

MEMORANDUM

Date: January 7, 2015

From: Jeff Viar, School Bus Consultants

To: Brian Allen, Chief Financial and Operations Officer, Worcester Public Schools
John Hennessey, Director of Transportation, Worcester Public Schools

Re: **School Bus Routing and Contract Analysis**

This memorandum details the results of analyses of the current routing structure and contract structure for Worcester Public Schools (WPS) in an effort to reduce overall costs of transportation. The routing work plan was to develop a revised routing structure using WPS's Versatrans routing database. This was accomplished by developing new routes from a sampling of existing routes that would also include the routing of all students. One key point in the original report was that WPS does not route and assign all students and therefore cannot produce driver manifests from the software. This results in the need to rely on the contractor to develop the manifests and provide route counts to WPS to maintain levels of efficiency in the routing. Additionally, there was a concern about the inability to achieve incremental cost reductions from more efficient routing due to the structure of the current contract. In order to address this issue, an effort was made to obtain contracts from other comparable districts in the Northeast and develop an understanding of the potential impact of alternative pricing structures. Six districts were identified for this information and five responded with sufficient data.

Contract Analysis

The objectives of this section are to address the opportunities and the shortcomings associated with Worcester Public Schools current pupil transportation pricing structure, and address the potential for lower pricing if other pricing structures would be pursued.

WPS Service Overview

The September 2014 Durham School Services invoices reveal that WPS is being served by the following:

- 96 Regular Transportation Buses at \$338.67 each
- 31 Special Needs Mid-Size Buses at 468.10 each
- 20 Special Needs Wheelchair Buses at \$491.65 each
- 4 Special Needs Midday Buses at \$130.38 each

These per bus rates are fixed amounts and do not vary for shorter or longer bus runs times. The per bus rates for special needs include a bus monitor (attendant) if such is required for that bus.

WPS Current Pricing and Routing Structure

WPS' pricing with Durham is based upon a calculated number of route hours as determined by WPS through route development and pairings. Depending on the time of day the routes are operating, the route times vary from a minimum of one hour per run (mid-day runs) to a maximum of 6.4 hours per run (combination of morning and afternoon routes). These hours are based on the Route Matrix Report from the Verstrans routing system but do not include idle time. Idle time is when buses are not actually picking up or dropping off students. This time may include when a bus has finished one route and is waiting to start the next route or waiting at a school to load students. Therefore, the calculated hours for bid and invoicing purposes are actual driving time as described above plus idle time from gate to gate as well as pre and post trip bus inspection time. As Durham must pay their drivers a minimum of five hours per day, based on a collective bargaining agreement, then it is imperative that WPS create routes that are also a minimum of five hours per day in order to not pay for time that is not productive. The five hours is measured from gate-to-gate. There is no credit or price reduction if a bus is regularly utilized for less than five hours per day. Mid-day bus runs are not included in the five hour window. There are no billings from Durham for overage hours.

We anticipated that WPS' buses were not all exactly five hour buses and made an effort to validate the length of the bus runs, to solve for how many, if any, routes were scheduled for under (or over) five hours. We examined several Versatrans data extracts of the district's route and run data in order to establish the gate-to-gate times and tally the number of bus runs at five hours, at four hours forty-five minutes, four hours thirty minutes, etc. In the end, the extractable data was insufficient to calculate the gate-to-gate bus times with a reasonable degree of precision. Reasons for such included:

- The data did not include the time of day the bus left the depot, or the time of day the bus returned to the depot; we could not determine gate-to-gate without those times.
- The data contained bus runs that were assigned no bus stops and no riders, although miles and times were assigned; we could not readily ascertain if these bus runs were or were not operated daily.
- The data contained bus run times that overlapped several minutes with each other on the same bus such that the beginning time of a bus run was before the end of the previous run; we could not add the times together to produce a meaningful total.

For these reasons, we could not accurately inventory the scheduled bus times to determine if all buses are at a minimum of five hours. Further discussions resulted in additional District assurances that the routes are at a minimum five hour routes and that route times actually average in the 6 to 6.5 hour range. Therefore we will assume that the current Durham routes, for morning and afternoon pairings (excluding mid-day routes) are all packaged at a minimum of five hours.

We analyzed the data from several perspectives to better understand the routing structure and practices. Our review of the routing information revealed three distinct categories of scheduled bus time: 1) loaded travel time, 2) deadhead travel time, and 3) idle/waiting time. Loaded travel time and deadhead travel time are specified within the Bus Metrics Report. However the Bus Metric Report excluded the idle/waiting bus time in the total calculated time; this time would represent when a bus is at a school waiting for the school building release, bus staging time in between morning runs, and bus runs scheduled to be performed, but not performed at all. We found that the average regular education bus averaged 3 hours of travel time per day, leaving approximately 2 hours of idle/waiting time per bus per day if paying for a minimum 5 hour day.

The routing data provided included 36 morning runs, 2 mid-day runs and 31 afternoon bus runs assigned to a bus number for which a school, a route number and origin time, a destination time, and route miles was affixed. However, these runs had no bus riders and no bus stops assigned to them. Of these 69 zero rider, zero stop bus runs, 47 runs were on regular education buses and 22 runs were on special education buses. It is possible that some of these runs are shuttle runs where no specific students are assigned, and those buses actually perform that bus run. It is also possible that the routing system is not paralleling what is actually occurring. We found some of these zero rider, zero stop regular education bus runs published with stop locations on the District's website as of November 1 that would indicate that the runs were regularly occurring.

It was explained that the District's routing practice is to not aggressively purge the routing system when a specific bus run is eliminated or when it is determined that there are no pupils riding the bus. These bus runs therefore become a "placeholder" in the bus schedule. This practice intentionally creates capacity in the system for daily buses (and drivers) to provide a layer of cushion against unexpected circumstances, and further assure the timeliness of the bus service. However, this practice makes it more difficult to manage bus utilization and efficiency as buses appear to be in operation that may not actually be in operation.

This practice consumes driver time. Durham is being paid for performing a minimum of five hours of bus service per day during which the driver is paid by Durham regardless of whether the bus is being productive. That their daily schedule might include bus runs that are not actually occurring is counterproductive to managing the system and its costs. This may be an unintended consequence of attempting to tightly and neatly package five hour minimum bus runs. Could the push to create five hour bus runs to get full value from the pricing structure be contributing to ineffective bus scheduling practices?

Our review of the routing information indicates that WPS' scheduled bus runs are typically brief in duration and have considerable idle seating capacity. This is likely the byproduct of two strategies relating to compliance with the pricing rules:

1. Bus routes (a package of the morning or afternoon bus runs) are intentionally managed to meet a minimum of five hours. This can result in some bus routes not being designed to best utilize the bus and the seats. For example, it is possible that a bus could operate for 15 minutes longer, transport another 20 pupils, and a subsequent bus run could be eliminated.
2. Bus runs are unintentionally curtailed to create an abundance of short bus runs. Having an abundance of short bus runs make it easier to package a route to assure that it operates five hours.

Therefore, we offer that strictly complying with a five hour minimum route limitation could result in more bus runs, more routes, and ultimately more buses in daily operation than a variable pricing scheme.

Comparisons to Peer Districts

We identified several surrounding school districts, from which we intended to make comparisons of contract structures and the potential cost impact of these different structures on WPS costs. Those districts included:

- Bridgeport, CT
- Buffalo City, NY
- Nashua, NH
- Providence, RI
- Schenectady, NY

- Springfield, MA

We pursued certain documents for those peer districts to glean pricing information. These documents included the following:

- Request for proposal
- Pupil transportation draft or signed agreement
- Pricing support
- Contract awards
- Amendments and addendums

Sufficient documents were gathered for all districts to include in this analysis other than Schenectady. Certain pieces of information had to be found within these documents to facilitate a meaningful comparison of peer district pricing. Key elements included:

- Who pays for the fuel?
- Who pays for special needs bus monitors (aides or attendants)?
- What is the basis, in hours, for the daily pricing per bus?
- Identifying other major dissimilarities.
- Interpreting the pricing schedules.

As no two RFP's or agreements or pricing schedules were identical it was difficult to isolate these variables, confirm an understanding of each, and create apples-to-apples comparative data. Some professional judgment and industry knowledge was applied to condense an abundance of incongruent data into a rollup that would be useful for analysis. Below is a high-level summary of that information:

	<u>Worcester</u>	<u>Bridgeport</u>	<u>Nashua</u>	<u>Buffalo City</u>	<u>Springfield</u>	<u>Providence</u>
Contractor ?	Durham	WE	First	First	First	First
Monitors Paid By?	Contractor	Contractor	Pass Thru	District	District	District
Fuel Paid By?	Contractor	Contractor	Contractor	District	Contractor	Contractor
Regular Education - 65-71 Pass						
5 Hour Rate	\$338.67	\$356.00	\$267.11	\$253.79	\$389.87	\$328.98
Special Needs - Type A & WC						
5 Hour Rate - w/ Monitor	\$538.99	n/a	n/a	n/a	n/a	n/a
5 Hour Rate - no Monitor	n/a	\$348.00	\$267.11	\$239.39	\$345.13	\$328.98
5 Hours of Monitor	n/a	\$100.00	n/a	\$78.95	n/a	n/a
Excess Hour Rate	n/a	n/a	n/a	\$23.12	\$45.00	\$57.56

Some of the nuances applicable to each district are:

Bridgeport's base pricing is based upon 2 ½ hours of service in the morning and 2 ½ hours in the afternoon, as defined from first pickup to last drop-off.

Buffalo City's pricing is variable from 4 to 6 hours per day with 30 minute increments. It is based upon the "out-of-the-gate" bus time, is inclusive of deadhead time, and includes a 15 minute allowance for pre and post trip inspections. An assumption is made that the contractor's depot is within the school district boundaries.

Nashua's daily prices are based upon "The average time for a three-tier route is expected to be five (5) hours."

Providence's daily prices are based upon "For home-to-school public, private, parochial, summer, and special education services, vehicle prices will be based upon the time that the vehicle is serving the Providence Public Schools. All full day buses shall be based on a five (5) hour day. The length of day shall be determined based on the time from the first student pickup to the last student drop off of each route. The duration of each route shall be calculated solely by the District. For any run times that may exceed five hours in a day, the District is requesting prices for an Excess Hourly Rate which will be billed in 15 minute increments rounded to the near quarter hour." (Note: Providence's 2014 RFP pursued a 6 hour day price and pricing monitors separately from the base prices.)

Springfield's daily prices are based upon "The daily usage shall be based upon "live" run time which is defined . . . as from the point of first pick-up to the last point of drop-off for each of the AM and/or PM runs. The daily usage does not include deadhead time for the bus to travel to or from the contractor's terminal." Springfield's prices were set for 4 hour and 6 hour service; we calculated the 5 hour price at the midpoint of those two prices.

No two school districts' pricing structure was exactly the same, thus it is not possible to declare with certainty that WPS would likely secure any other district's exact pricing if WPS employs the same pricing structure. Particularly when the assumption is that every WPS route is, in fact, a minimum five hour route. WPS' regular education daily five hour pricing is on the high side, but not the highest; WPS' five hour special needs pricing, which includes a bus monitor, appears to be the highest.

Therefore, the degree of uncertainty and variability do not allow for a definitive conclusion to be drawn about the competitiveness of Worcester's regular education services, other than WPS' pricing does not appear to vary remarkably from the others. However, WPS's special needs transportation prices appear to exceed the market.

The Buffalo City pricing structure best aligns with our philosophy as to a superior strategic pricing structure. That structure establishes base pricing at thirty minute increments ranging from a low of four hours to a peak of six hours. Beyond six hours, the service is priced at \$23.12 per hour. This structure allows for a wide range of daily route assignment practices, premised upon all daily routes not being of exactly the same makeup. Some buses may be 4 ½ hour buses, some at 5 hours, some at 5 ½ hours and so forth. **This structure causes the pricing to adjust to the routes, instead of the routes adjusting to the pricing.** As we have referenced earlier and will hereafter further explain, we have concluded that Worcester's routes have been adjusted to the pricing, and we will address the challenges that approach creates as to fiscal and operational efficiency.

Pricing Approaches

Two pricing structures dominate the contracted pupil transportation industry: 1) a fixed price per day per bus, and 2) a base price per day per bus plus overage hours.

Both approaches are premised upon a common assumption; that there is a base (or minimum) amount of time, service and labor that occurs daily to satisfy pupil transportation demands. Contractors typically guarantee bus drivers a base (or minimum) number of hours per day, recognizing drivers must make two round trips daily from home to the depot and inciting them as a part-time worker to work two short shifts. Driver guarantees are typically at

least four hours (2 hours per shift) in a single or dual tier system, and five to six hours in dual and triple tier systems. Seldom will contractors guarantee drivers in excess of six hours per day.

Contractors will compensate drivers who regularly or irregularly work in excess of the number of hours guaranteed to them. A driver's paycheck will include his/her base guarantee number of hours, plus excess hours relating to daily routes, mid-day routes, activity trips and athletic trips. This method of pay allows the contractor to attract drivers with the guarantee, and to then manage the contractor's costs by paying for additional hours and services as performed, rather than being obligated to a higher level of base pay.

This driver pay strategy becomes even more important to the contractor when the number of hours the daily buses operate are not the same or not similar. Assume that 20 buses operate 6 hours per day, and 30 buses operate only 5 hours per day. The contractor's ability to pay 20 drivers 6 hours and pay 30 drivers only 5 hours enables keeping the contractor's costs as low as possible. Accordingly, **the contractor's driver wage costs are for the most part variable, rising and falling with the work schedule.**

Beyond driver payroll, certain other significant contractor's costs are also variable, rising and falling with the work schedule or the bus in-service intervals. This includes fuel, shop labor, tires, oil, and repair parts. The contractor will argue that the cost of the bus is a fixed cost, and will purposefully recover that cost in their base charge, not in their variable rate.

The matters of "simplicity" and "minimal recordkeeping" may be argued by the contractor as reasons they oppose variable client pricing. It is certainly easier to keep track of how many buses were operated and multiply the number of buses by the number of school days and the rate, then tender the invoice. Simple yes, but who is winning and who is losing?

Establishing a base rate and an overage rate will complicate the process but not to the extent that may be argued. Regular education bus routes are typically established then executed with minor, if any, deviations from day to day. Special needs routes do vary and require more attention as to determining the base rates. However, it is a straightforward process for the contractor and for the district to determine what a typical school day's manifest of routes is, and to establish which routes are scheduled to meet the base hours and those routes that will exceed the base hours.

As an example, assume that the vast majority of the buses are expected to operate 5 hours per day as measured from the moment the bus departs the terminal to when it returns to the terminal in the morning and in the afternoon. If the base rate is established based upon a 5 hour route, then all routes scheduled to be 5 hours or less will be billed at the base rate of 5 hours. All routes scheduled to be more than 5 hours will be billed at the base rate plus a rate for each time increment (typically in 15-30 minute steps) that the route is scheduled to exceed the base.

Ideally, the base hours would be set high enough to include 50 to 70% of the routes, such that most routes fall within the base expectation. Longer routes become exceptions, and should be managed accordingly. A different base can be established for special needs buses if the situation dictates such.

In the end, this pricing strategy protects both the contractor and the District. The contractor can recover its costs if its service exceeds what the district described or what the contractor estimated. The district can avoid paying for efficiencies that the contractor may enjoy via improved routing tactics, and accordingly shorter bus runs.

Consider this, if you were asked to provide a fixed price for an uncertain service level or demand, would you set the price higher or lower? Obviously, you would strive to set it higher. Contractors will follow the same logic. In our opinion, districts give up operational and fiscal control with fixed prices.

Bus Monitors (Attendants)

The pricing of special needs bus monitors (attendants) follows the same logic. Rather than building the monitor price into the bus price, break it out and incur that charge only when a monitor is on the bus. The daily hours and rates can be similarly determined based upon the scheduled route times, such as a 5 hour monitor, 6 hour monitor, and so forth, plus overage hours.

Other Bus Runs

Pricing other bus services by way of an a-la-carte menu should be limited to the extent possible. A-la-carte pricing allows the contractor to invoice fees in addition to the home-to-school services, such as for vocational school shuttles, special needs career assignments, mid-day kindergarten, and tutoring. The fees for these services are often developed upon the contractor's assumption that the bus will be dispatched from and return to the terminal, thus resembling another round of trip service. However, some of these bus runs will not require a return to the depot before the run initiates.

Increased fiscal control can be achieved by addressing contiguous bus service. Contiguous bus runs are those that immediately follow the morning home-to-school service and those that occur immediately before or after the school-to-home afternoon services. In effect, these services should be defined and treated as additional tiers and added hours to the home-to-school bus routes. Doing so causes only the variable costs of that service to be reflected in the contractor's pricing, rather than a round trip or the recovery of more fixed costs. In WPS these extra runs are not scheduled by transportation personnel but are directly scheduled with the vendor through school personnel. Therefore the logistics involved in determining the extra runs that could be attached to a bid package would need to be considered. This may include who is involved in the scheduling, are the extra runs regularly operated every day of the week or only two to three days a week, and how and by what department the additional runs will be paid. These extra runs are not currently a transportation department expenditure.

Proposed Definitions and Contract Terminology

The following text was copied from the Buffalo City School's *Student Transportation Services for 2010-2015 #0910-018" Operations Memorandum of Understanding*. It addresses how daily "usage time" is to be determined for its daily home to school transportation services:

For each of the Home-to-School contracts, the pricing system used in this contract is based upon the length of day the specific vehicle is in use on behalf of the BCSD, including deadhead times as described herein, and stipulated pre/post trip times. The daily usage shall be determined based upon the scheduled run length as determined by the BCSD where the bus is in direct service to the BCSD, including a 15 minute pre/post trip time for each AM, mid-day (if not continuous time), and PM run.

The daily usage time is based on an "out-the-gate" designation determined by the BCSD utilizing the VersaTrans routing software which is calculated to allow the bus to arrive at the first pick-up point on schedule. A similar calculation is provided for the bus to return to the terminal at the end of the AM, mid-day or PM run. The run length assumes that the Contractor's terminal is located within the City of Buffalo. If the terminal is outside of the City, the run time will begin and end from the City border nearest the entry point as determined by the BCSD utilizing the

VersaTrans routing software. If the Contractor operates more than one terminal, the BCSD will designate the terminal for the run length determination.

Run times, including pre/post trip times, will be calculated by the BCSD utilizing the VersaTrans routing software. The total time for the day shall determine the pricing level for that bus (4 hours, 5 hours, or 6 hours based upon the rates submitted). Run times that exceed the number of hours shown will be rounded to the closest half hour (ex. 4 hours and 10 minutes would be rounded to 4.0 hours; 4 hours and 20 minutes would be rounded to 4.5 hours). Half hour rates would be calculated based upon the average between the hourly rates above and below the half hour period (example, 4.5 hours would be paid at the average of the 4 hour rate and the 5 hour rate).

Times in excess of the 6 hours per day rate would be based upon the Excess Hours Rate charge as described herein. This excess hourly rate is based upon route times rounded to the nearest quarter-hour. This excess time shall be established by the BCSD in similar fashion to the run lengths determined for the base length of day.

The Excess Hourly Rate shall be determined by subtracting the four (4) hour rate from the six (6) hour rate and dividing the difference by two (2). For example, if the 4 hour rate is \$100, and the 6 hour rate is \$150, the difference is \$50 which would be divided by 2 to result in an Excess Hourly Rate of \$25.

The District anticipates that most if not all of the late runs will be attached to scheduled PM runs as described in the specifications.

Run times will be determined by the BCSD five times per school year. The initial run length will be for the start of school, with updates or modifications occurring on the first Wednesday of October, December, February, and April. All billing from the Contractor must coincide with the stipulated run lengths.

Specialized runs such as during school day routes, or late runs, that operate within 30 minutes of a scheduled AM or PM run may be considered part of the scheduled length of day for the bus use and may be charged as part of the base home-to-school times on the bus. For example, if a PM route terminates at 3:55 and the late run begins at 4:10, the BCSD will have the ability to add this additional work onto the basic length of day. Should this occur, the non-driving time between the end of the regular run and the beginning of the special run will be considered "live time" for billing purposes. A determination on the applicability of a run qualifying as a base bus cost will be made solely by the BCSD.

Late runs that operate separately from a scheduled PM route would be based upon a one hour guarantee. All minimum guarantees may be modified for specialized runs, early dismissals, or exceptional circumstances as determined by the BCSD. Prior to the initiation of any late run, the BCSD will notify the Contractor of the time allocation and approved payment basis for the run. Late runs shall be paid based upon the Excess Hours Rate as determined above.

Mid-day runs that operate separately from the scheduled AM or PM routes would be based upon a one-hour guarantee. If the vehicle is being operated contiguous to an AM or PM run, then the BCSD reserves the right to add this time onto the basic length of day. Should this occur, the non-driving time between the end of the regular run and the beginning of the special run will be considered "live time" for billing purposes. A determination on the applicability of a run qualifying as a base bus cost will be made solely by the BCSD. Prior to the initiation of any midday run, the BCSD will notify the Contractor of the time allocation and approved payment basis for the run. Mid-day runs that are not part of the AM or PM home-to-school base bus fee shall be paid based upon the Excess Hours Rate as determined above.

The BCSD is also requesting a bid for the hourly charge associated with supplying a trained Bus Attendant on those runs as designated by the BCSD. The Attendant time shall coincide with the run length as determined by the BCSD

and as described above. A bid on the hourly rate for the Bus Attendant must be included in the bid document for a bid to be considered by the BCSD.

These excerpts nicely frame the concept of variable pricing and outline the various decision points that WPS will need to make or define as to the details of that pricing method.

Routing Analysis

Background

The routing section of this project was to explore an alternative method of routing that could be merged with a revised contracting method resulting in possible overall savings. As discussed in the original report, WPS bus routes overall are short in length by time and distance. The results in the current routing system are multiple routes assigned to buses which increases the reuse of the bus but does not promote higher capacity usage of buses. The following is a brief recap of the existing routing methods;

1. WPS does not make complete assignments of regular education students in Versatrans, particularly at the elementary school level. Special needs/charter/private/parochial assignments overall are better defined. For special needs routes, this is likely due to the multiple requirements of children with special needs and types of equipment required with this type service and the need for more attention to details to meet individual program requirements for each student. For charter/private/parochial routes WPS has an application process for transportation that identifies known riders.
2. WPS has multiple school locations where they operate routes outside of the normal attendance areas. There is no documentation available for a non-WPS person to determine whether routes should go outside any particular attendance boundary, or not, other than to look at routing maps and visually see whether routes are running outside. Once that is determined there is no determination as to how far off an established route WPS will go to pick up eligible students. Basically school choice students are not eligible for transportation however there are a high number of students that show up as eligible within the routing map. This makes it difficult to determine, when trying to streamline existing routes, which students should/should not be routed. Extra stops are determined on a case by case basis starting with a request by a parent to school administration. If school administration believes a new stop may be warranted they may contact transportation personnel to determine if adding a stop is feasible.

Routing analysis process

It was decided that the best opportunity to determine if reducing routes was possible was to review schools (regular education only) that are served by five or more buses, with one exception, Clark St Elementary School. The schools reviewed in this dataset are listed below:

Seven Hills Charter	Burncoat HS/MS Combined
Forest Grove	Clark Street
Doherty	Goddard Academy

Nelson Place	North HS
Chandler Magnet	City View
Bancroft	Hiatt
NCC	Quinsigamond
Roosevelt	South HS
St Peter Central Catholic	St Peter Marian
Sullivan	Worcester Arts Magnet
Worcester East	

The initial phase was to individually review longer routes in the sampling to try and effect a reduction in distance, and consequently time, of existing routes with the further intent to increase capacities on these routes. After reviewing approximately 25 routes the results of this initial step showed no marked reduction in either time or distance. The next step was to utilize the option within Versatrans for One Touch Routing (OTR). This option was selected to build routes that would include the WPS parameters for maximum capacity and maximum time on routes. This option also routes "all" eligible students showing in the route map which was a desired outcome. Therefore, in areas where it could be determined that students outside of the attendance areas, as established in Versatrans, were not eligible, another process was run where if a students' place of residence did not equal the school of residence, those students were removed from the routing scheme and OTR was processed. The following parameters were followed;

- a. WPS's maximum capacity of passengers and maximum time were used in the process
- b. Schools that had routes outside of attendance areas, all students were assigned to routes
- c. System generated routes were produced listing ride times and capacities on the routes

Student and Route Results of Sampling

- Twenty-one schools were selected for review that have five or more bus routes (with exception of Clark that had four)
- Of the twenty-one schools, three schools could not be assessed as the system indicated there were no students to route, leaving eighteen schools (this was due to all students being assigned already)
- Of the eighteen schools, OTR was performed on 162 routes. Of the 162 routes there were ten routes with zero loads. These zero load routes were left in during the OTR process to utilize the routes
- Results of the OTR increased the number of total routes by five to 167 routes that included the ten zero load buses
- Existing route data in Versatrans before the OTR indicated 2,377 students on 162 routes which equals an average of fifteen students per route. It is important to remember WPS does not assign all eligible students in the system therefore this result is accurate for data purposes in the Versatrans system but is not accurate in reality
- Route data after the OTR, where all students were assigned a bus, indicated 5,792 students on 167 routes with an average of thirty-five students per route
- Actual route loads were obtained from WPS (the Durham September 2014 one-day count) which indicated 5,801 students riding that day for the selected routes (morning session only on the sampling of schools) on 160 routes with an average of thirty-six students per bus (one school was not in session on the count day hence the two bus discrepancy)

- There was a total of 8,558 students overall (non-sped) reported by Durham as transported on the day of the count
- Two schools showed a reduction in required routes. Burncoat middle and high school students were all routed together on all buses (existing routes indicated only four buses were scheduled to both schools). Even with all students assigned, there was a one bus reduction.
- Quinsigamond results were a two bus reduction from seven to five
- Seven schools showed an increase in the number of required routes
- Five school had no changes in the number of required routes

The snapshots in Figure 1 and Figure 2 below depict morning pickup routes for North High School before and after running the OTR process.

Figure 1: North High to School – Current

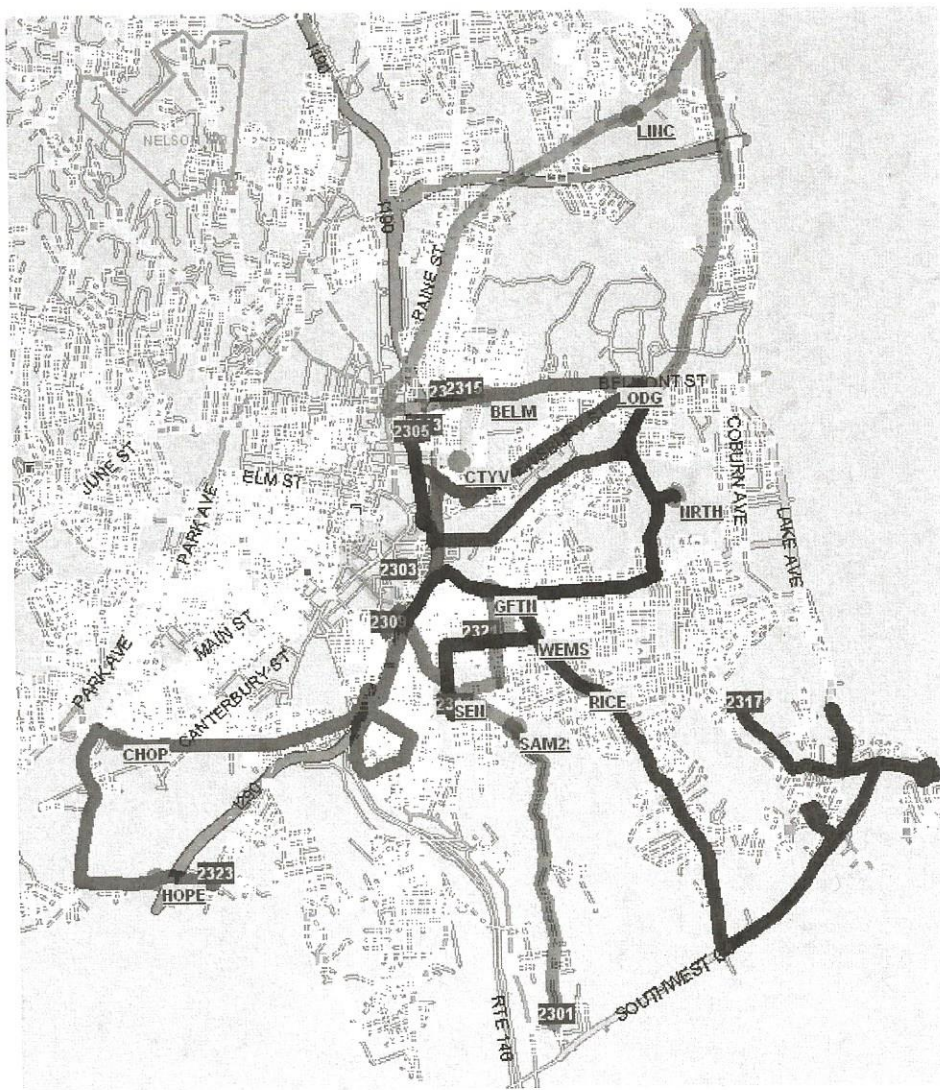
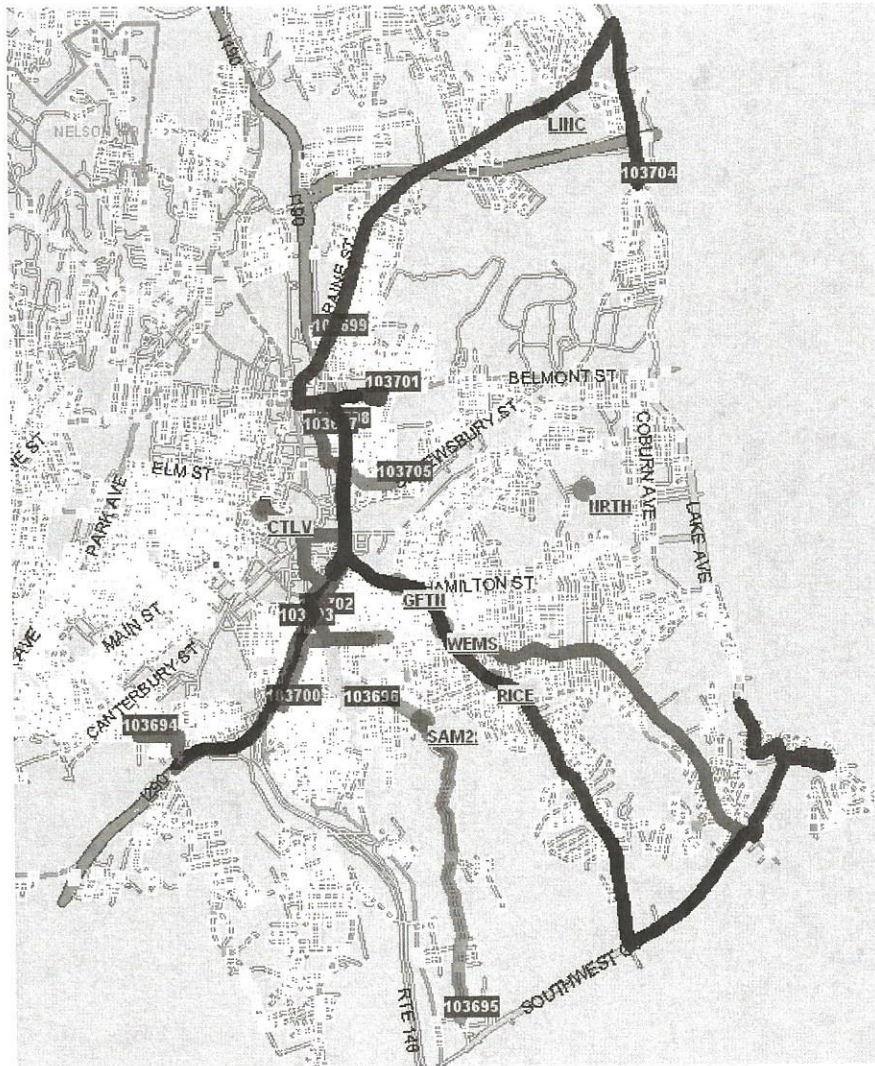


Figure 2: North High to School after OTR



It is visually obvious that the OTR reconstruction of the routes for North High School results in the appearance of more straight-lined routes that appear to be more efficient as well as accomplishing the desired outcome of assigning all students to buses. However, the resulting data below belies that appearance and summarizes the expense (in higher miles, longer ride times with no significant increase in average capacities) to accomplish the desired outcome. For North High School there was no change in the required number of trips (12) before and after the OTR for this school.

Eligible students before OTR	Durham actual load count	Load count after OTR	Average count by bus before OTR	Average load count after OTR	Maximum route time before OTR	Maximum route time after OTR	Total distance before OTR	Total distance after OTR	Difference in distance
555	536	555	45	46	28 minutes	35 minutes	51 miles	174 miles	+123

The higher route times are due to the extra time Versatrans calculates for any additional stops created and the time of loading of additional students. While there was no significant increase in capacities and no reduction of routes there was a significant increase in mileage which further computes in higher fuel costs that will translate into higher costs for the vendor that would be passed on to WPS in future bids, regardless of the vendor.

Of particular note in the overall OTR exercise is the minimal difference in the number of routed students using the OTR (5,792), whereby all students are routed within Verstrans, and the number of students reported by Durham riding on the September 2014 count (5,801), a difference of nine students. This indicates that even though WPS does not assign students to regular education routes on a regular basis within Verstrans, virtually 100 percent of the reported eligible students in Verstrans are riding the buses based on the OTR of the routing sample. Based on the coverage area of current routes it appears the distances students have to travel to stops is not a roadblock to accessibility and that eligible students are making use of the existing availability of stops and routes.

The re-routing of routes using the OTR provided an extension of routes and availability of closer stops that increased the number of required routes by three percent from 162 routes to 167 routes. The objective of routing all students resulted in a substantial increase in ride times and route miles as noted in the table below. A slight increase in the number of routes was a possible outcome as we routed "all" students. An increase in mileage was expected. However, the volume of increased miles was not expected. While it cannot be quantified because student information is not captured at each stop, it is highly likely there are incidents in the system where the OTR routed students are not currently riding. Consequently, there is no mechanism to reconcile those students in order to remove the students to reduce the mileage. At the same time, the OTR typically does not schedule overloaded buses and stays within the routing parameters of time, with very minor overages (WPS system of manually creating routes does overload buses in some instances, and it is acceptable to do because routing personnel know the areas where, historically, not all students that are assigned will ride).

Time and Distance Results of Sampling

Minimum Ride Time before OTR	Minimum Ride Time after OTR	Maximum Ride Time before OTR	Maximum Ride Time after OTR	Distance before OTR	Distance after OTR
8 minutes	21 minutes	31 minutes	41 minutes	777 miles	1638 miles

The results of this route sampling, while beneficial in an assignment of all riders, did so at the expense of over doubling the mileage of current routes. Increases in the minimum and maximum ride times of students are within the allowable routing parameters and therefore were not considered a concern. The undocumented rules for routing are unclear as to the limits of allowable route extensions when attempting to improve the current system and route all students. This was the desired outcome so that accurate driver manifests could be produced and known prior to school starting. And additionally, for any future analysis of Versatrans data to gauge efficiencies, that the system data would be more reliable versus the current need to compile data from multiple sources.

Routing Conclusions

The current routing scheme is effectively providing rides for the students, but as noted in the initial May 2014 report, the capacity usage did not provide for efficiencies in this measure of performance. In cases where routes are covering the entire district the time restrictions do limit an increase in capacities. Many WPS routes, particularly for larger schools, are largely based on a transit style form of routing where routes are often operated in a more direct, inline style, stops are determined along the way at points where known ridership occurs, and riders are expected to get to these locations just as riders would on the Worcester transit system. This is actually commendable as often transit style runs are the last resort to efficiency because of the significant possibility of a decrease in customer satisfaction. Staff interviews have not indicated that the existing routes present customer dissatisfaction. And as stated earlier in this memorandum, based on the coverage area of current routes it appears the distances students have to travel to stops is not a roadblock to accessibility and that eligible students are making use of the existing availability of stops and routes. A challenge that exists in trying to create any further efficiency in capacity in the system is the multiple locations that are served where minimal amounts of students, often using larger capacity buses, must be transported for districtwide schools and multiple programs that have no boundaries. This is where multiple routes with very low capacities become the "fill in" for time in the contracted day and are utilized by routing personnel as much as possible so as not to create additional, stand-alone systems for schools and programs that would increase the number of required buses. This necessarily creates the appearance of the situation described in the contract section whereby buses have excessive idle time (not picking up students). But these buses are being utilized in various roles to prevent stand-alone service. Instances in the lack of route data where there are no route origin times and no calculated times for layover (idle) time make it impossible to determine on a bus by bus basis how much slack time is actually available. However, based on the routing analysis results, it is not recommended that WPS pursue a different routing strategy but we do recommend that current data where route times and student counts are not showing on active routes, be corrected. As different as the current routing scheme is to what we typically see employed in most districts, it is not an ineffective use of resources, and most importantly it works for WPS.

Lastly, without a system of detecting public school students who "will" use the bus, as is used in the private and parochial schools where students must apply for transportation, further reductions in the number of required buses is unlikely within Versatrans. Therefore it is recommended that WPS pursue a process whereby regular education students may be determined. This may include requiring the contractor to turn in manifests versus simple route counts. Manual assignment of students from their home location to a bus stop can be performed in Versatrans without actually routing the bus near the home. In addition to the administrative benefit of this approach there are also risk management related benefits. A worst case, but wholly anticipatable scenario is that of a bus accident. In nearly every accident with any type of injury law enforcement and legal staff will require a rider manifest. The idea of creating this list on site with the associated trauma of the accident is not consistent with best industry practices. The ability for the district to generate manifests with contact information would only be possible if revised procedures were developed that included the assignment of students to stops and of stop to specific routes.

Contract Conclusions

Alternative contract solutions have been presented for consideration. The current routing scheme has some already defined concerns but these do not result in the need to change from the current process of bidding route packages. We reported in the initial May 2014 operations review report that WPS effectively reuses buses in the system where the efficiency indicator value was 6.4 times per day in a three tier routing scheme as compared to a 5 to 6 industry guideline. The number of buses required to transport 100 students rated a 1.5 compared to the industry guideline of

1.0 to 1.3 buses per 100 students. These measures adversely affect the actual seating capacity indicator that rated a 52 percent measure as compared to a 50 to 60 percent industry guideline, which was considered on the low end of the measure. These lower measures counterbalance the high reuse of buses to a degree. However from a contract bid model standpoint for WPS, it is believed that the high reuse of buses, even at the cost of lower capacities, is a necessary evil to keep other potential higher costs down. The strategy of focusing on high rates of asset use coupled with the lack of designated student to stop assignments described in the routing section, results in a system that is different from traditional service delivery models, but is effective within WPS.

Based on this more nuanced analysis of the routing scheme, we are not recommending a switch to a different method of packaging to and from school routes. We do believe that the district should consider the regular "other uses" of buses that occur in the district that could be added onto a pre-determined number of buses during the bid process. This was discussed in the contract section with the intent of not paying additional to/from the bus depot charges but paying only for additional mileage and driver costs since the vehicle is already on the road. Many districts have buses that are scheduled for after school athletics and other events that operate every day. These numbers are unknown in WPS as the schedules are not administered by transportation, but we believe it is likely significant and worth exploring. Whereas any cost savings in this area would not affect the transportation department's costs, it could result in savings to the school or department currently paying for these services.