Taylor Street Bridge
Its History, Design, Function, and Future

Prepared for the Montpelier City Council
by the Taylor Street Bridge Committee:
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Taylor Street Bridge, 1929

Executive Summary

After full consideration of seven distinct options, members of the Taylor Street Bridge Committee recommend that the Montpelier City Council adopt Option 1, described in Section 8 of this report: Enroll the bridge in the Vermont Historic Bridge Program, and authorize work to begin on rehabilitation of Taylor Street bridge for 2-lane use, 50,000 – 72,000 lbs. Members of the committee selected Option 1 because it achieves the following:

- preserves the historic, aesthetic, and distinct characteristics of the Montpelier cityscape;
- saves more of the original bridge than any of the other options and strengthens the bridge to a certified level over 50,000 pounds and probably to a level that is significantly higher;
- is likely to handle traffic anticipated in all currently proposed projects for the City of Montpelier;
- creates a welcoming gateway effect which could be enhanced through lighting;
- provides safe, convenient, and efficient access across the Winooski for vehicles and pedestrians;
- will provide for continued vitality and economic growth in the downtown;
- is eligible for the Vermont Historic Bridge Program that will cover 100% of the bridge rehabilitation costs with money from the Federal Highway Program and VTrans;
- is the most cost-effective option, representing a significant cost-savings to the city in comparison to all the other options;
- demonstrates that old bridges can be preserved and can meet current functional requirements as well;
- demonstrates public recognition that we need not sacrifice the built environment unnecessarily for the sake of motorists' convenience; and
- citizens have expressed their wishes to preserve truss bridges.

Furthermore, other options described in Section 9 of this report were not selected because a wider bridge would very likely aggravate traffic conditions given the characteristics of the intersections at either end of the bridge; there are significant costs to the city for any new bridge construction; and any structural work that is not a rehabilitation of the bridge results in a loss of the bridge's contribution to the city's distinct heritage and character.

The committee also recommends that the city immediately implement a maintenance plan with adequate budget support for Taylor Street bridge and well as other vehicle and pedestrian bridges owned by the city. (See Appendix B for a list of Montpelier's bridges.)

Table 1. Decision Matrix for the Taylor Street Bridge

Key: H=High M=Moderate L=Low N=None

Options	Historic Value	Aesthetic Value	City Gateway	Distinct Character of City	Safe Access Cars/Ped	Support for Ec. Vitality	Afforda-bility	Total Project Cost	Funding Sources	Major Maintenance Responsibility	Timing-from project planning
Opt. 1. Rehabilitation for 2-Lane Use 50,000-72,000 Lbs. Enrollment/acceptance in VT Historic Bridge Program (VHBP).	H	H	H	H	H	H	H	$451–$516,000 Lichtnstn Rpt $802,230 Vtrans	VHBP Fed. 80% State 20% City 0%	After initial rehab, paid by state	6 ½ yrs
Opt. 2. Rehabilitation/Reinforcement for 2-Lane Use 72,000 Lbs. Enrollment/acceptance in VT Historic Bridge Program (VHBP).	H	H	H	H	H	H	M	$1.96–2.16 million Lichtnstn Rpt No estimate possible without in depth structural analysis VTrans	VHBP Fed. 80% State 20% City 0%	After initial rehab, paid by state	6 ½ yrs
Opt. 3. Rehabilitation/Reinforcement up to 72,000 Lbs. with Widening Enrollment/possible acceptance in VT Historic Bridge Program (VHBP).	M	H	H	H	H	H	L	$2.34–$2.66 million Lichtnstn Rpt $1.95 million VTrans plus costs to widen abutments and right-of-way	If VHBP Fed. 80% State 20% City 0% If not VHBP city 5%	If VHBP, after initial rehab, maint. paid by state. If not VHBP city pays 100%	6 ½ yrs+
Opt. 4. Build New 1-Lane Bridge for Right-Hand Turns (Not independent – possible companion with Opt. 1 or 2).	L	L	L	M	M	H	L	$772,200 VTrans plus costs to widen abutments, right-of-way, and Opt. 1 or 2	Fed. 80% State 10% City 10%	city 100%	Unknown
Opt. 5. Build New, 2-Lane Truss Bridge.	L	M	M	M	H	H	L	$1.70–1.95 million VTrans plus costs to widen abutments, right-of-way, and reloc. or demo.	Fed. 80% State 10% City 10%	city 100%	9 ½ yrs
Opt. 6. Build New, 3-Lane Truss Bridge.	L	L	L	M	M	H	L	$2.78 million VTrans plus costs to widen abutments, right-of-way, reloc. or demo.	Fed. 80% State 10% City 10%	city 100%	10+ yrs
Opt. 7. Build New, 2-Lane Girder Bridge with Pier.	N	L	L	L	H	H	L	$1.93 million VTrans plus cost of pier, sidewalk, abut-ments, right-of-way, reloc./demo.	Fed. 80% State 10% City 10%	city 100%	10+ yrs
Opt. 8. Build New, 3-Lane Girder Bridge with Pier.	N	L	L	L	M	H	L	$2.57 million VTrans plus cost of pier, sidewalk, abut-ments, right-of-way, reloc./demo.	Fed. 80% State 10% City 10%	city 100%	10+ yrs
Opt. 9. Relocation or Demolition of Taylor Street bridge (Not independent – additional cost with Opts. 5 – 8).								$1,000,000 for relocation OR $165,000 for demolition	State 90% City 10%	NA	Unknown

Section 1. Introduction

Montpelier's geography is one of mountains and rivers. This geography has determined its settlement patterns and history. Settled at the confluence of the Winooski River and North Branch, Montpelier has by necessity become a city of bridges. The major highways that lead to the city come into town on the south side of the Winooski. The main business area, state government buildings, and the schools are on the north side of the Winooski, and significant portions of the city's residents live on each side of this river. Similarly, Montpelier's downtown straddles the North Branch with government buildings and businesses on the west side and the city's Main Street on the east side. Crossing rivers is an inescapable part of living, working, and visiting our city. As a community, we have to decide how we will solve the problems of crossing our rivers efficiently and safely, balancing these considerations with the appearance of the city and the experience of crossing the river.

On December 20, 2000, the Montpelier City Council voted unanimously to establish a committee to study the history, design, function and future of the Taylor Street Bridge. Also known as Montpelier Bridge No. 5, this bridge crosses the Winooski between Main St. and Bailey Ave., linking State Street and US Route 2/Memorial Dr. at the eastern side of the Capitol Complex and serving as a gateway to downtown. Residents of the city were invited to apply for appointment to this committee. On February 14, 2001, nine residents who applied for appointment to the Taylor Street Bridge study committee were appointed, along with two Council representatives. Soon after the committee's regular meetings began, one member resigned, leaving ten members who have done the research and writing for this report. The committee has followed these steps in carrying out its charge:

1. Investigated the core values and planning guidelines that have given direction to decision-making and planning for Montpelier up to now;

2. Created a context for making a decision about the future of Taylor Street bridge by looking at its history and what it represents in terms of the development of the state's transportation system and use;

3. Learned about increasingly sophisticated engineering capabilities and new materials;

4. Reviewed technical reports on the condition of the bridge and maintenance work required by VTrans (Vermont Department of Transportation);

5. Reviewed available information about current traffic levels and conditions;

6. Assessed the traffic implications of proposed future development in the city, as presented in the city's key planning documents, the *City of Montpelier Master Plan*, the *Capital District Master Plan*, *Traffic Impact Study for the Court Street Parking Facility*, *Capital City Welcome & Transit Center Purpose and Needs Statement*, and others;

7. Assessed 7 distinct options for the future of the bridge, addressing values, costs, funding, maintenance, and timing for each option;

8. Prepared a report of the committees findings, including Table 1 that summarizes each option on the basis of key criteria;

9. Reached consensus on Option 1 as the committee's recommendation to the Montpelier City Council; enroll Taylor Street bridge in the Vermont Historic Bridge Program and proceed expeditiously with rehabilitation for 2-lane use for 50,000 to 72,000 pounds. And in the interim, implement a maintenance program for the bridge until the rehabilitation work is underway.

Section 2. Values and Criteria to Guide Decision-Making

The Taylor Street Bridge Committee has identified the following set of values, drawn from current planning documents and policies, to use as criteria for our analysis of a recommended course of action for the city of Montpelier to adopt regarding the future of Taylor Street bridge.

Historic Value. Bridges, like other architectural objects, represent the experiences, technological options, and choices of people in the past. By creating a Historic District and including it on the National Register of Historic Places, Montpelier has chosen to honor its past.

The *City of Montpelier Master Plan* (2000), identifies preserving the city's natural and historic features as key components in its vision for the future, specifically stating "When possible, in light of public safety concerns, preserve the historic features of the bridges over the Winooski" (pg. 11).

Aesthetic Value. Aesthetics deals with the creation and appreciation of beauty and art. As applied to Montpelier's downtown, it means creating and maintaining a sense of tasteful design with balanced and interesting structural components. The aesthetic value of a place is a reflection of the thoughtfulness with which the parts fit together, how traditional elements of the cityscape are maintained, and how new pieces are added.

With respect to a bridge, aesthetic value emphasizes the movement from land, across water and back to land. Bridges by their very nature are transitional structures which are not simply structural but include aesthetic elements, including views of the space and river over which the traveler passes. As architectural historian Richard Ewald has written "a bridge is the only architecture that flies. It carries us through the air, taking off here and landing over there" (Ewald, pg. 115).

Establishing a City Gateway. The *Master Plan* defines the importance of clearly defining the boundaries and entry points of the city.

> The significant entrances to the city should be given priority consideration for urban design. "Gateways" have been defined as those points on the major arterial roadways leading into the city where the first glimpse of the Statehouse and City Hall tower appear (pg. 23).

The *Capital District Master Plan* has also established a position on city gateways and bridges.

> City gateways at Bailey Avenue, Taylor Street, and Main Street have been defined in the Montpelier Master Plan for over 10 years. Envisioned as identifiable public junctures, the gateways should frame views of the Capitol and downtown. Integrated with the city's natural and historic character, gateways will welcome visitors to the commercial and cultural opportunities Montpelier has to offer (pg. 28).

Highlighting the Distinctive Character of Montpelier. The *Master Plan* also provides clear direction about the present and future role of bridges in the city, the need to balance historic preservation with functional considerations, and the need to recognize the depth of public interest in the city's bridges. It is the collection of bridges and the variety of architectural styles that help define the unique character of the city.

> Montpelier is a city of rivers and bridges. As we increasingly turn our attention to highlighting our riverfront, we must also focus on our bridges for both their functional and aesthetic value. Functionally, bridges must move traffic safely and efficiently across the city's rivers. The city's historic bridges are recognized treasures of state and national importance that, for some, serve as symbols of the city. The City maintains seventeen bridges within city limits; there are several other rail, foot, and highway bridges in Montpelier. Railroad bridges are maintained by the State.

> The proposed replacement of various historic bridges has been one of Montpelier's most contentious issues, it has fostered passionate debate and citizen referendums on the issues. This includes the Langdon and Pioneer Street bridges, which are slated for replacement and will soon include Taylor Street, which is in need of maintenance. The City's challenge is to develop a framework for addressing bridge improvements that balances historic preservation with functional considerations (pg. 30 and Recommendation 2 pg. 35).

Safe Access Across the Winooski - Vehicles and Pedestrians. It is essential that the bridge at Taylor Street has the capacity to carry cars, buses, trucks, and pedestrians safely and conveniently. It is similarly essential that pedestrians using the bridge at Taylor Street have a sidewalk that separates the walkers from the vehicular flow.

What are the needs of drivers and pedestrian who select the Taylor Street bridge as their route for crossing the Winooski? Does a 2-lane bridge meet the capacity requirements of those who live in the city, as well as those who come into Montpelier to work, conduct business, or shop? Is a 3-lane bridge more consistent with current and expected needs for access across the Winooski at Taylor Street? In the context of the city's five bridges that cross the Winooski within 5 miles of each other, can we adapt our access needs to preserve a functioning example of past technology? Alternately, by building a bigger, wider bridge, are we creating new problems such as the need to widen Taylor Street to three lanes and the need to accommodate greater congestion at the intersections where Taylor Street traffic feeds into State Street and US 2/Memorial Drive?

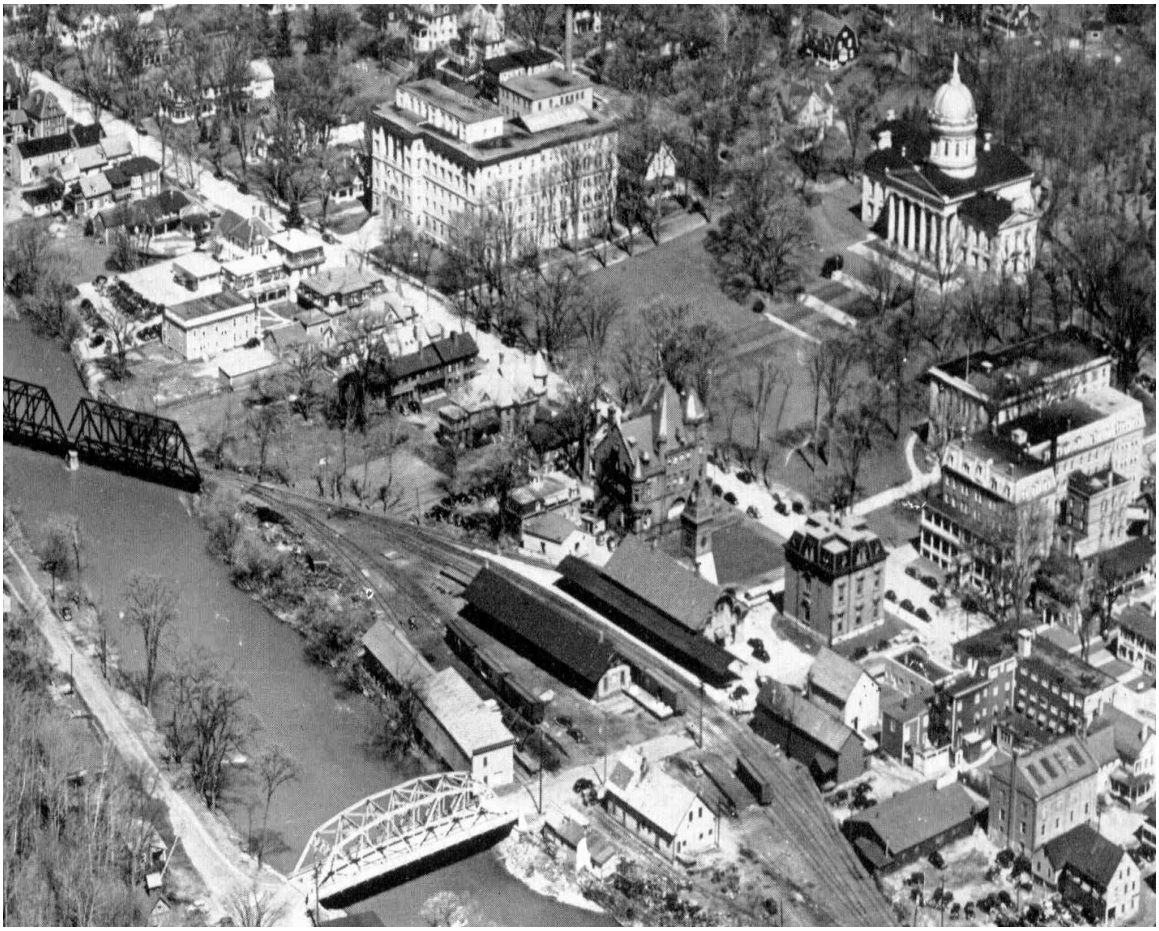
Supporting Economic Vitality in the Downtown. The bridge at Taylor Street has the potential to enhance downtown business activity or discourage it. What the City of Montpelier does to Taylor Street bridge will have an effect on the downtown businesses. The bridge at Taylor Street provides one of the main routes to the economic core of the downtown. Moreover, the state promotes "heritage tourism" and many visitors travel to see the State Capitol and other sites in Montpelier. For individuals who prefer taking care of their business or shopping needs in a place that displays a distinctive character, Montpelier will be among the top choices.

The historic appearance of the downtown has been carefully nurtured by private property owners and the city because of its attractiveness for shopping, tourism, and business. The *Capital District Master Plan* calls for the preservation and restoration of the truss bridge, noting that it is optimally located to serve as a contributing gateway to the city, particularly in combination with development of the proposed Welcome & Transit Center and development of the Barre Street extension.

Affordability. Cost and affordability, and more specifically life cycle costing, are key factors in the decision-making about the future of the Taylor Street bridge. Life cycle costing means taking into consideration the initial construction costs as well as the costs of maintenance that will occur during the expected life of the structure. Costs of construction, major maintenance, and programs and other governmental entities that will provide support and funding are covered in detail in Section 9.

Section 3. History of the Taylor Street Bridge

Montpelier has the largest concentration of historic truss bridges of any community in Vermont, giving it a special character as a "city of bridges." Five of the state's approximately 115 remaining metal truss highway bridges lie in Montpelier. The Taylor Street bridge, an excellent example of a Parker through truss, was constructed in 1929 by the Berlin Construction Company, and replaced an earlier covered bridge on the site. A prominent feature in the city's historic district, Taylor Street bridge is listed on the National Register of Historic Places.



Circa 1940

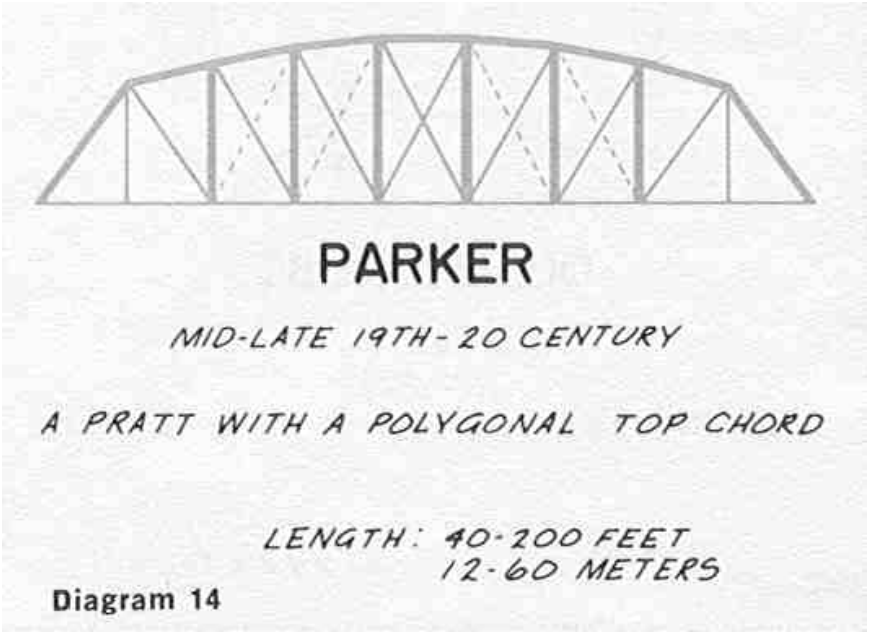
Early Development of Truss Bridges. Truss bridges were invented in the early nineteenth century by engineers and entrepreneurs who wanted to construct bridges that could carry heavy loads, using a minimum of material. They created and patented bridge designs that used interconnected triangles in different patterns known as truss types. The horizontal, vertical and diagonal members of a truss acted in tension (stretching) or compression to transfer loads to the bridge abutments. The first truss bridges were wood and were usually covered to protect them from the elements; these are known today as covered bridges. By the late nineteenth century, engineers were expanding the array of truss designs and using metal, first wrought iron, and then steel, to construct them. Companies developed factories to manufacture the bridges in pieces, which were then shipped by rail and quickly erected at their final sites.

After the Flood. The worst flood in Vermont's history struck on November 3 and 4, 1927, and it was most severe in the Winooski River valley where 9 1/2 inches of rain fell in 24 hours. The 1927 flood wiped out 1200 bridges in Vermont, 12 of them in Montpelier. It destroyed the covered bridge that crossed the Winooski at Taylor Street, then the westernmost river crossing in the city. (A bridge was not constructed at Bailey Avenue until 1958.) The current Taylor Street bridge was part of the state's massive effort to rebuild after the flood. Prefabricated metal truss bridges offered a quick and efficient way to replace missing spans, especially at wide crossings like Taylor Street.

The task of rebuilding the state's bridges after the flood was huge. Bridge construction had formerly been done by towns. After the flood, the state took a central role in bridge building for the first time, and

expanded the state Highway Commission to manage the effort. To finance the rebuilding, the legislature bonded for an unprecedented $8 million dollars and accepted an unprecendented $2.6 million in federal assistance. With the help of structural engineers loaned by the federal government and one of the large bridge manufacturers, the Bridge Department of the Highway Commission produced a set of standardized bridge designs, both concrete and metal truss, that could be used throughout the state. The effort was directed by Vermont's own bridge engineer, A. D. (Joe) Bishop. The Vermont flood-era bridges, including Taylor Street, used the new steel technology of rolled members, and were pictured in engineering textbooks of the time to illustrate state-of-the-art bridge design. The post-flood rebuilding effort centralized bridge design in state government, and it is fitting that the capital city retains a good collection of these structures.

For Taylor Street, the engineers specified a polygonal or curved top chord Parker design, the standard for spanning wide waterways. (The Taylor Street crossing is 166 feet wide.) Berlin Construction Company, one of the two major fabricators of Vermont's metal truss standardized designs, produced the Parker truss for Taylor Street. The state paid for the entire cost of the bridge, $38,736.64.



The Parker Truss type was used to span wide crossings.
The heavy lines indicate compression members.
American Association for State & Local History (AASLH)
Technology Leaflet 95, History News Vol. 32, No. 5, May 1977.

The Design – Parker Truss. In the late nineteenth century, C. H. Parker of Boston created a variation of the mid-nineteenth century Pratt truss design, and it became known as the Parker truss. It used a curved top chord which gave it greater strength. Shorter vertical members were in compression, and longer diagonal members were in tension. The side trusses were joined overhead to create a through truss. One variant of the Parker truss known commonly as a camelback truss, utilized five slopes to make the arch of the top chord. The Taylor Street bridge is a camelback version, with six segments (the center two with the same slope) making up the arch.

The Taylor Street bridge is 1 of 24 Parker trusses identified in a state bridge inventory in 1985. Seven of these, or almost 30%, have been or are scheduled to be demolished. Soon, the Taylor Street bridge will

be one of seventeen Parker trusses in Vermont, and the number is likely to continue shrinking. Many of these large through trusses are being removed from major highways where their narrower width cannot accommodate the flow of traffic. The Taylor Street bridge is a surviving example of an increasingly rare bridge truss type.

The Maker -- Berlin Construction Company. The Berlin Construction Company was formed after the original business, the Berlin Iron Bridge Company of Berlin, Connecticut, was purchased by Andrew Carnegie's American Bridge Company and moved to Pennsylvania. Three former Berlin Iron officers started Berlin Construction in 1902 in a new factory in Berlin. They concentrated on the New England market from a sales office in Springfield, Massachusetts. Together with American Bridge, they supplied the majority of Vermont's flood-era truss bridges. The company is credited on the bridge's builder's plate, affixed to the south entrance to the bridge. Gordon & Sutton, contractors from North Adams, Massachusetts, erected the bridge. The Taylor Street bridge is the only Berlin Construction Company bridge in Montpelier, and one of only ten known in Vermont. Three of these ten are scheduled for demolition. There are only three known Parker through trusses built by the Company in Vermont, including the Taylor Street bridge. The Taylor Street bridge is an important example of a prominent bridge maker in Montpelier's collection of bridges.

Section 4. Specifications and Current Condition of the Taylor Street Bridge

Specifications for Montpelier Bridge No. 5, Taylor Street over the Winooski River

- span 166'
- width: roadway from the outside edges of the beams - 22'; sidewalk on east side is outside the truss - 5'4"; total width is 25'4"
- vertical clearance through structure 14'9"
- VTrans' Structural Inventory and Appraisal (SIA) sheet rates the strength at 25 tons (50,000 lbs.) for 2 lanes HS20 type loading (Lichtenstein Report, p.1)

On May 15, 2001, David Hoyne, VTrans Bridge Maintenance Engineer, led the Taylor Street Bridge Committee on a tour of the bridge, pointing out key features indicating its current condition.

Superstructure.

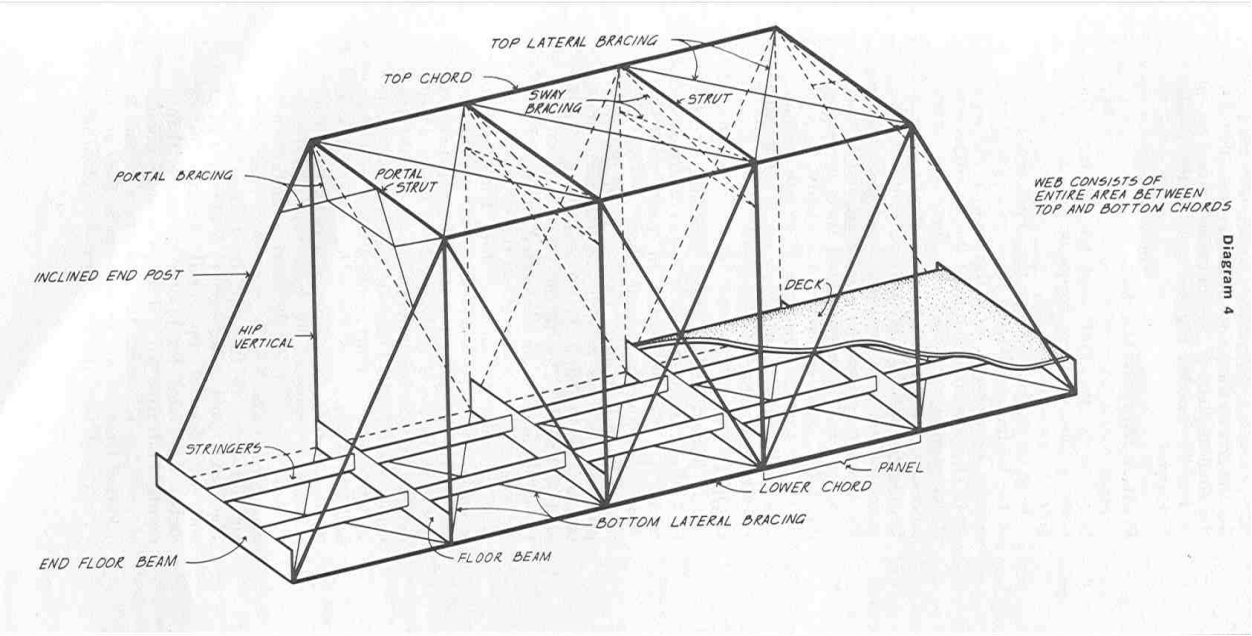
- Paint covering is in poor condition, with numerous areas of heavy peeling and fading.
- Steel truss members above the rail elevation reveal scattered areas of rust. At the rail level, some members have spots of blistering and heavy rust scale with areas of deep pitting. (Salt is the major cause of failure of the paint system.)
- Welded steel plates have been attached to several web members to counteract section loss.
- Below the deck, numerous verticals have heavy section loss with rust holes through their webs.
- Panel points have heavy rust scale where there is an accumulation of gravel and sand.
- Bottom chords have areas of rust scale.
- The ends of several floor beams have rust holes. Stringers also have some areas of heavy rust and section loss.
- Bearings reveal heavy rust scale.

Deck.

- The reinforced concrete deck was replaced in the 1964 and is fairly sound, with some areas of cracking and potholes. Where there has been no water, paint and steel are in good condition.

Substructure.

- Back walls have some areas of cracking and spalling (concrete surface is beginning to wear away, allowing moisture to get into the reinforcing bars). The southerly abutment has heavy spalling and section loss along its front edge, although bearing support is not threatened at this time.



Components of a truss bridge.
AASLH Technology Leaflet 95.

Sufficiency Rating. A sufficiency rating is developed by assigning numerical values to a set of factors that are considered to be indicative of a bridge's sufficiency to remain in service. The result of this calculation based on sufficiency rating factors is a percentage in which 100% would represent an entirely sufficient bridge and 0% would represent an entirely insufficient or deficient bridge. VTrans calculates and reports sufficiency ratings on Vermont bridges.

Appendix A identifies the 23 factors that are given numeric ratings and combined to determine a bridge sufficiency rating. These factors are grouped into four categories: structural adequacy and safety; serviceability and functional obsolescence; essential public use; and special factors. Older bridges consistently receive lower sufficiency ratings because they may not meet current highway standards on items such as roadway width and alignment, and older bridges predate some modern safety features. A low sufficiency rating does not mean that older bridges are incapable of achieving serviceable function.

The 1994 VTrans Structure Inventory and Appraisal Form reports a 51.2 Sufficiency Rating for the Taylor Street Bridge (*Lichtenstein Report* Appendix C pg. 40). In May 1994, a signal project was completed at the intersection where the bridge connects with US2/Memorial Dr., greatly reducing the severity of vehicle accidents. The 51.2 rating has not been updated to reflect the installation of the traffic signal (*Lichtenstein Report* pg. 1).

Section 5. Maintenance of Taylor Street Bridge

A meeting September 27, 2001, with Montpelier Public Works Director Stephen Gray confirmed that for many years there has been no comprehensive maintenance program for Taylor Street bridge, or any of Montpelier's bridges.

Annual Cleaning and Preventive Maintenance. Inspection reports going back to 1992 point out the need for annual cleaning and painting and the removal of salt, dirt, and gravel. Stephen Gray stated that the city has had no specific budget item for funding annual routine maintenance on Taylor Street bridge or any of the city's bridges, although he tried for several budget cycles to initiate a regular maintenance

program that would address three bridges each spring with approximately $25,000 of contracted cleaning and painting work. (See Appendix B for a list of Montpelier's bridges.)

Taylor Street bridge is now at the top of the Public Works Department's list for needing serious attention and work. Cummings Street and the Rialto bridge follow in the priority list for needing serious work.

VTrans Inspections. On a regular two-year cycle, VTrans inspects the Taylor Street bridge and all Vermont bridges that are greater than 20' in length to ensure their safety for public use. Recent inspection reports for Taylor Street bridge from 1996, 1998, and 2000 document structural problems such as dirt and debris, rust, rust scale, and section loss on the deck, superstructure, and substructure. The summary in the October 1998 inspection report reads:

> The superstructure needs a full cleaning and painting with all subsequent damage found dealt with appropriately. The end floor beams should either be replaced or the holes in the right end web sections properly repaired. The hole in the web of the left fascia stringer at abutment #2 and its connection to the end floor beam should be either properly repaired or the member replaced. The web section of the I-beam support of the sidewalk at the first pork chop section past abutment #2 should be properly repaired and resealed. The dirt and gravel build up on top of abutment #2 should be cleaned off. All loose concrete should be removed from the backwall and abutment and areas properly patched. The trees on the embankments at the abutment ends should be trimmed back as necessary. If repairs are not made in a timely fashion, it may be necessary to place weight limit restrictions on the bridge. Inspectors Richard Knowlton and Mike Gallant (FAU, Br.5, Montpelier, Taylor Street over the Winooski River, 10/23/98).

No maintenance or repair work was done in response to this 1998 report. No cleaning or touch up painting has been done since 1998.

One picture is worth a thousand words.

The most recent VTrans inspection in June 2000 identified advanced corrosion and serious problems needing immediate attention and repair. On June 5, 2000, VTrans required the city to limit the load on the bridge to 3 tons (6,000 lbs). The structural problems identified in 2000 were:

1. Floor System
   a. The web for the northern end of the upstream fascia stringer in floor beam #7 has rusted completely through vertically. The web portion at the south end of the upstream fascia stringer at abut. #2 (south) is also rusted through with only the flanges remaining.

   b. The web portion of the downstream end of the abut. #1 (north) floor beam has heavy section loss. Large rust holes have developed at its top and bottom.

2. Trusses
   a. Numerous verticals were patched in the past with steel plating above the deck elevation. Many verticals now have heavy section loss along their lower portions below the deck elevation at the panel points with large rust holes. The upstream verticals which are difficult to access are in the worst condition (6/5/2000 letter to William Fraser, Montpelier City Manager, from J.B. McCarthy, VTrans, RE: Montpelier, Taylor Street, Bridge #5)

Stephen Gray awarded the repair contract to Blow & Cote, Inc., of Morrisville. The estimated cost was $25,000. Work included repairs to individual stringers, floor beams, and vertical members of the trusses, all of which displayed various degrees of section loss due to rust. Actual cost was approximately $8,700. Taylor Street repairs were completed and VTrans lifted the load limit as of July 7, 2000.

Major Maintenance History. The earliest record of maintenance to Taylor Street bridge is a 1967 contract between the Vermont State Highway Board and Walter O. Anderson of South Burlington for the following work:

> Remove and Replace Existing Concrete Deck and 5 foot Sidewalk, Repair Backwall and Bridge Seat Abutment No. 2, Clean and Repaint Steel Inclined Pratt Truss (Vermont Department of Highways Standard Road and Bridge Specifications Contract Agreement, May 29, 1964).

The contracted payment for the 1967 work was $25,611.70

A letter to VTrans, signed by Ryan Cotton, City Manager, dated June 1989, reports the "urgent repairs" that the City made to five bridges as a result of the 1988 Bridge Inspection Reports prepared by Warren B. Tripp, Structures Engineer. The City Manager reports the following work on the Taylor Street bridge.

> On Bridge #5 the end floor beam at abutment #1 and the second stringer from the right have been repaired or replaced. The four verticals on the right truss panel which have holes through the webs have been repaired or replaced. This work was completed on May 5, 1989. . . The City further agrees to notify the Agency of Transportation when the less urgent recommended repairs are made to these bridges (*Lichtenstein Report*, Appendix W, pg. 70).

It is difficult to estimate the costs that could be avoided by a regular program of cleaning and preventive maintenance. It is equally difficult to calculate the life expectancy of bridges because so many unpredictable factors are involved. However, bridges that are checked and maintained on a regular, annual basis will, in the long run, be less costly to repair than to replace. By adopting a sound maintenance plan and implementing it consistently, the city can prolong the lives of its bridges and save substantial costs.

Section 6. Traffic in the Taylor Street Bridge Area

Taylor Street bridge is one of five bridges that connect US2/Memorial Dr. with Montpelier's downtown, crossing the Winooski River. Of these bridges, according to VTrans data, Taylor and Granite Street bridges are the least used bridges in the city. The latest traffic count for Taylor Street bridge and the intersection with US2/Memorial Dr. shows that this bridge is used more often in the afternoon (2,369 vehicles between noon and 6 pm) than in the morning (1,650 vehicles between 6 am and noon). Taylor Street bridge receives very light truck traffic, usually in the range of 1-2%.

Traffic on the bridge has remained fairly constant over the past decade. The data show some variation, which seems to be due more to seasonal variation (May, July, and August measurement dates) than changing traffic rates. According to VTrans studies, morning traffic actually declined between 1997 and 1999, from 1,950 vehicles to 1,650. Afternoon traffic has fluctuated between 2,334 in 1993 to 2,531 in 1997 and 2,369 in 1999, also showing a decline between 1997 and 1999 that is consistent with the morning traffic counts. (Note: 1993 data are not available for the morning.)

Traffic on US2/Memorial Dr. during that period showed a similar fluctuation from 5,378 (1997) to 5,312 (1999) in the mornings and 5,054 (1993) to 6,915 (1997) to 6,310 (1999). The increase in traffic on US2/Memorial Dr. is the only interesting change in the area of the bridge during the 1990s.

Traffic on State Street at the Taylor Street intersection is approximately 4,000 vehicles in the morning and 5,200 in the afternoon.

Most traffic leaving downtown across the Taylor Street bridge turns east (left) on US2/Memorial Dr. In 1999, 64% of vehicles leaving Montpelier in the afternoon turned left; in 1997, 71%; in 1993, 74%. Right turn on red accounted for 23%, 24%, and 28% of right turn movements respectively.

In addition to reviewing VTrans traffic counts done during the 1990's, a committee member observed peak traffic on June 25, 2001 and recorded the following observations.

Observation time: 8 am and 9 am Monday, June 25, 2001

- Movement into city from US2/Memorial Dr. was not a problem. The turn lanes never backed up, and outbound traffic was minimal.

Observation time: 3:30 pm to 4:45 pm Monday, June 25, 2001

- Primary traffic problems were on State Street (at least in part caused by construction) and US2/Memorial Dr. (traffic backed up from Main Street light several times).
- Almost all traffic crossing the bridge was car traffic.
- Intersection was on a 1 minute 30 second cycle. Green light to Taylor Street every 1:30.
- Intersection appeared to be controlled by a remote sensor.
- Green light for Taylor Street varied between 10-45 seconds, depending on traffic volume.
- Sensor unit seemed to work well, except between 3:30 and 4:00 the unit seemed to be over ridden and intersection was programmed to go for 40-45 seconds no matter what.
- Around 4:30 pm, state employees backed up in the state's parking lot; most cars got across the bridge and through the US2/Memorial Dr. intersection when the light turned green.
- 434 cars were observed crossing the bridge and leaving downtown in the 75 minute period, setting a peak hour value of about 350 cars. 74% of cars crossing Taylor Street bridge turned left.
- Taylor Street had a green light 20 out of the 75 minutes.
- Maximum of one car for every 2 seconds of green light was observed when the intersection functioned most efficiently.

Level of Service at Adjacent Intersections. Level of Service (LoS) ratings are calculated for intersections based on the average delay per vehicle. LoS ratings range from A – Little or no delay to F – Extreme delay. The *Traffic Impact Study* prepared by Resource Systems Group, Inc. in January 2001,

reports Level of Service data for the intersections at either end of the Taylor Street bridge. According to Resource System's traffic data, the current overall LoS for the intersections at either end of Taylor Street bridge are

US 2/Memorial Dr./Taylor St. intersection	–	"18.2 sec. – B"
State/Taylor/Gov. Davis Ave. intersection	–	"> 100 sec – F." (Resource Systems Group, pg. 9)

The committee also requested level of service information on these two intersections from VTrans. There wasn't sufficient time to do a full analysis, however Maureen Carr, VTrans Traffic Research, reviewed the LoS ratings prepared by Resource Systems. She concurred with the LoS "F" for the intersection at State/Taylor/Gov. Davis Avenue However, she expressed concern about the traffic volumes reported for the intersection at US 2/Memorial Dr./Taylor St. In her view, this intersection is more likely to be lower than LoS "B" because of problems at the intersection at Main/Northfield/US2/Memorial Dr. that cause traffic to back up at the Taylor Street intersection.

It seems clear that any changes that widen Taylor Street bridge are likely have a detrimental impact on traffic flow and aggravate traffic conditions at the intersections at either end of the bridge.

Safety Analysis and Crash Histories. VTrans maintains an Accident Reporting System which is a statewide database of all reported accidents. A reported accident is a collision or crash with one or more of the following: property damage exceeding $1,000, personal injury, or fatality. The State St./Taylor St./Gov. Davis Avenue intersection was once a HAL (high accident location). Improvements to the signage made in 1994 have reduced crashes, and if the current trend continues the intersection will be removed from the High Accident Location list (Resource Systems Group, pg. 11).

Similarly, the US2/Memorial Dr./Taylor St. intersection is reported to be on the HAL list in the Carr Lot's *Purpose and Needs Statement*. The 1997 installation of a traffic signal has greatly reduced the number and severity of crashes at this intersection, and it too may be removed from the HAL list if the current trend continues (*Purpose and Needs Statement,* pgs. 6-8 and *Lichtenstein Report*, pg. 1) The key point is that the intersections where Taylor Street crosses State Street and where Taylor Street terminates at US2/Memorial Dr. have had alarming crash histories that have been declining in recent years. Increasing the traffic on Taylor Street bridge and at these intersections could have a detrimental effect on safety by increasing the incidents of reportable accidents.

Conclusions about Traffic. Taylor Street and the Taylor Street bridge do not seem to limit morning peak traffic in any way, probably because general traffic levels are less and inbound traffic moves more easily than outbound. There are longer green lights at the Taylor Street – US2/Memorial Dr. intersection and dedicated turn lanes. Left and right turns onto Taylor Street bridge from US2/Memorial Dr. had short waiting times. Any delays resulted from the limitations due to cars crossing State Street.

The afternoon peak traffic on Taylor Street was just after 3:30, 4:00, and 4:30. This seemed to correspond to the end of the workday at major employers such as the state and Vermont Mutual. Peak traffic on US2/Memorial Dr. was between 4:00 and 4:30.

Recent traffic observations are consistent with VTrans traffic data gathered in the 1990s;

- 65% – 74% of the vehicles leaving Montpelier across Taylor Street bridge in the afternoon turn left (east) on US2/Memorial Dr.;
- Roughly 35% of the cars turned right (west) on US2/Memorial Dr.

This lower number of right-turning cars is probably due to the traffic on State Street. Because it is difficult to cross traffic on State Street, a driver wanting to go west on Memorial Drive would very likely continue along State Street and turn left off of State Street with the traffic light at the Bailey Avenue intersection, then cross the Bailey Avenue bridge and the make the right on Memorial Dr. Similarly, a driver at the intersection of Gov. Davis Avenue and State Street would very likely turn right onto State Street, turn left

at the signal at the Bailey Avenue intersection, cross Bailey Street bridge and turn right (west) on Memorial Dr. Drivers typically avoid crossing one or two lanes of State Street traffic by going west on State Street and using the signalized Bailey Avenue intersection to go west and out of town.

Traffic bottlenecks in the area of US2/Memorial Dr., Taylor Street, and State Street seem to be caused by heavy traffic on US2/Memorial Dr. in the afternoon and heavy traffic on State Street in the morning and afternoon (due again to the difficulty crossing State Street). Also, the traffic light at intersection of Taylor Street and US2/Memorial Dr. caused long waits for some drivers. The 1 minute 30 second timing, combined with short green light times (10 seconds) caused drivers arriving immediately after the green to wait 75 seconds for the next green light.

Finally, the recent designation of a "Left Turn Only" turning lane on eastbound US2/Memorial Dr. at Main Street leaves only one lane for thru-traffic. This lane backs up traffic past Taylor Street at peak times.

Effects of Possible Traffic Changes. A proposal to add a right hand turn lane on Taylor Street bridge seems to have relatively little benefit for the Taylor Street – US2/Memorial Dr. intersection. Approximately one car out of three turns right (west) at peak times. In addition, the fifteen minute period from 4:00 to 4:15 was the greatest single period for right hand turns. Most of these drivers were leaving the state parking lot on the other side of the bridge. Most of these drivers were able to leave the lot and get through the intersection in one light.

Another proposal is to make Taylor Street bridge one-way, flowing into Montpelier in the am and flowing out of the city in the pm. Current traffic levels and congestion do not seem to require consideration of one-way traffic flow on Taylor Street bridge or other complicated traffic management schemes. Furthermore, there is outbound traffic in the morning and significant inbound traffic in the afternoon.

A 75 second traffic signal cycle, as opposed to a 90 second cycle, might provide the best means to reduce wait times at the US 2/Memorial Dr. intersection. This solution may not work with Main Street timing, which seems to be coordinated with Taylor and Bailey Avenue intersections. Greater use of shorter green lights on Taylor Street during light traffic could reduce delays on Memorial Drive without having a serious impact on Taylor Street wait times.

Based on current and past traffic data, it is apparent that the major traffic limitations in the area of the Taylor Street bridge are the traffic levels on State Street and on US2/Memorial Dr., as well as the intersections at those locations.

The bridge is not the problem. Modifying the bridge so that it accommodates a greater traffic flow will only aggravate the traffic problems at either end of Taylor Street.

Section 7. Traffic and Access Implications of Future Development

The committee finds that the proposed future projects, discussed below, will not significantly impact the volume of traffic traveling across the Taylor Street bridge.

Effects of Proposed Court Street Garage on Taylor Street Bridge. In mid-2000, the Department of State Buildings, using funds appropriated by the Vermont Legislature, hired an architect and appointed an advisory committee to design a parking facility along Court Street at the corner of Gov. Davis Avenue. The architect, Freeman French Freeman, Inc., presented its report, *Court Street Parking Facility Schematic Design and Cost Estimate* to the Department of State Buildings in January 2001.

The Phase 1 design calls for a three-story garage with space for 235 cars to be built behind the Thrush Tavern on property currently owned by the State of Vermont. State employees are using this property for ground level parking. If Phase 2 of the project were implemented, the parking structure could be enlarged to the east on land currently owned by Vermont Mutual Insurance Co., doubling its capacity.

The architects did not examine Phase 2 in detail. The only entrance to the parking structure would be located on Court Street, approximately opposite Witt Place.

The Court Street Garage would be used by state employees, with perhaps a few spaces reserved for use by the city. The Commissioner of State Buildings, Tom Torti, has stated that the state is not increasing the number of employees in the Capital Complex, so the state employees who would be parking in this garage are already driving into the Capital Complex and parking in state lots in the Complex. The Commissioner has also stated his desire to eliminate state parking spaces along the river to increase green space. Thus the total number of state employee parking spaces in the Capitol Complex will remain unchanged after the new garage opens. It is not clear who would park in the city parking spaces, if there were to be any, in the proposed garage.

As part of its study and preliminary design of the parking structure, Freeman French Freeman contracted with Resource Systems Group, Inc. to conduct a traffic study of the area surrounding the proposed parking structure, including the State Street/Taylor Street intersection and the Taylor Street/Memorial Dr. intersection. This study was conducted in December 2000 when the legislature was not in session, and a report was issued in January 2001. The report assumed that everyone parking in the proposed 235-car garage (Phase 1) would be a state employee.

The architects summarized the traffic study as follows:

> The Traffic Impact Study reveals that the construction of the proposed new parking structure will not create undue congestion or unsafe conditions with respect to the highways [i.e., streets] (Freeman French Freeman Design and Cost Estimate, January 23, 2001, Section1 - Executive Summary).

The *Traffic Impact Study* prepared by Resource Systems Group (Section 5, Freeman French Freeman) reports that based on traffic counts, the new parking structure would generate approximately 67 new vehicle trips from the site. Resource Systems also reports that the level of service (LoS) at the State Street/Taylor Street/Gov. Davis Avenue intersection is LoS "F" (not unusual for downtown area) and recommends that a traffic signal be installed at the State Street/Taylor Street intersection, along with a westbound, left-turn lane on State Street for vehicles turning onto Gov. Davis Avenue to get to the Court Street parking facility. The *Traffic Impact Study* concludes with several safety recommendations, including eliminating 12 spaces of on-street parking, and states,

> With these recommendations, the new parking structure will not create undue congestion or unsafe conditions with respect to the highways (pg. 14).

Because the traffic study was not conducted during the legislative session, when the traffic around the State House is heaviest, the results of the study are open to question. There are serious concerns about the impact of a signal light. It would very likely cause serious congestion on State Street. Valerie Capels, Montpelier's Director of Planning and Development, told our committee that the city will probably require a traffic study that is conducted during the legislative session before it will approve the garage (Committee meeting, July 31, 2001).

In their report, the traffic consultants argue that the presence of the legislature will not change their conclusions. First, they argue that "since the hours of the sessions tend to start at 10:00 and end before 4:00, the congestion impacts of the session on the peak traffic hours are likely to be minimal" (Resource Systems Group, p. 10). Second, they argue that their study is based on a full parking garage, so the garage cannot generate any more traffic even if the legislature is in session.

The state's timetable for building the garage is unknown. The legislature has not appropriated any money to build this structure, although Department of State Buildings has enough funds to continue design work for the project. A letter sent by City Manager William Fraser to the Commissioner of State Buildings on May 15, 2001 expressed the city council's support for the garage as long as it is consistent

with the residential character of the neighborhood, enhances street level activity, and results in the reduction of parking along the river. Recent meetings with city officials and private developers suggest that an altogether different plan is now being developed for this site.

Based on the only traffic study that has been done to date and based on assurances from the state buildings commissioner that the number of state parking spaces in the Capitol Complex will not increase, we conclude that the construction of a 235-car garage at the corner of Gov. Davis Avenue and Court Street will not create significant amounts of additional traffic on Taylor Street and thus will not have a detrimental effect on the Taylor Street bridge.

***Capital District Master Plan's* Proposed Projects: Capital City Welcome & Transit Center and the Barre Street Extension.** The Capital City Welcome & Transit Center is one of the major elements presented in the *Capital District Master Plan*. It is proposed as a transportation hub for tourist buses, Vermont Transit (the interstate bus company owned by Greyhound Bus Lines), state employee off-site parking shuttles, and Wheels (Central Vermont Transportation Association, inter- and intra-city transit provider). The *Capital District Master Plan* presents the Welcome & Transit Center as an interface between different modes of transportation.

Another element in the *Capital District Master Plan* is a new street linking Taylor Street to Main Street, including a new bridge over the North Branch. This new Barre Street extension would be located along the north side of the Washington Co. Railroad tracks and would present opportunities for private development on property that has been landlocked. The existing bike path that ends at Taylor Street and begins again on the east side of Main Street, might adjoin this new street.

Another key element in the *Capital District Master Plan* is "Gateways." The Plan states that bridge connections to the Capital District and Downtown – *i.e.* Taylor Street, Main Street, and Bailey Avenue bridges – will receive greater definition, additional landscaping, and lighting to emphasize these important city elements (*Capital District Master Plan,* pg. 17). In the brief discussion of City Gateways, Taylor Street bridge is described as follows:

> The steel truss bridge on Taylor Street is one of the "City of Bridges'" most treasured historic and visual assets. Taylor Street is optimally located to serve as a contributing gateway to the city, particularly in combination with development of the visitor/transit center. The bridge will be improved structurally, and modified to accommodate pedestrians from the greenway and city sidewalk systems (pg. 29).[1]

The *Capital District Master Plan* presents its ten major elements with the assumption that individually or in combination, they will not have a significant impact of traffic and access in Montpelier. On June 26, 2001, Gregg Gossens, a leading participant in the preparation of the Plan, reported to this committee that the Plan assumes that existing traffic will continue without significant increases or change because the *Capital District Master Plan* addresses the interfacing of transportation systems that serve Montpelier. The Plan also proposes integrating alternative transportation systems (CVTA Wheels, bicycles, pedestrians, bus companies, and the use of commuter lots) and the possible need for a new parking structure at Gov. Davis and Court Streets. The Barre Street extension is expected to improve internal circulation for the city, not change the inflow or outflow of traffic.

Although the *Capital District Master Plan* did not include any investigations of traffic and access implications, this Plan proposes that the projects and elements it presents will not have a significant impact on traffic and access in Montpelier and that the Taylor Street bridge is sufficient in size and capacity for serving Montpelier into the future.

[1] Recent planning documents indicate that modifications to accommodate pedestrians are not necessary.

Progress and Reporting by the Carr Lot Group. In March 2000, the City Council authorized an ad hoc group to work on two elements in the *Capital District Master Plan*: the Welcome & Transit Center and the Barre Street extension. In March 2001, the *Capital City Welcome & Transit Center Purpose and Needs Statement and Project Status Report* was prepared for the city. This report is a further definition of the Welcome & Transit Center and the Barre Street extension projects proposed in the *Capital District Master Plan*. This document makes several references to traffic and access and Taylor Street bridge. By connecting multiple modes of transportation and allowing for changes within transportation modes, the Welcome & Transit Center is presented as possibly reducing traffic in downtown Montpelier.

The introductory paragraph in Section 2. Project Status, states,

> Many locations in Vermont have few options to actually reduce traffic in their town and city centers; however, the situation in Montpelier is quite different (*Purpose and Needs Statement*, pg. 3).

The *Purpose and Needs Statement* continues,

> Structural improvements must respect the important historical role of the Taylor Street bridge in Montpelier's downtown. The bridge does not need to be widened to accommodate bicycles or additional pedestrians, as the Winooski West Bike Path is located just downstream from Taylor Street.
>
> Under separate study for the VTrans VT Steel Truss Bridge Study, the bridge has been identified for possible rehabilitation under a programmatic agreement between VTrans and the Vermont Division for Historic Preservation. Under this program alterations to the bridge would need to comply with the Secretary of the Interior's Standards for Rehabilitation (pg. 9).

Section 8. Information and Program Resources for Taylor Street Bridge

Information and Consultation from VTrans. VTrans personnel have been very helpful and supportive when committee members have called requesting data and information as well as their opinions and estimates about future costs and opportunities.

Vermont Historic Bridge Program. The Vermont Historic Bridge Program was established in 1998 by the Vermont Agency of Transportation to assure the preservation of a meaningful collection of different types of historic bridges in Vermont. The program recognizes that these bridges are resources of distinct economic, aesthetic, and educational values and seeks a comprehensive approach to preserve them. The program offers an opportunity to demonstrate that, with proper maintenance, these bridges can continue to function as part of Vermont's network of highways and do so at a substantial cost-saving to taxpayers.

Bridges that are eligible for or listed on the National Register of Historic Places are eligible for enrollment in the program, provided they have been included in a preservation plan for specific bridge types. Towns owning eligible bridges are invited to enroll in the program by signing a document titled "Historic Bridge Participation Agreement." Once a bridge has been enrolled in the program and rehabilitation is complete, VTrans will pay all costs of future rehabilitation or restoration, subject to certain minimal maintenance requirements on the part of towns. In return, towns are asked to convey a bridge preservation easement to VTrans, agreeing to keep the bridge in use for highway purposes. The goal is to establish a partnership between towns and the bridge program in the hope that this will offer the best long-term method for preserving the state's historic bridges.

The Programmatic Agreement, dated July 7, 1998 that implemented the Vermont Historic Bridge Program adopted the *Lichtenstein Report's* recommendation and places Taylor Street bridge in Category 1, Limited Highway Use (up to 25 tons or 50,000 pounds). The Federal Highway Administration and VTrans are both parties to this agreement.

Lichtenstein Report: Historic Metal Truss Bridge Plan for Montpelier Bridge No. 5. Prepared in 1997 for VTrans by A. G. Lichtenstein & Associates of Watertown, Connecticut, with DuBois & King, Inc. of Vermont, this comprehensive report presents the research and findings of these engineering firms' analysis of the Taylor Street bridge. Six different options are investigated, including rehabilitation/restoration of the bridge and construction of a new bridge. Cost estimates are presented for the components of each option.

This report was a primary source of information for the committee. However, since costs for both repair and new construction have increased significantly since 1997, cost estimates quoted in the *Lichtenstein Report* were updated to reflect current prices. Cost information from the *Lichtenstein Report* has been updated using the Consumer Price Index and VTrans' Vermont Unit Prices. The CPI has increased about 3% per year for the last four years, for a total increase of 12%. VTrans' Vermont Unit Prices have increased 28% over the same period. In the discussion of future options for the bridge, any cost information drawn from the *Lichtenstein Report* is increased by 12% – 28% to reflect current prices.

Section 9. Future Options for Taylor Street Bridge

The committee investigated seven distinct options for the Taylor Street bridge. The first three options were explored in the 1997 *Lichtenstein Report*, and they involve enrolling the bridge in the Vermont Historic Bridge Program. The committee also gathered information from VTrans Chief Structures Engineer, J.B. McCarthy, on the feasibility and project costs for each option investigated in this report.

Each option is described and rated on the seven values and criteria presented in Section 2. The option can be ranked at one of four levels; High, Moderate, Low, or None. Using current cost information from updated estimates in the Lichtenstein Report or VTrans, or both sources, a total project cost is presented for each option. Funding sources, responsibility for maintenance costs, and timing are also discussed for each option.

A table summarizing the key information for each option is at the front of this report.

Option 1. Rehabilitation for 2-Lane Use for 50,000 to 72,000 Lbs. This option was investigated in the *Lichtenstein Report*. After a thorough evaluation of the bridge's condition and structural capacity, the *Lichtenstein Report* concludes that the Taylor Street bridge is capable of being rehabilitated for a structural capacity of 25 tons (50,000 pounds) for two lanes of traffic. This would allow the types of heavy traffic currently using the bridge, including tour buses typically weighing 48,000 lbs. and most trucks, to continue using the bridge. The heaviest vehicles, logging trucks and 18 wheel gravel trucks, are currently excluded from using the Taylor Street bridge. These trucks use two other bridges, each with unlimited capacity, that are located on either side of the Taylor Street bridge. With the work that is expected on the deck, possibly including a new deck and membrane, the bridge could achieve 72,000 lbs. In general, the bridge's condition presents no difficulties to rehabilitation. Once repairs have been completed, the structure will continue to be fully serviceable for all vehicles that currently use it, and its capacity will be increased, possibly, to as high as 72,000 lbs.

Historic Value – High: Taylor Street bridge is an important functional, structural, and visual element of Montpelier's history. Maps from 1873 and 1884 show the location and construction of bridges in Montpelier, indicating how the city has come to be called "The City of Bridges." The bridge is a contributing resource in the Montpelier Historic District, which is included in the National Register of Historic Places.

Constructed in 1929, it is one of four remaining historic metal truss automobile bridges in Montpelier, each of which represents a distinct truss design patent used in the bridge rebuilding campaign that followed the 1927 flood. Only two of these bridges function as truss bridges. These standardized bridge designs are an attribute unique to the city. This 165' steel Parker through-truss bridge is a character defining feature of the City of Montpelier and the State of Vermont (*A. G. Lichtenstein Report* pg. 2).

Aesthetic Value – High: visual characteristics of the bridge signal its place in time and make an aesthetically pleasing statement for motorists and pedestrians who visit Montpelier as well as those who see the bridge every day. The Parker truss is distinguished by its curved top chord, which delivers strength and a visually pleasing element. Steel latticework, the texture of the rivets, and the rolled I-beams of various sizes that form the vertical and diagonal members of the bridge create dramatic geometric patterns. Artists, photographers, and sight seers are fascinated by the visual impact of the bridge and capture its unique design, its geometric patterns, and its intricate play of light and shadow on their canvasses and film.

Establishing a City Gateway – High: the *Capital District Master Plan* describes the long term plans for enhancing the city gateway at Taylor Street as follows:

> The bridge connections to the Capital District and Downtown, Taylor Street, Main Street and Bailey Avenue, will receive greater definition. Additional landscaping and lighting design will provide more emphasis to these important city elements (pg. 17).

Taylor Street bridge is and has been one of the principal entrances to the city. The *Capital District Master Plan* recognizes the importance of this bridge. Seeing it or crossing it, the traveler immediately knows, both consciously and unconsciously, something about the character of Montpelier. Located along a reach of river with four metal truss bridges in close proximity, the bridge is an integral part of a virtually unique cityscape. The Taylor Street truss bridge frames a vista of the city and introduces the city's 150-year tapestry of development and growth.

In the discussion of City Gateways, the *Capital District Master Plan* states:

> The steel truss bridge on Taylor Street is one of the City of Bridges' most treasured historic and visual assets (pg. 29).

Noting that the truss bridge is in need of structural improvements, the plan nevertheless ranks it as a very important gateway to be integrated with new development such as the Welcome & Transit Center.

Highlighting the Distinct Character of Montpelier – High: Montpelier is justly proud of its historic downtown. A great deal of private and public money has gone to restore many of the city's structures. That investment, and the appearance of the downtown, has created a sense of place that makes Montpelier the unique, vital place that has earned it a national reputation. A significant, contributing factor to that sense of place is the city's bridges. For example, Langdon Street merchants and residents worked hard to preserve the character of the Langdon Street bridge. That street would simply not have its welcoming, historic character without its bridge.

Safe Access Across the Winooski - Vehicles and Pedestrians – High: Taylor Street bridge is structurally capable of safely carrying traffic well into the future. The bridge's traffic capacity seems limited by the characteristics of the streets to which it is connected. Left turns across the bridge onto US2/Memorial Dr., which make up the majority of the traffic flow, are limited by backups at the stoplight and intersection at Main and River Streets.

The bridge provides pedestrian access by a sidewalk structure on the eastern fascia (outside) of the bridge. The sidewalk provides visual and structural security for walkers as it is separated from the vehicular flow by the verticals of the bridge.

Supporting Economic Vitality in the Downtown – High: all options for Taylor Street bridge that are proposed in this report will equally support traffic to the downtown business area and function well with development proposals including the Welcome & Transit Center on the Carr lot, the extension of Barre Street, the bicycle path, the Court Street parking structure, and proposed uses for the state employee parking lot.

Affordability – High: the Federal Highway Administration (FHWA) has determined that rehabilitation of this bridge for continued highway use is a feasible and prudent alternative under the regulations that implement Section 4(f) of the Surface Transportation Act of 1966. Therefore, Montpelier taxpayers will not be responsible for funding the cost of the rehabilitation or, for the foreseeable future, major maintenance, once the bridge is enrolled in the Vermont Historic Bridge Program.

Total Project Costs for Option 1 – The 1997 *Lichtenstein Report*, commissioned by VTrans, presented a $310,000 construction cost estimate for work to rehabilitate Taylor Street bridge. Work required for rehabilitation included repair of deteriorated areas of the floor system (floor beams and stringers), repair of deteriorated truss members, new bearings for the trusses, cleaning and painting the superstructure, repairs to the abutments, new approach rails and guard rails, and signage.

Applying the 12% to 28% cost increase factors produces an updated construction cost range in current dollars of approximately $347,200 to $396,800. Adding in preliminary engineering costs (30%) produces a cost estimate in the range of $451,000 to $516,000.

A second source that the study committee contacted, J.B. McCarthy - VTrans Chief Structures Engineer, finds that any project on this bridge will require replacing the concrete deck. A new deck with a sheet membrane is essential because the current structural steel floor system has many members that need replacement. In addition, McCarthy finds that members that have previously been repaired with steel plates due to holes will require replacement.

VTrans also offered another method for estimating the cost of rehabilitating Taylor Street bridge: applying the costs for truss work in a comparable rehabilitation project on a truss bridge in Waterbury– Duxbury, completed in 1997. $170 per sq. ft. is the cost for the Waterbury– Duxbury project. With the addition of 30% for engineering costs, the estimated total project costs are $802,230.

Truss bridge	$170 (165' X 22') =	$617,100
Engineering costs (30%)		$185,130
		$802,230

Funding for Option 1 – Implementation of Option 1 means enrolling the Taylor Street bridge in the Vermont Historic Bridge program, which would access federal funding through the Federal Highway Administration (FHWA). 80% would come from the federal government, 20% would come from VTrans, and 0% from the city.

Maintenance Cost after VHB Program Rehabilitation – If the Taylor Street bridge is enrolled in the Vermont Historic Bridge Program, once the rehabilitation work is completed all major maintenance would be funded by the state. The city would be responsible for annual, minor maintenance and regular cleaning. Specifically, the city would be responsible for spot painting, keeping the river channel under the bridge free of debris, assuring that drainage is being moved away from the bridge properly, and periodic washing and cleaning (at least once a year, preferably two times a year). Without the Historic Bridge Program, the owner of the bridge, the City of Montpelier, is responsible for the full cost of all maintenance.

Timing – First step is enrollment of the bridge in the Vermont Historic Bridge Program, which puts the project in line for federal funding. Once the bridge is approved for federal funding and project planning, it will take about 6 ½ years to complete the rehabilitation work.

Design work	3 years
Waiting for funding	3 years
1 construction season	4-5 months
Total project time from the beginning of project planning	**6 ½ years**

Several factors make this option relatively less time consuming:

- all of the work is done out of the river;

- bridge remains in place while work is being done;
- no temporary bridge;
- no right-of-way work.

Option 2. Rehabilitation/Reinforcement for 2-Lane Use 72,000 Lbs. Under this option, Taylor Street bridge would be rehabilitated and reinforced to the design standards used in the Waterbury truss bridge rehabilitation project.

Taylor Street bridge would get a new deck system, increasing its capacity to the HS-20 standard for a 72,000 lb., 3 axle truck with an 8,000 lb. front axle and two 32,000 lb. rear axles spaced 14' apart. Eighteen wheelers, the largest trucks, can use a bridge with a capacity of 72,000 pounds.

Historic Value – High: same as Option 1.

Aesthetic Value – High: same as Option 1.

Establishing a City Gateway – High: same as Option 1.

Highlighting the Distinct Character of Montpelier – High: same as Option 1.

Safe Access Across the Winooski - Vehicles and Pedestrians – High: same as Option 1.

Supporting Economic Vitality in the Downtown – High: same as Options 1 through 8.

Affordability – Moderate: this option is more costly than Option 1, although federal and state funds cover the costs with no portion required from the city.

Total Project Costs for Option 2 – The *Lichtenstein Report* presents an estimate of $1.3 million (1997 dollars) for a project that is equivalent to Option 1 with a new deck. Updated 12% – 28% to reflect current prices, the estimate is $1.46 – $1.66 million. Adding 30% for engineering costs, the estimate is $1.96 – $2.16 million.

VTrans cannot give an estimate for option 2 without additional in-depth structural analysis.

Funding for Option 2 – As is the case with Option 1, enrollment of Taylor Street bridge in the Vermont Historic Bridge program would make Option 2 costs fully eligible for the federal funds (80%) and state funds (20%) and city funds (0%).

Also, funds might be available from the new bridge research program to reduce the cost to the state if a new, fiber reinforced polymer deck system were used.

Maintenance Cost after VHB Rehabilitation – Same as Option 1. If the bridge is enrolled in the Historic Bridge Program, once the bridge is rehabilitated the city is responsible for annual, minor maintenance and regular cleaning, and the state covers the cost of all future major maintenance.

Timing – Same as Option 1; about 6 ½ years after the bridge is enrolled in the Vermont Historic Bridge Program and after it is approved for federal funding and project planning.

Option 3. Rehabilitation/Reinforcement for up to 72,000 Lbs. with Widening. The *Lichtenstein Report* describes an option (Option B) for rehabilitation of the Taylor Street bridge, reinforcing the structure to handle greater capacity. Key repair work includes: truss repairs, truss painting, concrete repairs, pot bearings, a steel floor system, lightweight deck system, and sidewalk deck and floor systems. This option would widen the bridge to meet current design standards for a new bridge, specifically

allowing 15' for each lane for a total width of 30'. This would also involve widening the bridge abutments and right-of-way.

The committee discussed the feasibility of widening the bridge to three 15' lanes with VTrans Structures Engineer David Hoyne, who said it is not possible to widen the existing structure to three lanes. Furthermore, widening to three lanes would require replacing all the truss members, making it a new bridge. It is highly unlikely that this new structure would be eligible for enrollment in the Vermont Historic Bridge Program and the funding provided by this program.

Historic Value – Moderate: comparable with the historic value content of Option 1, however, since many members of the truss bridge will be replaced, consistency with the historic value is somewhat diminished.

Aesthetic Value – High: same as Option 1.

Establishing a City Gateway – High: same as Option 1.

Highlighting the Distinct Character of Montpelier – High: same as Option 1.

Safe Access Across the Winooski - Vehicles and Pedestrians – High: same as Option 1.

Supporting Economic Vitality in the Downtown – High: same as Options 1 through 8.

Affordability – Low: this option is more costly than Options 1 and 2, although federal and state funds cover most of the costs with 0% from the city's taxpayers if the project is accepted in the Historic Bridge Program or 5% required from the city's taxpayers if the project is considered a new bridge, which is unlikely.

Total Project Costs for Option 3 -- The *Lichtenstein Report's* 1997 estimated cost for rehabilitation, reinforcement, and widening the Taylor Street bridge at $1.6 million. Increasing this cost estimate by 12% - 28% to reflect current costs results in a cost range for Option 3 of $1.8 to $2.05 million. With the addition of 30% for engineering costs, the estimate becomes $2.34–$2.66 million.

A recent study addressing the feasibility of widening a historic truss bridge in Jamaica, VT offers additional current cost information on Option 3. Widening the Jamaica truss bridge that crosses the West River was not the selected option, but the findings of this study are relevant to the cost estimate for comparable work on the Taylor Street bridge. The Jamaica study included two options for the new deck system; a standard lightweight system and a more costly, aluminum deck that greatly reduces the deck's weight, allowing for reuse of the original trusses. Cost estimates for rehabilitation/reinforcement and widening the Jamaica truss bridge are:

$2.4 million with lightweight deck system
$2.6 million with the aluminum deck system

A cost factor of $350 per sq. ft. is based on the Jamaica bridge study, including the new aluminum deck.

Truss bridge rehab. with widening	$350 (165' X 26') =	$1,501,500
Engineering costs (30%)		450,500
		$1,951,950

Costs for widening the abutments and right-of-way are not included in this estimate.

VTrans Chief Structures Engineer pointed out to the committee that Taylor Street is classified as a minor arterial, and according to Section 4.5 of the Vermont State Standards, 11' lanes and 2' or 3' shoulders would be adequate for this site with appropriate offsets to curbs and railings. (Large vehicles, buses and delivery trucks, will use this bridge so 10' lanes would be rather tight, especially given the turning radius

from Memorial Drive.) Therefore, widening to (2-11-11-2) or 26' would meet the current state standard for a new bridge, with the current 5'5" sidewalk on the outside of the truss.

Funding for Option 3 – If widening to 26' is acceptable by the Vermont Historic Bridge Program, this rehabilitation/reinforcement project would be eligible for 80% federal funds, 20% state funds, and 0% city funds.

If this option, which includes widening, results in the replacement of a major portion of the truss members, it is unlikely that the project would qualify for the Historic Bridge Program. In this case, the bridge would be considered a new bridge. According to J.B. McCarthy, any superstructure option that saves or widens the existing substructures is considered rehabilitation and qualifies for a 5% local share rather than the 10% local share required for new bridges.

Maintenance Costs – If the rehabilitation/reinforcement and widening is defined so that enough of the existing structure is preserved to make the bridge eligible for the Historic Bridge Program, all major maintenance in the future is covered by federal funds (same as Options 1 and 2). If the bridge is considered a new bridge because so much of the structure is replaced, the city is responsible for 100% of all maintenance costs.

Timing – The need for land acquisition for the widened right-of-way adds a major unquantifiable factor to the timing of this option. The city and the state are the land owners on the west side of the bridge; on the east side, Allan Carr and Bob's Sunoco are the property owners. After the agreements are reached on the right-of-way, this option is similar to Option 2, which requires approximately 6½ years for construction time.

Option 4. Build New, 1-Lane Bridge for Right-Hand Turns. This is not an independent option. An additional, 1-lane bridge for right turns could be an enhancement to Options 1 or 2. This new, 1-lane truss bridge on the west side of the current bridge would be close to the original structure but fully independent of it. This new structure would accommodate one lane of traffic flowing out of Montpelier, and all traffic on it would turn right onto US2/Memorial Dr. A design exemption from VTrans would be necessary because a 1-lane bridge is not a standard design.

Although it would be aesthetically awkward to have 2 dissimilar truss bridges side by side, the option to build an independent, 1-lane bridge for right-hand turns could be combined with Options 1 or 2, enabling the city to proceed with rehabilitation work on the Taylor Street bridge. The new right-hand turn bridge could be built at some future date when there is a major increase in downtown traffic that would use the Taylor Street bridge to leave the city and turn right on US2/Memorial Dr.

Historic Value – Low: in fact this option diminishes the historic value of Taylor Street bridge. An archaeological study would very likely be required, contracted by VTrans.

Aesthetic Value – Low: having two different bridges so close together is visually disruptive.

Establishing a City Gateway – Low: adding a new, 1-lane bridge presents a tangled and confusing entry to the city.

Highlighting the Distinct Character of Montpelier – Moderate: since this new 1-lane bridge is a companion to the historic truss bridge (Option 1 or 2), it maintains the city's collection of bridges.

Safe Access Across the Winooski - Vehicles and Pedestrians – Moderate: small benefit for vehicles leaving downtown and wanting to turn right from the bridge to get onto I89; the additional lane of traffic would have a negative impact on pedestrians and bicyclists who would be crossing the intersections at either end of Taylor Street bridge.

Supporting Economic Vitality in the Downtown – High: same as Options 1 through 8.

Affordability – Low: this option, selected as a companion to Option 1 or 2, would have a negative impact on Montpelier taxpayers, making them responsible for 10% of the cost of this 1-lane bridge.

Total Project Costs for Option 4 – Single lane bridges are not standard construction. However, a rough estimate of the cost can be calculated using the $300 per square foot factor.

New 1-lane bridge	$300 (165' X 12') =	$594,000
Engineering costs (30%)		178,200
		$772,200

This cost would be added to the cost of Option 1 or 2. There are additional costs for new abutments and right-of-way.

Funding for Option 4 – It is remotely possible to get new bridge funding for a non-standard bridge. If the 1-lane bridge qualifies for federal funding, it could get the regular distribution of new bridge funds; 80% federal funds, 10% state funds and 10% city funds.

Maintenance – The city is responsible for all maintenance.

Timing – unknown

Option 5. Build New, 2-Lane Truss Bridge. New truss bridges have horizontal and vertical members, and they generally look like the historic truss bridges. However, the details of new truss bridges are different from historic truss bridges because new truss bridges have flatter surfaces and members are welded together rather than being bolted together. A new, 2-lane truss bridge could be constructed at the Taylor Street site, incorporating the existing abutments. As with any new bridge option, removal or demolition of the old bridge as well as some right-of-way work would be needed.

With a design exception, a new bridge can be built with the same width as the bridge it replaces, according to the Vermont State Design Standards (Minor Arterial Roads and Streets, Section 4.7 Bridge Widths and Structural Capacities, 10/22/97). In fact, state design standards favor preserving the existing footprint when a bridge is being replaced.

> State policy for the reconstruction of bridges on Minor Arterials favors preservation with existing footprints, in order to ensure compatibility with the Vermont setting and to reduce costs and environmental impacts. Where reconstruction within the existing footprint is not feasible, the full width of approach roadways . . . should be provided across all new and replacement bridges on urban and village Minor Arterials.
>
> With regard to a bridge located on a municipal highway, a municipality may request the agency to adhere to one or more of the following guidelines:
>
> 1. Where feasible, the rehabilitated or replacement bridge shall occupy the same curb-to-curb width or alignment, or both, as the existing bridge or the existing approaches to the existing bridge, or both;
>
> 2. Unless otherwise required by law, a bridge that does not already carry a sidewalk may be rehabilitated without adding a sidewalk and a replacement bridge may be built without a sideband or with a sidewalk on only one side; or
>
> 3. In rehabilitating a historically significant bridge, the design of the rehabilitated bridge must retain the bridge's historic character, to the extent feasible (pg. 35).

On the other hand, there would be strong sentiment to build a new bridge to current standard width, 30'.

Historic Value – Low: a new truss bridge resembles the 1929 truss bridge, but the historic bridge is removed or demolished.

Aesthetic Value – Moderate: a new truss bridge could be designed to complement the architectural elements of the city and contribute to the city's aesthetics, although the bridge and Taylor Street would be 8' wider than the historic bridge and current street width.

Establishing a City Gateway – Moderate: gateway enhancements could be included in the design and construction.

Highlighting the Distinct Character of Montpelier – Moderate: the new truss bridge makes a modest contribution to Montpelier's collection of bridges and the variety of architectural styles that characterize the city.

Safe Access Across the Winooski - Vehicles and Pedestrians – High: same as Options 1 through 8.

Supporting Economic Vitality in the Downtown – High: same as Options 1 through 8.

Affordability – Low: Montpelier taxpayers would be responsible for 10% of the cost of this new 2-lane bridge, plus costs for relocation or demolition of the old bridge..

Total Project Costs for Option 5 – Based on recent construction projects to build new truss bridges in Jamaica and St. Johnsbury, VTrans estimates the cost for a new 2-lane truss bridge in the range of $304 – $350 per sq. ft. of deck. 11' lanes and 2' or 3' shoulders would be adequate for this site, according to VTrans sources, making the bridge 2-11-11-2 (26' rail to rail, plus a 5.5 sidewalk on the outside of the truss).

New 2-lane truss bridge	$304(165' X 26') =	$ 1,304,160
	$350(165' X 26') =	$ 1,501,500

Adding the standard 30% for engineering costs puts the total cost in the range of $1.70 to $1.95 million.

There are additional costs for work on the abutments and right-of-way, plus relocation ($1,000,000) or demolition ($165,000) of the old bridge, and gateway enhancements.

Funding for Option 5 – See Option 4.

Maintenance – See Option 4.

Timing – The need for land acquisition adds a major unquantifiable factor to the timing of this option. Once the project has been accepted for federal funding and project planning has begun, it will take about 9 ½ years to construct a new truss bridge at the Taylor Street site.

New bridge design, permitting, right-of-way issues	5 - 6 years
Waiting for funding to build	3 years
1 construction season	4-5 months
Total project time	**9 ½ years**

These additional factors make this option difficult to estimate: time requirement for demolishing and removing the old bridge; there will be no temporary bridge; abutment work and right-of-way issues must be addressed. A time-saving factor is the fact that the work is done out of the river.

Option 6. Build New, 3-Lane Truss Bridge. If there is certainty that traffic volume will expand to require three lanes on the Taylor Street bridge, with one lane a dedicated right-turn lane onto US2/Memorial Dr., then a new, 3-lane truss bridge is a reasonable option. Width of the 3-lane bridge would be 41'. Larger abutments and right-of-way would be required, involving negotiations with adjacent landowners; Allan Carr, Robert Rushford, and the State of Vermont.

Historic Value – Low: a 3-lane truss bridge is inconsistent with the city's historic district, and it does not preserve the city's natural and historic features in the vision for the future.

Aesthetic Value – Low: a 3-lane truss bridge is out of scale and out of balance with the components of the cityscape.

Establishing a City Gateway – Low: although gateway enhancements could be included in the design and construction of this option, this bridge will be disproportionate and out of scale for framing the view of the city in a manner that is integrated with the city's natural and historic character.

Highlighting the Distinct Character of Montpelier – Moderate: same as Option 5.

Safe Access Across the Winooski - Vehicles and Pedestrians – Moderate: same as Option 4.

Supporting Economic Vitality in the Downtown – High: same as Options 1 through 8.

Affordability – Low: same as Option 5.

Total Project Costs for Option 6 – VTrans confirms that the cost factor for the new truss bridge in Jamaica, $350 per sq. ft. provides a reasonable estimate. 11' lanes with 2' or 3' shoulders would be adequate for this site, so a new 3-lane bridge would be 2-11-11-11-2 or 37' rail to rail plus the 5.5' sidewalk.

New 3-lane truss bridge $350 (165' X 37') =	$2,136,750
Engineering costs (30%)	614,025
	$2,777,775

Additional costs include abutments and right-of-way, relocation ($1,000,000) or demolition ($165,000) of the old bridge, and gateway enhancement.

Funding for Option 6 – Same as Option 4.

Maintenance – Same as Option 4.

Timing – After the bridge is accepted for federal funding and project planning has begun, it will take over 10 years to construct a new, 3-lane truss bridge at the Taylor Street site.

Option 7. Build New, 2-Lane Girder Bridge with Pier. A new, 2-lane steel girder bridge, in a style like the Bailey Avenue bridge or the new Pioneer Street bridge, would require construction of a pier in the Winooski River. This bridge would have a rise of at least 5 feet, which would complicate entering the US2/Memorial Dr. intersection. Ledge in the river bed might make the construction of the pier easier if the ledge can be used as a foundation for the pier. Alternately, the ledge could make construction of the pier more complex and costly.

Vermont Agency of Natural Resources would very likely be strongly opposed to the construction of a pier in the river, given the narrow width of the river at Taylor Street (166' wide compared to 250' in width at Bailey Avenue bridge), the shallowness of the river, and the effect of a pier on the river's hydraulics (erosion and ice dams).

Historic Value – None: a girder bridge is not consistent with Montpelier's commitment to preserving its historic district and preserving the city's natural and historic features in the vision for the future.

Aesthetic Value – Low: a girder bridge does not demonstrate thoughtfulness in the process of balancing traditional elements in the cityscape with new components. Also, a girder bridge does not create an awareness of transition from one side of the river to the other.

Establishing a City Gateway – Low: same as Option 6.

Highlighting the Distinct Character of Montpelier – Low: the girder bridge option eliminates the centerpiece in Montpelier's collection of bridges and reduces the variety of architectural styles that have characterized the city.

Safe Access Across the Winooski - Vehicles and Pedestrians – High: same as Option 1.

Supporting Economic Vitality in the Downtown – High: same as Options 1 through 8.

Affordability – Low: same as Option 5.

Total Project Costs for Option 7 – Cost estimate for a new, 2-lane girder bridge is based on a cost factor for new bridges provided by VTrans; $300 per sq. ft. Width of this girder bridge is 3-12-12-3 or 30'.

New 2-lane girder bridge	$300 (165' X 30') =	$1,485,000
Engineering costs (30%)		445,500
		$1,930,500

Additional costs include the pier, sidewalk, abutments, right-of-way work, relocation ($1,000,000) or demolition ($165,000) of old bridge, and gateway enhancements.

Funding for Option 7 – Same as Option 4.

Maintenance – Same as Option 4.

Timing – It will take more than 10 years to construct a new girder bridge at the Taylor Street site. These factors make this option difficult to estimate: time requirement for relocating or demolishing the old bridge; there will be no temporary bridge; abutment work and right-of-way issues must be addressed, permitting for work in the stream is time consuming at best and may result in eliminating this option.

New bridge design, permitting, right-of-way issues	5 - 10 years
Waiting for funding to build	3 years
1 construction season	4-5 months

Option 8. Build New, 3-Lane Girder Bridge with 1 Pier. This option is like Option 7, except the bridge width is 2-12-12-12-2 or 40'. Vermont Agency of Natural Resources would very likely be strongly opposed to this option for the same reasons discussed in Option 7.

Historic Value – None: same as Option 7.

Aesthetic Value – Low: same as Option 7.

Establishing a City Gateway – Low: same as Option 6.

Highlighting the Distinct Character of Montpelier – Low: same as Option 7.

Safe Access Across the Winooski - Vehicles and Pedestrians – Moderate: same as Option 4.

Supporting Economic Vitality in the Downtown – High: same as Options 1 through 8.

Affordability – Low: same as Option 5.

Total Project Costs for Option 8 – Cost estimates for a new 3-lane girder bridge are based on a cost factor for new bridges provided by VTrans; $300 per sq. ft. Width is 2-12-12-12-2 or 40'.

New 3-lane girder bridge	$300(165' X 40') =	$ 1,980,000
Engineering costs (30%)		594,000
		$ 2,574,000

Additional costs include the pier, sidewalk, abutments, right-of-way work, relocation ($1,000,000) or demolition ($165,000) of the old bridge, and gateway enhancements.

Funding for Option 8 – Same as Option 4.

Maintenance – The city is responsible for all maintenance. (Same for Options 4 – 8.)

Timing – It will take more than 10 years to construct a new girder bridge at the Taylor Street site. (See Option 7.)

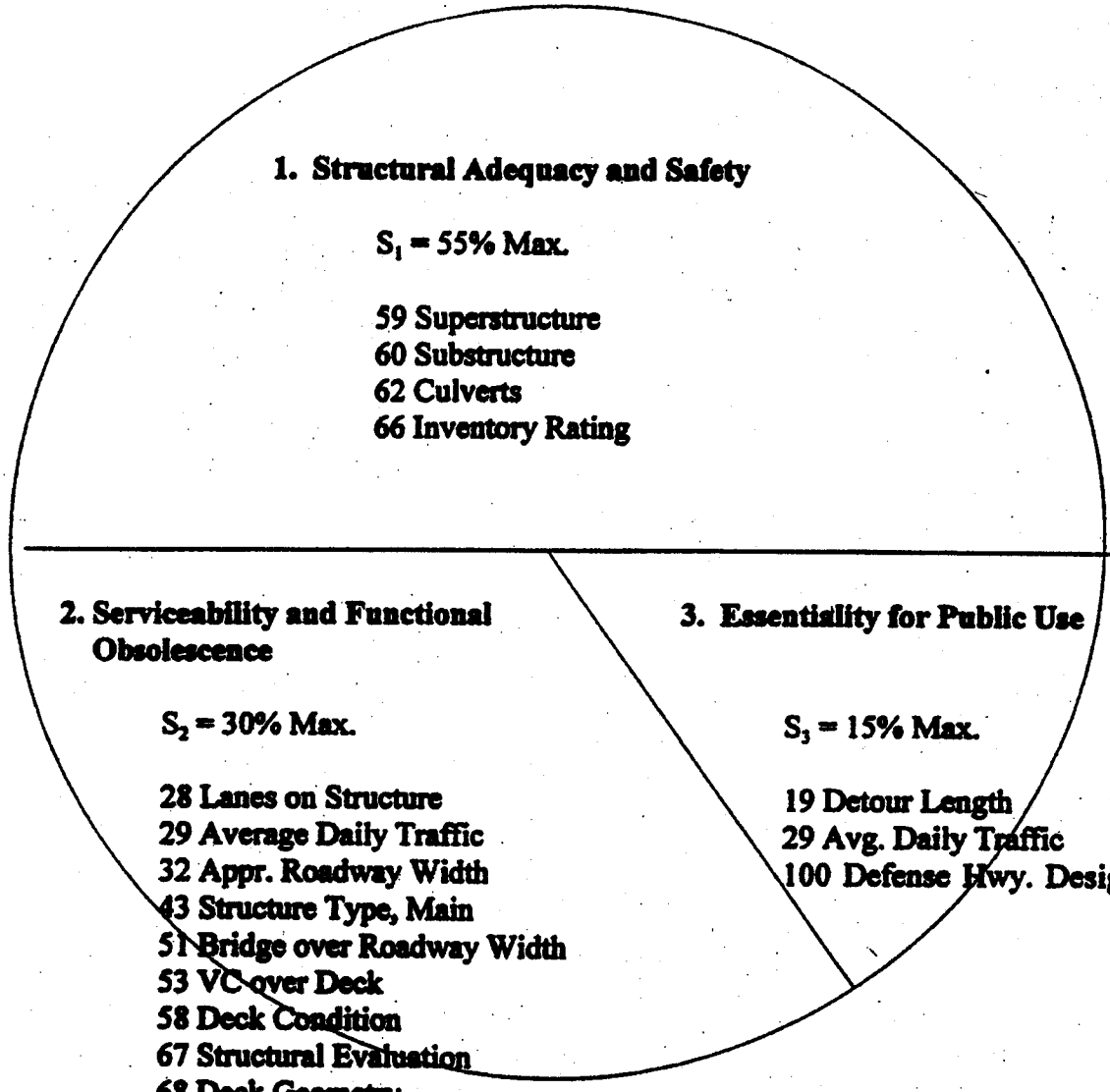
Option 9. Relocation or Demolition of the Truss Bridge at Taylor Street. This is not an independent option; it is a component of Options 5 – 8, each of which involves building a new bridge at the Taylor Street site and relocating or demolishing the historic truss bridge.

There is discussion in the *Lichtenstein Report* of both relocation and demolition of the bridge. If relocation is selected, the historic bridge would be dismantled and moved to another location for storage and possible future use at another location. The *Lichtenstein Report's* estimate for relocation is $1,000,000. This cost is so great, the state is not likely to authorize any bridge relocations in the future.

Cost for demolition of a bridge can be estimated using a factor of $1,000 per ft. of deck. Cost for demolishing the Taylor Street bridge is therefore $165,000.

Funding for Relocation or Demolition – As indicated above, state funding for relocation is no longer available. If demolition is selected, the city would be responsible for the cost.

Appendix A: Summary of Sufficiency Rating Factors



4. Special Reductions

S_4 = 13% Max

19 Detour Length
36 Traffic Safety Features
43 Structure Type, Main

Sufficiency Rating = $S_1 + S_2 + S_3 - S_4$

FIGURE 1. SUMMARY OF SUFFICIENCY RATING FACTORS
Source: VTrans

Appendix B: Inventory of Bridges

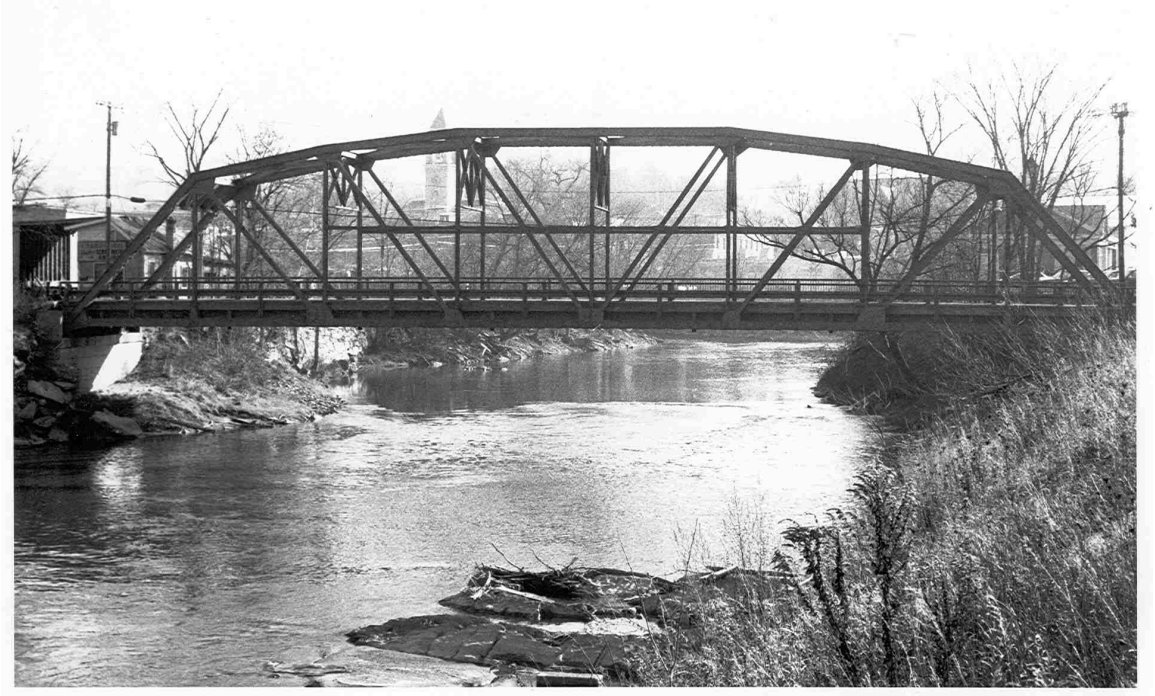
City of Montpelier's 21 Vehicle & Pedestrian Bridges
Prepared by Montpelier Department of Public Works 11/29/01

Bridge No.	Location	Year Built	Type	Length ±	Crosses
1	Rialto Bridge, State Street	1915	concrete encased steel beam	70 ft	North Branch
2	Main Street	1976	steel beam, concrete	147 ft	Winooski
4	Montpelier Junction Road	2002	steel beam, concrete	90 ft	Dog River
5	Taylor Street	1929	Parker through-truss	165 ft	Winooski
6	Pioneer Street	2002	steel beam, concrete	167 ft	Winooski
10	School Street	1991	steel beam, concrete rehab truss	77 ft	North Branch
11	Langdon Street	1928	Warren pony truss	68 ft	North Branch
13	Cummings Street	1928	steel beam, concrete	64 ft	North Branch
14	Gould Hill Road	1983	steel beam, concrete	105 ft	North Branch
15	Grout Road	1977	concrete, wood deck	69 ft	North Branch
16	Haggett Road	1984	concrete, wood deck	87 ft	North Branch
17	Granite Street	1902	Baltimore through- truss, wood deck	205 ft	Winooski
60	Bailey Avenue	1994	steel beam, concrete	255 ft	Winooski
62	East Montpelier Road near Rt. 302	1971	steel beam, concrete	236 ft	Winooski
64	East Montpelier Road @ City Line	1962	steel beam, concrete	106 ft	Winooski
73	Spring Street	1972	steel beam, concrete	83 ft	North Branch
74	Elm Street (City Dump Road)	1983	concrete box	12 ft	Dump Brook
12	Vine St. Foot Bridge	1974	steel beam, wood deck	70 ft	North Branch
•	Winooski West Bike Path Bridge	1998	Steadfast prefabricated wood deck	178 ft	Winooski
•	North Branch Foot Bridge	2001	Pratt prefabricated half through- truss	120 ft	North Branch
•	Poolside Drive Rec Field Foot Bridge	1975	Steel prefabricated, wood deck	80 ft	North Branch

Montpelier's Railroad Bridges
Prepared by VTrans
Division of Rail & Aviation

Bridge No.	Location	Year Built	Type	No. Tracks	Length	Crosses
3	Milepost 1.04, State heating plant	1903	Thru-truss	1	77 meters	Winooski
4	Milepost 1.28, Shaw's	1909	Thru-truss	1	46 meters	North Branch
5	Milepost 2.28, House of Tang	1925	Plate-girder	1	73 meters	Winooski
6	Milepost 3.14, Grossman's	1902	Thru-truss	1	44 meters	Winooski
7	Milepost 3.56, Cabot Creamery	1904	Thru-truss	1	32 meters	Winooski

Note: All these bridges are used by the Washington County Railroad.



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Information requested by Tim Tomasi from Steve Gray, Director of Public Works:

Bridge inspection reports: *1996, 1998, 2000*

9/27/96 FAU, Br.5, Taylor Street over the Winooski River: Inspectors Arlan W. Elwood and Jeff Clark.

10/23/98 FAU, Br.5, Taylor Street over the Winooski River: Inspectors Richard Knowlton and Mike Gallant.

History of maintenance of the bridge: *Repairs done June, 2000*

6/5/2000 letter to William Fraser from James B. McCarthy, RE: Montpelier, Taylor Street, Bridge #5.

7/6/2000 letter to James B. McCarthy from Stephen Gray, RE: Montpelier, Taylor Street, Bridge #5.

Information on the last time the bridge was painted: *VTrans contract, May 1967*

9/16/92 memo to Stephen Gray from Thomas McArdle, Subject: Taylor Street Bridge Water Main Repair (Flood).