- Existing Disturbed Rail Bed
- Proposed Track Centerline
- Bridge Span (above ground or water)
- Permanent Impact - Structure or Parking
- Permanent Impact - Grading & Fill
- Potential Temporary Impact Areas

0 50

Feet

1 inch = 50 feet

Figure 4
Wilton Bridge
MP 6.64
on Curve 6B

Original in Color - FHI - 10/21/2011

Danbury Commuter Rail Electrification Study

Floodway, 100-year Floodplains & SCEL Impacts

Legend

- Water Channel
- Stream Channel Enchroachment Line
- 100 Year Flood Zone
- Floodway
- Existing Track Centerline
- Existing Disturbed Rail Bed
- Permanent Impact - Structure or Parking
- Permanent Impact - Grading & Fill
- Potential Temporary Impact Areas

0 50

Feet

1 inch = 50 feet

Figure 5
Norwalk Substation MP 1.62

Original in Color - FHI - 10/21/2011

Danbury Commuter Rail Electrification Study

Floodway, 100-year Floodplains & SCEL Impacts

Legend

- Water Channel
- Stream Channel Enchroachment Line
- 100 Year Flood Zone
- Floodway
- Existing Track Centerline
- Existing Disturbed Rail Bed
- Bridge Span (above ground or water)
- Permanent Impact - Structure or Parking
- Permanent Impact - Grading & Fill
- Potential Temporary Impact Areas

0 50

Feet

1 inch = 50 feet

Figure 6
Erickson Road Bridge
MP 34.74
New Milford

Original in Color - FHI - 10/21/2011