Audit of the Champlain Flyer Commuter Rail Service

Pursuant to 2002 Session, Act 141, Sec. 18
Joint Fiscal Office
Prepared by Neil Schickner
February 4, 2003

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I. Act 141, Sec 18

This report is filed in compliance with Act 141, Sec. 18 of the 2002 Session which provides as follows:

Sec. 18. Audit And Study Of The Champlain Flyer

(a) The Joint Fiscal Office, with the cooperation and assistance as needed from the Vermont Transportation Authority, the Chittenden County Metropolitan Planning Organization and the agencies of administration and transportation, shall develop and carry out an audit on the Champlain Flyer commuter rail service. The audit shall be based on performance through federal fiscal year 2002 and utilize numerical ratios derived from standard operating and financial data, and performance measures that are industry standard, including performance measures contained in the September 1999 CCMPO Burlington Corridor Analysis.

(b) In addition, the Joint Fiscal Office shall consider and review the following: FTA-approved capital and operating budgets versus actual capital and operating budgets from the start of the project; actual versus projected ridership levels, actual versus projected revenue; capacity utilization; rail service air pollutants versus displaced vehicles pollutants, rail service fuel usage versus displaced vehicles fuel usage, projected vehicle congestion relief versus actual vehicle congestion relief; and projected cumulative operating surpluses and deficits, taking into account equipment useful life.

(c) The study shall also compare performance with that of similar commuter rail services around the country.

(d) The agency of transportation shall transfer to the Joint Fiscal Office, as reimbursement upon certification of expenses, incurred up to $45,000.00 of transportation development funds to carry out specific elements of this audit.

(e) The study shall be submitted to the members of the Joint Fiscal Committee and the House and Senate committees on transportation by January 15, 2003.

II. Background

(a) The 1993 Vermont Rail Feasibility Study

The Champlain Flyer is a passenger rail service that operates along a 12.9 mile segment of the Vermont Railway corridor between Burlington and Charlotte. The project was developed in the 1990s. In March 1993, the Agency of Transportation ("AOT") released the "Vermont Rail Feasibility Study"[1] (hereafter the "1993 Feasibility Study") which examined the potential for commuter rail services in three corridors: (1) Burlington – Barre, (2) Burlington – Rutland, and (3) Burlington – St. Albans. The study concluded that the financial risks were too high to justify development of any of the corridors on a complete basis.

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[1] "Vermont Rail Feasibility Study" submitted by LS Transit Systems, Inc. in association with R.L. Bank & Associates, Inc., Resource Systems Group, Inc. and CGA Consulting Services for the Vermont Agency of Transportation, March 1993.

As an alternative, the report recommended development of a shorter segment of a corridor on a demonstration basis. The report recommended the segment from Burlington to Charlotte primarily because it was expected the service could be up and running by the time major reconstruction on Route 7 was scheduled to occur. The feasibility of commuter rail could be tested on a more limited basis as compared to development of an entire corridor while at the same time an alternative to a congested construction zone would be provided to Route 7 users.

Track improvements on the segment between Burlington and Charlotte would also benefit rail freight service on the Burlington-Rutland rail corridor. The study noted that 80% of the rail between Burlington and Rutland was manufactured prior to 1940 and that "much of the rail is severely worn and has visible defects."[2] Poor rail bed conditions due to soil subsidence were also noted as a serious problem with 5 locations between Burlington and Charlotte needing soil stabilization and subgrade improvements.[3] If rail freight service along the Burlington-Rutland corridor were to be maintained, it is clear that certain basic track and rail bed improvements would eventually have to be made.

Track improvements on the Burlington-Charlotte segment would also be part of any future connection between Vermont's western rail corridor and the national Amtrak inter-city rail network. The 1993 study recommended the further exploration of two options: (1) a connection from Whitehall, NY to Rutland and then north to Burlington (an extension of the Ethan Allen service) and (2) a connection from Albany, NY to Bennington and then north to Burlington. The latter concept evolved into the "ABRB" (Albany-Bennington-Rutland-Burlington) project.

As conceived in the 1993 study, the "Shelburne Road Demonstration Service" was proposed to run between Burlington and Charlotte. The cost of upgrading the track and rail bed for the service to a Class 3 normalized maintenance program status was $6.6 million.[4] The study concluded, however, that for purposes of the demonstration project, the track and rail bed improvements could be scaled back to $4.1 million. With the track and rail bed improvements scaled back, total capital investment costs for the proposed service were estimated to be $8.8 million as follows,

1993 Feasibility Study
Capital Cost Projections for
the Shelburne Road Demonstration Service[5]

Track bed	$3,082,334
Rail repair	1,000,000
Signals / Crossings	894,000
Stations	600,000
Rolling stock	3,000,000
Total	8,776,334

[2] 1993 Feasibility Study, p. 2-25
[3] 1993 Feasibility Study, p. 2-25
[4] 1993 Feasibility Study, p. 2-122. See Glossary for definition of specialized terms.
[5] 1993 Feasibility Study, Table 2.47, p. 2-123

The 1993 Feasibility Study projected operating costs for the Shelburne Road Demonstration Service based on the following assumptions:

1) The service would have two morning rush hour departures from Charlotte and two evening rush hour departures from Burlington (3 round trip train trips per day),
2) This service would be run 250 days a year, that is, 5 weekday days a week for 50 weeks, and
3) A one way fare of $1.25 would be charged.

The study estimated operating costs under several scenarios concerning the impact of Route 7 / Shelburne Road construction zone delays on motor vehicle travel times along the corridor. Assuming a zero or 10 minute construction zone traffic delay, the ridership forecast called for a two car train set. Assuming a 40 minute traffic delay, the ridership forecast called for a 3 car train set to handle the additional passengers projected to be attracted to the train service by the longer traffic delay. Passenger and operating cost projections in the 1993 Feasibility Study for the no construction zone traffic delay and the 40 minute construction zone traffic delay scenarios are presented below:

1993 Feasibility Study
Passenger and Operating Cost Projections for
the Shelburne Road Demonstration Service

Annual data except where indicated	No traffic delay[6]	40 minute traffic delay[7]
Passenger trips[8]	115,000	244,500
Ticket revenue	$143,750	$305,625
Operating costs	$978,021	$1,180,410
Farebox recovery ratio[9]	15%	26%
Cost per passenger trip	$8.50	$4.83
Operating deficit	$834,271	$874,785
Operating deficit per passenger trip	$7.25	$3.58

(b) The 1995 Shelburne Road Corridor Major Investment Study

In June, 1995 AOT released "Major Investment Study, Shelburne Road Corridor (US 7) Transportation Solutions"[10] (hereafter the "1995 MIS") which further developed and refined the proposal for a passenger rail service between Burlington and Charlotte. As evident in the title, this study had a much narrower focus than the 1993 Feasibility Study, namely the

[6] The 1993 Feasibility Study did not contain a separate table of cost projections on a no traffic delay assumption. The study, however, did include the above ridership projection on a no traffic delay assumption (p. 2-72). With no traffic delay, 115,000 passenger trips per year were projected. With a 10 minute traffic delay, 130,500 passenger trips were projected. On the assumption that this difference in passenger volume would have no effect on the train set configuration required for the service, the figures above are derived by combining the no traffic delay passenger projections with the 10 minute traffic delay operation cost estimates.

[7] 1993 Feasibility Study, p. 2-124

[8] See Glossary

[9] See Glossary

[10] "Major Investment Study, Shelburne Road Corridor (US 7) Transportation Solutions," prepared for the Vermont Agency of Transportation, prepared by LS Transit Systems, Inc. in association with Freese and NIchols, KKO & Associations and Resource Systems Group, June 1995.

travel congestion problems along the Route 7 / Shelburne Road corridor between Burlington and Charlotte. The study recommended a package of solutions to the congestion problem, the major elements being the reconstruction of Route 7 and a passenger rail service between Burlington and Charlotte.

As conceived in this study, the passenger rail component of the improvements package, referred to as the "Rail Improvement Solution," was in all essential respects the Champlain Flyer service as it was finally developed. The Rail Improvement Solution proposed a service with the following features:

1) 4 stations with parking facilities located in Burlington, South Burlington, Shelburne and Charlotte[11];
2) 14 daily trains from Charlotte departing every hour on the hour with the first train at 7:00 AM and the last at 8:00 PM; and 14 daily trains from Burlington departing every hour on the half hour with the first train at 7:30 AM and the last at 8:30 PM, ie 14 daily round trip train trips operating from 7:00 AM to 9:00 PM.[12]
3) This service would be run 7 days a week, 365 days a year.[13]
4) The study analyzed two fare scenarios: a free fare system and a $1.00 one way fare, and
5) A shuttle bus system coordinated with train departures and arrivals at the four stations.[14]

Capital costs required to implement the Rail Improvement Solution were estimated as follows:

1995 MIS
Capital Cost Projections for Rail Improvement Solution

Item	**Cost**
Track and rail bed improvements	$4,300,000
Grade crossing improvements	1,450,000
Station and parking facilities[15]	1,000,000
Train equipment	1,000,000
Total capital costs	**$7,750,000**

Annual operating costs for the proposed service were estimated as follows:[16]

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[11] 1995 MIS, p. 25-26.
[12] 1995 MIS, p. 25.
[13] 1995 MIS, p. 25 and 29. The report does not explicitly state that the same schedule would be run weekdays and weekends but operating costs were calculated assuming 122,640 train miles per year which is derived by 365 days x 14 round trip train trips x 24 mile round trip = 122,640.
[14] 1995 MIS, p. 26.
[15] The projection for station and parking facilities was based on an estimate of $200,000 for each of the four stations plus a $200,000 contingency. 1995 MIS, p. 28. The study, however, also proposed that the Burlington station be located at the Main Street Landing site and in a note to the table of capital costs stated that the "Burlington Station improvements ($1,500,000) will occur as a stand-alone Multi-modal Transit Center." p.29. See discussion of the Main Street Landing lease.
[16] 1995 MIS, p. 30.

1995 MIS
Projected Operating Costs for Rail Improvement Solution

Item	Annual Cost
Operations and right of way maintenance	$625,000
Administration	100,000
Shuttle bus service	200,000
Stations and parking	70,000
Total annual operating costs	**$995,000**

As in the the 1993 Feasibility Study, train service ridership projections took into account the intended coordination of the train service with the anticipated major reconstruction work scheduled to occur on Route 7 / Shelburne Road. Total annual rail passenger trips and ticket revenues[17] were projected as follows:

1995 MIS
Annual Rail Passenger Trip and Ticket Revenue Projections

Period	Passengers-free fare scenario	Passengers-$1.00 One way fare	Ticket Revenue
Pre-Route 7 construction	229,488	214,562	$160,922
During Route 7 construction	233,220	No estimate	--
Post Route 7 construction	138,066	136,200	$102,150
10th year in service	253,743	236,952	$177,714
20th year in service	281,730	263,072	$197,304

(c) The 1996 Environmental Assessment

In July 1996, AOT released "Environmental Assessment for Shelburne Road Corridor Improvement Solution"[18] (hereafter the "1996 EA"). Approval of this document by the federal government was one of the key steps in securing federal funding for the project. The proposed service schedule, capital cost and operating cost estimates for the service were unchanged from the 1995 MIS study. A $1.00 one way fare was recommended. Ridership projections assuming a $1.00 one way fare were also unchanged. In response to public comment, an estimate of "during construction" ridership on a $1.00 one way fare assumption was provided to fill the gap in the 1995 MIS table.[19] Ridership projections were as follows with "construction" again referring to the scheduled reconstruction of Route 7 / Shelburne Road.

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[17] Ticket revenue was estimated on the assumption that with a base one way fare of $1.00 and discounts for children, etc, the average fare would be $.75 per passenger. 1995 MIS, p. 30.

[18] "Environmental Assessment for Shelburne Road Corridor Rail Improvement Solution," prepared for the Vermont Agency of Transportation, prepared by LS Transit Systems, Inc. in association with Freese and Nichols, Inc. July 1996.

[19] 1996 EA, appendix E.

1996 EIS
Annual Rail Passenger Trip Projections for
the Shelburne Road Corridor Rail Improvement Solution
$1.00 one way fare scenario

Time period	**Annual Trips**	**Change**	**% Change**
Pre-Route 7 construction	214,562		
During Route 7 construction	217,000	+2,438	+11%
Post Route 7 construction	136,200	-80,800	-37%
10th year in service	236,952	+100,952	+8.2% per annum
20th year in service	263,072	+26,120	+1.0% per annum

Regarding the ridership forecasts, the report stated:

> "The sources of data for the ridership forecast were the 1993 Chittenden County Network Model (PM Peak Hour); a mode choice model based on 1993 data gathered in Chittenden County; and a market research survey carried out in October, 1994. The methodology was presented in September, 1994 to the Federal Transit Administration and subsesquently accepted.
>
> The model does not take into account people who chose rail during construction of Route 7 and continued to use rail after construction had concluded. Also, the numbers are conservative for the post-construction period because the highway improvements will only provide temporary relief. Congestion and delay will return to Route 7 in the future. Rail ridership may improve as a result. Ridership related to tourism is also not reflected in the model. Growth in this area could be substantial."[20]

Regarding the impact of train noise on the environment and measures planned to mitigate such noise, the report states:

> "Train noise control at the source can involve equipment and track-related measures as well as operational modifications. Since the greatest potential noise impact of the proposed passenger system is from train horns, one of the mitigation measures planned for this project is designed to minimize the use of train horns at grade crossings. It is proposed that all grade crossings be gated, and that 'quiet zones' be established to eliminate horn blowing at Flynn Avenue in Burlington and at all crossings south of Flynn Avenue to, but not including, Harbor Road in Shelburne."[21]

III. Audit Sources, Methodology and Issues

Capital cost data for this report was provided by AOT. Operating cost data was provided by AOT and VTA. Passenger count and train mile data was provided by Vermont Railway. Invaluable assistance in processing the operating cost data was provided by the accounting firm of Mudgett, Jennett & Krogh-Wisner, P.C. , VTA's independant auditor.

[20] 1996 EA, p. 1.8.
[21] 1996 EA, p. 7.1.

Based on the available raw data, the Joint Fiscal Office determined the capital and operating costs of the Champlain Flyer service. The environmental impact analysis of the service was performed by Resource Systems Group, Inc. under contract to the Joint Fiscal Office.

(a) Audit Time Periods

The Champlain Flyer service commenced and has been in continuous operation since December 2000. Act 141, Sec. 18 (2002 Session) directs that this audit analyze service performance through federal fiscal year 2002, that is through September 2002. Thus, in one respect, this report covers the 22 month period from December 2000 through September 2002. Nearly all the capital costs and some pre-service start up costs, however, were incurred prior to December 2000. On an accrual basis, these costs have been allocated to the 22 month period from December 2000 through September 2002 during which the Flyer was in actual service.

This report divides the 22 month time frame into two periods: (1) the 10 month period from December 2000 through September 2001, referred to as "Year 1", and (2) the 12 month period from October 2001 through September 2002, referred to as "Year 2". This division was made so that the most recent full 12 month period of operations could be used to compare actual to projected performance. To remove distortions, actual performance during the truncated 10 month "Year 1" period is compared to 10/12s of the various annual projected performance measures.

(b) Methodology

The methodology of the environmental analysis is described in the report of Resources Systems Group. This section describes the methodology employed by the Joint Fiscal Office to determine the Champlain Flyer's capital and operating costs.

The financial records of AOT and VTA with respect to the Champlain Flyer are all on a cash basis. The starting point for the analysis was an AOT database of all check disbursements made in connection with the Champlain Flyer project. This database contained records which identified the date a check was disbursed, the vendor to whom the payment was made, the amount, voucher number and a short description of the nature of the payment. This database started in August 2000 and therefore does not include any of the capital costs incurred prior to that date. Data on capital costs incurred prior to August 2000 was separately provided by AOT. The vast majority of the records concerned operating costs but the database did include disbursements relating to some of the smaller capital costs incurred after August 2000.

The database was refined by adding: (1) a "Class" entry to identify whether the expense was capital or operating in nature, (2) a "Category" entry to identify the expense in terms of the cost categories used in the 1995 MIS and 1996 EA studies and (3) a "Subcategory" entry to further refine the data. For most entries, the appropriate Class and Category were self-evident. As the database was refined, copies were furnished to AOT and VTA for their review and assistance in classifying uncertain items.

Every attempt was made to identify disbursements which needed to be converted to an accrual basis. For example, the Flyer's liability insurance is effective for a 12 month period from December through the following November. In the database, the insurance premium payments appear as one or two disbursements in December. These payments had to be deleted and re-entered as 12 monthly accruals.

For each category of capital cost, a monthly depreciation rate was determined based on the useful life of the particular asset. If the database included disbursements related to the capital cost, those records were deleted and replaced with monthly accruals. For each capital expense incurred prior to August 2000, 22 monthly accruals at the appropriate depreciation rate were added to the database to cover the period from December 2000 through September 2002.

When that was completed, all the costs were tabulated by Class, Category and Sub-category by state fiscal year and the results compared to VTA's audited financial statements. That comparison revealed some discrepancies which were narrowed to an acceptable level with the assistance of AOT, VTA and VTA's independant auditor. When the accrued costs on a state fiscal year basis acceptably matched the same categories of expenses covered by VTA's audited financial statements, the data was re-tabulated in terms of the defined audit periods for this report.

(c) Audit Results versus VTA's Financial Statements

VTA's financial statements cover all of the current operating expenses of the Champlain Flyer and of VTA itself. With respect to capital costs, the VTA financial statements include: (1) the Main Street Landing capital leasehold interest and (2) several small capital equipment expenditures incurred after December 2000 (e.g. wheelchair lifts). The VTA financial statements do not include any of the capital costs relating to: (1) track and road bed improvements, (2) grade crossing improvements or (3) station improvements.

The Champlain Flyer service is owned by the state which "contracts" with VTA to operate the service. As the owner, the state is responsible for all of the capital improvements which were incurred to enable the service to operate. VTA, in turn, is only responsible for tracking those current expenses incurred in actually operating the service. VTA's financial statements accurately represent the current costs of operating the service, and, as noted above, the results of this audit closely match the results in VTA's financial statements with respect to all expense categories covered in the VTA financial statements. The total financial cost of the Champlain Flyer service, however, includes not only the current operating costs of the service but also the amortized capital costs which were incurred in connection with and which are attributable to the delivery of the passenger rail service. The purpose of this audit is to determine, on an accrual basis, the total financial cost of the Champlain Flyer service; and the results therefore vary from VTA's financial statements in that respect.

(d) Audit Issues – Analysis "A" and "B"

A number of judgment calls had to be made in performing this audit with respect to items which reasonable people could disagree whether they should be included or excluded as as being a cost of the Champlain Flyer. These items are discussed in more detail below.

This report presents two analyses. In Analysis “A”, some of the debateable items are resolved by charging the full cost or an allocated portion of the cost to the Flyer. In Analysis “B”, the same debateable items are resolved by charging a lower allocated portion of the full cost to the Flyer or by excluding them as a cost. With respect to the remaining debateable items, a judgment call is made and the cost is charged or not charged to the Flyer. The two analyses are intended to represent two reason based perspectives on issues that are too complex to be boiled down to a single number.

(1) Capital Improvements

The most difficult issue in this audit is how to allocate the cost of basic track and road bed improvements which were incurred to enable the Flyer to operate. On the one hand, these improvements had to be made for the Flyer to operate. On the other hand, the improvements directly benefit existing freight service along the corridor, and will benefit any future Amtrak like inter-city passenger rail service that develops in the future. It is also clear that as the owner of the rail corridor, the state would eventually have been forced to make most of these improvements if freight rail service were to be maintained in the corridor.

The argument for apportioning the cost of the track and rail bed improvements is based on the position that these improvements benefit other existing and potential corridor uses. For more than 3 decades the state has been committed to the policy of encouraging the development of rail services, and to the end of preserving and maximizing the options for development of rail services, the state has purchased a number of rail corridors which otherwise would have been abandoned. Given that policy commitment, the essential base line starting point for the analysis of any passenger rail proposal should have been the determination of the present value of the cost of all the inevitable and unavoidable track and rail bed improvements that would have to been made if the rail corridor’s potential for future rail service were to be preserved. That base line determination would have represented the real, current dollar cost of the state’s policy commitment to preserving rail service options for the state, and the true capital costs of the proposed passenger rail service would have been the difference between the cost of the track and rail bed improvements required for the Flyer service and that base line estimate.

Such a base line determination, and the view of the project that it reflects, however, would have been inconsistent with the requirements of federal law. Federal grants for rail projects are only available for mass transit projects and the focus of the federal law is to ensure that a project’s total costs are justified by the benefits of the proposed mass transit service. Thus, in the conceptual framework of the federal grant program, although the ancillary benefits of capital improvements are well understood, all of the costs of capital improvements are charged to the mass transit project, and the benefits of the proposed mass transit service are measured against them. Accordingly, Analysis “A” allocates the entire $4.85 million cost of track and rail bed improvements to the Champlain Flyer.[22] This figure is compared to the projected total cost for track and rail bed improvements, which is referred to as “Projected A”.

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[22] AOT reported that track and roadbed improvements cost $4,397,249. To this was added $97,249 in “environmental mitigation” costs. Finally, $1,717,615 in consultant fees was allocated among (1) track, roadbed and environmental, (2) grade crossings and (3) stations on a pro rata basis.

On the other hand, it is an undeniable economic reality that the basic track and rail bed improvements made in connection with the Flyer project have directly benefited existing freight service, potential future inter-city passenger service and the state's long term rail policy. The total financial cost of the Champlain Flyer as shown in Analysis "A" is, to that extent, clearly overstated by some indeterminate amount.

Analysis "B" attempts to apportion the cost of the basic track and rail bed infrastructure improvements by making that base line determination referred to above. Specifically, the analysis allocates the cost of track and rail bed improvements by estimating the cost of upgrading the track and rail bed to a Class 2 normalized maintenance program status and then the incremental cost of upgrading from that sustainable Class 2 condition to a Class 3 normalized maintenance program status. The theory here is that if freight service were to be maintained along the corridor, the track and rail bed would eventually have to be upgraded to a sustainable Class 2 condition. The true costs chargeable to the passenger rail service, therefore, are limited to the additional costs required to upgrade from a sustainable Class 2 condition to a sustainable Class 3 condition.

While this approach is sound in theory, the data available to make such calculations is unfortunately thin. Further, the 1995 MIS report states that the rail line between Burlington and Charlotte was already classified as being in a Class 3 condition. Other statements in the report, however, as well as the description of the track and rail bed conditions in the 1993 Feasibility Study (see background section on 1993 Feasibility Study), suggest that this classification was in name only. According to the 1995 MIS report, the Burlington to Charlotte segment was in a deteriorated condition, "is restricted over much of the line by slow orders", and over most of the segment "shows signs of deferred maintenance".[23]

The 1993 Feasibility Study included estimates of the cost to upgrade several state rail corridors (but not Burlington to Charlotte) to Class 2 normalized maintenance program status and separate estimates to upgrade the corridors to Class 3 normalized maintenance program status. The incremental cost of upgrading from Class 2 to Class 3 as a percentage of the total cost of upgrading to Class 3 varied among the corridors between 10.3% and 18.0% with an aggregate group average of 12.5%.

If you assume that the track and rail bed between Burlington and Charlotte in 1993 was in approximately the same condition as the average condition of the track and rail bed in other state rail corridors at that time, then it is reasonable to infer that 12.5% of the $4.85 actual cost of upgrading the Burlington-Charlotte track and road bed to Class 3 status represents the incremental cost of upgrading from a normalized, sustainable Class 2 condition to a normalized, sustainable Class 3 condition. Following this line of reasoning, Analysis "B" limits the track and rail bed improvements attributable to the Champlain Flyer to $4,858,802 x 12.5% = $607,995. To properly compare this adjusted figure to the projected costs for track and rail bed improvements, the same adjustment must be made to the projected figures. These adjusted projections are referred to as "Projected B".

The other categories of capital costs are more directly and exclusively linked to passenger rail service. Station costs are obviously solely attributable to passenger rail. The grade crossing improvements certainly benefit the public with respect to freight trains and some

[23] 1995 MIS, p. 7.

portion of the cost of grade improvements would most probably have been incurred over time to maintain the line for freight service; but the overwhelming proportion of the costs incurred for grade improvements was attributable to the construction of “quiet zones” for the high frequency passenger service. In addition, no objective basis exists for apportioning the costs. Accordingly, the full cost of grade crossing improvements is allocated to the Champlain Flyer in both Analysis “A” and “B”.

(2) Main Street Landing Capital Lease

In January 1998, to secure the Main Street Landing site for the Burlington station, the state executed a transaction in which, in exchange for a $1.5 million up front payment, the state received a 20 year leasehold interest in the site and an option, exercisable at the end of the 20 year lease term, to purchase the leased premises for an additional payment of $500,000. This transaction was more in the nature of an economic development project than a lease. For purposes of this report, the state is viewed as the landlord and owner of the purchase option with VTA and the Champlain Flyer being a simple lessee. The cost of the station chargeable to the Champlain Flyer is thus limited to the rental cost of the premises.

The $1.5 million paid by the state in the Main Street Landing transaction is therefore not included as a capital cost of the Champlain Flyer in either Analysis “A” or “B”. That still leaves the problem of determining the rental cost of the Main Street Landing station to the Champlain Flyer service. To the extent the market value of the station site was expected by the market in 1998 to be in excess of $500,000 at the end of the 20 year lease term, the state’s purchase option would have a positive present value in 1998, meaning the 1998 present value of the carved out pure leasehold interest would be equal to $1.5 million minus the present 1998 value of the purchase option. The higher the market’s assessment of the property’s purchase value at the end of the 20 year lease term, the higher the present value of the state’s purchase option and the lower the present value of the remaining pure leasehold interest.

Rough calculations based on estimates of the current market value of the leased premises suggest that as of January 1998, the state’s purchase option could very well have had a present value, a price, of between $700,000 and $1,000,000, meaning the present value of the 20 year leasehold was between $800,000 and $500,000. Taking the midpoint of this range, $650,000 and converting it to a 20 year annuity at the long term interest rates prevailing in 1998 yields a stream of 20 annual payments of $54,392. This is the measure of the annual rental cost of the Main Street Landing station that is included in Analysis “A”. On a current cost basis, this annual rental charge works out to $8.85 per square foot which is comparable to the per square foot rates of other leases in the Main Street Landing building.

Analysis “B” utilizes the annual depreciation rate for the $1.5 million transaction as determined by VTA’s independant auditors. This rate is based on a straight line depreciation of the full $1.5 million payment over of a period of 39 years, i.e. $1,500,000 / 39 = $38,462 per year. This treatment is in accordance with generally accepted accounting principles but has the acknowledged disadvantage of failing to account for the time value of money.

The Main Street Landing lease presented one other issue – namely the lease period started in January 1998 while the Champlain Flyer service did not start until December 2000. On the theory that the state was the interest holder and risk taker with respect to the transaction as a matter of economic development policy, the monthly rental costs of the leased space were not charged to the Champlain Flyer under either Analysis "A" or "B" until December 2000 when the service started.

(3) Locomotive Lease

In the spring of 2000, the state paid $404,000 up front for a 36 month lease of a locomotive to be used by the Champlain Flyer. The lease term started in April 2000 while the Flyer did not start service until December 2000, so the locomotive sat unused at a cost of $11,222 per month for 8 months. VTA's first audit was for state fiscal year 2001 and its auditors started accruing the locomotive lease as a monthly expense starting in July 2000. VTA's FY-01 financial statements thus include 5 months of accruals on the locomotive lease during which time the locomotive was idle.

Recently the state and Vermont Railway agreed to extend the lease term an additional 8 months at no additional cost to the state. This action was equivalent to changing the effective starting date of the lease from April 2000 to December 2000. In this report, monthly accruals to account for the cost of the locomotive lease are charged to the Flyer starting in December 2000.

(4) VTA expenses

AOT's cash disbursement database includes a total of $56,423 in expenses over the 22 month audit period which were paid for stenographer / transcription services. As a public body, VTA is obligated to hold its meetings in public and to maintain detailed minutes, and these expenses were incurred to meet that obligation. Analysis "A" includes these costs; Analysis "B" excludes them on the theory they are a cost of government process rather than a cost of the passenger rail service.

IV. Actual vs Projected Costs and Performance

(a) Gross Capital Expenditures

Actual gross capital expenditures attributable to the Champlain Flyer as compared to the projected capital costs for the passenger rail service as stated in the 1995 MIS and 1996 EA reports are set forth below:

Champlain Flyer
Gross Capital Expenditures
Actual vs Projected Costs

Expense	Projected Cost "A"	Actual Cost "A"	Projected Cost "B"	Actual Cost "B"
Track & road bed	$4,300,000	$4,858,802	538,070	$607,995
Grade crossings	1,450,000	10,467,159	1,450,000	10,467,159
Stations	1,000,000	2,755,495	1,000,000	2,755,495
Equipment	1,000,000	1,030,861	1,000,000	1,030,861
Total Capital Costs	**$7,750,000**	**$19,112,317**	**$3,988,070**	**$14,861,510**

The most obvious difference between actual and projected capital costs is in the category of grade crossings which includes the construction cost of quiet zones. As stated in the background section, nearly all the quiet zones actually built were contemplated in the original proposal. At the time the quiet zones were proposed, they were apparently an entirely new concept in railroad engineering involving design and equipment concepts that had been worked out in theory but not applied in practice. Even so the magnitude by which the costs of the quiet zones was underestimated is obviously large.

(b) Current Operating Costs

Actual versus projected current operating costs for the Champlain Flyer are presented below. For this purpose, the figures for the full 12 month period in audit period "Year 2" are used (October 1, 2001 through September 30, 2002).

Champlain Flyer
Annual Operating Costs
Actual vs. Projected

Expense Category	Projected Cost	Actual Cost "A"	Actual Cost "B"
Operations	$625,000	$1,598,958	$1,598,958
Stations	70,000	135,410	119,480
Shuttle service	200,000	151,332	151,332
Administration	100,000	774,878	742,551
Total operating costs	**$995,000**	**$2,660,578**	**$2,612,321**

Without more information about the assumptions used in making the projections, little guidance can be provided as to the differences between the projections and the actual results. It does appear, however, that the projections did not adequately take into account the cost of liability insurance for the Champlain Flyer. Liability insurance for the Flyer cost $471,792 = $39,316 per month in audit "Year 2", accounting for more than 60% of the costs of Administration. After September 11, the Flyer's liability insurance premium increased 58%.

(c) Total Costs

The Champlain Flyer's total annual costs, consisting of current operating and amortized capital costs, compared to projected total annual costs are presented below. Again, for this purpose, the figures for the full 12 month period in audit period "Year 2" are used.

Champlain Flyer
Total Annual Costs
Actual vs. Projected

Expense Category	Projected Cost "A"	Actual Cost "A"	Projected Cost "B"	Actual Cost "B"
Track & road bed	$215,000	$242,940	$26,904	$30,400
Grade crossings	72,500	523,358	72,500	523,358
Stations	50,000	137,775	50,000	137,775
Equipment[24]	30,303	35,031	30,303	35,031
Total Capital	**$367,803**	**$939,104**	**$179,707**	**$726,564**
Operations	625,000	1,598,958	625,000	1,598,958
Stations	70,000	135,410	70,000	119,480
Shuttle service	200,000	151,332	200,000	151,332
Administration	100,000	774,878	100,000	742,551
Total Operating	**$995,000**	**$2,660,578**	**$995,000**	**$2,612,321**
Total Costs	**$1,362,803**	**$3,599,682**	**$1,174,707**	**$3,338,885**

(d) Passenger trips and ticket revenue

Actual passenger trips and ticket revenues for audit Year 2 of the Champlain Flyer are compared to projected trips and revenues in the table below. Since the major reconstruction work on Route 7 / Shelburne Road anticipated in 1995-96 to coincide with the beginning years of the Champlain Flyer's service has yet to occur (construction is scheduled to commence in the summer of 2003), for this purpose the "Pre-construction" passenger estimates are used.

Champlain Flyer
Annual Passenger Trips and Ticket Revenue
Actual vs. Projected

	Projection	Audit Year 1[25]	Audit Year 2
Passenger trips	214,562	85,403	82,811
Ticket revenue	$160,922	N/A[26]	$52,831

A monthly summary of passengers and ticket revenue is below:

Champlain Flyer
Monthly Passenger Trips and Ticket Revenue

Month	Passengers	12 month moving sum	Ticket Revenue	12 month moving sum
Dec 00	2,399			
Jan 01	1,853			
Feb 01	1,720			

[24] The Champlain Flyer's equipment is being depreciated on the basis of an average dollar weighted useful life of 33 years. Projected equipment capital costs of $1.0 million is depreciated on the same basis.
[25] Annualized, ie 10 month total x 12/10.
[26] Champlain Flyer operated on a free fare basis from December 2000 through April 2001. Starting in May 2001, a $1.00 one way fare was charged.

Month	Passengers	12 month moving sum	Ticket Revenue	12 month moving sum
Mar 01	5,289			
Apr 01	8,295			
May 01	7,281		$3,367	
Jun 01	9,637		$5,854	
Jul 01	14,472		$7,251	
Aug 01	12,587		$5,814	
Sep 01	7,636		$4,351	
Oct 01	7,708		$5,359	
Nov 01	4,672	83,549	$2,639	
Dec 01	6,213	87,363	$3,234	
Jan 02	4,167	89,677	$3,269	
Feb 02	3,914	91,871	$2,611	
Mar 02	4,285	90,867	$2,694	
Apr 02	5,260	87,832	$2,694	$49,138
May 02	7,230	87,781	$4,043	$49,814
Jun 02	8,819	86,963	$5,617	$49,577
Jul 02	12,915	85,406	$6,970	$49,297
Aug 02	10,533	83,352	$7,286	$50,769
Sep 02	7,095	82,811	$6,413	$52,831

(e) Performance ratios

Attachments “A” and “B” combine the financial data under Analyses “A” and “B” with the performance data on passenger trips and miles. The following comments concern items in the attachment.

Train miles and passenger capacity – The 1995 MIS and the 1996 EA did not project total passenger capacity. The projected figure is based on discussions with VTA and AOT Rail Division officials and assumes that weekday morning and evening rush hour service would utilize two passenger cars with seating capacity for 173 passengers and that weekday non-rush hour service and weekend service would utilize one passenger car with a seating capacity for 74 passengers. The “Year 1” projection is adjusted for the truncated 10 month audit period. The 1995 MIS and 1996 EA projections assumed the rail line would be 12 miles long as opposed to its final length of 12.9 miles. The projections have not been adjusted for this difference.

Farebox and revenue ratios – These ratios are not provided for the audit Year 1 period because the service operated with a free fare from December 2000 through April 2001. A one way fare of $1.00 was in effect for the full 12 months of audit Year 2.

(f) Scope of Analysis

The tables in this section and in the attachments represent a financial analysis of the Champlain Flyer. As such, it is limited to an analysis of those direct economic costs and benefits of the Champlain Flyer that are linked to the operation of the service and which can be tracked and quantified through transactions in the money economy. A financial analysis of a factory would, on the cost side, take into account the cost of any pollution reduction equipment used in the factory; but on the benefit side would only take into account the cash revenue generated by the sale of the factory's output. A full analysis of the economic costs and benefits of the factory would extend the financial analysis to take into account the impact on the environment of the factory's operations, including the benefits of the pollution reduction equipment and other indirect savings. The environmental analysis of the Champlain Flyer contained in this report represents an attempt to extend the financial analysis to take into account, at least in part, some of the nonfinancial, economic costs and benefits of the Flyer.

A full economic analysis of the Flyer, however, is beyond the scope of this report. The scope of this report is also defined by its time perspective. As directed in Act 141, Sec. 18 this analysis is strictly retrospective, limited to the actual performance of the Champlain Flyer during the 22 months of the designated audit period.

V. <u>Comparisons to other rail systems</u>

Act 141, Sec. 18(c) directs that this report shall compare the performance of the Champlain Flyer "with that of similiar commuter rail services around the country." There are two obvious grounds for identifying "similiar" commuter rail operations, namely population size and service mode type. Both present problems. With respect to population size[27], the 2000 National Transit Database[28] includes only one rail service in a city comparable in population size to that of Burlington. A number of rail services are being planned in smaller cities[29], and their start up experience would certainly provide a useful comparision, but the existing universe of rail services in smaller cities with National Transit Database operating data is simply too small to be of any value.

Identifying similiar commuter rail services by focusing on the mode of the service and the type of equipment used would also be misleading. Under the mode definitions used by the Federal Transit Administration in the National Transit Database, the Champlain Flyer is primarily a "Commuter Rail" service (diesel propulsion, operations between city center and suburbs).[30] The Champlain Flyer is not a "Light Rail" system which is defined by lightweight passenger rail cars operating on a right of way that is not separated from other traffic for much of the way (formerly called "streetcar" or "trolley" systems).[31]

The distinctions between "Heavy Rail", "Commuter Rail" and "Light Rail" are misleading in this context because the state's mode choice was essentially pre-determined by the state's ownership of the pre-existing heavy freight rail line between Burlington and Rutland. If the state were to develop any commuter rail service, the least expensive solution was to

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[27] The federal government uses two different systems to identify urban areas and their populations. The Census Bureau identifies "Urbanized Areas" or "UZAs" applying a concept that focuses on population density. The Burlington 2000 "UZA" population was 105,365. The Office of Management and Budget identifies "Metropolitan Statistical Areas" applying a concept that focuses on regional commuting patterns. The Burlington 2000 "MSA" population was 169,391. This report refers to UZAs because that is the concept employed in the Federal Transit Administration's National Transit Database.

[28] See http://www.ntdprogram.com/NTD/ntdhome.nsf

[29] See http://www.apta.com/sites/transus/commrail.htm

[30] See website of the American Public Transportation Association at http://www.apta.com/info/define/mode

[31] See http://www.apta.com/info/define/mode

upgrade the existing heavy freight rail infrastructure so that it could accomodate commuter rail service. Limiting the comparison to other heavy rail and commuter rail services would therefore be misleading.

For the above reasons, Attachment C compares the Champlain Flyer's key performance ratios, as defined in the National Transit Database, in audit Year 2 (Oct 01-Sep 02) to the ratios of every heavy rail, commuter rail, and light rail service contained in the Federal Transit Administration's National Transit Database 2000 report. These services are identified with reference to the 2000 Census "Urbanized Area" ("UZA") in which the transit service operates and by the mode of the service. The National Transit Database was used because it is the only source of financial information on nationwide rail operations that is reported on a consistent, uniform accounting basis. The database for the year 2000 was used because it includes national averages by system mode.

Be advised that this table presents a number of comparison issues. It includes small downtown loop trolley systems as well as metropolitan-wide, integrated network commuter rail systems. It also includes a broad range of "third rail" and other electric power motive systems, which, while expensive to build, being powered by electricity, are much less expensive to operate compared to the Flyer's diesel locomotive. Since the table is limited to operating costs, the infrastructure costs, which to a large extent dictate the level of operating costs, and the difference in the infrastructure costs incurred with respect to each system, are not reflected.[32]

VI. Environmental Analysis

Attachment D to this report is the enviromental analysis provided by Resources Systems Group, Inc.

[32] The costs of diesel fuel and maintenance for the Flyer locomotive compared to the cost of electricity and maintenance for a third rail electric powered system explains, in part, the difference between the "Operating costs per vehicle revenue hour" (under Service Efficiency) for the Flyer as compared to other systems in the table.

Glossary and Acronyms

AOT – Vermont Agency of Transportation

Farebox recovery ratio – the ratio of ticket revenue to total operating costs. It shows the percentage of operating costs that are covered by ticket revenues.

Normalized maintenance program – A rail line that is in a Class 3 normalized maintenance program status has been upgraded to the point where going forward only routine annual maintenance and periodic life cycle maintenance are required to preserve the line at Class 3 standards. A rail line, not in a normalized maintenance program status, may still qualify for Class 3 status but due to the condition of its infrastructure, face substantial capital improvement costs in the future as aging infrastructure components need to be replaced.

Passenger trips – Passengers are counted in terms of one way trips. A commuter boarding the the train in Charlotte in the morning to go the Burlington and returning in the evening from Burlington to Charlotte is counted as two passenger trips. Put simply, whenever a person boards a train, that is a passenger trip.

Track Classes – The Federal Railroad Administrtion (FRA) classifies track and rail bed conditions using a variety of engineering specifications designed to define safe operating limits. FRA **Class 1** track has a speed limit of 15 mph for passenger trains and is mainly suitable for freight operations. FRA **Class 2** track is subject to more restrictive specifications and has a speed limit of 30 mph for passenger trains. FRA **Class 3** track is subject to even more restrictive specifications and has a speed limit of 59 mph for passenger trains. A rail line may have, for example, an overall Class 3 classification yet still have track segments that are below standard. Such segments would be subject to a "slow order", a standing order that trains must slow down to a specified speed along the specified stretch of track. Generally speaking, the higher the track class, the higher the infrastructure costs.

Vehicle revenue hours – The number of hours a transit vehicle is in actual service. For a bus service, the time spent by the driver driving from the bus depot to the starting point of the bus route would not count as a vehicle revenue hour.

Vehicle revenue miles – The number of miles a transit vehicle is in actual service. For a bus service, the mileage from the bus depot to the starting point of the bus route would not count as vehicle revenue miles.

VTA – The Vermont Transportation Authority, the public body charged with operating the Champlain Flyer.

Champlain Flyer Performance Audit Analysis "A"

Performance Ratios - Analysis A*			Audit Year 1		Audit Year 2	
#	**System data**	Formula	Projected	Actual	Projected	Actual
1	Amortized capital construction costs					
2	Tracks and rail bed		179,167	202,450	215,000	242,940
3	Grade crossings		60,417	436,132	72,500	523,358
4	Stations and parking		41,667	114,812	50,000	137,775
5	Equipment		25,253	29,193	30,303	35,031
6	**Total amortized capital costs**	Sum 2-5	**306,504**	**782,587**	**367,803**	**939,104**
7	Operating costs					
8	Operations		520,833	1,436,324	625,000	1,598,958
9	Shuttle services		166,667	43,398	200,000	151,332
10	Station & parking maintenance		58,333	159,227	70,000	135,410
11	Administration		83,333	754,359	100,000	774,878
12	**Total operating costs**	Sum 8-11	**829,166**	**2,393,308**	**995,000**	**2,660,578**
13	**Total costs**	6+12	**1,135,670**	**3,175,895**	**1,362,803**	**3,599,682**
14	Farebox revenue		134,102	26,637	160,922	52,831
15	Other revenue			680		3,024
16	Total Revenue	14+15	134,102	27,317	160,922	55,855
17	**Operating deficit**	16-12	**-695,064**	**-2,365,991**	**-834,078**	**-2,604,723**
18	**Capital and operating deficit**	16-13	**-1,001,568**	**-3,148,578**	**-1,201,881**	**-3,543,827**
19	Passenger trips		178,802	71,169	214,562	82,811
20	Passenger capacity		843,728	560,866	1,014,670	946,656
21	Total passenger miles		2,145,624	852,745	2,574,744	850,121
22	Vehicle revenue miles		102,144	41,822	122,640	70,589
23	Vehicle revenue hours		4,256	1,621	5,110	2,736
Cost Effectiveness Performance Ratios						
24	Operating costs per passenger trip	12/19	4.64	33.63	4.64	32.13
25	Operating costs per passenger mile	12/21	0.39	2.81	0.39	3.13
Service Efficiency Performance Ratios						
26	Operating costs per vehicle revenue mile	12/22	8.12	57.23	8.11	37.69
27	Operating costs per vehicle revenue hour	12/23	195	1,476	195	972
Service Effectiveness Performance Ratios						
28	Passenger trips per vehicle revenue mile	19/22	1.75	1.70	1.75	1.17
29	Passenger trips per vehicle revenue hour	19/23	42.01	43.90	41.99	30.27
Other Performance Ratios						
30	Amortized capital cost per passenger trip	6/19	1.71	11.00	1.71	11.34
31	Total capital & operating costs per passenger trip	13/19	6.35	44.62	6.35	43.47
32	Farebox revenue per passenger trip	14/19	0.75		0.75	0.64
33	Operating deficit per passenger trip	17/19	-3.89	-33.24	-3.89	-31.45
34	Total capital & operating deficit per passenger trip	18/19	-5.60	-44.24	-5.60	-42.79
35	Farebox recovery ratio	14/12	16.2%		16.2%	2.0%
36	Capacity utilization	19/20	21.2%	12.7%	21.1%	8.7%
37	Revenue per passenger mile	16/21	0.06		0.06	0.07
38	Revenue per vehicle mile	16/22	1.31		1.31	0.79
39	Passenger miles per vehicle mile	21/22	21.0	20.4	21.0	12.0

Analysis "A" includes: (1) the full cost of rail and track bed capital improvements, (2) the rental value of the Main Street Landing station site based upon the annuity value of the estimated leasehold residual and (3) costs incurred by VTA for transcription services.

Champlain Flyer Performance Audit Analysis "B"

Performance Ratios - Analysis B*			Audit Year 1		Audit Year 2	
#	**System data**	Formula	Projected B	Actual	Projected B	Actual
1	Amortized capital construction costs					
2	Tracks and rail bed		22,420	25,333	26,904	30,400
3	Grade crossings		60,417	436,132	72,500	523,358
4	Stations and parking		41,667	114,812	50,000	137,775
5	Equipment		25,253	29,193	30,303	35,031
6	**Total amortized capital costs**	Sum 2-5	**149,757**	**605,470**	**179,707**	**726,564**
7	Operating costs					
8	Operations		520,833	1,436,324	625,000	1,598,958
9	Shuttle services		166,667	43,398	200,000	151,332
10	Station & parking maintenance		58,333	145,952	70,000	119,480
11	Administration		83,333	723,623	100,000	742,551
12	**Total operating costs**	Sum 8-11	**829,166**	**2,349,297**	**995,000**	**2,612,321**
13	**Total costs**	6+12	**978,923**	**2,954,767**	**1,174,707**	**3,338,885**
14	Farebox revenue		134,102	26,637	160,922	52,831
15	Other revenue			680		3,024
16	Total Revenue	14+15	134,102	27,317	160,922	55,855
17	**Operating deficit**	16-12	**-695,064**	**-2,321,980**	**-834,078**	**-2,556,466**
18	**Capital and operating deficit**	16-13	**-844,821**	**-2,927,450**	**-1,013,785**	**-3,283,030**
19	Passenger trips		178,802	71,169	214,562	82,811
20	Passenger capacity		843,728	560,866	1,014,670	946,656
21	Total passenger miles		2,145,624	852,745	2,574,744	850,121
22	Vehicle revenue miles		102,144	41,822	122,640	70,589
23	Vehicle revenue hours		4,256	1,621	5,110	2,736
Cost Effectiveness Performance Ratios						
24	Operating costs per passenger trip	12/19	4.64	33.01	4.64	31.55
25	Operating costs per passenger mile	12/21	0.39	2.75	0.39	3.07
Service Efficiency Performance Ratios						
26	Operating costs per vehicle revenue mile	12/22	8.12	56.17	8.11	37.01
27	Operating costs per vehicle revenue hour	12/23	195	1,449	195	955
Service Effectiveness Performance Ratios						
28	Passenger trips per vehicle revenue mile	19/22	1.75	1.70	1.75	1.17
29	Passenger trips per vehicle revenue hour	19/23	42.01	43.90	41.99	30.27
Other Performance Ratios						
30	Amortized capital cost per passenger trip	6/19	0.84	8.51	0.84	8.77
31	Total capital & operating costs per passenger trip	13/19	5.47	41.52	5.47	40.32
32	Farebox revenue per passenger trip	14/19	0.75		0.75	0.64
33	Operating deficit per passenger trip	17/19	-3.89	-32.63	-3.89	-30.87
34	Total capital & operating deficit per passenger trip	18/19	-4.72	-41.13	-4.72	-39.64
35	Farebox recovery ratio	14/12	16.2%		16.2%	2.0%
36	Capacity utilization	19/20	21.2%	12.7%	21.1%	8.7%
37	Revenue per passenger mile	16/21	0.06		0.06	0.07
38	Revenue per vehicle mile	16/22	1.31		1.31	0.79
39	Passenger miles per vehicle mile	21/22	21.0	20.4	21.0	12.0

Analysis "B": (1) includes a portion of the cost of rail and track bed capital improvements, (2) includes the value of the Main Street Landing station site based upon the capital leasehold's annual depreciation and (3) excludes costs incurred by VTA for transcription services.

Champlain Flyer Audit - Attachment C - National Transit 2000 Database - Heavy Rail, Commuter Rail & Light Rail Operations											
	Source: National Transit Database 2000, Tables 31 & 32					**Cost Effectiveness**		**Service Efficiency**		**Service Effectiveness**	
State	UZA Name	UZA Population	UZA Population Density per square mile	Transit Agency	Mode	Operating cost per passenger trip	Operating cost per passenger mile	Operating costs per vehicle revenue mile	Operating costs per vehicle revenue hour	Passenger trips per vehicle revenue mile	Passenger trips per vehicle revenue hour
NY	New York - NE NJ	17,799,861	5,309	Metro North RR	Commuter Rail	7.6	0.3	3.6	400.2	1.5	52.6
NJ	New York - NE NJ	--	--	New Jersey Transit	Commuter Rail	6.6	0.3	3.8	313.5	1.4	47.5
NY	New York - NE NJ	--	--	Long Island Rail Road	Commuter Rail	6.6	0.3	4.2	233.3	1.9	35.3
NY	New York - NE NJ	--	--	Port Authority	Heavy Rail	1.9	0.5	4.9	218.9	6.0	112.6
NY	New York - NE NJ	--	--	New York City Transit	Heavy Rail	1.2	0.3	2.7	119.5	5.2	95.9
NJ	New York - NE NJ	--	--	Port Authority Transit	Heavy Rail	2.7	0.3	2.9	201.3	2.6	74.9
NY	New York - NE NJ	--	--	Staten Island	Heavy Rail	6.1	1.0	4.8	262.9	2.0	42.8
NJ	New York - NE NJ	--	--	New Jersey Transit	Light Rail	2.2	0.9	10.5	201.8	7.6	90.7
CA	Los Angeles	11,789,487	7,068	Southern Calif RR Auth	Commuter Rail	11.8	0.3	3.3	522.4	1.1	44.4
CA	Los Angeles	--	--	Los Angeles County Metro	Heavy Rail	1.7	0.6	6.3	250.8	7.8	150.7
CA	Los Angeles	--	--	Los Angeles County Metro	Light Rail	2.1	0.3	6.4	313.2	6.4	152.3
CA	Los Angeles	--	--	Santa Clara Valley TA	Light Rail	4.8	1.1	4.6	233.6	3.3	48.4
IL	Chicago, IL - NW IN	8,307,904	3,914	NE IL METRA	Commuter Rail	5.4	0.2	4.5	339.1	2.0	62.3
IN	Chicago, IL - NW IN	--	--	Nor IN Commuter TD	Commuter Rail	7.9	0.3	4.1	356.3	1.3	45.1
IL	Chicago, IL - NW IN	--	--	Chicago Transit Authority	Heavy Rail	1.8	0.3	2.6	116.9	3.2	65.3
PA	Philadelphia	5,149,079	2,861	SEPTA	Commuter Rail	5.3	0.4	5.4	296.9	2.0	56.0
PA	Philadelphia	--	--	SEPTA	Heavy Rail	1.3	0.3	3.7	132.8	5.5	101.7
PA	Philadelphia	--	--	SEPTA	Light Rail	1.6	0.6	6.2	129.5	8.1	82.0
FL	Miami - Hialeah	4,919,036	4,407	Miami-Dade Transit Agency	Heavy Rail	3.6	0.5	3.2	217.8	2.4	60.3
TX	Dallas-Fort Worth	4,145,659	2,946	Dallas Area RTA	Light Rail	2.9	0.5	5.2	214.9	4.7	74.8
MA	Boston	4,032,484	2,323	Mass Bay Transp Auth	Commuter Rail	4.8	0.2	2.5	267.2	1.7	55.4
MA	Boston	--	--	Mass Bay Transp Auth	Heavy Rail	1.4	0.4	4.0	207.4	6.7	147.2
MA	Boston	--	--	Mass Bay Transp Auth	Light Rail	1.2	0.6	7.0	211.3	11.6	174.4
DC	Washington, DC-MD-VA	3,933,920	3,401	Washington Metro	Heavy Rail	1.9	0.3	2.6	180.9	4.5	96.6
GA	Atlanta	3,499,840	1,783	Metro-Atlanta RTA	Heavy Rail	1.5	0.3	2.2	154.7	3.9	102.5

CA	San Francisco-Oakland	3,228,605	6,130	Bay Area Rapid Transit	Heavy Rail	3.4	0.3	2.1	201.6	1.6	59.2
CA	San Francisco-Oakland	--	--	Municipal Railway	Light Rail	2.2	0.9	6.7	196.0	9.6	87.8
WA	Seattle	2,712,205	2,844	King County DOT	Light Rail	3.0	2.9	21.2	114.0	10.6	37.9
CA	San Diego	2,674,436	3,419	San Diego Trolley	Light Rail	1.1	0.2	2.0	97.6	4.1	87.3
MO	St. Louis, MO-IL	2,077,662	2,506	Bi-State Development	Light Rail	1.4	0.2	3.5	193.2	5.6	139.7
MD	Baltimore	2,076,354	3,041	MTA-Maryland DOT	Heavy Rail	2.7	0.5	3.6	217.2	3.2	80.5
MD	Baltimore	--	--	MTA-Maryland DOT	Light Rail	3.4	0.5	5.0	167.0	3.1	49.3
CO	Denver	1,984,889	3,979	Regional Transp District	Light Rail	1.7	0.4	3.0	103.3	4.6	61.7
OH	Cleveland	1,786,647	2,761	Greater Cleveland RTA	Heavy Rail	3.4	0.5	5.2	261.3	3.6	76.7
OH	Cleveland	--	--	Greater Cleveland RTA	Light Rail	3.7	0.6	5.7	216.1	3.6	58.8
PA	Pittsburgh	1,753,136	2,057	Port Authority Alleghany	Light Rail	3.8	0.8	5.5	222.4	4.0	58.8
OR	Portland-Vancouver	1,583,138	3,340	Tri-County Metro District	Light Rail	1.7	0.3	2.4	141.6	4.8	83.4
CA	Sacramento	1,393,498	3,776	Sacramento RTD	Light Rail	2.2	0.4	3.9	177.2	3.9	79.1
LA	New Orleans	1,009,283	5,102	RTA - Orleans & Jefferson	Light Rail	1.4	0.6	5.8	95.4	8.0	69.4
NY	Buffalo-Niagara Falls	976,703	2,664	Niagara Frontier TA	Light Rail	2.2	0.9	6.7	196.0	7.3	88.7
TN	Memphis, TN-AR-MS	972,091	2,431	Memphis Area TA	Light Rail	1.9	2.3	4.2	61.1	4.0	31.8
UT	Salt Lake City	887,650	3,847	Utah Transit Authority	Light Rail	1.2	0.1	2.6	97.5	4.1	81.3
WI	Kenosha	110,942	2,632	Kenosha Transit	Light Rail	3.1	1.6	8.1	68.2	3.3	21.9
--	National Average				Heavy Rail	1.5	0.3	6.8	139.1	4.6	93.1
--	National Average				Commuter Rail	6.5	0.3	10.8	308.1	1.7	47.5
--	National Average				Light Rail	1.9	0.5	11.6	177.6	6.2	94.1
VT	Burlington	105,365	1,704	Champlain Flyer A (Yr 2)	Commuter Rail	32.1	3.1	37.7	972.4	1.2	30.3
VT	Burlington	105,365	1,704	Champlain Flyer B (Yr 2)	Commuter Rail	31.6	3.1	37.0	954.8	1.2	30.3

To: Neil Schickner
From: Leslie A. Barbour
Subject: Evaluation of the Champlain Flyer
Date: 27 January 2003

1.0 PROJECT OVERVIEW

1.1 INTRODUCTION/BACKGROUND

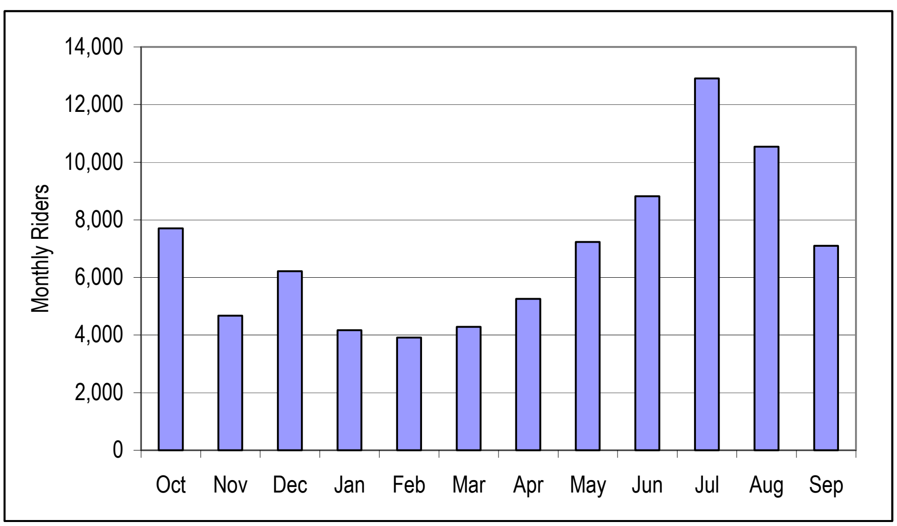
This Technical Memorandum has been prepared for the Joint Legislative Fiscal Office in accordance with Transportation Capital Bill H.764., Sec. 18, *Audit and Study of the Champlain Flyer*. Part (b) of Sec. 18 states, "In addition, the Joint Fiscal Office shall consider and review the following: . . .actual versus projected ridership levels, . . .rail service pollutants versus displaced vehicles pollutants, rail service fuel usage versus displaced vehicles fuel usage, projected vehicle congestion relief versus actual congestion relief. . . ."

1.2 RELEVANT FACTS OF OPERATION

The Champlain Flyer is a commuter train service that runs between Charlotte and Burlington, with stops also in Shelburne, South Burlington, and the General Dynamics (Burlington Innovation Center) facility. For the time period studied, Fiscal Year 2002 (October 2001-September 2002), there were an average of 7.5 round trip trains daily, for a total average of 52.5 round trips per week. This translates into 16 one-direction trips per day between Charlotte and Burlington.[33] The Champlain Flyer had 82,811 riders during this time period. Figure 1 shows the monthly ridership numbers for FY 2002.

Figure 1: Champlain Flyer Monthly Ridership, FY 2002

Month	Riders
Oct-01	7,708
Nov-01	4,672
Dec-01	6,213
Jan-02	4,167
Feb-02	3,914
Mar-02	4,285
Apr-02	5,260
May-02	7,230
Jun-02	8,819
Jul-02	12,915
Aug-02	10,533
Sep-02	7,095



A General Motors GP38-2 2000 horsepower diesel electric locomotive powers the Champlain Flyer. This locomotive was built in 1974, and the engine was re-built in 1999.

[33] It is important to note that the current schedule, effective October 28, 2002, has a total of 60 round trips per week.

The fare for a trip on the Flyer is $1, and monthly passes for unlimited rides are available for $33. A 10-ride pass is also available.

We collected the following data for this analysis:

- Ridership and schedule information
- Fare and headway information
- Transit (CCTA) connections to the Champlain Flyer
- Engine specifications
- Past Projections

2.0 APPROACH TO ESTIMATING IMPACT

2.1 CHITTENDEN COUNTY TRAVEL DEMAND MODEL

We used the Chittenden County Travel Demand model to estimate changes in travel for peak AM and PM periods, considering two scenarios. The first scenario ("with Flyer") includes the commuter rail service, and is calibrated to replicate historic average peak hour ridership. The second scenario eliminates the commuter rail mode from the travel network ("without Flyer"). Model results for the "with Flyer" scenario are compared with those from the "without Flyer" scenario to estimate the net impacts of the commuter rail system along the dimensions of interest: air emissions, fuel consumption, and traffic impact.

The original Chittenden County Travel Demand Model was developed in 1988-89 by Resource Systems Group and has been updated continuously since then. Major model upgrades occurred in 1992 and 1998. In 1998 a commuter rail mode was added to the Model's capability.

The Model's components include: trip generation, trip distribution, mode choice, transit assignment, vehicle assignment, and air quality calculations. Trip generation and distribution parameters were estimated from a 1998 household trip diary survey. Mode choice parameters were estimated from a stated preference survey conducted in Chittenden County in 1993. This stated preference survey analyzed people's response to a rail transit mode. The model is run with custom-developed software known as the Integrated Transportation Model (ITM), except for the vehicle assignment module which is performed with TMODEL3 software.

2.2 MOBILE 6/ITM

The US EPA MOBILE6.2 air pollution emissions model was used to estimate the motor vehicle emissions for all criteria pollutants, carbon dioxide, and a set of air toxics. The output from MOBILE6.2 was then processed into files that could be used by the ITM air quality module. The ITM air quality module calculates total region-wide emissions based on vehicle volume, travel speeds, and idling time per link.

3.0 RESULTS

3.1 RIDERSHIP COMPARISON WITH PAST ESTIMATES

Resource Systems Group had conducted previous ridership estimates for the commuter rail system prior to the Champlain Flyer start-up. At a number of points during the 1990s, Resource Systems Group was asked to estimate ridership for commuter rail systems that were projected to serve the Shelburne Road corridor. In all cases, the systems studied were similar to the Champlain Flyer system in many, but not all, aspects.

Ridership estimates were published in 1995 for several different Shelburne Road reconstruction scenarios. The scenario that most closely matches current operating conditions, a 1995 pre-construction scenario, projected an annual ridership of 214,562 rail trips.[34] Key assumptions made for the study include a fare of $1, which is the same fare as the current service, and a frequency of 1 round-trip per hour, for 14 hours of the day, for a total of 14 round-trip trains per day (28 one direction trips).

The actual ridership for the Champlain Flyer during Fiscal Year 2002 was 82,811 riders. As mentioned previously, the current service consists of 7.5 round trip trains per day, approximately half the number of trains assumed in the projection. It is important to note this key difference in operating conditions for the projection versus the service. This difference must be taken into account when comparing this projection with the actual ridership.

3.2 COMPARATIVE CORRIDOR TRAVEL TIMES

We used the model to measure auto travel times on 3 selected corridors (Route 7, Spear Street, and Dorset Street) for all scenarios. Our analysis showed modest reductions in travel times with the Flyer as opposed to without the Flyer, but these reductions are not considered significant. Table 1 illustrates the travel time differences along these corridors.

Table 1: Travel Time Change with the Champlain Flyer

	Change in Travel Times in minutes					
	Spear Street		Route 7		Dorset Street	
	SB	NB	SB	NB	SB	NB
PM Peak Hour	-0.06	-0.01	-0.04	-0.04	0.00	0.00
AM Peak Hour	0.00	-0.05	-0.03	-0.06	0.00	0.00

This result is to be expected as any vehicles drawn away from the corridor due to the commuter rail alternative will be replaced by other vehicles that formerly found alternative routes from the corridor, or decided not to make a trip. This type of compensating activity is common in traffic analysis, and it is entirely reasonable in this analysis.

There is, however, a region-wide improvement in overall travel time that is measurable when the "with Flyer" and "without Flyer" scenarios are compared. A typical regional measurement of travel time is vehicle hours of travel (VHT), which measures the total time spent in vehicles over a specified time period. The commuter rail scenarios showed a decrease in region-wide VHT of an estimated 100 – 200 hours for the year of interest (FY02).

3.3 TRAFFIC VOLUMES

As with the vehicle travel times, the model results show no significant difference in corridor traffic volumes between the "with Flyer" and "without Flyer" scenarios. This is an effect that could also be anticipated. The Route 7 corridor is relatively congested, and drivers have already changed their trip-making patterns in response to that. Any relief in congestion typically is erased by new vehicles being drawn to the corridor.

3.4 VEHICLE MILES TRAVELED

The region wide number of vehicle miles traveled (VMT) was obtained from each model run and annualized. While the travel times and traffic volumes do not differ much between the "with Flyer" and "without Flyer"

[34] *Major Investment Study: Shelburne Road Corridor (US 7) Transportation Solutions*. Prepared for Vermont Agency of Transportation by LS Transit Systems with Freese and Nichols, KKO and Associates, and Resource Systems Group.

scenarios, the "with Flyer" scenario shows a decrease in the actual number of vehicle miles traveled. Table 2 shows the Peak Hour Regionwide VMT numbers for each scenario, and Table 3 illustrates the Daily and Annual VMT totals displaced by the Flyer.

Table 2: Regionwide Peak Hour VMT

Peak Hour Impact Regionwide VMT	
PM with Flyer	426,806
PM without Flyer	427,947
Difference during PM Peak	**-1141, or 0.27%**
AM with Flyer	369,063
AM without Flyer	369,926
Difference during AM Peak	***-857, or 0.23%***

Table 3: Daily and Annual VMT Displacement

Total Daily VMT Displaced	2871
Total Annual VMT Displaced	1,033,430

3.5 FUEL CONSUMPTION

To calculate automobile fuel consumption for the with and without Flyer scenarios, Resource Systems Group took the difference of VMT and multiplied it by the average Vermont fleet fuel efficiency of 19.6 miles per gallon.[35] Due to the drop in VMT shown by the model, the amount of gasoline used by automobiles is also less. Table 4 illustrates the regionwide drop in gasoline usage by motor vehicles caused by the operation of the Champlain Flyer.

[35] The average Vermont Fuel Efficiency was obtained through the MOBILE6.2 model.

Table 4: Gasoline Conserved by On-Road Vehicles by Operation of Champlain Flyer

Total Daily Gallons of Gas Conserved	146
Total Annual Gallons of Gas Conserved	52,726

The Champlain Flyer engine consumes 1.75 gallons of fuel for each mile of travel. Based on a round trip length of 25.8 miles, and a train schedule of 7.5 round trips per day, Table 5 shows the amount of fuel consumed by the Champlain Flyer's engine.

Table 5: Fuel Consumed by Champlain Flyer Engine

Total Daily Gallons of Diesel Fuel Used by Champlain Flyer Engine	45
Total Annual Gallons of Diesel Fuel Used by Champlain Flyer Engine	123,530

4.0 AIR EMISSIONS

The operation of the Champlain Flyer will divert motor vehicles from using the highway network and result in a drop of vehicle miles traveled in the corridor. While this will reduce air pollution from highway vehicles, there are offsetting increase in emissions from the Champlain Flyer locomotive itself. We analyzed the extent of this offset through a comprehensive emissions analysis of each mode of transportation. The results of this analysis are shown below.

4.1 METHODOLOGY

4.1.1 EMISSIONS FROM MOTOR VEHICLES

As described above, network modeling runs were done for the PM peak hour for the "with Flyer" and "without Flyer" scenarios. These runs provide us with traffic volumes and speeds for each link. With this information, we can then calculate air pollution emissions for each link, sum up all the links, and obtain the total area-wide emissions for each scenario.

The first step in the process is to run the US EPA MOBILE6.2 air pollution emissions model. The computer program estimates the motor vehicle emissions for all criteria pollutants, carbon dioxide, and a set of air toxics. We used the following input parameters in our MOBILE6.2 runs (Table 6).

Table 6: **MOBILE6.2 Input Parameters**

Parameter	Setting
Vehicle Mix	US EPA Default
Pollutants	CO, NOx, SO_2, $PM_{2.5}$, CO_2, VOC's
Air Toxics	Benzene, Acetaldehyde, Acrolein, Formaldehyde, 1,3-Butadiene
Temperature Range	20° to 60°F
Fuel RVP	10.5
Anti-Tampering Program	Vermont Defaults (1997 start year, gasoline vehicles only, test & repair, annual inspection, 96% compliance rate, catalyst check only)
Inspection/Maintenance Program	None
LEV/ZEV Program	National Default
Calendar Year	2002
Month	January
Speed	1 mph increments from 3 to 65 mph
Diesel Sulfur	0.015%
Oxygenates	US EPA Default
Gasoline Aromatics	25%
Olefin Content	15%
Benzene Content	1.5%

The output from MOBILE6.2 was then processed into files that could be used by the ITM air quality module. The ITM air quality module calculates total region-wide emissions based on vehicle volume, travel speeds, and idling time per link. It then adjusts these emissions to daily totals by using the assumptions shown in Table 7. These totals were then further adjusted to annual VMT, consistent with the values in Table 3.

Table 7: ITM PM Peak to Daily Adjustment Factors

Parameter	Setting
Fraction of Day at Peak Hour Speeds	0.29
Fraction of Day that Intersections are as Congested as in the Peak Hour	0.34
Fraction of the AADT in the peak hour	0.12

Using these parameters, the ITM model calculates the total emissions for each pollutant for each scenario, in terms of kilograms per day. The results of this analysis are shown in Table 8.

Table 8: Change in Total Region-Wide Emissions from Motor Vehicles Due to the Champlain Flyer

POLLUTANT	Without Flyer (Tons/Year)	With Flyer (Tons/Year)	Difference (Tons/Year)
Carbon Monoxide (CO)	41,455.53	41,429.37	(26.17)
Sulfur Dioxide (SO2)	124.75	124.67	(0.08)
NOx	4,830.87	4,828.19	(2.68)
Particulates (PM)	87.19	87.13	(0.06)
Hydrocarbons	2,864.78	2,862.53	(2.25)
Acetaleldahyde	19.12	19.11	(0.02)
Benzene	109.81	109.73	(0.09)
1.3-Butadiene	12.50	12.49	(0.01)
Formeldehyde	40.96	40.92	(0.03)
Acrolein	1.68	1.68	0.00
Carbon Dioxide (CO2)	889,072.53	888,476.59	(595.94)

4.1.2 EMISSIONS FROM THE CHAMPLAIN FLYER

As mentioned above, the Champlain Flyer schedule during fiscal 2002 provided 2,736 round trips per year of 25.8 miles per roundtrip. Each round trip is scheduled for one hour with approximately 40 minutes running time and 20 minutes idle time between trips.

The train is powered by a GP38-2 2,000 hp 2 cycle diesel-electric locomotive manufactured by the Electro-Motive Division (EMD) of General Motors. The locomotive was built in 1974 and was rebuilt in 1999. Fuel consumption for the locomotive is approximately 1.75 gallons per mile of number 2 distillate fuel oil.[36]

The emissions of the diesel engine that powers the locomotive produces a number of air pollutants, which include the criteria pollutants regulated under the National Ambient Air Quality Standards of the Clean Air Act, and a number of toxic air pollutants, some of which are subject to Vermont Hazardous Air Contaminant Rules. In this analysis, particular air toxics were chosen because they were the only air toxics that are estimated by the MOBILE6.2 model. However, we should note that both diesel and gasoline engines have emissions of other air toxics that were not included in this analysis.

This locomotive was not subject to state or federal air emissions standards at the date of its manufacturing or at its rebuild, nor is it subject to any current requirements for additional emission reduction. The Champlain Flyer locomotive is therefore classified by EPA as uncontrolled with respect to emissions.

There are no emissions tests for the Champlain Flyer locomotive nor are there any tests available for GP38-2 model of engine. However, it is possible to estimate the emissions from the engine from data compiled by the EPA that included tests from engines in the same family. The emission rates for uncontrolled criteria pollutants (hydrocarbons, nitrogen oxides and particulate mater) were taken from a comprehensive study of diesel locomotive engines undertaken by the EPA in support of their locomotive air emissions regulations introduced in 1998[37]. These emission rates are adjusted for the duty cycle of line haul (as opposed to switcher) locomotives using the assumption that the Champlain Flyer duty cycle was similar to other line haul locomotives[38]. Emissions of sulfur dioxide and carbon dioxide were calculated from combustion emission factors in the EPA AP42

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[36] Data on the locomotive was provided by Vermont Railway Company, Burlington VT.
[37] US EPA, Locomotive Emissions Standards, Regulatory Support Document, April 1998, Table 6-1.
[38] The assumption that the duty cycle was comparable to average line haul was confirmed by Vermont Railway Company.

documentation[39]. Toxic air emissions were derived from emission factors for comparable uncontrolled stationary engines given in EPA AP42 documentation.[40] The annual emissions are reported in Table 9.

Table 9: Annual Emissions from the Champlain Flyer Locomotive

Pollutant	**Emissions (Tons/Year)**
Carbon Monoxide (CO)	5.14
Sulfur Dioxide (SO2)	2.63
NOx	52.22
Particulates (PM)	1.28
Hydrocarbons	1.92
Acetaleldahyde	0.00663
Benzene	0.00804
1.3-Butadiene	0.00034
Formeldehyde	0.15565
Acrolein	0.00080
Carbon Dioxide (CO2)	1377.36

The emissions, on both a round trip and annual basis, were calculated for the operation of the Champlain Flyer locomotive. This was done using the emission rates, the engine horsepower, and the fuel consumption in Table 5.

4.2 COMPARISON OF EMISSIONS

With data on the reduction of emissions from motor vehicles and the increase in emissions from the Champlain Flyer locomotive, we can now compare the two to determine the change in region-wide air pollution burdens. Table 10 shows that region-wide air pollution emissions increase with the operation of the Champlain Flyer. As shown, some pollutants, like carbon monoxide show a decreased level as a result of the Flyer operation, and some, like NOx show an increase. However, if the pollutants are weighted by their health impact, the overall results show a net increase in region-wide pollution burden from ground transportation sources of approximately 0.5% and an increase in carbon dioxide emissions, a greenhouse gas, of 0.09% with the Champlain Flyer.[41]

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[39] US EPA, Compilation of Air Pollution Emission Factors, Publication AP42, Volume 1 table 1.3-1 and 1.3-12

[40] US EPA, Compilation of Air Pollution Emission Factors, Publication AP42, Volume 1 table 3.3-2

[41] The increase in pollution burden was calculated as follows:

1 – Each pollutant was weighted by its relative toxicity based on factors developed by EPIndex (see www.epindex.com)

2 – The total regional emissions for each pollutant were multiplied by their respective weighting factors for the With Flyer and Without Flyer scenarios.

3 – The weighted emissions for each scenario were then totaled and compared to each other.

Table 10: Net Change in Region-Wide Emissions with the Champlain Flyer

Pollutant	Reduction in Auto Emissions (Tons/Year)	Locomotive Emissions (Tons/Year)	Difference in Emissions Due to the Champlain Flyer (Tons/Year)
Carbon Monoxide (CO)	(26.17)	5.14	(21.02)
Sulfur Dioxide (SO2)	(0.08)	2.63	2.55
NOx	(2.68)	52.22	49.54
Particulates (PM 2.5)	(0.06)	1.29	1.23
Hydrocarbons	(2.25)	1.93	(0.32)
Acetaleldahyde	(0.015)	0.007	(0.008)
Benzene	(0.087)	0.008	(0.079)
1.3-Butadiene	(0.011)	0.000	(0.011)
Formeldehyde	(0.034)	0.156	0.122
Acrolein	0.000	0.001	0.001
Carbon Dioxide (CO2)	(595.94)	1377.36	781.42

5.0 SUMMARY

Using ridership data for Fiscal Year 2002 and runs from the Chittenden Country Regional Travel Demand Model, we were able to estimate the net change in traffic resulting from operation of the Champlain Flyer. With these data, we were then able to estimate the net change in a number of traffic and environmental parameters region-wide. These conclusions are shown in Table 11.

Table 11: Net Change in Traffic and Environmental Parameters Resulting From the Operation of the Champlain Flyer

Parameter	Net Change
Ridership	82,811 annual riders compared with forecast of 214,562 (considering frequency differences between projected and actual service)
Travel Times along Shelburne Road	Approximately -3 seconds during AM and PM peak hours
Vehicle Miles Traveled Regionwide	-0.23% during AM peak hour and -0.27% during PM peak hour
Vehicle Hours Traveled Regionwide	-100 to -200 hours per year
Fuel Consumption	+70,804 gallons of fuel
Air Pollution Emissions	+0.5% regionwide
Greenhouse Gas (CO_2) Emissions	+0.09% regionwide

The above table indicates that while there is a small drop in vehicle miles traveled along Shelburne Road and outlying areas, this drop is not enough to offset the increased fuel and air pollution emissions generated by the Champlain Flyer under current operating conditions.