U.S. Department of Transportation
Office of the Secretary of Transportation

FY 2013 TIGER Discretionary Grant Application

Project Narrative / Attachment to SF-424 for the

Apponaug Circulator Long-term Improvements Project

Apponaug Business District and Government Center
City of Warwick, Rhode Island

Rhode Island Department of Transportation

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Please visit www.apponaugtiger.com for all supplemental documentation (including reports, studies, and letters of support) referenced in this Project Narrative.

Dear TIGER Evaluation Team:

The Rhode Island Department of Transportation (RIDOT) is pleased to submit the Apponaug Circulator Long-term Improvements Project for funding consideration under the Fiscal Year 2013 TIGER Discretionary Grant program. Through construction of a bypass around the Apponaug Business District – a blighted urban center located at the heart of our Economically Distressed region in southern New England – this project will transform a congested, outmoded circulator system into a dramatically more efficient, safer, accessible, and sustainable facility, allowing the City of Warwick and State of Rhode Island to realize the long-term socioeconomic revitalization goals for the area. As described in this document, construction of the bypass and associated improvements is wholly consistent with the USDOT's Strategic Plan and will achieve significant, tangible benefits across all grant selection criteria. The RIDOT is ready to break ground on this vital project and appreciates your continued support.

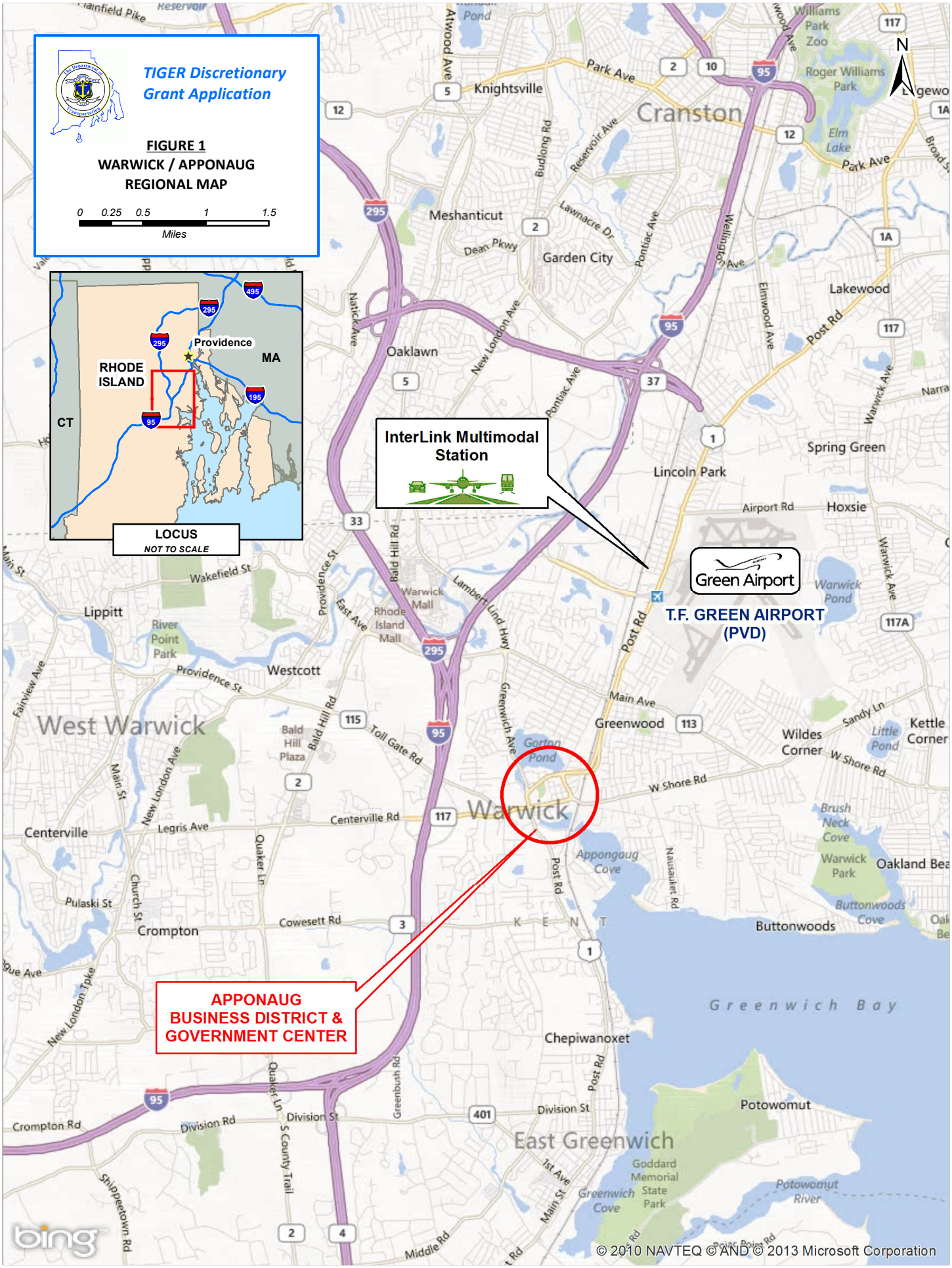
Michael P. Lewis, Director, Rhode Island Department of Transportation

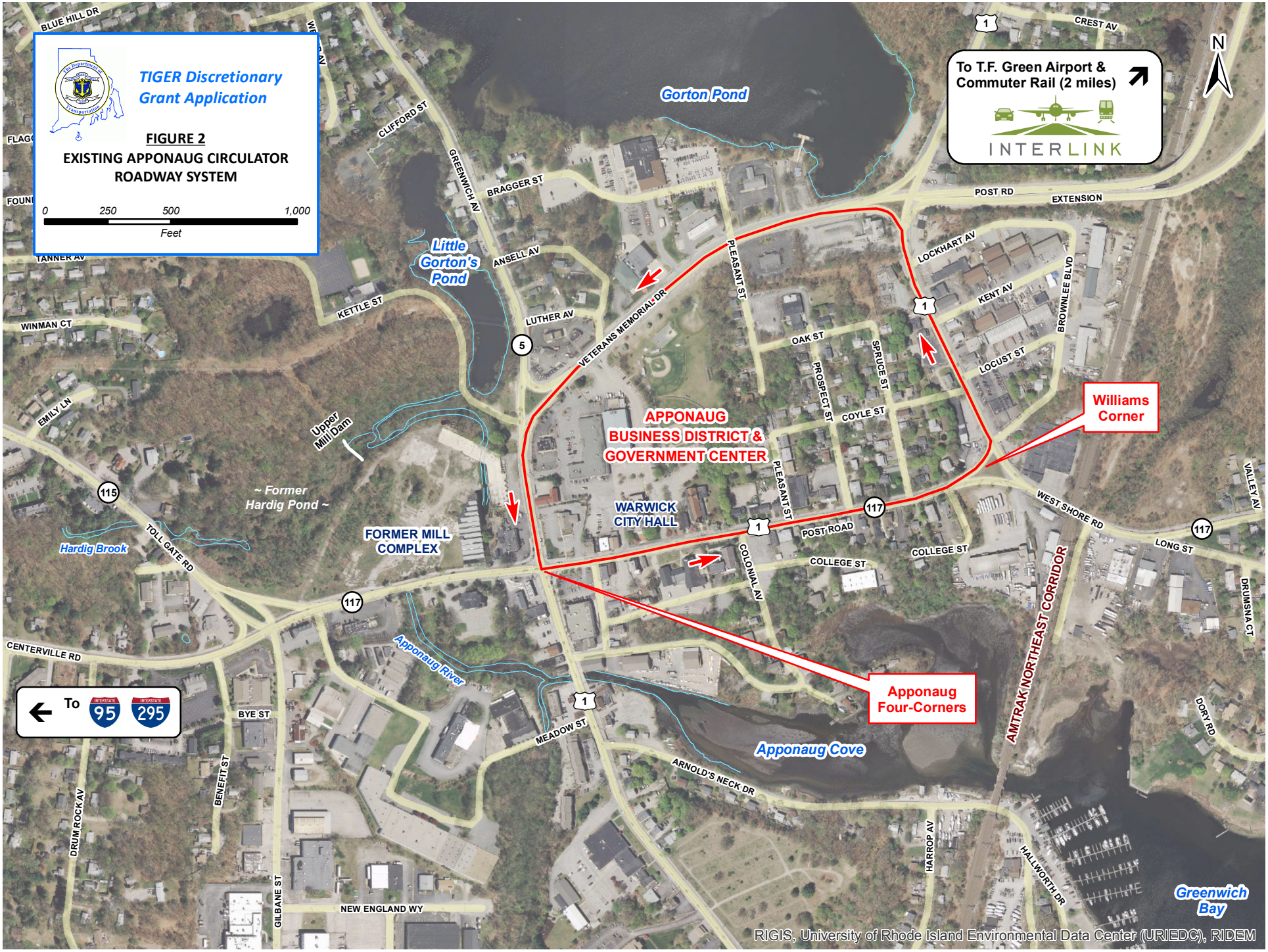
I. Project Description

As the second most populous municipality in the State of Rhode Island, the City of Warwick is currently contending with the numerous socioeconomic challenges which continue to beleaguer urban communities within the Northeast Corridor of the United States, including stagnant economic growth, high unemployment, and significant constraints in state and local budgets. The City's 2012 average unemployment rate of 9.4%[1] is well above the national average, and prevailing conditions throughout Warwick and its neighboring communities have resulted in the region (including the Rhode Island Counties of Kent and Providence) being designated as "Economically Distressed" by the U.S. Department of Transportation, Federal Highway Administration (FHWA).[2] While the City is host to a number of key regional transportation assets – including southeastern New England's major commercial service airport (T.F. Green), the recently-opened *InterLink* commuter rail station, and ample connectivity with major Interstate freeways (Routes 95 and 295) – efforts to revitalize Warwick and its environs remain limited by deficiencies in its arterial roadway network, as evidenced by the congestion and poor levels of service at several major intersections throughout the City. These conditions are particularly prominent along the one-way circulator through the Apponaug Business District and Government Center (see Figures 1 and 2 below), which consists of the following four roadway segments:

- *Post Road (U.S. Route 1 and State Route 117)* between the intersections of Greenwich Avenue/Centerville Road (commonly referred to as Apponaug Four-Corners) and West Shore Road (Williams Corner);
- *Post Road (U.S. Route 1)* between West Shore Road (State Route 117) and the Post Road Extension;

[1] See http://www.dlt.ri.gov/lmi/laus/town/town.htm
[2] See http://hepgis.fhwa.dot.gov/hepgismaps11/


TIGER Discretionary Grant Application
FIGURE 1
WARWICK / APPONAUG REGIONAL MAP
0 0.25 0.5 1 1.5
Miles
RHODE ISLAND
Providence
MA
CT
LOCUS
NOT TO SCALE
InterLink Multimodal Station
Green Airport
T.F. GREEN AIRPORT (PVD)
APPONAUG BUSINESS DISTRICT & GOVERNMENT CENTER
Cranston
Warwick
West Warwick
East Greenwich
Greenwich Bay
© 2010 NAVTEQ © AND © 2013 Microsoft Corporation


TIGER Discretionary Grant Application
FIGURE 2
EXISTING APPONAUG CIRCULATOR ROADWAY SYSTEM
0 250 500 1,000
Feet
To T.F. Green Airport & Commuter Rail (2 miles)
INTERLINK
N
Gorton Pond
Little Gorton's Pond
Upper Mill Dam
~ Former Hardig Pond ~
Hardig Brook
Apponaug River
Apponaug Cove
Greenwich Bay
APPONAUG BUSINESS DISTRICT & GOVERNMENT CENTER
WARWICK CITY HALL
FORMER MILL COMPLEX
Williams Corner
Apponaug Four-Corners
AMTRAK NORTHEAST CORRIDOR
To 95 295
BLUE HILL DR
CREST AV
CLIFFORD ST
GREENWICH AV
BRAGGER ST
POST RD
EXTENSION
TANNER AV
ANSELL AV
LOCKHART AV
KENT AV
BROWNLEE BLVD
KETTLE ST
LUTHER AV
VETERANS MEMORIAL DR
PLEASANT ST
OAK ST
SPRUCE ST
PROSPECT ST
COYLE ST
LOCUST ST
WINMAN CT
EMILY LN
TOLL GATE RD
POST ROAD
COLONIAL AV
COLLEGE ST
WEST SHORE RD
LONG ST
VALLEY AV
DRUMSNA CT
DORY RD
CENTERVILLE RD
BYE ST
MEADOW ST
ARNOLD'S NECK DR
BENEFIT ST
DRUM ROCK AV
GILBANE ST
NEW ENGLAND WY
HARROP AV
HALLWORTH DR
FLAG
FOUN
1
5
115
117
RIGIS, University of Rhode Island Environmental Data Center (URIEDC), RIDEM

- *Veterans Memorial Drive* between Post Road/Post Road Extension and Greenwich Avenue (State Route 5);
- *Greenwich Avenue (State Route 5)* between Veterans Memorial Drive and Centerville Road (State Route 117).

The RIDOT, with full support at the local, state, and federal planning levels, is preparing to construct the Apponaug Circulator Long-term Improvements Project, through which a new two-way bypass system around the heart of the district will be implemented. Completion of such a bypass around the segment of Post Road between Apponaug Four-Corners and Williams Corner – host to the Warwick Civic Center Historic District (including the iconic City Hall building), the Central Rhode Island Chamber of Commerce, the local U.S. Post Office, and several small businesses – will allow the City of Warwick to pursue long-range plans for redevelopment of this area, while realizing significant traffic safety, efficiency, and accessibility benefits at this critical node in the surface transportation network.

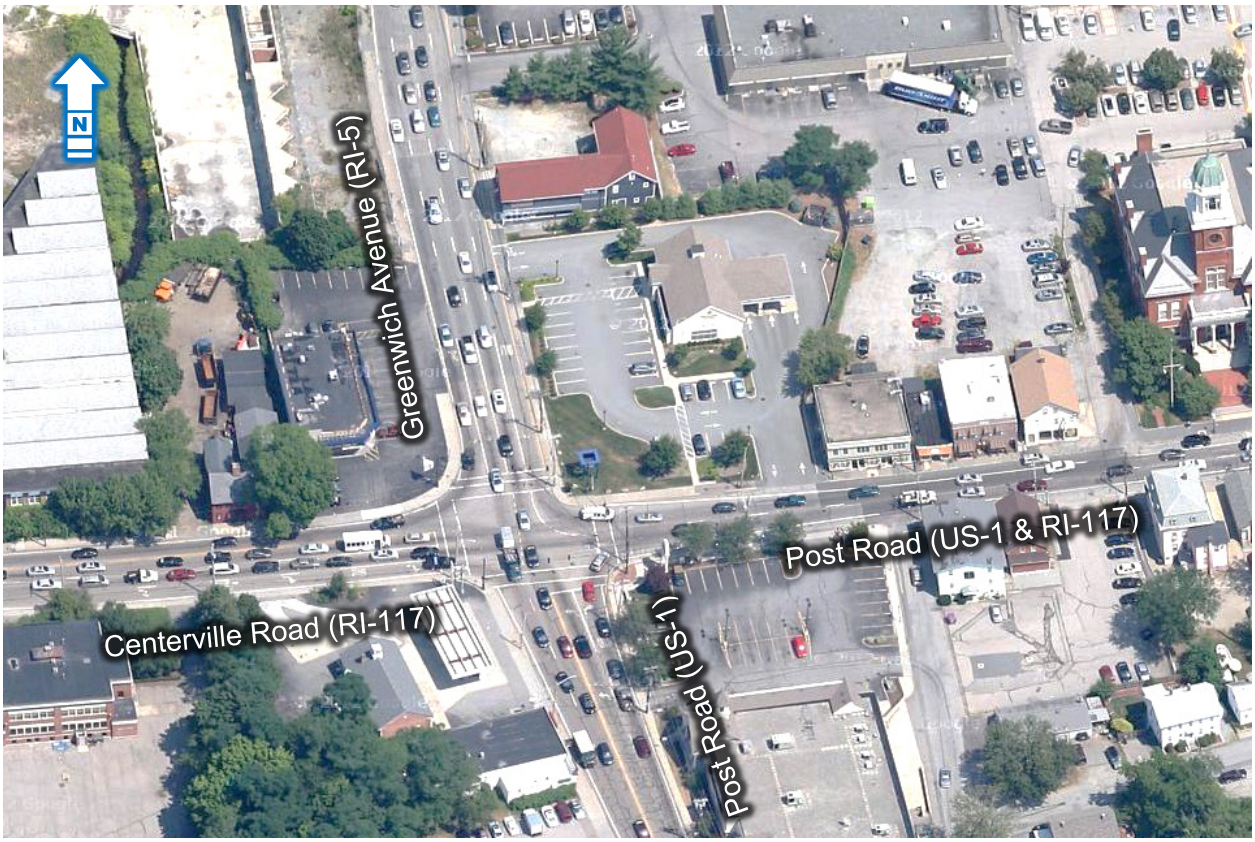


Figure 3 *– Typical peak-hour congestion at the Apponaug Four-Corners Intersection*

Given its strategic importance in economic and transportation plans for the region, the RIDOT plans to advertise and award the construction project later this year, despite a shortfall in funding available for the project. Without additional funding from a TIGER Discretionary Grant or other source, the Department will likely have to defer or table other projects under the

Highway Program to ensure that this priority project is delivered on schedule. ***The injection of TIGER grant funds will allow the RIDOT to construct the long-delayed Apponaug Bypass as efficiently as possible while minimizing the diversion of resources from other key transportation projects in development throughout the State.***

Apponaug's history is not unlike that of most early New England settlements. Originally settled in 1696 and located just inland along the westerly shoreline of Narragansett Bay, the village's growth into a civic and cultural center was closely intertwined with advances in industrialization and the hydropower resource provided by the Apponaug River. Containing several successful mills, the area continued to prosper through the mid-nineteenth century, at which time the people of Warwick authorized the construction of the town hall on Post Road. The establishment of the Warwick Civic Center at this time enhanced the residential and industrial desirability of the village. With the advent of the automobile and the subsequent improvements to area highways in the twentieth century, commercial development in and around Apponaug increased steadily, particularly along Post Road (U.S. Route 1), the primary roadway link connecting urban centers along the Atlantic Corridor.

In the 1970s, in conjunction with the construction of a new north-south roadway known as the Post Road Extension, a four-leg, one-way traffic circulation system was implemented in Apponaug as a "temporary" traffic measure. This one-way system subsequently remained in place and became known as the Apponaug Circulator, with traffic patterns remaining virtually unchanged through to the present day. All legs of the circulator are now functionally classified as urban Principal Arterial highways (each carrying upwards of 24,000 vehicles per day), and the circulator includes two major routes: U.S. Route 1 and State Route 117, the latter of which is a major east-west route and one of only three primary corridors serving the easterly sections of the City. This route serves a large volume of through traffic traveling between the extensive residential communities to the east and Interstate Route 95 to the west. The southerly, eastbound leg of the circulator, Post Road, carries an estimated 24,500 vehicles per day through the heart of the business district and in front of the City Hall.

The social and economic decline of the area has long been documented. The existing circulator system acts as a corridor for through trips and, as a result, has detracted from the historic character and commercial vitality of the district. These large volumes of through traffic are generally acknowledged as the cause for the decline of the business district, as the associated noise, congestion, and pedestrian/bicycle use conflicts continue to discourage new business and inhibit the expansion of existing businesses. Additionally, numerous roadway deficiencies exist along all legs the circulator, including narrow lane widths, narrow or nonexistent shoulder widths, insufficient horizontal curves, poor curb reveal, and poorly defined curb openings.

For many years, it has been the desire of the City to have the RIDOT consider a bypass around Apponaug to divert through traffic from the historic business and government center. Reducing the existing traffic volumes is a key component in the City's revitalization plans, which envision a vibrant, pedestrian-friendly environment that would be a destination for its shops, restaurants,

and cultural events, thus improving the livability of the densely populated residential communities surrounding the district.

The need for improvements to the Apponaug Circulator was initially targeted by the RIDOT in 1986, at which time a study was undertaken to assess feasible alternatives for long-term improvements and to develop a plan for short-term improvements (including reconstruction of all four segments of the Circulator, widening of Post Road from Apponaug Four-Corners to Williams Corner, and capacity and signalization improvements at key intersections). For long-term improvements, two bypass linkage concepts were found to be feasible for further consideration within an Environmental Assessment (EA). Further assessment of long-term improvements was deferred at that time, however, with priority given to the development of short-term improvements. Final design of the latter continued until 1993, at which time the City of Warwick formally requested that the RIDOT reconsider its approach to Apponaug by reactivating the study of an east-west bypass. The position taken by City officials was that the reconstruction of the existing roadways, while likely to improve traffic flow, was not consistent with long-term goals for this area. Following further consultation and coordination with the City of Warwick, the RIDOT reactivated the study of a bypass (and long-term improvements) and postponed the reconstruction / short-term improvements project indefinitely.

After a lengthy study of various alternatives, the preparation of an EA in compliance with the National Environmental Policy Act (NEPA), and extensive local and public coordination, the preferred alternative that was selected is the current two-way bypass around the Apponaug Business District and Government Center (see Figure 4 below). This configuration will divert through traffic to the north and will include extending Veterans Memorial Drive through the disused former mill complex to the junction of Toll Gate Road (State Route 115) and Centerville Road (State Route 117). ***Construction of the bypass is projected to reduce the 2020 traffic volumes along the main district segment from an estimated 29,500 vehicles per day to approximately 5,000 vehicles per day***. This traffic reduction, in conjunction with the suite of streetscape improvements along the corridor (including widened and fully accessible sidewalks, colored concrete crosswalks, a bicycle lane, lighting and landscaping) will create an environment conducive to the much-needed revitalization of the Apponaug Business District.

Following approval of the EA through the issuance of a Finding of No Significant Impact (FONSI) by the FHWA in March 2005, a key refinement to the project design has been the replacement of signalized intersections with modern roundabouts at the five major nodes of the bypass network (see Figures 4 and 5 below). These facilities, in addition to improving traffic efficiency and throughput, have been specifically engineered to maximize safety through traffic calming, elimination of high-severity collisions, and reductions in pedestrian conflicts (see the Safety subsection under Selection Criteria). In accordance with NEPA procedures, the RIDOT completed a reevaluation of the EA to consider the effects of this design modification on the findings of the original EA. Shortly thereafter the FHWA issued a letter concurring that the FONSI issued for the project remains valid for the current design.

APPONAUG CIRCULATOR
LONG-TERM IMPROVEMENTS

WARWICK, RHODE ISLAND

FIGURE 4

Gordon R. Archibald, Inc.
Civil and Environmental Engineers
Pawtucket, Rhode Island

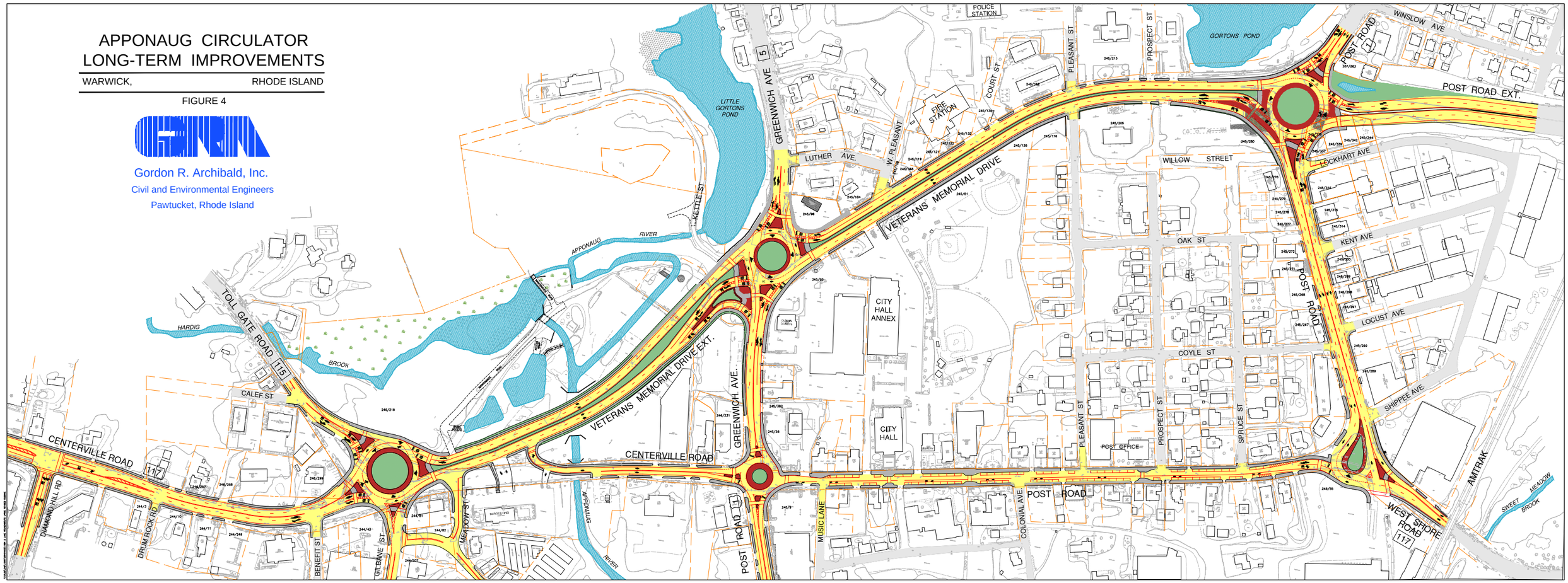


Figure 5 *– Conceptual rendering of Apponaug Four-Corners following project completion*

II. Project Parties

The primary project parties are the State of Rhode Island and the Rhode Island Department of Transportation (RIDOT). Both entities have extensive experience with federal grant processes and have successfully leveraged federal assistance across a wide variety of transportation projects. Contact information for the lead applicant (RIDOT) is provided as part of the SF-424 application and is included on the cover page of this Project Narrative document.

State of Rhode Island www.ri.gov The state of Rhode Island is the official grant recipient.	**Rhode Island Department of Transportation** www.dot.ri.gov The RIDOT will be responsible for administering the grant funds and managing the Project.

III. Grant Funds and Sources/Uses of Project Funds

The following table shows the estimated remaining project costs, the amount of TIGER funding requested, sources and uses of all remaining project funding, and the percentage of the remaining project costs that would be covered by the TIGER Discretionary Grant award. Refer to the Project Readiness subsection under Selection Criteria for further detail.

Sources and Uses of All Project Funds	Amount	Percentage of Total
TIGER Discretionary Grant Funding	$10 million	29.8%
RIDOT Construction Funding	$23.6 million	70.2%
Total Project Cost	$33.6 million	100%

IV. Selection Criteria

a. Long-Term Outcomes

As presented in the Project Description and expounded upon in the subsections below, construction of the Apponaug Bypass represents a critical step towards the revitalization of an urban center within the Economically Distressed region, and will result in significant, positive long-term outcomes across all evaluation criteria. This project is a key priority for the State of Rhode Island, having been included as a major highway project in the State's *Transportation Improvement Program for Fiscal Years 2013-2016* (TIP)[3] prepared by the Department of Administration's Division of Planning and approved by the State Planning Council (Rhode Island's Metropolitan Planning Organization). A table summarizing how the project aligns with the FY 2013 TIGER Grant Selection Criteria is provided on the following page.

i. State of Good Repair

Through inclusion in the TIP, the Apponaug Circulator Long-term Improvements Project has been identified as a priority capital project and an essential component in the State's program to maintain its surface transportation network in a state of good repair. At the request of the City of Warwick, the RIDOT rescinded plans for short-term improvements in favor of pursuing a long-term bypass solution that more holistically addresses the congestion, circulation, and related issues in and around the Apponaug Business District. While minor intersection improvements have since been implemented at Apponaug Four-Corners, only minimal routine maintenance activities (patching, resurfacing, etc.) have been performed along the existing circulator's four roadway segments over the interim. Consequently, the following deficiencies – identified in the preparation of the EA Purpose and Need statement prepared in 1996 – remain in the existing one way circulator system:

- A very high volume of traffic travels through the heart of Apponaug (between Apponaug Four-Corners and Williams Corner) every day. This traffic (with its associated noise, pollution, unsafe pedestrian environment, and congestion) is viewed as being primarily responsible for the decline of the historic district from a social and economic viewpoint.

[3] See http://www.planning.ri.gov/statewideplanning/transportation/tip.php

Apponaug Circulator Long Term Improvements Project – TIGER Selection Criteria Summary	
a. Long-Term Outcomes	Enables the revitalization of an Economically Distressed urban area through construction of a bypass around the heart of the Apponaug Business District and Government Center
i. State of Good Repair	Provides a long-term solution to the traffic congestion, roadway deficiencies, and use conflicts associated with the existing one-way circulator system
ii. Economic Competitiveness	Significant benefits in travel time and reliability cost savings, with the bypass and related improvements being critical to the economic revitalization of the Apponaug Business District, a long-declining urban center and key transportation node in the Economically Distressed region
iii. Livability	Vast improvements in traffic mobility through and around Apponaug for all modes of transportation, enhancing the business, civic, and historic use of the main district corridor, pedestrian and bicycle use, multimodal connectivity, and recreational/cultural opportunities
iv. Environmental Sustainability	Reductions in energy use and emissions through improvements in traffic efficiency; Long-term environmental benefits through the restoration of Apponaug River and Hardig Pond (including enhancements for fish passage along the existing spawning run), modifications to existing flow control structures for improved flood protection, and implementation of stormwater best management practices
v. Safety	Improved vehicular, pedestrian, and cyclist safety along all project corridors (including extensive pedestrian and multiuse amenities along the road-dieted main segment through the historic district); Reduced frequency and severity of accidents through implementation of roundabouts and other traffic calming measures
vi. Project Readiness	Technical Feasibility – 90% design stage complete; authorization to proceed to PS&E Financial Feasibility – Included in TIP for FFY 2013-2016 Project Schedule • Environmental Assessment (EA) approved with a Finding of No Significant Impact (FONSI) issued March 2005 • All technical deficiencies in RIDEM Freshwater Wetlands Program application addressed; revised plans and documentation submitted for final permit approval in May 2013 • Right-of-Way Certification anticipated September 2013 • Contract Advertisement scheduled September 2013 Project Risks & Mitigation – Minimal as a result of extensive coordination with stakeholders (including city officials, property owners, utility providers, and regulatory agencies) through all phases of design
b. Innovation	True state-of-the-art, 21st-century urban transportation system design incorporating modern roundabouts at all major intersections, full accessibility for pedestrians and cyclists (including a road diet and streetscape enhancements along the main district corridor), improved access management, and environmental restoration
c. Partnership	Planning and design developed in coordination with the the City of Warwick and the stakeholder Apponaug Project Committee; full project support at all levels of government

- Numerous roadway deficiencies exist along the circulator, including narrow lane widths, narrow or nonexistent shoulder widths, insufficient horizontal curves, poor curb reveal, and poorly defined curb openings.
- Weaving conflicts exist on two legs of the circulator, conditions which contribute to congestion and adversely impact traffic safety.
- Poor levels of service currently exist within the circulator and are projected to worsen by year 2020.
- Four major intersections and two roadway segments in the study area currently have accident rates higher than generally-accepted thresholds.

If the bypass project is not implemented, the conditions outlined above would persist, continuing to incur disbenefits to users of the system (including residents/commuters, businesses, and municipal services) and hinder coordinated State and City efforts to revitalize the flagging surface transportation and socioeconomic conditions in this densely populated area. The RIDOT would alternately need to apply short-term, reactive solutions to maintain status-quo serviceability (resurfacing, restriping, signage, etc.) and/or implement a scaled-back reconstruction program to address the geometric and traffic design deficiencies present along the existing circulator roadways. This approach would invariably result in higher life-cycle costs (particularly in the operation and maintenance of signalized intersections); would not address the larger circulation, accessibility, and economic viability deficiencies present in the existing circulator; and would not realize any of the benefits associated with providing the two-way bypass with modern roundabouts.

Through construction of the project, the RIDOT will address long-standing deficiencies and inefficiencies in the existing roadway system at this location, creating an optimized and resilient long-term solution that will complement the regional connectivity assets in the immediate vicinity – particularly Interstates 95 and 295 and the new T.F. Green (PVD) Airport *InterLink*[4] multimodal station (see Figures 1 and 2). The complete reconstruction of existing roadways, extension of Veterans Memorial Drive, and installation of modern roundabouts at the five principal network nodes – all of which have been planned and designed in accordance with current standards and best practices for safety, efficiency, accessibility, and sustainability – will bring the arterial roadway network into full state of repair, enabling plans for the long-term revitalization of this Economically Distressed area to proceed unencumbered. As described in preceding sections and enumerated in the Benefit-Cost Analysis developed for this TIGER grant application, the Apponaug Circulator Long-term Improvements Project has been designated as a priority in the Highway Program of the TIP, with funding appropriately programmed to reflect this prioritization. The RIDOT will be responsible for construction oversight, management, and long-term operation and maintenance of the new facilities, assets which will be managed and maintained through the Department's Division of Highway and Bridge Maintenance and Transportation Management Center (TMC). The necessary support infrastructure has been provided in the project design so that the TMC can leverage its Intelligent Transportation

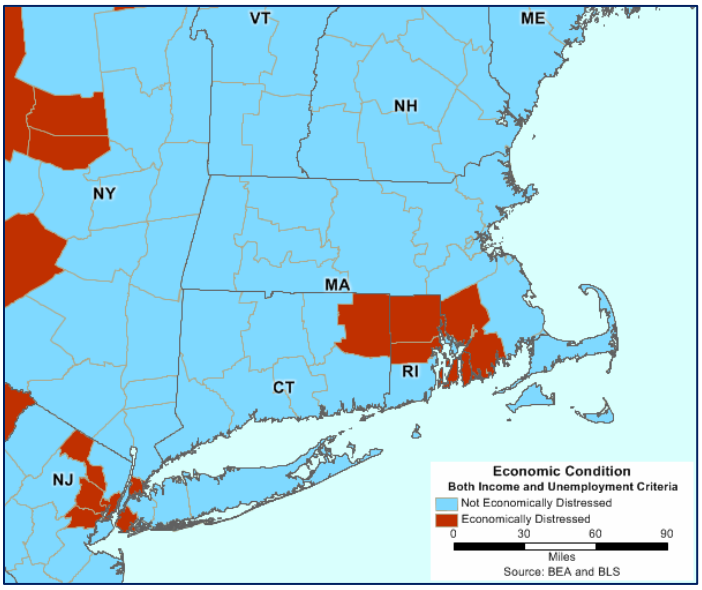
[4] See http://www.pvdairport.com/get-here/interlink

System (ITS) technologies to their full extent, allowing the RIDOT to monitor and maintain safe and efficient traffic conditions throughout the arterial system.

The RIDOT receives dedicated revenue from the Rhode Island gas tax which is utilized for operations and maintenance of the State's highway system. As the state highway agency, the RIDOT receives formula federal highway monies from the FHWA which are used to fund capital maintenance on state bridges and roadways. These funds are available for maintenance of the entire state highway system, including the arterial roads that comprise the surface transportation network in the Apponaug area. Despite significant budgetary constraints over recent years affecting all branches of government, the RIDOT remains committed to the maintenance of all state highways in a state of good repair.

ii. Economic Competitiveness

Implementation of the bypass project has long been recognized as the lynchpin in efforts to restore the economic competitiveness of Apponaug and the City of Warwick. The existing one-way circulator system, with its high traffic volumes, speeds, and congestion, has been responsible for the decline of economic activity within and around the the Apponaug Business District over the past several decades, as this configuration has proven incompatible with the urban center and its historic mix of commercial, government, and civic uses. Construction of the bypass will overcome these incongruences by diverting through traffic around the heart of the district, which in conjunction with the suite of long-term improvements to corridor – including pedestrian and bicycle accessibility, traffic calming, and streetscape improvements – will vastly improve its commercial viability and attractiveness for redevelopment.



By virtue of its prime location within the regional transportation network, including its proximity to the Interstate highway system and the *InterLink* multimodal / commuter rail station at T.F. Green Airport (see Figures 1 and 2), the long-term improvements project will also realize significant long-term benefits for surrounding communities in this Economically Distressed area. A detailed Benefit-Cost Analysis (BCA) has been prepared for the project in accordance with TIGER Grant application guidance, which clearly demonstrates the economic utility of the project. Employing accepted methodologies and conservatively omitting the tangible (but not readily quantifiable) livability benefits, the results of this analysis demonstrate that the long-term economic benefits of the bypass project – particularly in the travel time and reliability cost savings – substantially outweigh the costs associated with its implementation. While the project will generate strong

economic activity in the construction sector and supporting industries in the near term (creating approximately 200 direct jobs at the peak of activities), this short-term stimulus will be far exceeded by the economic activity generated following completion, as the Apponaug Business District will be revitalized to realize its full potential as an attractive and vibrant multi-use urban center.

iii. Livability

Improved Use of Existing Corridor – Upon completion of the bypass, shifts in traffic patterns will be an important component in the redevelopment of the surrounding area. In anticipation of this change, the City has instituted a new "Village District" zoning designation for Apponaug. This new code recognizes that many of the City's villages were constructed in a time before zoning existed, and thus are much less capable of conforming to current zoning requirements than newer developments. The Village District zone will provide greater flexibility in order to address the intrinsic characteristics of established urban centers and make the most of the amenities and sense of community so evident in these areas. City officials anticipate that the combination of the new traffic pattern, in conjunction with the zoning put into place in anticipation of this significant change, will lead to much-needed redevelopment and new development in this area.

This new zoning aims to revitalize and create new economic life in the Apponaug Business District. At its core, this mixed use designation will provide both valuable services for the district and surrounding area and unique opportunities for residents. It will foster economic development by allowing greater flexibility in uses, and by addressing parking requirements and building setbacks in an innovative way. By providing viable live/work opportunities, the new zoning will reduce the need for residents to travel outside of the Village to shop, eat, and participate in civic, cultural and recreational activities, in turn reducing fuel consumption and increasing pedestrian activity. All of this will be made possible and be enhanced by the construction of the bypass and the associated decrease in the volume of traffic through the historic main district corridor. This newly streetscaped segment, with emphasis placed on the pedestrian experience, bicycle access and more accessible on-street parking, will naturally foster an environment conducive to existing business and new business development. Through context-sensitive design, these modern urban amenities will complement the historic character of the area and create a true 21st-century, revitalized main street.

Pedestrian / Bicycle Facilities and Multimodal Connectivity – As part of the City's ongoing Comprehensive Plan update, a recently completed survey of residents found that 89 percent of the 700 respondents indicated that it was very important or important for the future of the City to install more sidewalks, walking paths, trails, and bicycle routes. Additionally, 81 percent of respondents expressed support for more walkable, pedestrian-friendly urban environment. Through a series of community meetings held to solicit public input for the Comprehensive Plan update, an overwhelming and recurring sentiment expressed by residents was that the City should seek to improve pedestrian and bicycle connections between its neighborhoods, villages, and commercial corridors.

There is presently very little pedestrian or bicycle activity in and around Apponaug owing to the incompatibility of these modes with the high volumes of motorized traffic along all legs of the existing circulator. Construction of the bypass will vastly improve upon these conditions through the provision of bicycle facilities (including a dedicated bike lane though the main district corridor, bicycle tolerant shoulders along new/reconstructed roadway segments, and bicycle ramps at all roundabout intersections) along with sidewalks, crosswalks, and other pedestrian amenities designed for full conformance with the Americans with Disabilities Act (ADA).

As part of its comprehensive planning process, the City is working towards the creation of a pedestrian and bicycling network throughout Warwick, which in concert with the Apponaug Circulator Long-term Improvements Project figures prominently in the City's shift to a new Transit-oriented Development (TOD) approach. The focus of TOD is to create compact, mixed-use, highly livable communities that are characterized by walkable streets and multimodal options, improving the quality of life for residents by fostering a true live, work and play environment.

A long-term City priority is to connect Apponaug to the new *InterLink* multimodal station at T.F. Green Airport (with connections to commuter rail, bus, and air transit) through improvements to pedestrian and bicycle facilities between these TOD nodes. Jefferson Boulevard (which runs parallel to Post Road / U.S. Route 1) is currently being evaluated for implementation of a "road dieting" lane reconfiguration, which would allow for construction of bicycle lanes on each side of the street and improved sidewalks. Connecting Apponaug with the City's new Airport Development District multimodal center will increase mass transit ridership, improve livability, reduce traffic congestion, and enhance transportation alternatives for City residents.

Civic Plaza Access – As part of the Bypass project, the RIDOT has acquired a historic mill building in close proximity to City Hall. While the City Hall building is historically and architecturally significant, the City lacks a true "civic center." With this property made available by the Bypass, there is an opportunity to reuse this mill building for municipal purposes. This would allow for the consolidation/collocation of government offices, which are currently spread throughout the City at three different locations, thereby creating a facility that is more environmentally sustainable and economical to operate.

The concept of a new civic center linking the existing City Hall building and the newly available mill building is supported by the Comprehensive Plan update currently underway. It is estimated that the consolidation/collocation of government offices would result in quantifiable travel and time savings for municipal employees, which have been incorporated (albeit with relatively minor benefits) in the Benefit-Cost Analysis prepared for this grant application.

Recreational and Cultural Opportunities – The reconfigured traffic pattern, along with the various accessibility improvements, will improve the public's access to and enjoyment off the natural features of the area (including the scenic shoreline of Apponaug Cove) as well as existing cultural amenities such as the Warwick Museum of Art located along the main district corridor. It is anticipated that the new Village District zoning and streetscape improvements, along with

the existing historic character of the district, will only serve to further attract cultural events such as street fairs, farmer's markets, and other activities of public interest.

iv. Sustainability

By all objective standards, construction of the bypass project will markedly improve the sustainability of the arterial transportation network and the urban environment it serves. Significant, tangible benefits will be realized through both (a) reductions in congestion and improved traffic flow, which will reduce emissions and improve air quality, and (b) the water resources and environmental design of the project, which will improve water quality, enhance wetland habitat and functions and values, and improve flood protection along the Apponaug River.

Air Quality and Energy – The entire state of Rhode Island has recently been classified as an attainment area for ozone. The City of Warwick has also been designated as a carbon monoxide (CO) attainment area. The bypass project will divert traffic away from the heavily congested Apponaug Four-Corners area, helping ensure that Rhode Island continues to improve air quality to meet the National Ambient Air Quality Standards (NAAQS).

A traffic and air quality evaluation was conducted to evaluate the impacts of maintaining traffic flow and roadways under the current configuration (no-build scenario) versus construction of the bypass and associated long-term improvements (build scenario).[5] The results of this evaluation indicate that the project will improve traffic flow and divert of traffic away from the Apponaug Four-Corners node, thereby reducing overall vehicle emissions in the region as follows:

- VOC emissions will decrease by 6.6 kg/day
- CO emissions will decrease by 145.3 kg/day
- NOx emissions will decrease by 6.8 kg/day
- $PM_{2.5}$ emissions will decrease by 0.2 kg/day

Similarly, the greenhouse gas (CO_2) emissions will decrease through implementation of the bypass project, as the congestion mitigation will decrease overall vehicle-miles travelled, fuel consumption, and travel time through the corridor. Model results based on existing and projected traffic volumes indicate that emissions of CO_2 will be decreased by 2,934.6 kg/day.

The net effect of implementing the bypass project will be to decrease mobile source emissions, thereby reducing the exposure to the public of levels of air pollution. This will help Rhode Island continue to meet the Clean Air Act requirements for Transportation Conformity and State Implementation Plans.

Water Resources, Wetlands, and Flood Protection – From the outset of project planning efforts, the RIDOT recognized that construction of the optimal bypass configuration – extending

[5] See the Apponaug TIGER website for the full technical memorandum (including supporting data and calculations).

Veterans Memorial Drive to the junction of Centerville Road (State Route 117) and Toll Gate Road (State Route 115) – would require a measured approach to the design of the facility across the disused former mill complex, particularly as the Apponaug River is culverted through most of the parcel. This watercourse was historically used for hydropower and, along with upstream flow controls along the Hardig Brook, was extensively reconfigured over several decades of mill operations. As a result of these activities, the flood conveyance and other riparian wetland values along this segment have been severely compromised. Despite its derelict condition, the reach does, however, still function as active fish spawning run for Alewife migrating between Apponaug Cove and Little Gorton's Pond.

In a broader context, the dense urbanization of this area of the State has contributed to the degradation of water quality within Greenwich Bay, which is subject to periodic shellfishing and contact recreation/swimming closures. Through extensive coordination with the Rhode Island Department of Environmental Management (RIDEM), and input from local and federal officials (including the U.S. Fish and Wildlife Service and U.S. Army Corps of Engineers), a holistic approach to the environmental design throughout the entire project area has been developed, consisting of the following key elements/benefits:

- The relocation and restoration of the Apponaug River from its present culverted state to a new, "daylighted" channel which will run parallel to, and ultimately discharge under, the Veterans Memorial Drive Extension (see Figures 6 and 7 below). Both the alignment and channel design have been developed to restore and maximize the natural riverine characteristics that existed prior to mill development, including features such as channel and bank stabilization (to safely convey major storm events), a pilot channel / low-flow section (to enhance the fish passage characteristics of the spawning run), and restoration plantings to recreate wildlife habitat within the blighted parcel.

- Through extensive hydrologic and hydraulic engineering efforts, modifications to the remnant control structures along the Hardig Brook tributary will result in restoration of the former Hardig Pond (which existed prior to and during various stages of mill development – see Figures 2 and 6), transforming this degraded wetland area into a sanctuary habitat along the stream corridor. Control of water levels within and outflows from the pond will be regulated by a primary control structure adjacent to the extant Upper Mill Dam, providing significant flood storage and attenuation benefits. Whereas the mill property, Centerville Road, and adjacent properties are presently subject to flooding from extreme rainfall events (as evidenced by the record floods of 2010), the proposed system of controls has been designed to safely convey floods up to and including the 100-year event without surcharge at the Veterans Memorial Drive Extension and Centerville Road bridges.

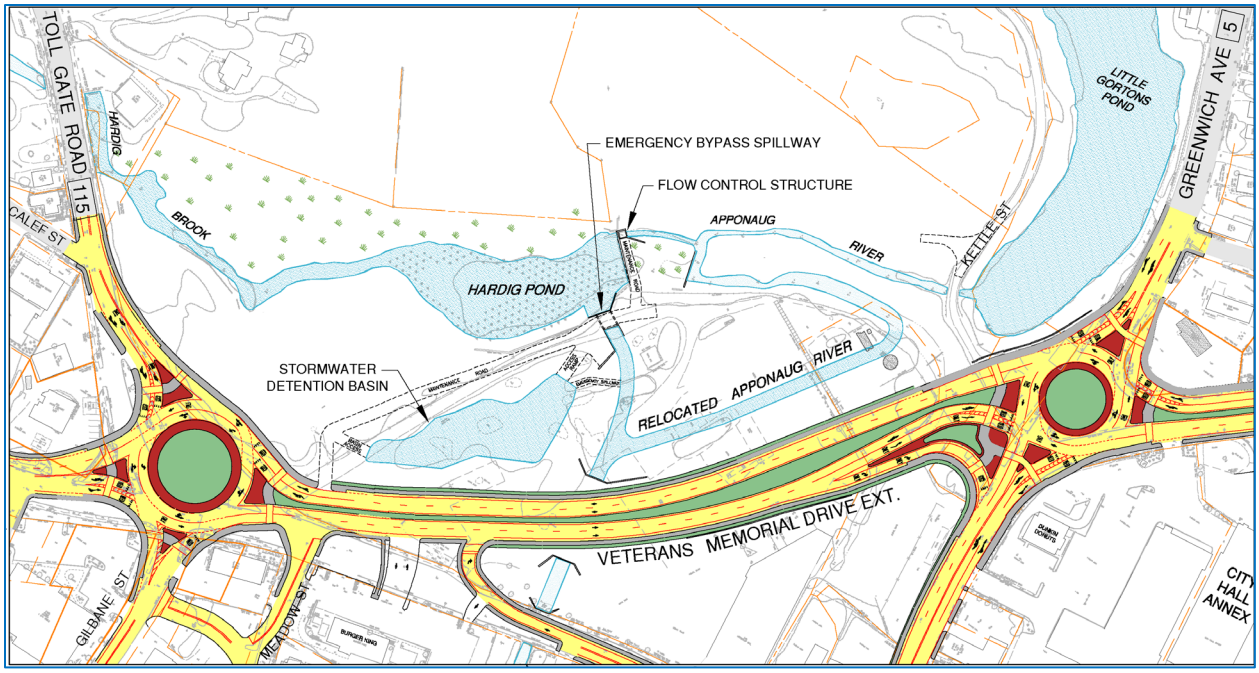


Figure 6 *– Overview of environmental improvements within the former mill complex.*

Figure 7 *– Looking southwest through the former Apponaug Mill Complex along the future Veterans Memorial Drive Extension (VMDE) alignment. In conjunction with construction of the bypass segment, major environmental improvements within this disused parcel include relocation/restoration of the Apponaug River (foreground, presently culverted through/under existing mill buildings), enhancements for fish passage along the existing spawning run, modifications to existing flow control structures for improved flood protection, construction of a new detention basin for stormwater management, and restoration landscaping.*

- The stormwater management design for the project has been developed to incorporate low-impact development and best management practices to mitigate the impact of stormwater runoff on water quality. Outdated drainage facilities throughout the entire project area currently discharge directly to receiving waters without treatment, mobilizing surface pollutants and contributing to the degradation of these waters. For the bypass project, a drainage design has been developed whereby runoff from Veterans Memorial Drive Extension and adjacent reconstructed roadways (16 acres of impervious surface total) will be collected and routed to a new wet extended detention basin, a facility that has been designed in accordance with the *Rhode Island Stormwater Design and Installation Standards Manual* [6] for maximum peak flow attenuation and water quality treatment. Other practices implemented elsewhere throughout the project – including pavement reduction (resulting in an overall net decrease of 1.2 acres), bioretention, and buffer landscaping – will serve to further mitigate the impacts of urban stormwater runoff. In total, the stormwater management provided in the project design represents a significant improvement over existing conditions within the highly urbanized Apponaug area.
- As the former mill complex (see Figure 7 above) was historically subjected to intensive industrial uses, construction of the project will require the remediation and management of contaminated soils in accordance with the state and federal regulations. Implementation of the bypass thus represents an appropriate, beneficial reuse of the property which will reduce the potential public health risks associated with this contamination.

v. Safety

Construction of the bypass project will realize significant, tangible safety benefits for all users of the reconfigured roadway network, including motorists, cyclists, and pedestrians. Brief descriptions of the safety deficiencies in the extant one-way circulator system, along with how these deficiencies have been addressed in the project design, are described under the headings below.

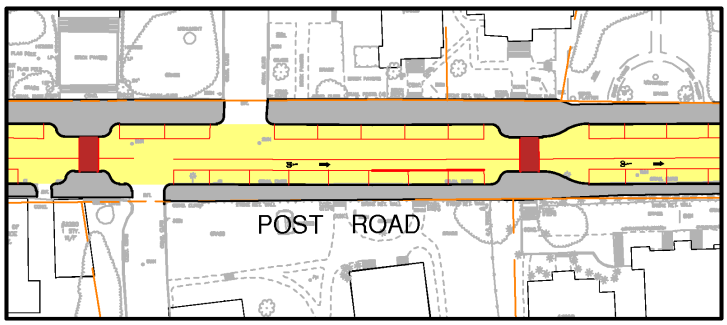
Roadway Geometry and Intersections – Under the existing conditions, three of the four legs comprising the Apponaug Circulator have 10-foot travel lanes, including Greenwich Avenue and the two segments of Post Road. Based on functional classification, the American Association of State Highway and Transportation Officials (AASHTO) recommends a minimum 11-foot width for all travel lanes on these roadways. There are presently no curb offsets or shoulder areas provided on Post Road (between Williams Corner and Veterans Memorial Drive) or on Greenwich Avenue. Although shoulders are provided on Veterans Memorial Drive, these shoulder areas are not striped. Additionally, most curb openings along the Post Road segments are poorly defined, creating driver confusion as motorists try to distinguish side streets from property driveways.

The existing horizontal alignment along the four roads of the Apponaug Circulator contains several curves, five of which do not meet the current AASHTO design criteria for minimum curve radius. All five of these curves are located within turning lanes at the corners of the circulator.

[6] See http://www.dem.ri.gov/programs/benviron/water/permits/ripdes/stwater/t4guide/desman.htm

A majority of the unsignalized intersections in the study area operate at Level of Service (LOS) "F" during peak hours, indicative of a forced flow condition with excessive backups and delay times. One such intersection, Greenwich Avenue at Veterans Memorial Drive, is a major node within the circulator. If left unimproved, conditions at unsignalized intersections within the circulator would only worsen as a result of projected increases in traffic volumes.

The final bypass design has been developed to address the above-described deficient conditions in the existing roadway system. The project has been designed to meet the AASHTO criteria for horizontal and vertical geometry (for the design speed), as well as for lane and shoulder widths. Along the reconstructed Veterans Memorial Drive and the new Veterans Memorial Drive Extension segment, a raised median strip has been provided in the design, which will eliminate left-turning movements at unsignalized intersections along these principal segments of the bypass. The proposed roundabouts will efficiently handle the traffic flow at the major intersections, eliminating signal phase delays, increasing vehicle throughput, and reducing queuing along approach segments. (The safety benefits of these facilities are discussed under subsequent headings.)



Pedestrians – A key characteristic of roundabouts is their ability to handle pedestrian crossings safely. In addition to realizing pedestrian safety improvements along the length of the bypass, the project will vastly improve pedestrian safety along the main corridor of the business district (between Apponaug Four-Corners and Williams Corner) through diversion of through traffic to the bypass. Upon completion, the projected volume of traffic along this segment will be reduced to an estimated 5,000 vehicles per day, providing a significant reduction from the approximately 24,500 vehicles per day under existing conditions. While remaining one-way, the cross section along this portion of Post Road will be modified from its present lane configuration (two travel / two parking) to a single travel lane, two parking lanes and a bicycle lane. Raised pedestrian crossings will be constructed with curb bump-outs to reduce the length of the crosswalks and with colored, stamped concrete surfaces for increased visibility. Those crosswalks, together with period lighting and streetscape enhancements, will provide traffic calming through the heart of the district. These features of the project will create a pedestrian-friendly environment, which is vital to the success of planned revitalization efforts. Project-wide, all pedestrian facilities have been designed to meet current accessibility criteria (including clear widths, slopes, and crosswalks) promulgated for compliance with the Americans with Disabilities Act (ADA).

Bicycles – As there are currently no provisions for bicycles within the existing Apponaug Circulator system, cyclists must either ride within vehicle travel lanes or use the sidewalk. The bypass project will vastly improve safety and mobility for cyclists in the area by (a) providing

bicycle-tolerant shoulders along reconstructed/new roadway segments and (b) providing a full bicycle lane through the Post Road business district segment. With the exception of the Post Road Extension (which is a high-speed facility and does not warrant bicycle access), bicycle ramps have been designed at all legs of the new roundabout intersections.

Access Management – Making use of portions of the existing circulator, the bypass design will alter the traffic pattern along the Veterans Memorial Drive corridor from four lanes in one direction to two lanes in each direction separated by a raised median. By restricting left-turn access/egress movements along most of the bypass (Veterans Memorial Drive and Extension – see Figure 4), these segments will be devoid of the vehicular conflicts and congestion associated with undivided highways, thereby increasing capacity and improving safety.

Roundabout Safety – The analyses originally conducted for the EA revealed that four of the project intersections in the study area had accident rates higher than the acceptability criterion (1.5 crashes per million entering vehicles) published by the Institute of Transportation Engineers (ITE):

- Centerville Road at Toll Gate Road
- Centerville Road / Post Road / Greenwich Avenue (Apponaug Four-Corners)
- Veterans Memorial Drive at Greenwich Avenue
- Post Road / Post Road Extension / Veterans Memorial Drive

A comparison of recent data (for the five-year period of 2008-2012) to those for the six-year period analyzed for the EA reveals that the actual crash frequencies have not materially changed: of the four intersections listed above, two saw lower averages in the number of crashes per year, while the other two had higher averages. Analysis of this most recent data revealed that a total of 448 crashes occurred within the study area over a five-year period. Of this total, 309 occurred at intersections (62 of which involved injuries), with the remaining 139 having occurred on roadway segments (27 of which involved injuries).

The implementation of roundabouts at the five key nodes of the bypass network will yield tangible safety benefits, as the safety and operational benefits of roundabouts over other forms of traffic management are well documented. Where roundabouts have been built to replace conventional signalized intersections, they have been widely successful in reducing the frequency and severity of accidents. The FHWA strongly supports the implementation of roundabouts for intersection control, listing these facilities amongst its nine Proven Safety Countermeasures.[7] In its interim best-practice guidance on the planning and design of roundabouts, the FHWA Office of Safety notes the following with regards to their traffic safety benefits:

> *Numerous studies have shown significant safety improvements at intersections converted from conventional forms to roundabouts. The physical shape of roundabouts eliminates crossing conflicts that are present at conventional intersections, thus reducing the total number of potential conflict points and the*

[7] See http://safety.fhwa.dot.gov/provencountermeasures/fhwa_sa_12_005.htm

most severe of those conflict points. The most comprehensive and recent study showed overall reductions of 35 percent in total crashes and 76 percent in injury crashes. Severe, incapacitating injuries and fatalities are rare, with one study reporting 89-percent reduction in these types of crashes and another reporting 100-percent reduction in fatalities. (FHWA-SA-10-006, 2010)

vi. Project Readiness

The Apponaug Circulator Long-term Improvements Project is ready for construction. As previously noted, mandatory FHWA procedures for documenting NEPA compliance are complete, with an Environmental Assessment having been approved and a Finding of No Significant Impact (FONSI) subsequently issued by the FHWA. At the time of this TIGER grant application, the final design has been advanced to the 90-percent stage of project development, and the RIDOT has now authorized its design consultant to proceed with preparation of the final PS&E (plans, specifications and estimate) design submission. Progressing parallel to the design process, other key prerequisites to construction are also near completion. Procurement of the required environmental permits from the applicable regulatory authorities is virtually complete, with final revisions to the RIDEM Freshwater Wetlands Program application package having been recently submitted for approval. The Department is also in the final stages of right-of-way acquisition, with certification expected in time for project advertising later this year.

Technical Feasibility – The technical feasibility of this project has been verified through completion of the 30-, 75- and 90-percent stages, through which the various aspects of the design have been revised and refined based on reviews by discipline specialists (e.g., traffic, construction, environmental) within the Department. Having undergone a thorough conceptual design during the Environmental Assessment, the project has been advanced through the various stages of final design, including detailed submissions to environmental regulatory agencies and utility providers for approvals and coordination, including the identification and elimination of potential conflicts. Finally, as required by FHWA for a project of this size on the National Highway System, a value engineering study was conducted for the project, and the accepted value engineering recommendations have been incorporated into the design.

Financial Feasibility – This TIGER Discretionary Grant application is being submitted to make up for a funding shortfall for the project. Presented below is a breakdown of the remaining costs for the construction phase of the project.

Source	Total Amount	Federal Share	State Match	Percent State Match
National Highway Performance Program (NHPP)	$14,297,066	$11,437,653	$2,859,413	20%
Earmark RI046	$6,793,900	$5,435,120	$1,358,780	20%
FY13 TIGER Funding	$12,500,000	$10,000,000	$2,500,000	20%
TOTALS	$33,590,966	$26,872,773	$6,718,193	20%

Note: All figures include engineering and contingencies (E&C) at 15%.

Since this project is a very high priority, the RIDOT intends to proceed with construction regardless of the outcome of this application, with the shortfall amount having to be funded out of the RIDOT's regular Federal Aid program, together with the required state matching funds. This approach would, however, result in the deferral of other needed transportation projects throughout the State. To minimize the effect on those other projects and its overall program, the RIDOT is applying for $10 million in TIGER Discretionary Grant funds to supplement its overall financing package.

Implementation of the project will involve the construction/reconstruction of approximately 2.32 miles of roadway in total, including five intersection roundabouts; a new bridge carrying the Veterans Memorial Drive Extension over the Apponaug River; roadway drainage and stormwater management facilities; curbing, sidewalks, and pedestrian facilities; landscaping; and the previously described program of environmental improvements. A breakdown of the project construction costs by general activity type is presented in the following table.

Activity	Cost Estimate	Percentage of Total Cost
Bridges	$2,740,335	8%
Earthwork	$1,917,950	6%
Management of Hazardous Materials	$1,631,200	5%
Landscaping	$1,415,902	4%
Pavement, Sidewalk, and Curbing	$7,200,065	21%
Site Preparation	$1,545,298	5%
Signals, Signing, Striping and Lighting	$1,645,968	5%
Stormwater Management	$5,036,733	15%
Traffic Control	$1,790,382	5%
Walls	$1,442,560	4%
Miscellaneous	$3,260,351	10%
Subtotal (Engineer's Estimate)	$29,626,745	88%
Utility Relocations, Remaining ROW, Police Details	$3,964,221	12%
TOTAL	$33,590,966	100%

Note: All figures include engineering and contingencies (E&C) at 15%.

Project Schedule – As with all RIDOT projects of this magnitude, a detailed Project Construction Schedule / Contract Time Determination (CTD) has been prepared, which includes a breakdown of all major activities by anticipated sequence. The full 90% design stage CTD Project Schedule (Gantt chart) is provided on the Apponaug TIGER website, a summary of which is provided in the table below.

Engineering and Construction Schedule

FFY:	2013	2014	2015	2016	2017
Preconstruction Engineering					
Contract Advertisement *September 6, 2013*	▲				
Construction Notice To Proceed *December 5, 2013*	▲				
Construction *March 17, 2014*					
Project Completion *May 15, 2017*					▲

Assessment of Project Risks and Mitigation Strategies – Given that the project is presently in the advanced stages of final design, the anticipated risks going forward into and through construction are minimal. The usual risk categories for urban highway projects of this scope and magnitude are outlined below.

- *Right-of-way* acquisition is nearing full completion. Most all property acquisitions and easements required to construct the project have been secured, with measures to acquire the remaining plots well underway. Having been directly involved with the design process since its inception, the RIDOT Real Estate Section is continuing to work in close coordination with the Design and Construction Management Sections to ensure that the project remains on schedule. The remaining right-of-way necessary to construct the project has been identified and consists of partial acquisitions (strip takes), permanent easements for drainage or utility relocations, and/or temporary construction easements. The RIDOT has the statutory power of condemnation and has issued written offers to the landowners and is making significant progress in securing releases from them. Statutory authority allows for the acquisition of land and easements for highway purposes upon recording of the condemnation documents so long as funds equal to the State's offer have been made available to the affected landowner(s). As of this date the Department is confident that it will be in a position to certify all right-of-way necessary to construct the project on or before September 6, 2013.
- *Environmental/Regulatory permitting* and procurement of authorizations often constitute a risk factor. Given the significant environmental elements of the project (including river relocation/restoration, site remediation, and stormwater management), the RIDOT has coordinated extensively with several arms of the RIDEM – including the Division of Fish and Wildlife, Office of Water Resources, and Office of Waste Management – to develop an environmentally positive and sustainable design. A permit application has been submitted to RIDEM's Freshwater Wetlands Program, with revised plans and documentation re-submitted in May 2013 which addresses all outstanding water quality, engineering, and wetland biology review comments. Consequently, the issuance of a permit (along with other interdependent authorizations, e.g., U.S. Army Corps of Engineers, Water Quality Certification) is expected to occur well in advance of the scheduled advertising date.

- *Utility coordination* is an integral component of the proposed project, particularly as the limits of work span several fully built-out highway corridors in a highly urbanized area. The RIDOT has set this project as a priority with the public and private utilities involved, with extensive coordination already having taken place. The relocation of existing utilities and provision of new facilities are coordinated and planned and are anticipated to take place in the proper sequence.

In summary, all of the activities necessary to address the range of identifiable risks have taken place, and Apponaug Circulator Long-term Improvements Project is fully expected to be advertised for construction on schedule.

b. Innovation

Through construction of the Apponaug Circulator Long-term Improvements Project, the RIDOT will create a state-of-the-art, 21st-century transportation system that effectively integrates current engineering best design principles and technology, including:

- Modern roundabouts for traffic control at all major intersections.
- Access management through the use of a raised median along the principal legs (Veterans Memorial Drive and Extension) of the bypass.
- Implementation of a "road diet" (another FHWA Proven Safety Countermeasure) along the business district / City Hall segment of Post Road, whereby the existing two travel / two parking lane configuration will be reduced to one travel lane, a bicycle lane, and two parking lanes. The new bypass will significantly reduce traffic volumes along this reach, allowing for its reconstruction as true urban "main street" with traffic calming and streetscape features, including curb bump-outs, three mid-block raised crosswalks (with stamped colored concrete for increased visibility), and period lighting. In addition to realizing the inherent pedestrian and bicycle safety benefits, these features will significantly enhance the livability and economic vitality of the business district, allowing the City to pursue its long-range plans for the redevelopment of Apponaug.
- A holistic and environmentally sustainable design will that realize the numerous long-term benefits described in Sustainability section of this document, incorporating best management practices and low-impact development principles to improve the environmental quality in this densely populated urban area.

c. Partnership

From its inception, the bypass project has benefitted from a strong, essential partnership between the RIDOT and the City of Warwick, which has participated through all stages of project development via its Planning Department (headquartered at the City Hall Annex just north of the City Hall). As discussed in the Livability section of this narrative, the socioeconomic decline of Apponaug is rooted in the current circulator traffic pattern and the associated traffic volumes, speeds, and congestion throughout. The very concept of a bypass around the Apponaug Business District and Government Center was initially put forward by the City, as such as bypass was initially identified (and remains) a critical component of its long-term

revitalization planning for the district. Indeed, City officials deemed plans for such a bypass as important enough to warrant the contribution of municipal funds ($75,000) to assist the RIDOT in the preparation of an Environmental Assessment.

In addition to close coordination with City government, a robust public participation component has been a central component of the planning and design of the project. Regular meetings have been held throughout the design process with the Apponaug Project Committee, formed specifically for the project and comprised of representatives from the following bodies:

- The *Apponaug Area Improvement Association*, a pre-existing organization of local business owners, residents and interested members of the public;
- The *Central Rhode Island Chamber of Commerce*;
- The *Warwick Historical Commission*; and
- The City's *Planning Department* (through which the City's Police and Fire Departments have also participated, when appropriate).

Throughout the planning and design stages, the committee has been kept apprised of developments and has contributed valuable input to the design decisions made, including the principal traffic management improvements as well as the associated access management and aesthetic improvements that will be provided. ***The Apponaug Project Committee fully supports the implementation of the bypass project.***

With regards to achieving related objectives and coordinating with economic development, housing and land use plans and policies, the Livability section of this document provides ample testimony as to the project's conformity with these evaluation criteria. The bypass project is clearly an endeavor aimed at "revitalizing a targeted area and fostering private capital investment in a disinvested community."

d. Results of Benefit-Cost Analysis

Completion of the Apponaug bypass will result in a variety of benefits, the sum of which more than offset the costs of construction. The benefits realized by this project can be categorized into the cost savings associated with lower travel times and vehicle operating costs; improvements in vehicular, pedestrian, and bicycle safety; reduced vehicular emissions; improved livability; and associated economic impacts. It should be noted that the present value of all benefits and costs are in 2013 dollars, discounted at 7%. (Appendix BCA-1 shows the sensitivity test and comparative benefit/cost ratios when the 3% rate is used).

Cost Summary

In undiscounted terms, the Apponaug bypass project is expected to cost $50.1 million in capital outlays, in comparison to a base-case cost of $4.8 million the state would incur by reconstructing existing facility without the bypass. Consequently the cost of capital outlays for the project (net of the alternative base-case cost) is $45.3 million. The present value of these costs is $39.9 million, leaving $0.4 million in residual value at the end of the construction period, yielding a present value of $39.5 million for the cost stream (see Table BCA-1 below and

Appendix BCA-1). As the bypass will make use of existing highway corridors and entail less than ½ mile of new roadway, the roadway operation and maintenance costs will be offset by operation and maintenance savings in the replacement of three traffic signals with roundabouts. Consequently, this project is not expected to result in any substantial changes in operation and maintenance costs.

Benefits Summary and B/C Ratio

The present value of the cumulative benefits of the project (to 2040) is $175.4 million, yielding a benefit-cost ratio of 4.4. In addition to the benefits quantified in Table BCA-1, some societal benefit categories are non-quantifiable and described in the Livability section of this document. Performance areas with non-quantifiable benefits are indicated with a check mark (✓).

Table BCA-1: Summary of Societal Benefits & Costs
(Constant 2013 dollars, in millions)

Performance Metric	Economic Competitiveness	Safety	Environmental Sustainability	Livability	State of Good Repair
Benefits					
Travel Time & Reliability Cost Savings	$167.4			$0.04	
Vehicle Operating Cost Savings	$7.4			$0.03	
Value of Safety Improvements		$0.4			
Value of Reduced Emissions			$0.1		
Non-Quantifiable (see text)	✓		✓	✓	✓
Total Benefit	**$175.4**				
Costs					
	Undiscounted		**Discounted (7%)**		
Capital (start-up) cost	$45.3		$39.9		
Operation & maintenance costs	$0		$0		
Residual value	$2.7		-$0.4		
Total Cost			**$39.5**		
Benefit-Cost Ratio	**4.4**				

- *Travel Time & Reliability Cost Savings* – In the period from 2014-2040, the project is expected to result in a total cumulative travel time and reliability savings of $167.4 million, $71.8 million of which is realized through savings for in personal travel and reliability for business purposes, approximately $3.2 million is realized through savings in freight delivery times (and improved reliability) and $92.3 million is realized through savings in personal travel time and reliability for household (non-business) purposes.

The travel time and reliability benefit occurs because of faster travel times and improved reliability associated with the additional capacity of the new bypass and by the continuous traffic flow supported by the five new roundabouts. The bases for vehicle mileage, time reductions, and congestion savings are provided in Appendix BCA-2. It should be noted that the travel time and reliability benefit includes both the per-hour value of travel time saved applied to both the direct time savings and the reliability savings as computed in terms of hours of "buffer time" using the Texas Transportation Institute (TTI) "Buffer Time Index" (see Appendix BCA-5).

- *Vehicle Operating Cost Savings* – From 2014-2040, the project is expected to result in just over $7.4 million in vehicle operating cost savings. Of this amount, $7.1 million will be saved among passenger vehicles with the remaining $0.3 million saved among trucks carrying freight. These savings include reduced vehicle mileage, wear and tear, fuel, insurance, and other operating costs saved due to an average 4% reduction in vehicle-miles travelled (VMT). The VMT reductions result from the more direct routing of traffic associated with the bypass. The savings also include reductions in idling time and stop-go traffic due to congestion and intersection stops (enabled by both enhanced roadway capacity and by the continuous flow of the roundabouts).
- *Safety* – The project is expected to result in $434,000 in crash-related savings. These savings are attributable to the above described reductions in VMT and to the safety benefits of roundabouts as described in Appendix BCA-3. Passenger vehicles account for most of the safety benefit (improved truck safety is valued at less than 1% of the safety savings).
- *Environmental Sustainability* – By 2040, it is expected that the more direct routing of traffic enabled by the bypass will be saving approximately 1 million VMT, and will significantly reduce idling and increase travel speeds. These changes in performance are expected to reduce emissions accounting for approximately $0.1 million. The methodology and assumptions for computing emissions reductions as a function of VMT and percent congested are shown in Appendices BCA-1 and BCA-5.
- *Livability* – Construction of the Apponaug bypass is expected to significantly improve the livability and quality of life for the area. These include the benefits expounded upon in the Livability Selection Criteria subsection of this Project Narrative, which cover both quantifiable and non-quantifiable aspects of livability. The calculations provided in Appendix BCA-4 show how the project will enable the city to develop a new civic plaza, which will result in nearly $68,000 worth of savings through reductions in municipal staff travel time to/from certain decentralized City offices). Non-quantifiable sources of livability benefit include improved use of the existing historic district corridor, improved pedestrian and bicycle facilities, and improved access to recreational and cultural opportunities.

Economic Impacts

The economic benefits described in the previous section are also likely to create stimulus to the local economy. For the purposes of this application, business attraction impacts are not considered, however the stimulus of short-term project construction outlays as well as enhanced economic activity as a result of reduced transportation costs are considered. The impact

analysis includes both the direct effects (earnings, output and employment directly resulting from construction outlays or transportation savings) as well as induced and indirect effects (multiplier effects as these dollars are spent in the economy and stimulate demand in other sectors). For more detailed year-by-year impacts see Appendix BCA-1.

As Table BCA-2 illustrates, the Apponaug bypass project is expected to support 200 jobs from construction of the facility (at the height of the construction period) and as many as 30 jobs resulting from long-term transportation efficiencies by 2040. The project is also expected to result in $59.4 million in cumulative wage income, with $28.1 million from construction and $31.3 million from the long-term transportation efficiency of the project. Cumulative Gross regional product (GRP) in the period to 2040 will receive a $76.8 million boost during the analysis period, with construction contributing $34.5 million and transportation efficiency contributing $42.3 million. Finally, the project will support $139.6 million in additional business output, with construction contributing $62.3 million and transportation efficiencies contributing $77.3 million.

Table BCA-2: Summary of Economic Impacts *

	Jobs	Wage Income ($ million)	Value Added (GRP) ($ million)	Business Output
Construction	200 **	$28.1	$34.5	$62.3
Transportation Efficiency	30 ***	$31.3	$42.3	$77.3
Total	**N/A**	**$59.4**	**$76.8**	**$139.6**

Notes: * Impacts calculated from construction outlays and cost savings using multiplies from Minnesota Implan group (MIG) as documented at www.tredis.com.
** Not cumulative; represents the highest value during the period of analysis.
*** Not cumulative; represents the value after 2040. This estimated figure is conservatively limited to only those jobs created by improved transportation efficiency and does not include any business attraction or business relocation effects.

V. Planning Approvals

National Environmental Policy Act (NEPA) – As previously noted in the Project Description section of this document, all documentation required to demonstrate NEPA compliance has been approved, culminating in the FHWA issuance a Finding of No Significant Impact (FONSI) for the project in 2005. With the project design subsequently modified to incorporate modern roundabouts at the five major nodes of the bypass network, the RIDOT prepared a reevaluation of the EA to consider the effects of this design modification on the findings of the original EA. Shortly thereafter the FHWA issued a letter concurring that the FONSI issued for the project remains valid for the current design. Full copies of both the original EA/FONSI and the Reevaluation (including FHWA Letter of Concurrence) are available through the Apponaug TIGER website.

Regulatory Permits – By its location, magnitude, and scope, the bypass project requires permit authorization under certain state and federal regulatory programs, the respective statuses of which are summarized below.

- *RIDEM Freshwater Wetlands Program* – In accordance with the State's Wetlands Protection Regulations, a formal permit application (No. 11-0099) has been submitted to the RIDEM Freshwater Wetlands Program for review and approval. The Freshwater Wetlands application process constitutes the principal environmental permitting mechanism, with several of the additional approvals listed below being contingent upon the receipt of a Freshwater Wetlands permit. The RIDOT has coordinated extensively with the RIDEM throughout the planning and design processes for the project, culminating in the submission of a formal freshwater Wetlands application in June 2011. Following a series of refinements to the project design based on further coordination, the RIDOT re-submitted plans and supporting documentation in May 2013 which addresses all outstanding water quality, engineering, and wetland biology review comments. Consequently, the issuance of a permit (along with the related authorizations listed below) is expected to occur well in advance of the scheduled advertising date.
- *RIDEM Water Quality Certification* – As a major action with the potential to affect Waters of the United States, the project requires review by the RIDEM's Water Quality Certification (WQC) program for consistency with Section 401 of the Clean Water Act and the State's Water Quality Regulations. This review is conducted through the above-described Freshwater Wetlands Program application process, with the pending issuance of a Wetlands Permit will constituting WQC approval. Through the resubmission of design plans and supporting documentation to the RIDEM, the RIDOT has made the appropriate refinements to the project design (including engineering modifications to the stormwater basin, additional low-impact development measures, and other mitigation strategies) to sufficiently address all comments and concerns issued by the RIDEM Water Quality section.
- *Rhode Island Pollutant Discharge Elimination System (RIPDES)* – In accordance with the Rhode Island Pollutant Discharge Elimination System (RIPDES) Regulations (RIDEM, 2003), projects involving more than 5 acres of soil disturbance are automatically authorized under the *RIPDES General Permit for the Discharge of Stormwater Runoff Associated with Construction Activity* upon receipt of a Freshwater Wetlands permit / Water Quality Certification from RIDEM. Documentation has been completed through the submission of a completed Notice of Intent (NOI) form to the RIPDES program and the preparation of a Stormwater Pollution Prevention Plan (SWPPP) for inclusion in the contract documents.
- *U.S. Army Corps of Engineers, Rhode Island Programmatic General Permit* – The U.S. Army Corps of Engineers (USACE) reviews the project for consistency with Section 404 of the Clean Water Act. Through federal/state interagency coordination, it has been established that, upon receipt of a Freshwater Wetlands permit from the RIDEM, the project will be covered as a "Category 2 / Reporting" activity under the Corps' Programmatic General Permit (PGP) for the State of Rhode Island.
- *Rhode Island Coastal Resources Management Program* – As the State's Coastal Zone Management (CZM) authority, the Coastal Resources Management Council (CRMC) has

jurisdiction over development activities within the coastal margin. Through interagency correspondence and coordination, the Council has determined that the project lies outside the 200-foot CRMC jurisdiction for projects of this type, and has deferred freshwater wetlands jurisdiction to the RIDEM Office of Water Resources, Freshwater Wetlands Program. Consequently, no further approvals are required from the CRMC for this project.

Legislative Approvals – Specific legislative approval is not required to advance this project. Broad support for the Apponaug Circulator Long-term Improvements project is demonstrated by the several letters of support received from State officials and departments, including Rhode Island's congressional delegation. These letters are available for review through the Apponaug TIGER website.

State and Local Planning – The RIDOT is the government agency charged with maintaining the State's transportation systems, including the arterial highway network, in a state of good repair. With broad support at all levels of government, the RIDOT has prioritized construction of the Apponaug Circulator Long-term Improvements Project by recommendation of the project for inclusion in the FY 2013-1016 TIP/Highway Program, through which State funds have been programmed for the project. The City of Warwick has been an active proponent of the project through all stages of development, formally requesting that the RIDOT evaluate alternatives for a long-term bypass of Apponaug (in lieu of short-term improvements) in 1993 and subsequently providing financial assistance towards the preparation of an Environmental Assessment. The City's continued support of the project is evidenced by the prominent focus given to Apponaug throughout the Comprehensive Plan update process, including the planned re-zoning of the district to facilitate economic activity and urban revitalization. Both the State Division of Planning and the City of Warwick have provided formal letters of support for the project and the RIDOT's current application for TIGER Discretionary Grant funds.

VI. Federal Wage Rate Certification

The RIDOT certifies that it will comply with the requirements of subchapter IV of chapter 31 of title 40, United States Code (Federal wage rate requirements), as required by the FY 2013 Continuing Appropriations Act. A standalone copy of this certification statement is available through the Apponaug TIGER website.

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

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FY 2013 TIGER Discretionary Grant Application
Long-Term Improvements to the Apponaug Circulator Project

FEDERAL WAGE RATE CERTIFICATION

The undersigned agrees to comply with the requirements of Subchapter IV of Chapter 31 of title 40, United States Code regarding Federal wage rate requirements, as required by the FY 2013 Continuing Appropriations Act.

Michael P. Lewis
Director, Rhode Island Department of Transportation
May 20, 2013

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