

Scheduling Efficiencies Assessment

Fall 2010

**December 2010
King County Metro
Service Development Section**



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Executive Summary

Executive Summary

King County Metro is implementing a system-wide effort to improve scheduling efficiency for fixed route bus service through use of enhanced scheduling techniques and software tools. The current focus on scheduling efficiencies is part of Metro’s response to findings of the 2009 Performance Audit and is also aimed at achieving savings targets that were identified in the 2010-2011 biennial budget. More detailed information about savings by base and route impacts of cycle time analysis is available in the full report.

Scheduling efficiencies fall into two categories: system-level efficiencies achieved through enhanced use of HASTUS MinBus and CrewOpt modules; and route-level efficiencies achieved through cycle time analysis. In Fall 2010, Metro achieved scheduling efficiency savings of 37,025 annual hours. Cycle time analysis was applied to routes 7, 10, 12, 14, 49, and 70 at Atlantic Base; route 221 at Bellevue Base; and routes 101, 106, 107, 128, 148, 150, 155, 156, 164, 166, 168, 169, and 181 at South Base.

Savings by Efficiency Category











Category	Annual Hours Savings
Enhanced HASTUS Techniques	21,894
Cycle Time Analysis	15,131
Total	37,025

Progress Towards 2010-2011 Budget Plan and Targets

Service Change	Annual Hours Targets (from 2010-2011 budget)	Current Annual Hours Targets	Actual Annual Hours Savings
Spring 2010	25,000	25,000	27,273
Summer 2010		15,000	16,446
Fall 2010	50,000	35,000	37,025
Spring 2011		20,000	
Summer 2011	50,000	10,000	
Fall 2011		20,000	
Total	125,000	125,000	80,744

Metro has achieved a cumulative savings of 80,744 annual hours through the Fall 2010 service change. This exceeds the target savings of 75,000 annual hours, so future savings may fall below targeted savings in an individual service change. Metro has identified more gradual and evenly phased targets for savings than laid out in the budget in order to maintain momentum, avoid potential workforce reductions, and increase in-year savings (e.g. by implementing a portion of Fall targeted savings in Summer). The actual savings in a given service change may slightly exceed or fall below the targets due to the uneven costing of transit service schedules.

System-Level Performance Measures

Measure	Goal	Fall 2009	Spring 2010	Summer 2010	Fall 2010	Progress
Recovery to In-Service Ratio	0.25	0.33	0.32	0.31	0.27	
“ “ w/o Trolley System	0.25	0.29	0.29	0.27	0.24	
Platform to In-Service Ratio	Decrease	1.51	1.50	1.49	1.46	
Deadhead Miles per Revenue Mile	Decrease	0.34	0.33	0.33	0.34	
Layover Lengths	Fewer layovers >40 min	2.7% over 40 min	2.6% over 40 min	2.8% over 40 min	0.9% over 40 min	
Pay to Platform Ratio	No Increase	1.11	1.11	1.10	1.10	
On Time Performance**	80%	80%	81%	77%	*	
Trips Leaving Terminal Late	No Increase	11%	10%	13%	*	
Average Scheduled Layover (in minutes)	Decrease	20.17	19.53 (-3.2%)	19.14 (-2.0%)	17.14 (-10.4%)	
Average Actual Layover (in minutes)	Decrease*** (at slower rate than scheduled)	17.27	16.86 (-2.4%)	15.60 (-7.5%)	*	

* Performance data is available approximately one month after the completion of the service change.

** On time performance is subject to seasonal variation, and should be compared to prior year data when available.

*** Ideally, average actual layover will decrease, but at a slower rate than average scheduled layover, so that the gap between the two measures is reduced

Cycle Time Analysis

Twenty routes were rescheduled in Fall 2010 using cycle time analysis techniques, with a primary focus on routes at Atlantic and South bases. The new schedules resulted in a net savings of 12,390 annual hours on the group. The cycle time analysis resulted in increases in hours on routes 10/12 and 181, reflecting the fact that past schedules needed adjustment to more accurately reflect observed travel times. The changes to Route 181 in particular are notable because they reflect changes to account for the fact that the route experienced performance problems following an initial implementation of cycle time analysis in February 2010.

Section 1. Purpose and Background

This Scheduling Efficiencies Assessment tracks steps taken by King County Metro to improve scheduling efficiency as recommended in the “Performance Audit of Transit, Technical Report B: Service Development, Report No. 2009-01B.” Recommendation B1a stated that:

“Transit should expand its set of efficiency indicators and goals using Appendix 1 and use them as targets when developing schedules. These goals should be used by management to monitor the performance of the service development group and regularly communicated to decision-makers (10).”

The 2009 audit identified that Metro scheduling practices have “put more emphasis on frequent, timely service and favorable working conditions for operators” and that these practices have “come at an added cost.” The 2010-2011 Transit Division budget assumed that Metro would meet cost savings targets by improving scheduling practices in ways identified by the audit, and through service reductions. This budget directive can be generally summarized as follows:

- During the biennium, the system will be reduced by 200,000 annual hours
- 125,000 hours of this reduction must be achieved through scheduling efficiencies that do not reduce service levels, number of trips, or span of service.
- 75,000 hours of this reduction can be achieved through actual reductions due to reduced service levels, elimination of trips, or changes in span of service.

This report will address the reduction of hours through improved scheduling efficiency and will not address reductions achieved through reduced service levels. The 2010-2011 budget assumed minimum savings to be achieved through scheduling efficiency at three service changes during the biennium. Metro has identified more gradual and evenly phased targets for savings than laid out in the budget in order to maintain momentum, avoid potential workforce reductions, and increase in-year savings (e.g. by implementing a portion of Fall targeted savings in Summer).

In 2010 and 2011, Metro will be proceeding with some service increases such as those funded by Transit Now (RapidRide, Service Partnerships), WSDOT Alaskan Way Viaduct Mitigation funds, and the SR520 Urban Partnership Agreement. In addition to these added services, regular seasonal reductions and scheduling practices may alter the number of annualized hours of service provided. For accurate comparisons, Fall 2009 will be used as a baseline and the service levels offered on all subsequent service changes will be itemized to identify increases or decreases in service levels not related to the implementation of scheduling efficiencies or service reductions.

As of Fall 2010, Metro has achieved a cumulative total of 80,744 annual hours of savings through scheduling efficiency work. This exceeds the minimum savings targeted to date.

Progress Towards 2010-2011 Budget Plan and Targets

Service Change	Annual Hours Targets (from 2010-2011 budget)	Current Annual Hours Targets	Actual Annual Hours Savings
Spring 2010	25,000	25,000	27,273
Summer 2010		15,000	16,446
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Spring 2011		20,000	
Summer 2011	50,000	10,000	
Fall 2011		20,000	
Total	125,000	125,000	80,744

Section 2. Performance Measures

Scheduling efficiencies being pursued by Metro fall into two major categories: system-level efficiencies achieved through enhanced use of HASTUS scheduling software; and route-level efficiencies achieved through cycle time analysis. Separate performance measures will be used to track the effects of scheduling efficiency work in each category.

2.1 System-Level Efficiencies/Enhanced HASTUS Techniques

System-level efficiencies will be achieved through improved use of HASTUS including increased use of the MinBus and CrewOpt modules. MinBus organizes all planned trips into vehicle assignments (blocks) to minimize platform hours. CrewOpt takes these vehicle assignments and optimizes them into pieces of work for operators to bid on within the constraints of the labor contract. These modules have been underutilized in the past and their functions have been completed using other techniques. Efficiencies that result from use of MinBus and CrewOpt will be tracked systemwide and by base. The measures that will be used are:

Measures Suggested by Audit	Additional Measures
Recovery to In-Service Ratio	On-time performance (System-Level)
Platform to In-Service Ratio	Percent of Trips Leaving Terminal Late
Deadhead Miles per Revenue Mile	Average Scheduled Layover
Distribution of Scheduled Layover by Length of Layover	Average Actual Layover
Peak to Base Ratio	
Pay to Platform Ratio	
On-time performance (System-Level)	

2.2 Route-Level Efficiencies/Cycle Time Analysis

Cycle time analysis involves comprehensive review of the established schedules for a route through a process that sets running times plus layover so that at least 90 percent of all trips in a given time period will be able to complete their trip in time to leave for the next trip on time. Built into the cycle time analysis process as defined by the audit is the assumption that as much as 10 percent of trips may depart late for their next trip. This represents a significant change in scheduling philosophy for Metro. Each report will track a set of measures before and after the service change for each of the routes where cycle time analysis is used to make schedule revisions. The measures that will be used are:

Measures Suggested by Audit	Additional Measures
Recovery to In-Service Ratio	Cost to Provide Route
On-time performance (Route-Level)	Percent of Trips Leaving Terminal Late
	Customer Complaints

Routes identified for cycle time analysis will also be considered for stop spacing changes. Close stop spacing can impact travel times because buses have to make more frequent stops and cannot travel with the regular flow of traffic. This can cause buses to miss more traffic signals and therefore travel at lower speeds. The current working guideline is 1/4 mile average spacing, but with flexibility of closer or longer stop spacing to account for all of the many factors that influence stops locations (topography, density, special populations, sidewalk systems, traffic control systems, etc). Stop spacing improvement projects at the route level can generate 1 to 3 minutes of savings per trip. When cycle time analysis is performed concurrently with a stop spacing improvement project, these travel time savings can be directly translated into more efficient schedules and additional operating cost savings. Reducing the number of times the bus pulls in and out of traffic will help improve service reliability, reduce wear on vehicles, and reduce capital costs to provide stop-level facilities.

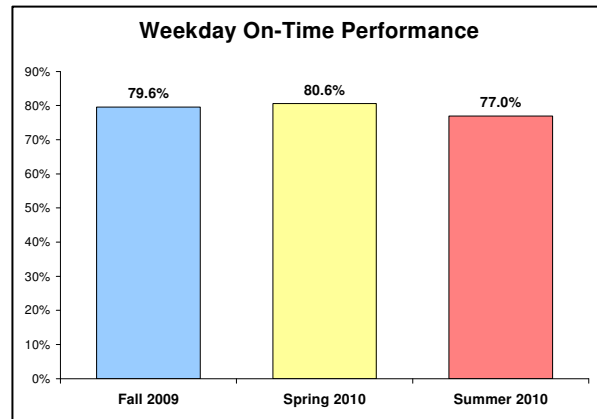
**Section 3. Summer 2010 Service Change -
Final Performance Data**

This section includes performance measures calculated using finalized actual data from the Summer 2010 service change. This data follows up preliminary data that was reported in the previous Scheduling Efficiencies Report. This data reflects the first full service change after implementation of scheduling efficiency changes.

3.1 System-Level Performance Measures

On Time Performance

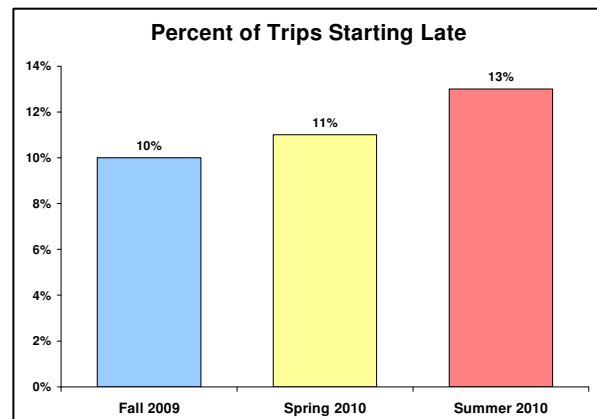
On time performance is a measure of service quality and how accurately schedules reflect the actual service provided. Metro defines on time performance as arrival at a scheduled time point between 1 minute before and 5 minutes after a scheduled time. On time performance has a cyclical nature that depends on factors like road construction, special events, economic conditions, and ridership changes, so changes in this measure cannot be viewed as fully attributable to scheduling efficiency work. At the same time, changes to schedules that make them more or less vulnerable to the volatility of all external conditions will ultimately affect on time performance.



On time performance decreased to 77 percent in Summer 2010. However, this may be due to seasonal fluctuations such as the increase in construction and related delays in the summer. These data are for illustrative purposes only. Summer 2010 data cannot be directly compared to Summer 2009 data due to a change in methodology for calculating performance. Future reports will compare to prior year data when available using the new methodology.

Percent of Trips Leaving Terminal Late

This is a measure of the number of trips leaving a terminal more than five minutes later than scheduled. A lower percent of trips leaving the terminal late is desirable. One limitation of measuring late starts is that Metro has a large number of routes that are through-routed, meaning that operators have no recovery time. While there are operational benefits from through-routing, this service design can significantly impact late starts because there is no chance for operators to get back on schedule.

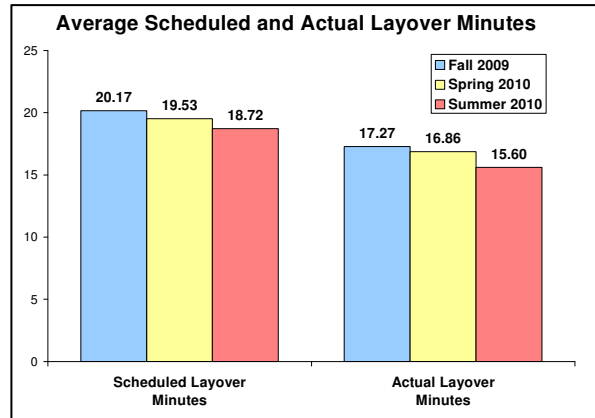


In Summer 2010, 13 percent of trips left their terminals late. The percentage of trips leaving the terminal late increased between Spring 2010 and Summer 2010.

Average Scheduled Layover and Average Actual Layover

These measures identify the average scheduled layover and average actual layover across all Metro bus trips. On any given trip, the actual layover may be different than scheduled due to factors such as congestion, construction, traffic accidents, high ridership (such as due to special events), high numbers of wheelchair lift deployments, and operator driving styles.

Measuring both scheduled and actual layovers indicates whether scheduling efficiency changes are affecting the accuracy of schedules and whether the changes are affecting the difference between scheduled and actual layover. This is important because it takes into consideration the actual operator working conditions. Historically at Metro, actual layover per weekday trip have been less than scheduled layover per weekday trip, and both actual and scheduled layover have been increasing. It is desirable for the actual and scheduled layovers to be the same. However, since day-to-day variability cannot be fully accounted for in writing schedules, it is desirable that the difference between the actual and scheduled layovers should be decreased.



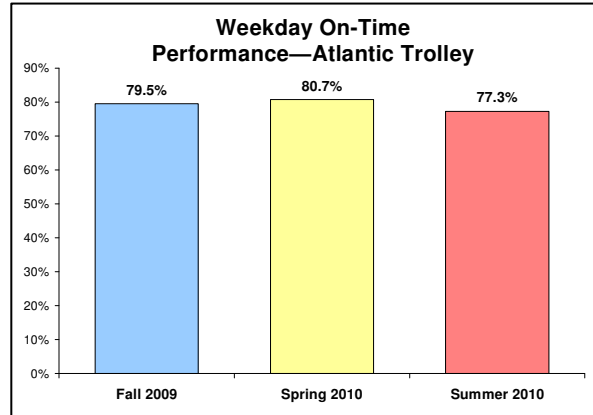
For the Summer 2010 service change, average scheduled layover decreased by 4.18 percent (19.53 minutes to 18.72 minutes), while average actual layover decreased by 7.47 percent (16.86 minutes to 15.6 minutes).

3.2 Base-Level Performance Measures

Atlantic Base Trolley

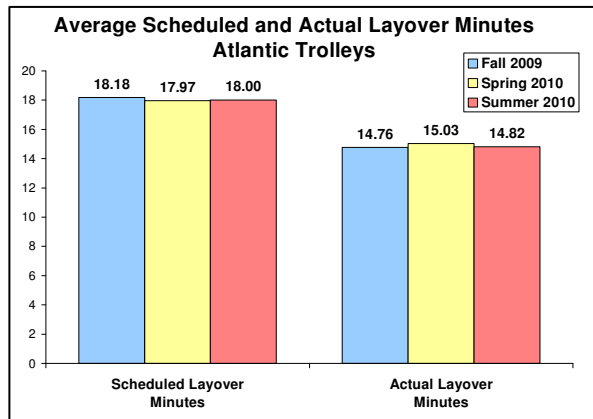
On Time Performance

On time performance decreased to 77.3 percent in Summer 2010.



Average Scheduled Layover and Average Actual Layover

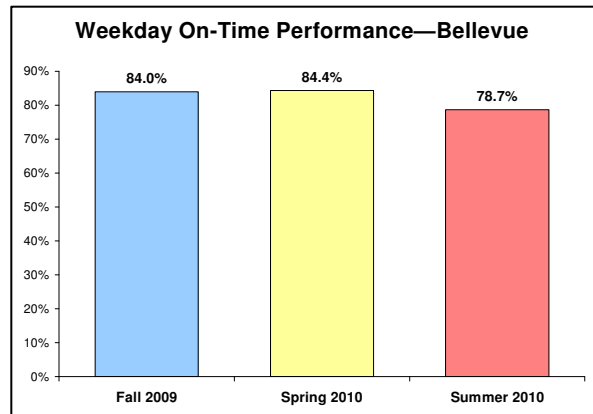
Average scheduled layover minutes decreased 0.17 percent, and average actual layover minutes increased 1.37 percent in Summer 2010.



Bellevue Base

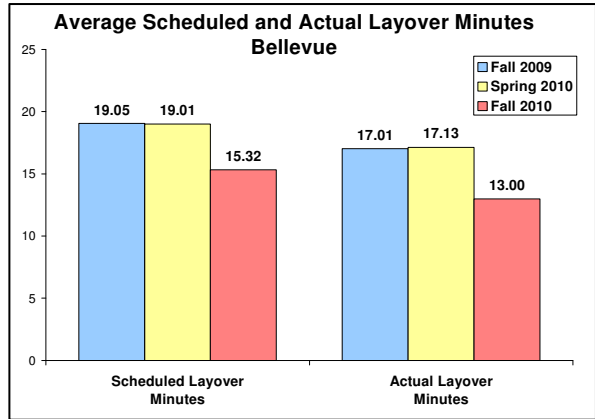
On Time Performance

On time performance decreased to 78.7 percent in Summer 2010.



Average Scheduled Layover and Average Actual Layover

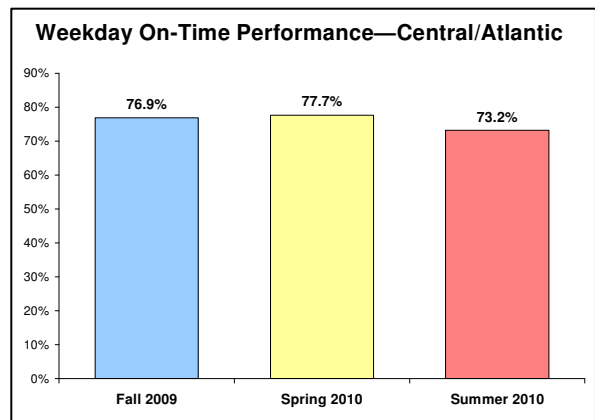
Average scheduled layover minutes decreased 19.40 percent, and average actual layover minutes decreased 24.09 percent in Summer 2010. Bellevue Base had the shortest average actual and scheduled layovers of any base.



Central/Atlantic Diesel

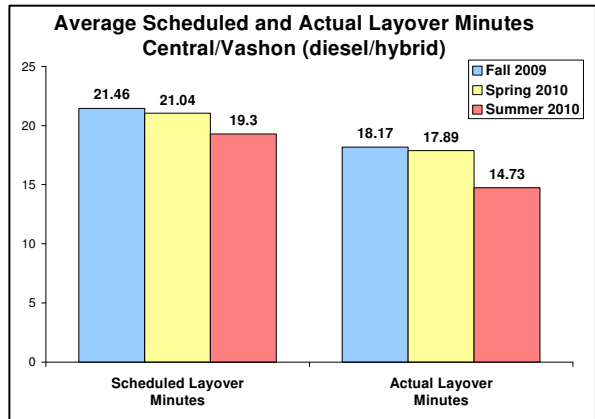
On time Performance

On time performance decreased to 73.2 percent in Summer 2010.



Average Scheduled Layover and Average Actual Layover

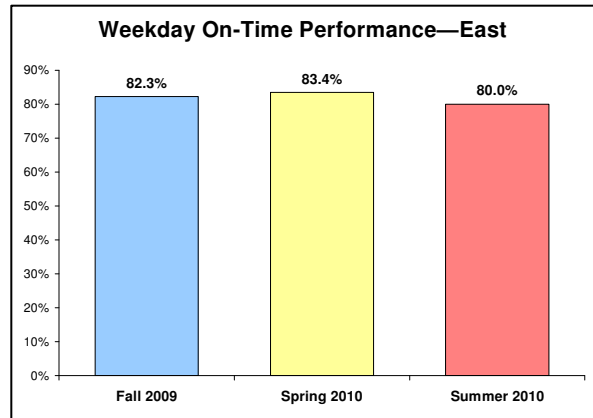
Average scheduled layover minutes decreased 8.26 percent, and average actual layover minutes decreased 17.67 percent in Summer 2010.



East Base

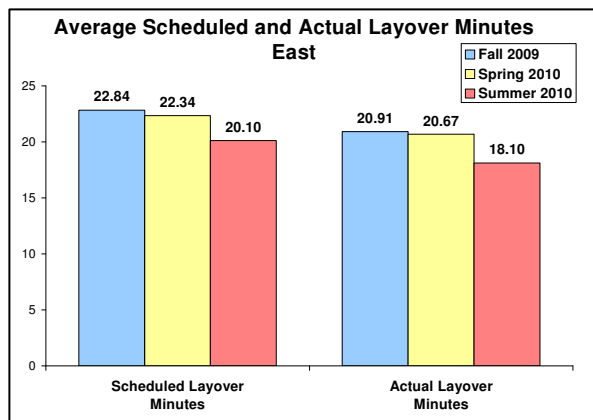
On time Performance

On time performance decreased to 80 percent in Summer 2010.



Average Scheduled Layover and Average Actual Layover

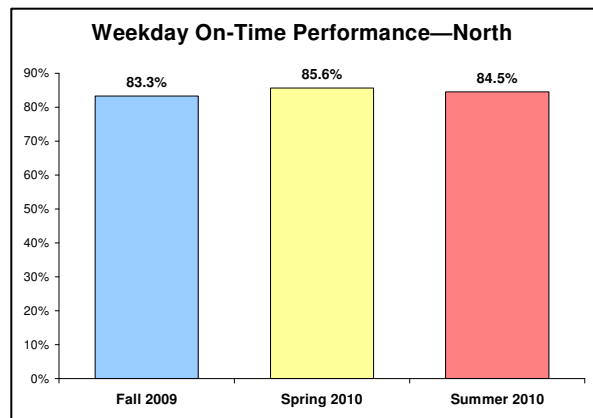
Average scheduled layover minutes decreased 10.06 percent, and average actual layover minutes decreased 12.47 percent in Summer 2010. East Base had the longest average actual layovers of any base.



North Base

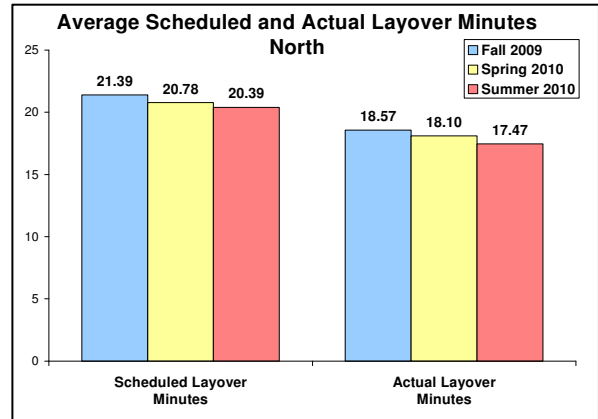
On time Performance

On time performance decreased to 84.5 percent in Summer 2010.



Average Scheduled Layover and Average Actual Layover

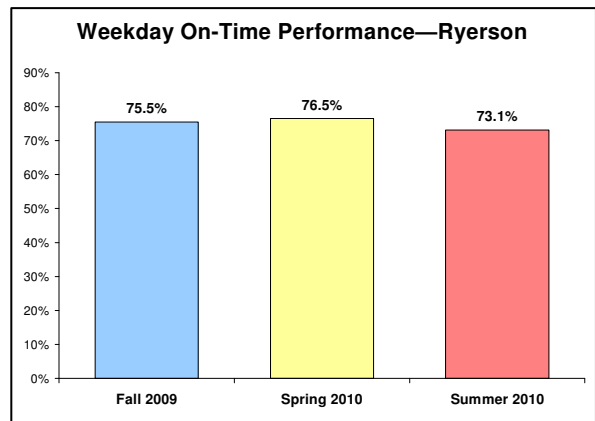
Average scheduled layover minutes decreased 1.90 percent, and average actual layover minutes decreased 3.48 percent in Summer 2010.



Ryerson Base

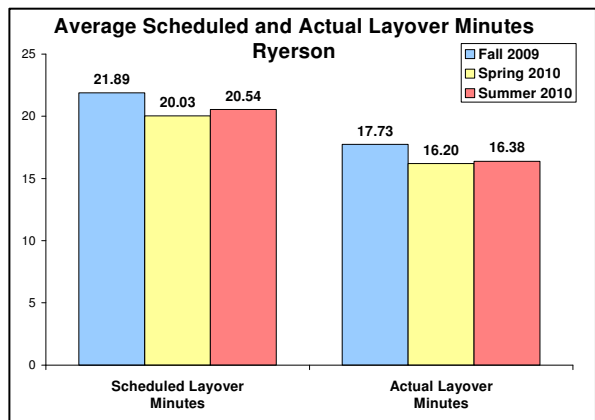
On time Performance

On time performance decreased to 73.1 percent in Summer 2010. This is the lowest on time performance of any base.



Average Scheduled Layover and Average Actual Layover

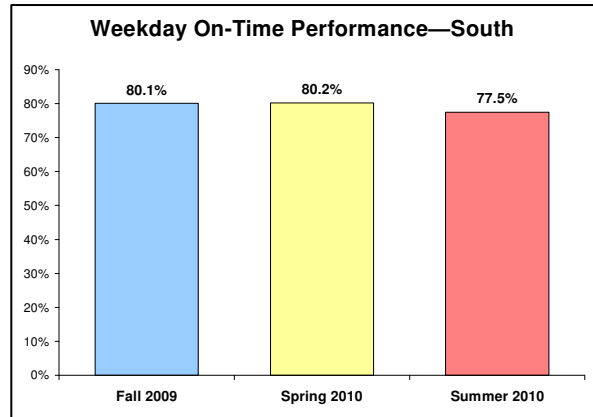
Average scheduled layover minutes increased 2.57 percent, and actual scheduled layover minutes increased 1.1 percent in Summer 2010. Ryerson Base had the longest average scheduled layovers of any base.



South Base

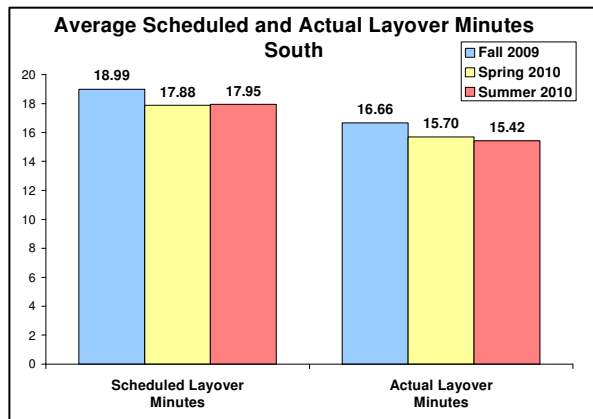
On Time Performance

On time performance decreased to 77% in Summer 2010.



Average Scheduled Layover and Average Actual Layover

Average scheduled layover minutes increased 0.42 percent, and average actual layover minutes decreased 1.78 percent in Summer 2010.



3.3 Route-Level Performance Measures

On time performance (route-level)

On time performance is a measure of how well buses adhere to schedules. This measure is explained in more detail in the systemwide performance measures section. Due to the seasonal variability of on time performance, performance on this measure is most accurately compared to the prior year data rather than the Fall 2009 baseline. However, changes in the way on time performance is calculated mean that Summer 2010 data cannot be accurately compared to Summer 2009 data. For future reports, data will be compared to prior year data when methodology for calculating on time performance is the same.

In Spring 2010, on time performance was worse or showed little change from Summer 2010 for most routes that were rescheduled using Cycle Time Analysis. Negative impacts were pronounced on routes 74, 202, 210, 222, 233, 234, 238, 240, 248, 251, and 224/929, which all had decreases of 10 percent or more in on time performance in at least one direction. On time performance in Summer is typically worse than Spring due to construction and special events, but the degree of negative change on these routes indicates that there may be significant negative impacts to performance due to implementation of new schedules.

More detailed data about on time performance by time period is available in Section 3.4.

Route	Dir	On Time Performance	
		Spring 2010	Summer 2010
Central Base			
71	IB	89%	86%
	OB	74%	77%
72	IB	86%	82%
	OB	77%	75%
73	IB	87%	83%
	OB	73%	74%
74	IB	89%	65%
	OB	85%	76%
East Base			
202	IB	95%	82%
	OB	91%	67%
209	IB	87%	79%
	OB	87%	79%
210	IB	93%	90%
	OB	92%	80%
214	IB	89%	85%
	OB	89%	93%
222	IB	89%	77%
	OB	70%	70%
233	IB	87%	71%
	OB	72%	56%
234	IB	81%	76%
	OB	78%	65%
236	IB	91%	88%
	OB	90%	86%
238	IB	86%	75%
	OB	79%	82%
240	IB	87%	70%
	OB	79%	77%
248	IB	91%	78%
	OB	92%	76%

Route	Dir	On Time Performance	
		Spring 2010	Summer 2010
East Base (continued)			
251	IB	80%	73%
	OB	81%	59%
224/92 9	IB	83%	44%
	OB	76%	17%

Percent of Trips Leaving Terminal Late

This measure is a measure of the number of trips leaving a terminal more than five minutes later than scheduled compared to the number of trips overall. A lower percent of trips leaving the terminal late is desirable.

In Spring 2010, most routes saw little or no change in the percent of trips leaving the terminal late. No routes had more than 10 percent of trips leaving the terminal late.

Route	Dir	% Trips Leaving Terminal Late	
		Spring 2010	Summer 2010
Central Base			
71	IB	1%	2%
	OB	2%	2%
72	IB	3%	3%
	OB	3%	3%
73	IB	4%	4%
	OB	3%	2%
74	IB	2%	2%
	OB	6%	4%
East Base			
202	IB	0%	1%
	OB	8%	3%
209	IB	3%	6%
	OB	0%	0%
210	IB	0%	0%
	OB	3%	6%
214	IB	0%	0%
	OB	3%	2%

		% Trips Leaving Terminal Late	
Route	Dir	Spring 2010	Summer 2010
East Base (continued)			
222	IB	2%	2%
	OB	11%	8%
233	IB	0%	2%
	OB	5%	4%
234	IB	3%	4%
	OB	2%	2%
236	IB	1%	2%
	OB	1%	2%
238	IB	12%	3%
	OB	1%	2%
240	IB	1%	4%
	OB	1%	2%
248	IB	0%	2%
	OB	1%	3%
251	IB	8%	4%
	OB	0%	4%
224/ 929	IB	3%	4%
	OB	0%	7%

Customer Complaints (reported to Metro Customer Assistance Office)

This is a measure of the customer complaints on a route. A lower number of complaints is desirable. Due to the seasonal variability of customer complaints due to impacts of weather, holidays and other factors, performance on this measure is compared to the prior year data.

During the Summer 2010 service change, there were fewer complaints per day on most of the routes, with the exception of the 73, 209 and 248, which all had fewer complaints per day. Route 74 had the same number as in 2009.

Route	Summer 2009		Summer 2010	
	Total Complaints	Complaints/Day	Total Complaints	Complaints/Day
71	18	0.16	14	0.13
72	27	0.24	22	0.20
73	16	0.14	25	0.22
74	7	0.06	7	0.06

Route	Summer 2009		Summer 2010	
	Total Complaints	Complaints/Day	Total Complaints	Complaints/Day
202	11	0.10	3	0.03
209	10	0.09	15	0.13
210	6	0.05	2	0.02
214	16	0.14	11	0.10
222	6	0.05	3	0.03
233	6	0.05	4	0.04
234	22	0.20	16	0.14
236	11	0.10	4	0.04
238	16	0.14	10	0.09
240	32	0.29	22	0.20
248	9	0.08	11	0.10
251	5	0.05	1	0.01
224/929	10	0.09	2	0.02

3.4 Route-Level Detailed Data

More detailed data for some of the route-level measures is presented below, for routes that were rescheduled in Summer 2010. This data is broken out by time periods listed below to allow for identification of improvement or problems that may be occurring only at certain times of day.

Time Period	Description	Hours
AAM	Early Morning	Before 600AM
AM	Morning Peak	600AM - 900AM
MID	Midday	900AM - 315PM
PM	Afternoon Peak	315PM - 616PM
XEV	Evening	615PM - 900PM
XNT	Night	After 900PM
All		All Day

On time Performance by Time Period

Route	Dir	Period	Spring 2010			Summer 2010			% OT Change
			% Early	% On Time	% Late	% Early	% On Time	% Late	
71	I	AAM	1%	99%	0%	3%	97%	0%	-2%
		AM	5%	92%	2%	3%	95%	3%	2%
		MID	9%	89%	2%	6%	92%	2%	3%
		PM	10%	81%	10%	3%	81%	16%	0%
		XEV	7%	85%	8%	13%	78%	9%	-7%
		XNT	4%	91%	5%	15%	80%	5%	-11%
71	I Total		7%	89%	4%	8%	86%	5%	-3%
71	O	AAM	15%	85%	1%	3%	63%	34%	-21%
		AM	28%	68%	4%	7%	86%	7%	19%
		MID	14%	81%	5%	6%	83%	12%	2%

			Spring 2010			Summer 2010			
Route	Dir	Period	% Early	% On Time	% Late	% Early	% On Time	% Late	% OT Change
		PM	15%	66%	19%	12%	68%	20%	2%
		XEV	5%	74%	21%	2%	60%	38%	-14%
		XNT	17%	75%	8%	5%	81%	14%	6%
71	O Total		15%	74%	11%	6%	77%	18%	2%
72	I	AAM	12%	88%	1%	26%	74%	0%	-14%
		AM	4%	90%	5%	1%	88%	11%	-3%
		MID	3%	89%	8%	2%	91%	7%	2%
		PM	6%	76%	18%	3%	77%	20%	1%
		XEV	4%	80%	16%	15%	70%	15%	-10%
		XNT	4%	92%	4%	9%	78%	13%	-14%
72	I Total		5%	86%	9%	7%	82%	11%	-4%
72	O	AAM	3%	96%	1%	1%	53%	46%	-43%
		AM	17%	80%	4%	10%	79%	11%	-1%
		MID	11%	75%	13%	7%	86%	7%	11%
		PM	9%	76%	16%	2%	64%	34%	-11%
		XEV	4%	62%	34%	12%	62%	26%	0%
		XNT	6%	85%	9%	2%	76%	22%	-9%
72	O Total		10%	77%	13%	6%	75%	19%	-2%
73	I	AAM	7%	91%	2%	6%	93%	1%	2%
		AM	5%	93%	2%	8%	85%	7%	-7%
		MID	7%	88%	6%	7%	85%	8%	-3%
		PM	4%	78%	18%	6%	75%	19%	-3%
		XEV	2%	83%	15%	8%	82%	11%	-2%
		XNT	3%	94%	3%	13%	81%	6%	-13%
73	I Total		5%	87%	8%	7%	83%	10%	-4%
73	O	AAM	2%	84%	13%	28%	70%	1%	-14%
		AM	26%	70%	4%	29%	68%	2%	-1%
		MID	15%	77%	8%	16%	80%	5%	3%
		PM	15%	68%	17%	12%	64%	23%	-4%
		XEV	4%	56%	41%	7%	74%	19%	19%
		XNT	9%	81%	9%	18%	74%	8%	-7%
73	O Total		15%	73%	12%	18%	74%	9%	1%
74	I	AM	8%	89%	3%	26%	65%	8%	-24%
		MID	8%	92%	0%				-92%
74	I Total		8%	89%	2%	26%	65%	8%	-24%
74	O	MID	1%	93%	6%	7%	87%	6%	-6%
		PM	4%	83%	14%	4%	72%	24%	-10%
		XEV	7%	91%	2%	4%	88%	8%	-3%
74	O Total		4%	85%	11%	4%	76%	20%	-9%
202	I	AM	2%	98%	1%	1%	82%	17%	-15%
		PM	6%	88%	6%	14%	82%	4%	-5%
		XEV	23%	76%	1%	26%	73%	1%	-3%
202	I Total		4%	95%	2%	4%	82%	14%	-13%
202	O	AM	0%	99%	1%	0%	89%	11%	-10%

			Spring 2010			Summer 2010			
Route	Dir	Period	% Early	% On Time	% Late	% Early	% On Time	% Late	% OT Change
		MID	3%	91%	6%	0%	76%	23%	-15%
		PM	2%	88%	9%	0%	58%	42%	-30%
202	O Total		2%	91%	7%	0%	67%	32%	-24%
209	I	AAM	2%	94%	4%	6%	91%	3%	-3%
		AM	1%	84%	15%	1%	86%	12%	2%
		MID	1%	85%	15%	1%	73%	26%	-12%
		PM	1%	83%	16%	1%	73%	26%	-10%
		XEV	2%	95%	3%	1%	88%	12%	-7%
209	I Total		1%	87%	12%	2%	79%	19%	-7%
209	O	AAM	8%	89%	2%	1%	96%	3%	6%
		AM	2%	91%	7%	10%	87%	3%	-5%
		MID	1%	87%	12%	3%	77%	19%	-10%
		PM	9%	89%	2%	5%	74%	21%	-15%
		XEV	4%	83%	13%	0%	74%	25%	-9%
209	O Total		4%	87%	9%	4%	79%	17%	-9%
210	I	AAM	0%	100%	0%	1%	95%	4%	-5%
		AM	0%	92%	8%	1%	89%	10%	-3%
210	I Total		0%	93%	6%	1%	90%	9%	-3%
210	O	PM	5%	92%	2%	4%	80%	16%	-12%
210	O Total		5%	92%	2%	4%	80%	16%	-12%
214	I	AAM	12%	88%	0%	4%	95%	2%	6%
		AM	9%	89%	2%	1%	82%	16%	-7%
214	I Total		10%	89%	1%	2%	85%	14%	-4%
214	O	MID				3%	94%	3%	94%
		PM	9%	88%	2%	3%	93%	4%	4%
		XEV	0%	99%	1%	4%	91%	5%	-8%
214	O Total		8%	89%	2%	3%	93%	4%	3%
222	I	AM	5%	93%	2%	1%	87%	13%	-6%
		MID	5%	91%	5%	0%	73%	26%	-17%
		PM	3%	83%	13%	1%	78%	22%	-6%
		XEV	16%	82%	3%	0%	66%	34%	-16%
		XNT	3%	93%	4%	1%	96%	3%	3%
222	I Total		6%	89%	6%	1%	77%	23%	-12%
222	O	AAM	0%	99%	1%	11%	81%	8%	-19%
		AM	2%	75%	23%	4%	77%	19%	2%
		MID	3%	70%	26%	3%	70%	27%	0%
		PM	5%	54%	41%	3%	59%	38%	5%
		XEV	5%	73%	22%	4%	72%	24%	-1%
		XNT	2%	97%	0%	1%	97%	3%	-1%
222	O Total		4%	70%	27%	4%	70%	26%	1%
233	I	AM	3%	92%	5%	5%	83%	12%	-9%
		MID	3%	84%	13%	1%	68%	31%	-16%
		PM	3%	85%	12%	0%	63%	36%	-22%
		XEV	5%	93%	2%	4%	70%	26%	-22%

			Spring 2010			Summer 2010			
Route	Dir	Period	% Early	% On Time	% Late	% Early	% On Time	% Late	% OT Change
233	I Total		3%	87%	10%	2%	71%	27%	-16%
233	O	AM	1%	68%	31%	4%	58%	38%	-10%
		MID	1%	81%	19%	1%	56%	43%	-25%
		PM	0%	59%	41%	1%	46%	52%	-13%
		XEV	3%	62%	34%	0%	74%	25%	12%
233	O Total		1%	72%	27%	2%	56%	42%	-17%
234	I	AAM	1%	93%	6%	16%	82%	2%	-12%
		AM	15%	81%	4%	16%	80%	5%	-1%
		MID	7%	79%	14%	15%	75%	10%	-4%
		PM	11%	80%	10%	17%	69%	15%	-11%
		XEV	4%	84%	12%	10%	78%	12%	-6%
234	I Total		9%	81%	11%	15%	76%	10%	-5%
234	O	AAM	1%	97%	2%	1%	95%	3%	-2%
		AM	2%	80%	18%	2%	86%	12%	7%
		MID	2%	76%	22%	1%	60%	39%	-16%
		PM	3%	67%	31%	0%	39%	60%	-27%
		XEV	4%	89%	7%	1%	74%	25%	-15%
234	O Total		2%	78%	20%	1%	65%	34%	-13%
236	I	AAM	3%	96%	2%	14%	86%	0%	-10%
		AM	2%	94%	4%	2%	94%	4%	-1%
		MID	4%	91%	5%	4%	90%	6%	-2%
		PM	10%	84%	6%	5%	82%	13%	-2%
		XEV	1%	93%	7%	8%	81%	11%	-12%
236	I Total		4%	91%	5%	5%	88%	7%	-3%
236	O	AAM	1%	96%	2%	5%	93%	2%	-3%
		AM	2%	89%	9%	4%	86%	10%	-2%
		MID	5%	92%	3%	4%	85%	10%	-7%
		PM	6%	84%	10%	5%	82%	13%	-2%
		XEV	4%	89%	7%	5%	91%	4%	1%
236	O Total		4%	90%	6%	5%	86%	9%	-3%
238	I	AAM	1%	94%	5%	5%	95%	1%	1%
		AM	2%	82%	16%	7%	81%	12%	-1%
		MID	1%	86%	13%	2%	70%	28%	-15%
		PM	3%	87%	10%	2%	80%	17%	-7%
		XEV	1%	89%	10%	1%	72%	27%	-17%
		XNT	1%	84%	15%	1%	76%	24%	-8%
238	I Total		2%	86%	12%	3%	75%	22%	-11%
238	O	AM	1%	71%	29%	3%	90%	7%	20%
		MID	1%	81%	18%	3%	81%	16%	1%
		PM	6%	80%	13%	12%	71%	17%	-9%
		XEV	2%	85%	13%	5%	84%	11%	0%
238	O Total		2%	79%	18%	5%	82%	13%	3%
240	I	AAM	2%	97%	1%	5%	87%	9%	-11%
		AM	1%	90%	9%	4%	69%	27%	-21%

			Spring 2010			Summer 2010			
Route	Dir	Period	% Early	% On Time	% Late	% Early	% On Time	% Late	% OT Change
		MID	2%	90%	9%	4%	69%	27%	-20%
		PM	3%	76%	21%	2%	68%	30%	-9%
		XEV	0%	86%	14%	2%	68%	30%	-18%
		XNT	1%	89%	10%	2%	76%	22%	-13%
240	I Total		1%	87%	11%	3%	70%	26%	-17%
240	O	AAM	12%	86%	2%	0%	75%	25%	-11%
		AM	14%	83%	3%	1%	81%	17%	-1%
		MID	16%	77%	7%	1%	79%	19%	3%
		PM	12%	75%	13%	1%	74%	25%	-2%
		XEV	9%	81%	10%	1%	69%	29%	-11%
		XNT	13%	85%	2%	6%	78%	16%	-7%
240	O Total		14%	79%	7%	2%	77%	21%	-2%
248	I	AAM	2%	97%	1%	4%	94%	3%	-4%
		AM	4%	83%	12%	4%	69%	27%	-14%
		MID	3%	91%	6%	1%	80%	19%	-11%
		PM	6%	89%	5%	1%	71%	27%	-17%
		XEV	2%	95%	3%	1%	78%	21%	-17%
		XNT	3%	96%	1%	2%	88%	10%	-9%
248	I Total		3%	91%	6%	2%	78%	20%	-13%
248	O	AAM	0%	99%	0%	0%	91%	9%	-8%
		AM	1%	95%	5%	0%	83%	17%	-12%
		MID	1%	90%	9%	1%	76%	23%	-13%
		PM	1%	88%	11%	0%	61%	38%	-27%
		XEV	1%	95%	5%	0%	69%	31%	-26%
		XNT	5%	94%	1%	0%	92%	8%	-2%
248	O Total		1%	92%	7%	0%	76%	23%	-16%
251	I	AM	8%	78%	14%	3%	79%	18%	1%
		MID	9%	79%	12%	1%	77%	22%	-2%
		PM	7%	83%	9%	4%	67%	29%	-17%
		XEV	10%	82%	8%	0%	69%	31%	-13%
251	I Total		8%	80%	11%	2%	73%	24%	-7%
251	O	AM	15%	81%	4%	6%	80%	13%	0%
		MID	11%	83%	6%	1%	54%	45%	-29%
		PM	13%	76%	11%	1%	33%	67%	-43%
		XEV	5%	93%	2%	4%	70%	25%	-23%
251	O Total		12%	81%	7%	3%	59%	38%	-22%
224/929	I	AAM	26%	70%	4%	0%	73%	27%	2%
		AM	9%	86%	6%	1%	43%	57%	-43%
		MID	3%	82%	15%	0%	35%	65%	-47%
		PM	3%	85%	13%	0%	42%	58%	-43%
		XEV	0%	95%	5%	1%	51%	48%	-44%
224/929	I Total		7%	83%	11%	0%	44%	55%	-38%
224/929	O	AAM	0%	73%	27%	1%	40%	59%	-33%
		AM	9%	72%	19%	0%	21%	79%	-51%

			Spring 2010			Summer 2010			
Route	Dir	Period	% Early	% On Time	% Late	% Early	% On Time	% Late	% OT Change
		MID	3%	83%	13%	1%	7%	92%	-76%
		PM	5%	70%	25%	0%	16%	83%	-53%
		XEV	0%	81%	19%	1%	13%	87%	-68%
224/929	O Total		4%	76%	20%	0%	17%	83%	-59%

Percent Trips Leaving Terminal Late (>5 min) by Time Period

			% Late	
Route	Dir	Period	Spring 2010	Summer 2010
71	I	AAM	0%	0%
		AM	0%	0%
		MID	1%	1%
		PM	3%	3%
		XEV	2%	5%
		XNT	2%	3%
71	I Total		1%	2%
71	O	AAM	0%	3%
		AM	1%	1%
		MID	1%	2%
		PM	5%	4%
		XEV	1%	5%
		XNT	2%	1%
71	O Total		2%	2%
72	I	AAM	0%	0%
		AM	1%	1%
		MID	4%	2%
		PM	6%	3%
		XEV	3%	8%
		XNT	1%	6%
72	I Total		3%	3%
72	O	AAM	0%	18%
		AM	1%	1%
		MID	3%	2%
		PM	4%	6%
		XEV	3%	2%
		XNT	1%	2%
72	O Total		3%	3%
73	I	AAM	0%	0%
		AM	3%	3%
		MID	3%	2%
		PM	6%	6%
		XEV	10%	9%
		XNT	2%	3%

			% Late	
Route	Dir	Period	Spring 2010	Summer 2010
73	I Total		4%	4%
73	O	AAM	4%	1%
		AM	2%	1%
		MID	3%	2%
		PM	8%	6%
		XEV	8%	1%
		XNT	1%	1%
73	O Total		3%	2%
74	I	AM	2%	2%
		MID	0%	
74	I Total		2%	2%
74	O	MID	5%	0%
		PM	7%	6%
		XEV	0%	0%
74	O Total		6%	4%
202	I	AM	0%	2%
		MID		
		PM	0%	0%
		XEV	0%	0%
202	I Total		0%	1%
202	O	AM	0%	1%
		MID	6%	1%
		PM	11%	4%
202	O Total		8%	3%
209	I	AAM	1%	3%
		AM	2%	10%
		MID	4%	4%
		PM	6%	11%
		XEV	3%	8%
209	I Total		3%	6%
209	O	AAM	0%	0%
		AM	0%	
		MID	0%	
		PM	0%	
		XEV		0%
209	O Total		0%	0%
210	I	AAM	0%	0%
		AM	0%	0%
210	I Total		0%	0%
210	O	PM	3%	6%
210	O Total		3%	6%
214	I	AAM	1%	0%
		AM	0%	0%
214	I Total		0%	0%
214	O	PM	3%	2%

			% Late	
Route	Dir	Period	Spring 2010	Summer 2010
		XEV	0%	0%
214	O Total		3%	2%
222	I	AM	0%	0%
		MID	5%	0%
		PM	0%	0%
		XEV	1%	3%
		XNT	1%	0%
222	I Total		2%	2%
222	O	AAM	0%	0%
		AM	8%	3%
		MID	7%	7%
		PM	30%	20%
		XEV	1%	3%
		XNT	0%	1%
222	O Total		11%	8%
224/929	I	AAM	0%	0%
		AM	0%	5%
		MID	3%	5%
		PM	3%	2%
		XEV	6%	3%
224/929	I Total		3%	4%
224/929	O	AAM	0%	8%
		AM		6%
		MID	0%	5%
		PM	0%	11%
224/929	O Total		0%	7%
233	I	AM	1%	1%
		MID	0%	2%
		PM	0%	0%
		XEV	0%	9%
233	I Total		0%	2%
233	O	AM	3%	5%
		MID	1%	3%
		PM	9%	6%
		XEV	25%	7%
233	O Total		5%	4%
234	I	AAM	2%	4%
		AM	0%	3%
		MID	3%	3%
		PM	6%	5%
		XEV	7%	7%
234	I Total		3%	4%
234	O	AAM	1%	0%
		AM	2%	1%
		MID	2%	2%

			% Late	
Route	Dir	Period	Spring 2010	Summer 2010
		PM	3%	2%
		XEV	2%	4%
234	O Total		2%	2%
236	I	AAM	0%	0%
		AM	1%	0%
		MID	1%	1%
		PM	3%	5%
		XEV	0%	6%
236	I Total		1%	2%
236	O	AAM	0%	0%
		AM	1%	3%
		MID	2%	2%
		PM	2%	2%
		XEV	1%	1%
236	O Total		1%	2%
238	I	AAM	2%	0%
		AM	11%	1%
		MID	22%	2%
		PM	9%	3%
		XEV	2%	7%
		XNT	13%	9%
238	I Total		12%	3%
238	O	AM	1%	1%
		MID	1%	1%
		PM	2%	2%
		XEV	1%	2%
238	O Total		1%	2%
240	I	AAM	0%	0%
		AM	0%	9%
		MID	1%	3%
		PM	2%	6%
		XEV	2%	1%
		XNT	0%	0%
240	I Total		1%	4%
240	O	AAM	1%	0%
		AM	1%	9%
		MID	1%	0%
		PM	5%	0%
		XEV	2%	9%
		XNT	1%	0%
240	O Total		1%	2%
248	I	AAM	0%	1%
		AM	1%	0%
		MID	1%	2%
		PM	0%	7%

			% Late	
Route	Dir	Period	Spring 2010	Summer 2010
		XEV	0%	4%
		XNT	0%	3%
248	I Total		0%	2%
248	O	AAM	0%	0%
		AM	1%	2%
		MID	1%	3%
		PM	2%	5%
		XEV	1%	4%
		XNT	1%	2%
248	O Total		1%	3%
251	I	AM	10%	1%
		MID	9%	0%
		PM	8%	8%
		XEV	3%	12%
251	I Total		8%	4%
251	O	AM	0%	5%
		PM	0%	0%
251	O Total		0%	4%

3.5 Next Steps

Performance measures, combined with additional operator and rider feedback, identified some service quality issues in Summer 2010. There were negative impacts to on time performance on routes 74, 202, 210, 222, 233, 234, 238, 240, 248, 251 and 224/929, which all had decreases of 10 percent or more in on time performance in at least one direction. Late starts increased on most routes, and on several routes they increased above the 10 percent threshold being targeted in scheduling. Though Summer data is not comparable to other periods of the year, it is likely that the cumulative effect of cycle time analysis on these and other routes is increasing lateness and late starts systemwide.

Several routes had performance issues that were significant enough to warrant modification. On-time performance on Route 234 became a significant issue, and minor schedule changes were made for Fall 2010 to respond to the problem.

Section 4. Fall 2010 Service Change - Scheduled Performance Data

This section includes summary of the performance indicators that are calculated using scheduled data from Fall 2010. Metro implemented cycle time analysis for routes 7, 10, 12, 14, 49, 70, 101, 106, 107, 128, 148, 150, 155, 156, 164, 166, 168, 169, 181 and 221 for Fall 2010. These routes were selected through consultation between scheduling, planning, and other Metro staff. These routes were identifying as having opportunities for savings, all-day service, and no other routing or service changes planned for the Fall 2010 service change.

Savings by Efficiency Category, Fall 2010

Category	Annual Hours Savings
System-level changes	24,095
Route-level changes	12,930
Total	37.025

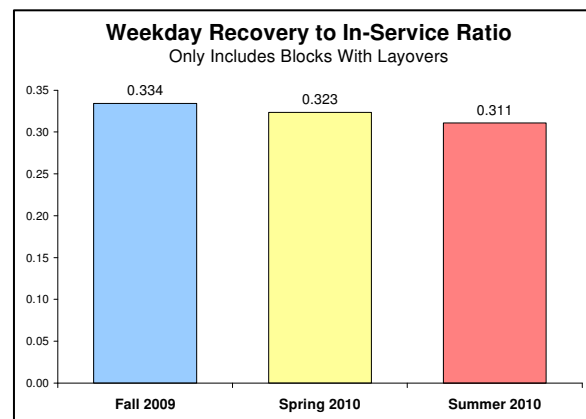
4.1 System-Level Performance Measures

This section includes information about system-wide performance. Information about performance on these measures by operating base can be found in Section 4.2.

Recovery to In-Service Ratio

This measure is a ratio of the total recovery hours (i.e. layover time between trips) to revenue service hours. This ratio indicates how schedules balance time serving passengers with time at terminals between trips. For example, a route with a trip time of 30 minutes followed by a recovery of 15 minutes would have a ratio of 50 percent, or 0.5. The audit recommended recovery to in-service ratios of: less than 25 percent for weekdays, less than 26 percent for Saturdays, less than 28 percent for Sundays, and less than 30 percent for all bases and days.

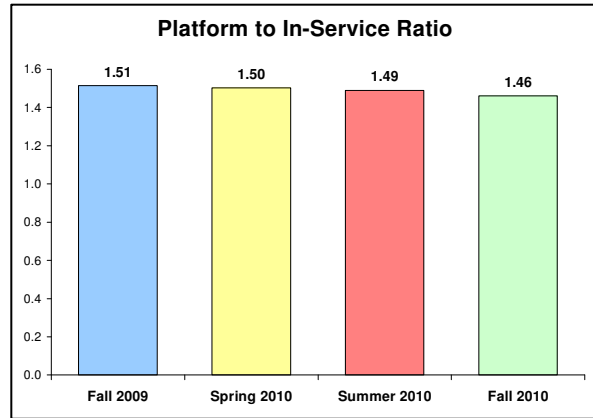
At a minimum, recovery time is provided at the end of a trip to provide a break for the operator and to allow late buses to get back on schedule. Service design also has a large impact on recovery time. At Metro, recovery time is added for some routes to allow service to be evenly spaced for “clock-face” headways or to support timed transfers. Regularly spaced and repeated headway patterns support transfers, so moving away from even headway intervals could significantly reduce the ease of transferring and discourage ridership.



In Fall 2010, scheduling efficiency changes resulted in a significant decrease in recovery time to in-service ratio on weekdays from 0.31 to 0.27.

Platform to In-Service Ratio (Platform Hours per Revenue Hour)

This measure is a ratio of total platform hours to total revenue hours. Platform hours include all hours from the time a bus leaves the base until the bus returns to base, including revenue hours, deadhead time (i.e. travel time to and from the base, between route terminals), and recovery time. Much like the recovery hours per revenue hour measure, a lower ratio is desirable for this measure.



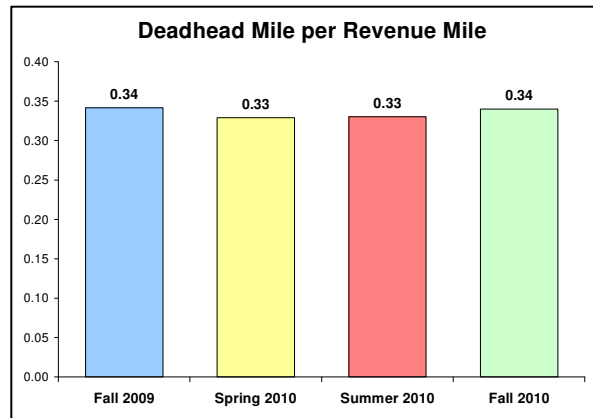
Service and facility characteristics such as routing, span of service, base locations, and bus type (i.e. diesel or electric trolley bus) can have a large impact on this measure. For example, this ratio is higher for peak-direction services, because buses spend more time deadheading to and from terminals, and may only provide one or two trips before returning to base. However, deadheading can be the most efficient way to provide service when there is little or no demand for service in the off-peak direction. Policy constraints such as subarea allocation rules also limit Metro’s ability to utilize deadheading buses for service when they cross subarea boundaries. Therefore, Metro is limited in the ability to reduce platform to in-service ratio in some cases.

In Fall 2010, platform to in-service ratio decreased to 1.46.

Deadhead Miles per Revenue Mile

This measure is a ratio of the miles that a bus is deadheading to or from a route versus the miles that a bus travels in service. Deadhead miles include miles a bus travels to get to and from the base, traveling between routes, or when there is no expectation of carrying revenue passengers. A low ratio is desirable for this measure.

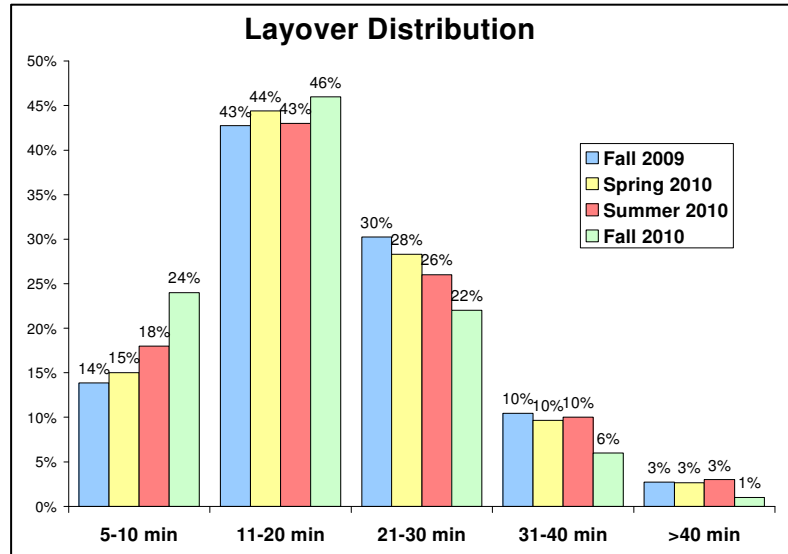
However, service and facility characteristics such as routing span of service, demand for services, base locations, and bus type (i.e. diesel or electric trolley bus) have a large impact on this ratio. For example, if an operating base is not located close to the beginning of a route, buses may need to deadhead a long distance before going into service.



In Fall 2010, the ratio of deadhead miles per revenue mile remained rose slightly to 0.34.

Distribution of Scheduled Layover by Length

This measure identifies the number of scheduled layovers that fall within discrete lengths of time. Layovers include short “pulses” where coaches wait at a transit center to allow timed transfers with other routes. The recommended standard is: no layovers longer than 40 minutes, while recognizing that some exceptions may occur when there are no other options or special conditions apply. A reduction in layovers between 21 and 40 minutes long is also desired. Layovers of less than 5 minutes outside of “pulses” are not allowable within the standards of the ATU Local 587 contract, so only the longer layovers will be tracked.

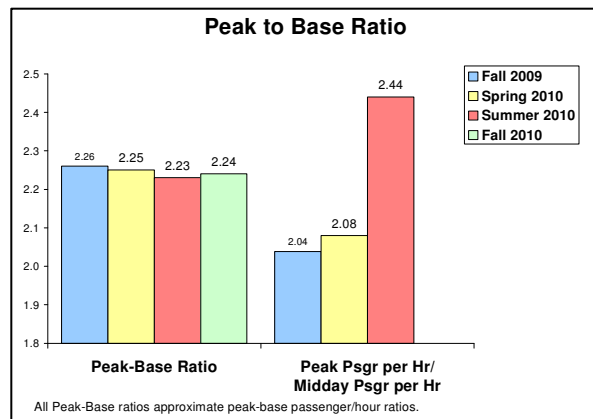


In Fall 2010, the percentage of system layovers that exceeded 40 minutes decreased significantly from 2.8 percent to 1.5 percent of all layovers. The percentage of layovers between 21 and 40 minutes decreased from 36 percent to 28 percent of all layovers. With the changes in those two categories, 70 percent of layovers were between 5 and 20 minutes long. These changes continued the trends of reductions in longer layovers since the baseline period.

Peak to Base Ratio

Peak to Base Passengers per Hour

This measure is a ratio of the maximum number of buses in use during peak period (weekday afternoons) to the minimum number buses in use during the weekday midday period. It is desirable for the peak to base ratio to match the ratio of peak to base passengers per hour, because that shows that the distribution of buses is being matched well to the distribution of riders during different time periods of the day. Service design and demand for services have a large impact on this ratio. Having a large number of commuter-oriented routes that operate only during peak periods leads to a high peak to base ratio because those routes only require buses for a few hours a day, leaving the buses idle during the remainder of the day and on weekends.

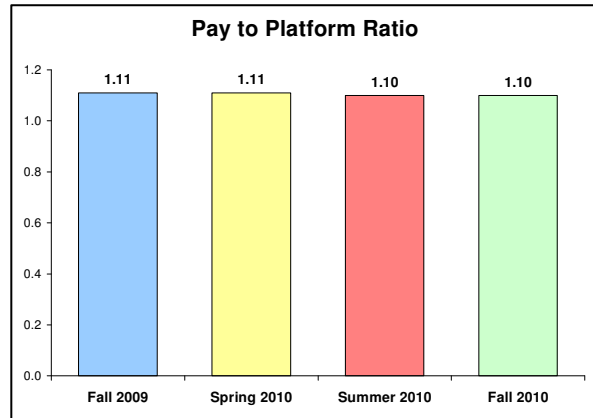


In Fall 2010, the systemwide peak to base ratio decreased slightly, reflecting use of scheduling tools and peak hour trip reductions. Peak to Base Passengers per Hour is not calculated for Summer 2010 because summer ridership varies significantly from the remainder of the year.

Ridership and passenger data will be available in Fall 2010 to indicate whether this progress is continuing in matching the peak to base ratio with passenger demand.

Pay to Platform Ratio

This measure is a ratio of the total pay hours divided by the total platform hours. Total pay hours include time for an operator to sign in, travel time (such as for road reliefs), guarantees, and overtime. It reflects efficiency of crew scheduling as it indicates the degree to which operators are paid for driving a vehicle versus other tasks. However, some degree of non-driving pay is required. Also, since pay hours do not include benefits provided to employees, it can sometimes be more cost-effective to provide scheduled overtime rather than increasing the number of employees. Therefore when tracking this ratio one must also consider whether reducing this ratio has increased costs in other ways, and what the tradeoffs are for reducing extra board or other non-driving pay time.



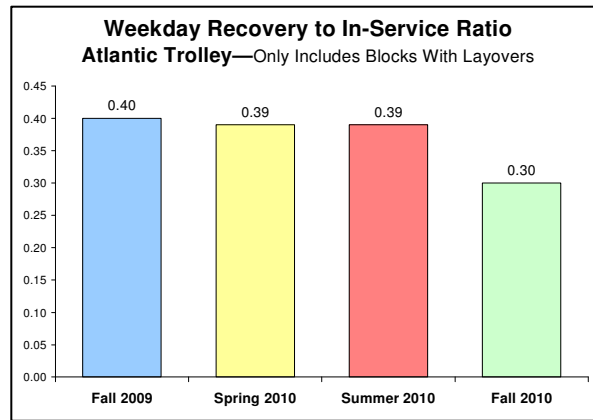
The 2009 audit identified that lower ratios are generally more efficient. Metro has what is considered by most in the industry to be a low “Pay to Platform” ratio. The pay to platform ratio remained steady between Summer and Fall 2010.

4.2 Base-Level Performance Measures

Atlantic Base Trolley

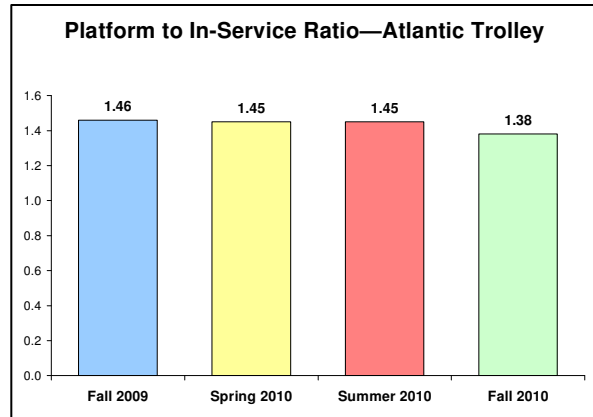
Recovery to In-Service Ratio

The recovery to in-service ratio decreased significantly to 0.30 on weekdays in Fall 2010. This reflects implementation of cycle time analysis on multiple trolley routes.



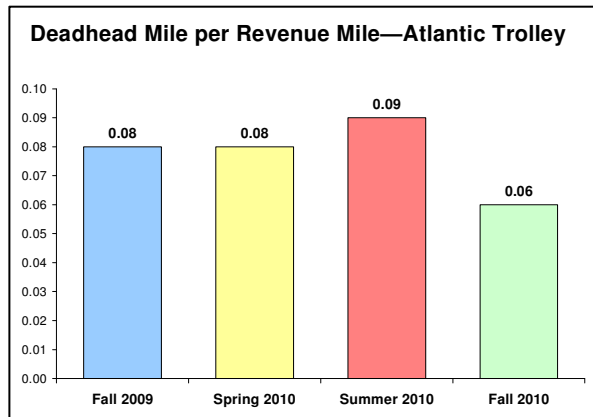
Platform to In-Service Ratio

The platform to in-service ratio decreased to 1.38 in Fall 2010. This reflects implementation of cycle time analysis.



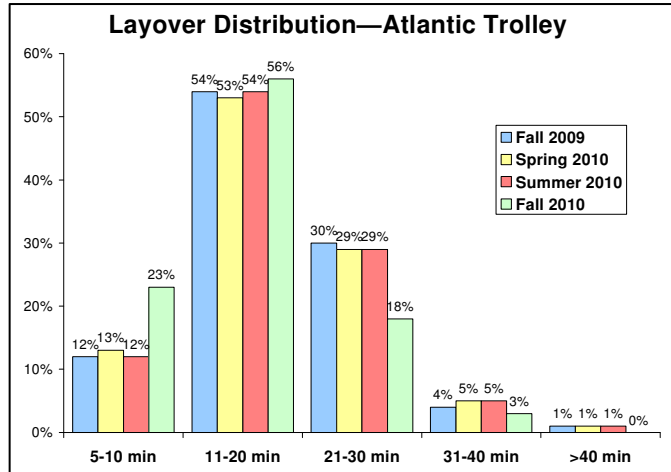
Deadhead Miles per Revenue Mile

Deadhead miles per revenue mile decreased to 0.06 in Fall 2010.



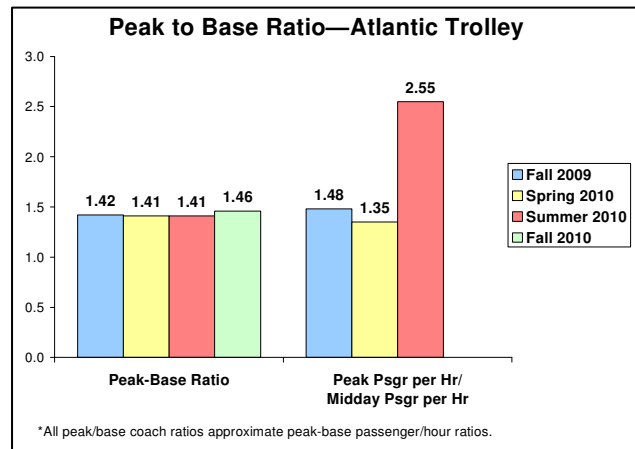
Distribution of Scheduled Layover by Length of Layover

The percentage of layovers longer than 40 minutes decreased in Fall 2010, to 0.3 percent, the lowest of any base. The percentage of layovers less than 20 minutes increased substantially as well. This reflects implementation of cycle time analysis.



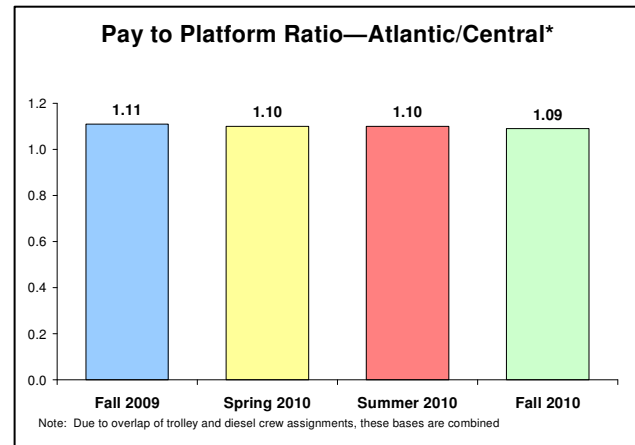
Peak to Base Ratio

The peak to base ratio increased to 1.46. Passenger data will be available in the Spring 2011 report to examine whether service levels are reflective of passenger demand.



Pay to Platform Ratio

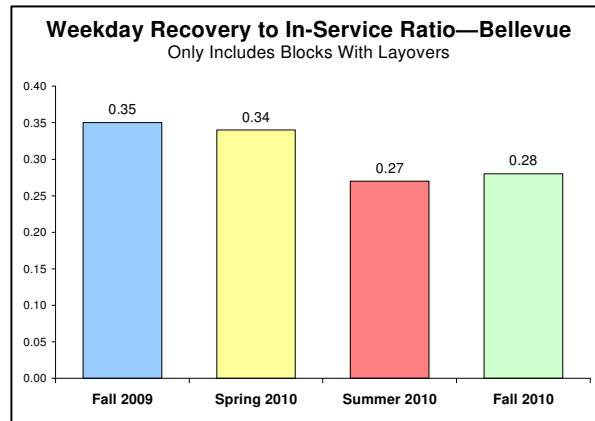
The pay to platform ratio decreased slightly in Fall 2010. Performance on this measure is combined with Central/Atlantic Diesel.



Bellevue Base

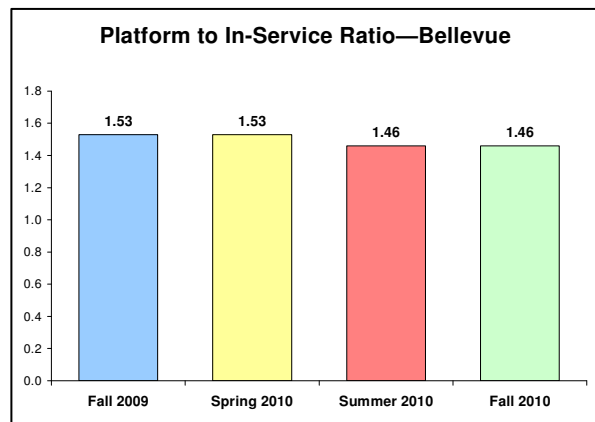
Recovery to In-Service Ratio

The recovery to in-service ratio increased very slightly to 0.28 in Fall 2010. The current ratio remains significantly lower than the baseline.



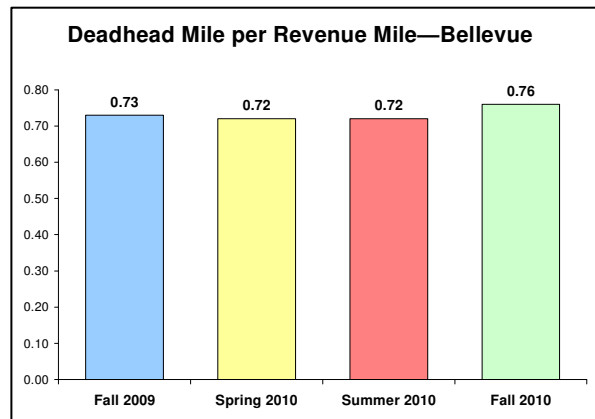
Platform to In-Service Ratio

The platform to in-service ratio remained steady at 1.46 in Fall 2010.



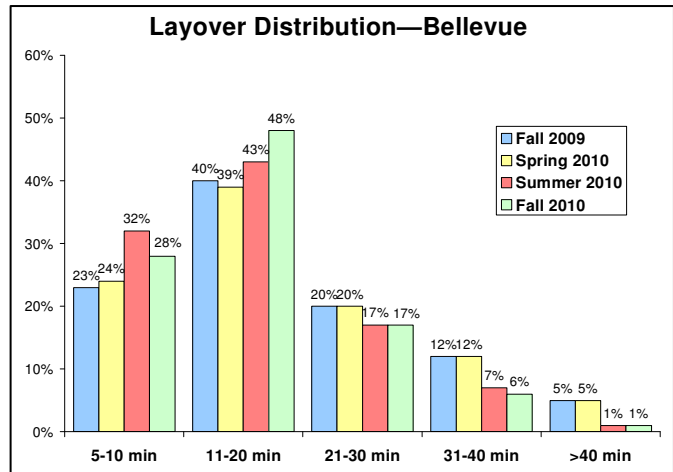
Deadhead Miles per Revenue Mile

Deadhead miles per revenue mile increased to 0.76 in Fall 2010.



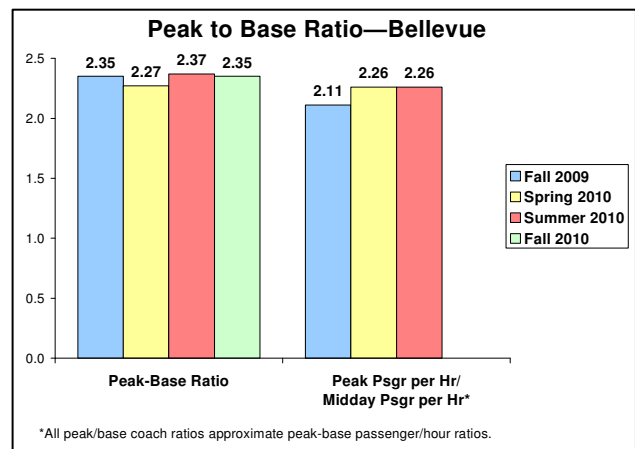
Distribution of Scheduled Layover by Length of Layover

The distribution of layovers remained steady for layovers greater than 20 minutes. Shorter layovers saw some changes, with an increase in layovers between 11 to 20 minutes long and a corresponding decrease in layovers between 5 and 10 minutes long.



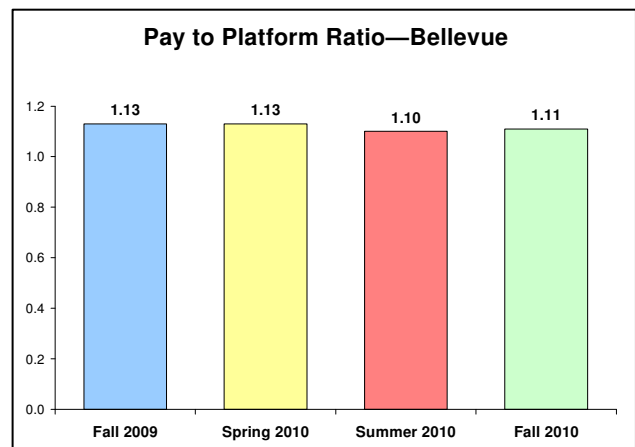
Peak to Base Ratio

The peak to base ratio decreased slightly to 2.35 in Fall 2010. This is the same value as during the baseline period, showing a fairly steady service pattern out of Bellevue Base. Summer passenger data will be available in Spring 2011, to determine how ridership changed as well.



Pay to Platform Ratio

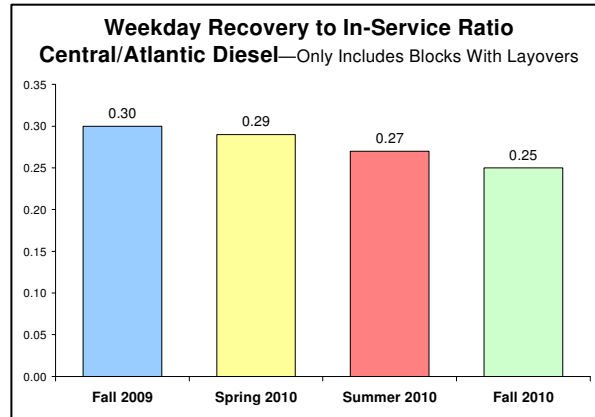
The pay to platform ratio increased slightly to 1.11 in Fall 2010.



Central/Atlantic Base Diesel

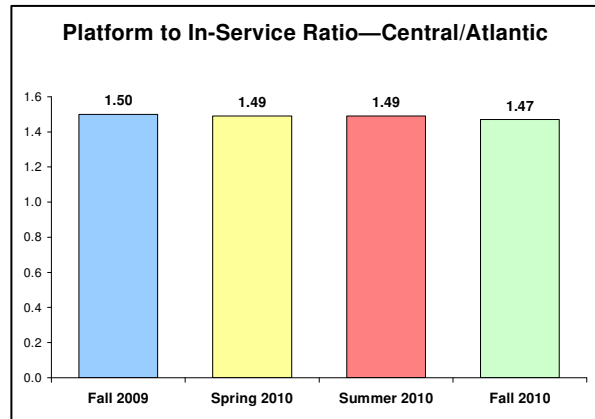
Recovery to In-Service Ratio

The recovery to in-service ratio decreased slightly in Fall 2010, continuing an overall pattern of decrease since the baseline period.



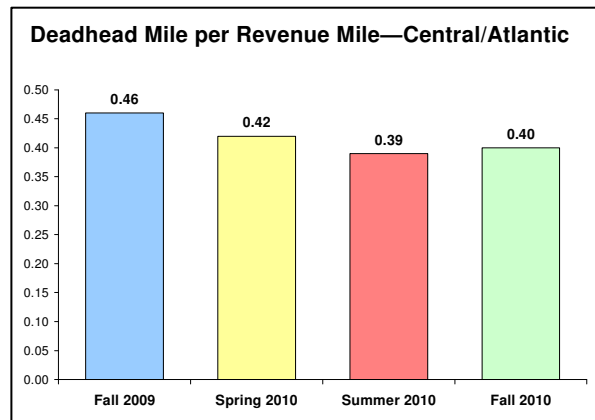
Platform to In-Service Ratio

The platform to in-service ratio decreased to 1.47 in Fall 2010.



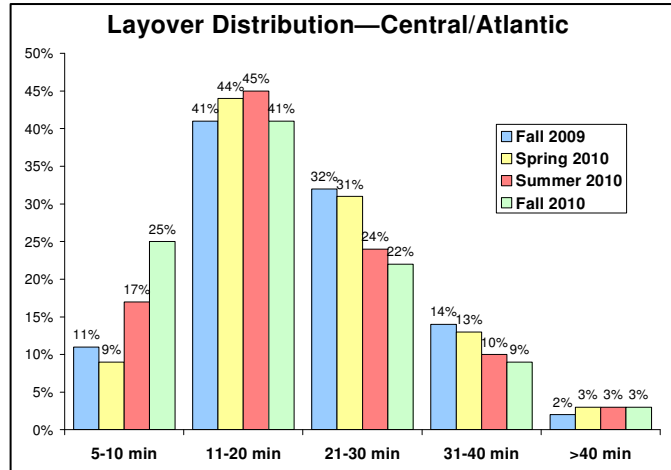
Deadhead Miles per Revenue Mile

Deadhead miles per revenue mile increased to 0.40 in Fall 2010, but remains substantially lower than the baseline period.



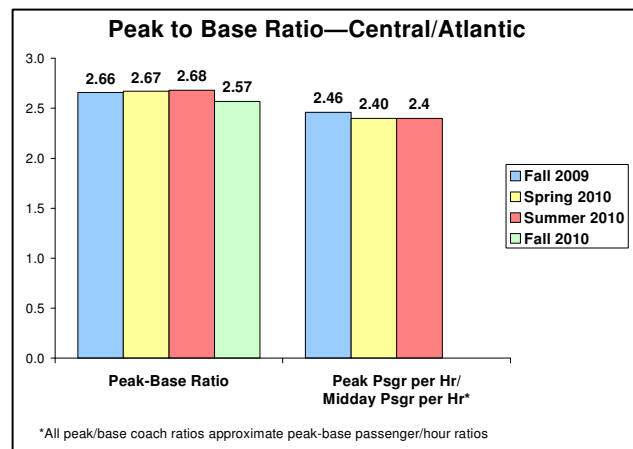
Distribution of Scheduled Layover by Length of Layover

The number of layovers longer than 40 minutes remained steady in Summer 2010. There was some increase in layovers between 5 and 10 minutes long, and a corresponding decrease in other lengths.



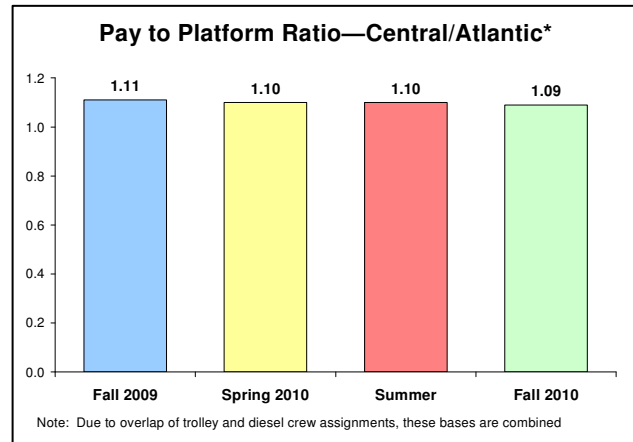
Peak to Base Ratio

The peak to base ratio decreased to 2.57 in Summer 2010, reflecting use of MinBus and some peak trip reductions. Passenger data will be available in Spring 2011 to examine how closely that service level is balanced to passenger demand.



Pay to Platform Ratio

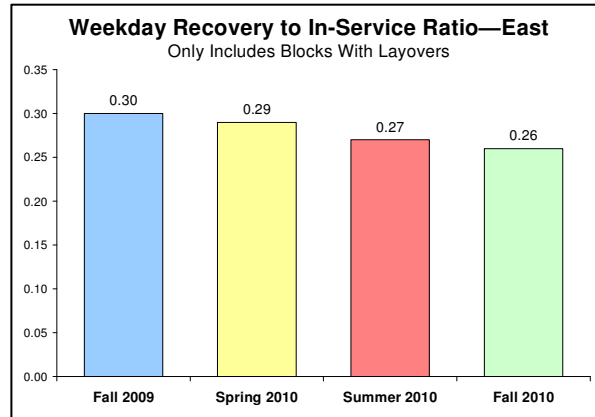
The pay to platform ratio decreased slightly to 1.09 in Fall 2010. Performance on this measure is combined with Atlantic Trolley due to overlapping crew assignments.



East Base

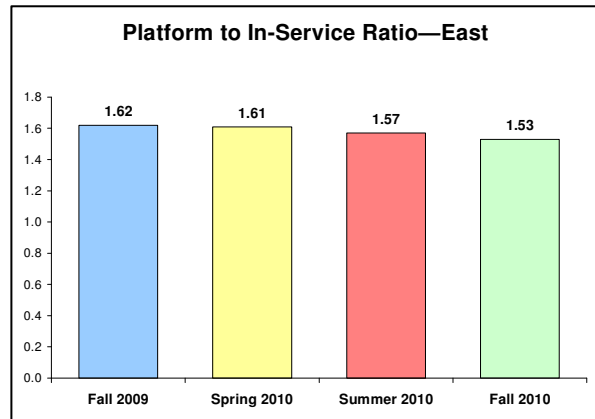
Recovery to In-Service Ratio

The recovery to in-service ratio decreased slightly to 0.26 on weekdays in Fall 2010, continuing a trend of decrease since the baseline period.



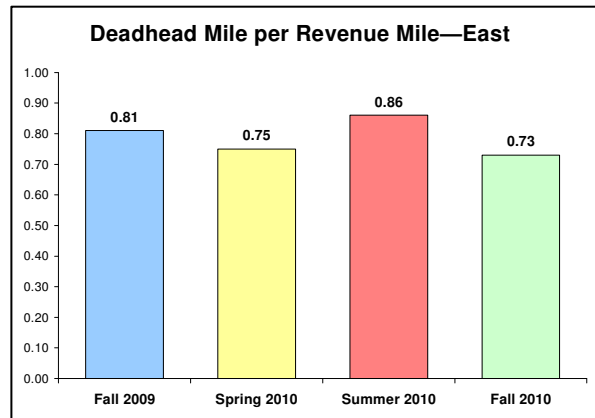
Platform to In-Service Ratio

The platform to in-service ratio decreased to 1.53 in Fall 2010.



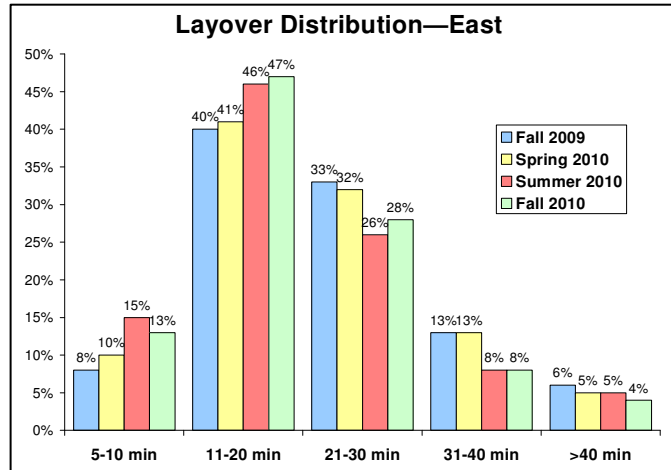
Deadhead Miles per Revenue Mile

Deadhead miles per revenue mile decreased to 0.73.



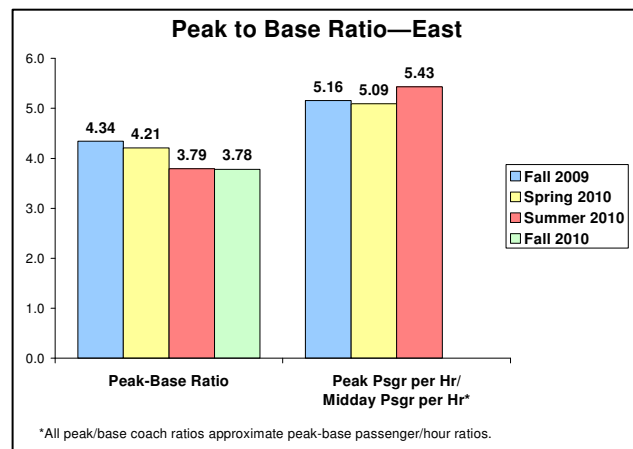
Distribution of Scheduled Layover by Length of Layover

The percent of layovers over 40 minutes decreased to 4 percent in Fall 2010, continuing a trend of decrease in very long layovers. There were minor changes in other lengths of layovers.



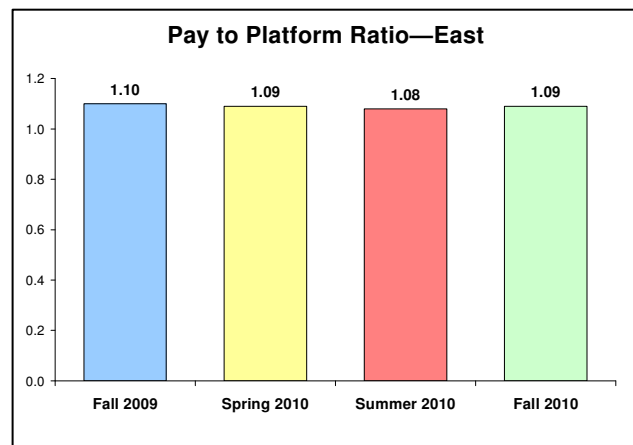
Peak to Base Ratio

The peak to base ratio remained very steady at 3.78 in Fall 2010. The ratio remained high relative to other bases reflecting the fact that East Base has a large number of peak-only routes and is very peak-oriented in comparison to the rest of the system. Passenger data will be available in Spring 2011 to examine how closely that service level is balanced to passenger demand.



Pay to Platform Ratio

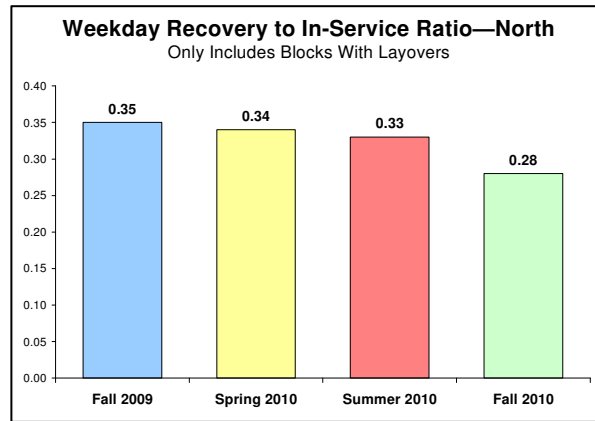
The pay to platform ratio increased slightly to 1.09 in Fall 2010.



North Base

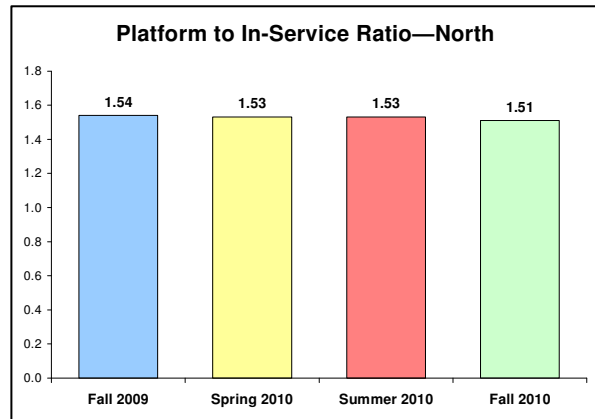
Recovery to In-Service Ratio

The recovery to in-service ratio decreased to 0.28 on weekdays in Fall 2011, meeting the recommended goals for the first time at this base.



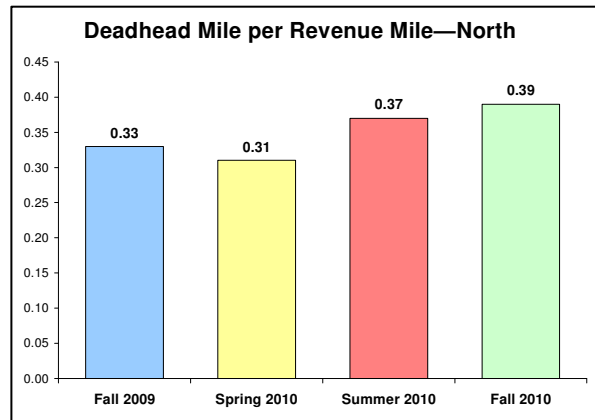
Platform to In-Service Ratio

The platform to in-service ratio decreased to 1.51 in Fall 2010.



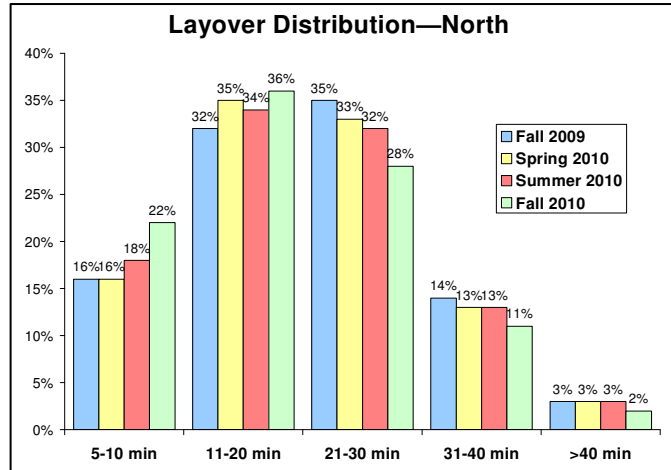
Deadhead Miles per Revenue Mile

Deadhead miles per revenue mile increased to 0.39 in Fall 2010, and remains higher than the baseline period



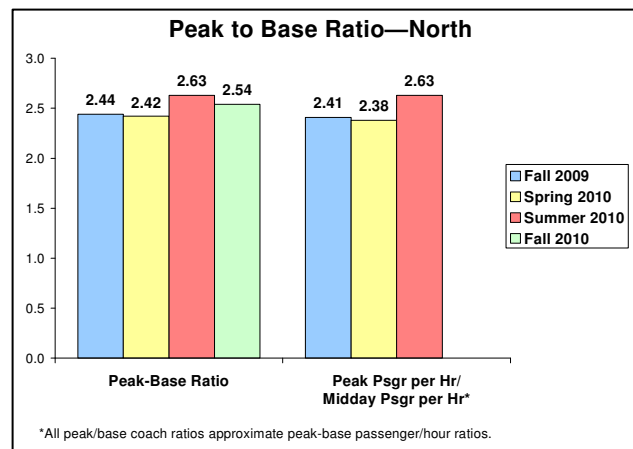
Distribution of Scheduled Layover by Length of Layover

The percentage of layovers longer than 40 minutes decreased to 2 percent. The percentage of shorter than 20 minutes increased to 58 percent of all layovers in Fall 2010. This is a significant increase over the baseline, when 48 percent were shorter than 20 minutes.



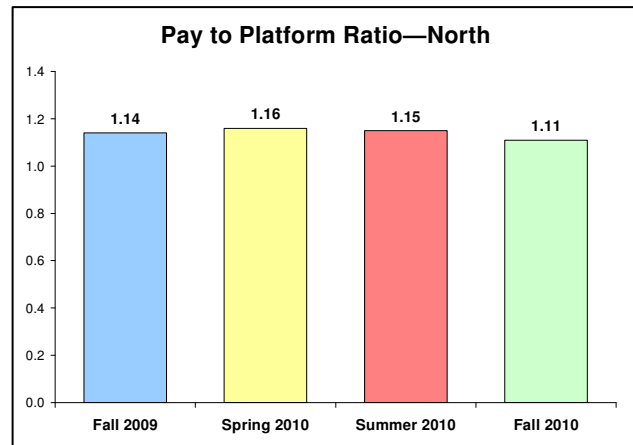
Peak to Base Ratio

The peak to base ratio decreased to 2.54 in Fall 2010, but remains higher than the baseline. Passenger data will be available in Spring 2011 to examine if the service level remained closely balanced to passenger demand.



Pay to Platform Ratio

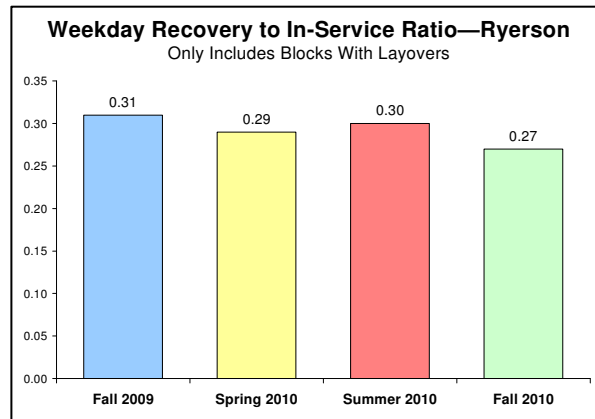
The pay to platform ratio decreased from 1.15 to 1.11 in Fall 2010. This was the largest change of any base.



Ryerson Base

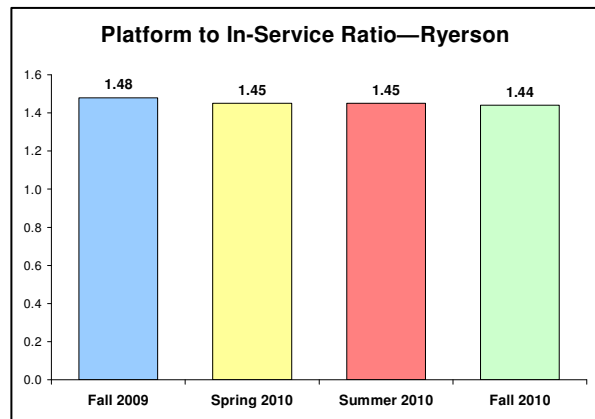
Recovery to In-Service Ratio

The recovery to in-service ratio decreased to 0.27 on weekdays in Fall 2011.



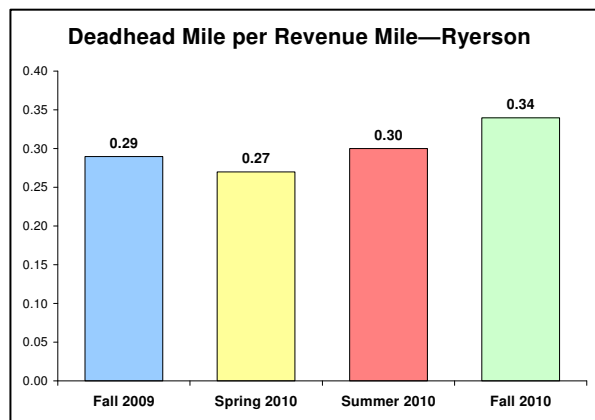
Platform to In-Service Ratio

The platform to in-service ratio decreased slightly to 1.44 in Fall 2010.



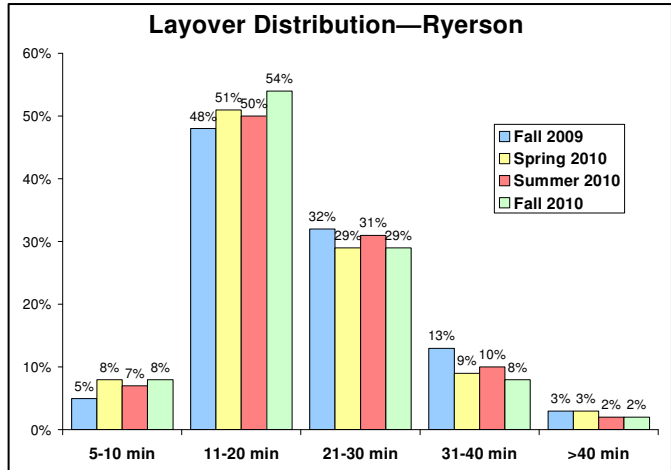
Deadhead Miles per Revenue Mile

Deadhead miles per revenue mile increased to 0.34 in Fall 2010, continuing a trend of increases since Spring 2010.



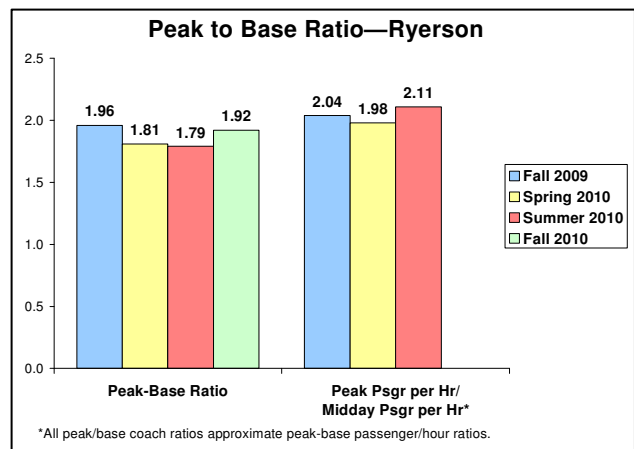
Distribution of Scheduled Layover by Length of Layover

The number of layovers longer than 40 minutes remained steady in Fall 2010. The distribution of layovers by length changed slightly, with a higher percentage of layovers falling below 20 minutes in length.



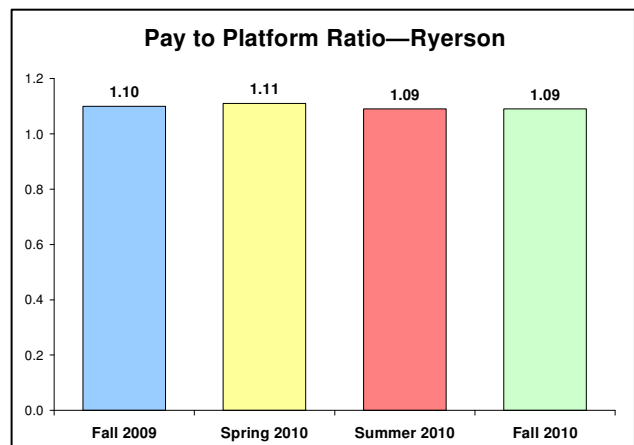
Peak to Base Ratio

The peak to base ratio increased to 1.92 in Fall 2010 to a level slightly less than the baseline. Passenger data will be available in Spring 2011 to examine how closely that service level is balanced to passenger demand.



Pay to Platform Ratio

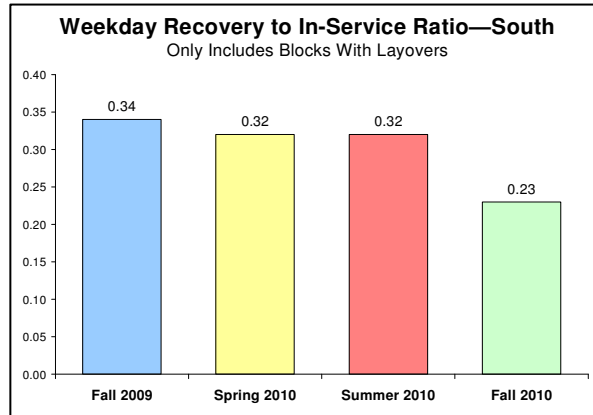
The pay to platform ratio remained the same in Fall 2010.



South Base

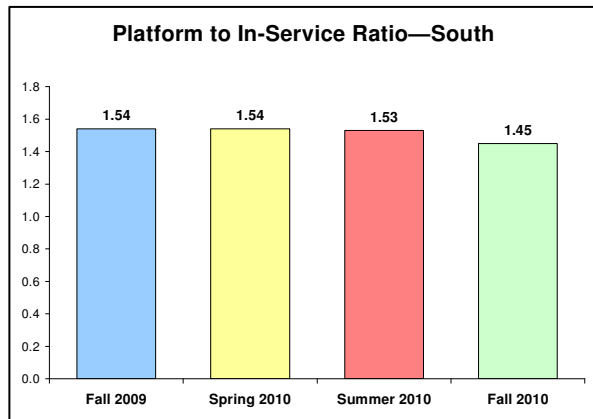
Recovery to In-Service Ratio

The recovery to in-service ratio decreased significantly to 0.23 in Fall 2010. This was the largest decrease of any base, and South Base now has the lowest recovery to in-service ratio of any base. This reflects implementation of cycle time analysis on multiple routes.



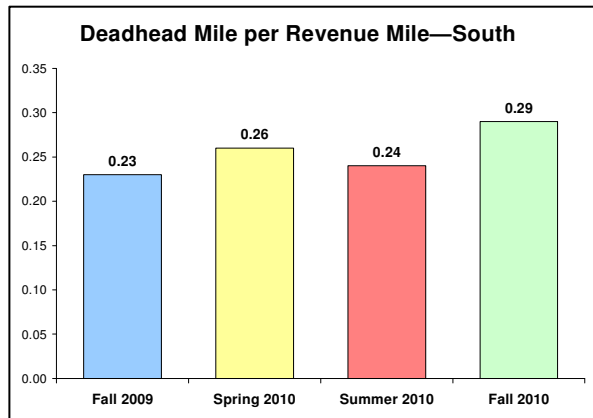
Platform to In-Service Ratio

The platform to in-service ratio decreased significantly to 1.45.



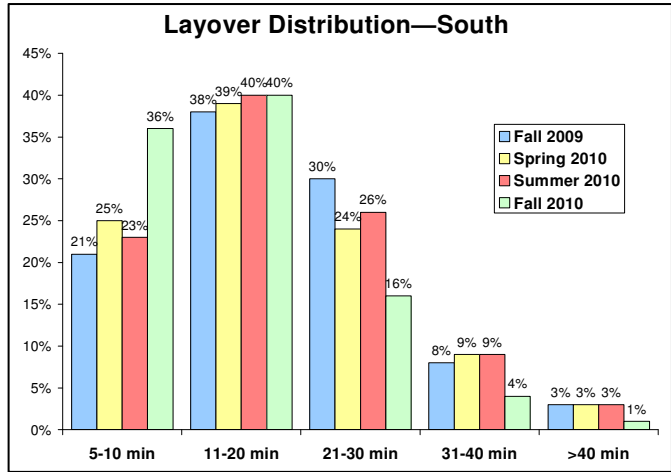
Deadhead Miles per Revenue Mile

Deadhead miles per revenue mile increased to 0.29 in Fall 2010.



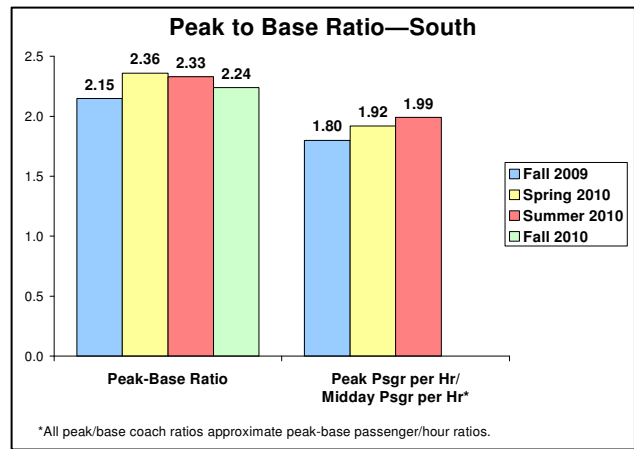
Distribution of Scheduled Layover by Length of Layover

The number of layovers longer than 40 minutes decreased to 1 percent in Fall 2010. There was a significant increase in the number of short layover in the range of 5 to 10 minutes long, and corresponding decreases in the 21 to 30 minute and 31 to 40 minute ranges.



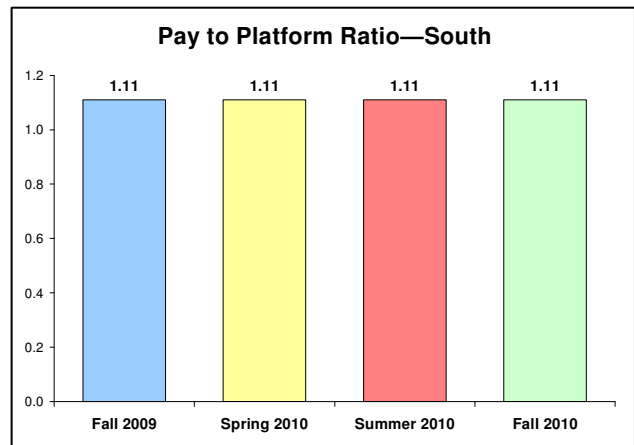
Peak to Base Ratio

The peak to base ratio decreased slightly to 2.24 in Fall 2010. Passenger data will be available in Spring 2011 to examine how closely that service level is balanced to passenger demand, and whether South Base continues to have a mismatch between service and demand.



Pay to Platform Ratio

The pay to platform ratio remained the same at 1.11 in Fall 2010.



4.3 Route-Level Performance Measures

For Fall 2010, cycle time analysis was performed on six routes from Atlantic Base, one route each from Bellevue Base and East base, and 13 routes at South Base. Atlantic Base routes 7, 10, 12, 14, 49, and 70 are trolley bus routes that serve central and southeast Seattle, and the University District. Bellevue Base route 221 serves Redmond, Overlake, and Eastgate. East Base Route 200 serves Issaquah. South Base routes 101, 106, 107, 128, 148, 150, 155, 156, 164, 166, 168, 169, and 181 serve multiple cities and make up a large portion of the bus network within South King County and connecting South King County to Seattle. Areas served by these routes include Auburn, Burien, Federal Way, Kent, Renton, Tukwila, SeaTac, Seattle - including Downtown, Southeast, SODO, and West Seattle - and unincorporated King County.

Cost to Provide Route

This measure is a measure of how much it costs to provide service on a given route. The savings achieved through cycle time analysis is evident when comparing this cost before and after cycle time analysis is implemented. Annual hours savings represent the time savings due to cycle time analysis, while annual cost savings represents the actual cost savings based on hours of service, route mileage, and vehicle types. A savings of 12,930 hours on these routes can be attributed to cycle time analysis. That savings represents approximately a 3.5% savings.

Route Group	Annual Hours Savings
Atlantic Base	5,108
Bellevue Base	1,573
South Base	6,249
Total	12,930

Recovery to In-Service Ratio

This measure is a ratio of the total recovery hours to revenue hours. This ratio indicates how schedules balance time serving passengers with time at terminals between trips, and is explained in more detail in the system-wide performance measures section. The recovery to in-service ratio decreased significantly for most routes where cycle time analysis was implemented, with the exception of Route 155. Routes 164 and 168 showed the most significant decreases, while routes 14, 49, 70, 101, 107, and 200 also saw ratio decreases of 0.20 or more.

Route	Base	Recovery to In-Service Ratio	
		Summer 2010	Fall 2010
7	Atlantic	0.32	0.20
10	Atlantic	0.42	0.32
12	Atlantic	0.36	0.26
14	Atlantic	0.47	0.26

Route	Base	Recovery to In-Service Ratio	
		Summer 2010	Fall 2010
49	Atlantic	0.43	0.23
70*	Central	0.47	0.19
101	South	0.47	0.19
106	South	0.34	0.19
107	South	0.39	0.19
128	South	0.20	0.10
148	South	0.30	0.17
150	South	0.35	0.17
155	South	0.25	0.33
156	South	0.49	0.37
164	South	0.60	0.23
166	South	0.26	0.25
168	South	0.56	0.19
169	South	0.36	0.20
181	South	0.22	0.19
200	East	0.43	0.21
221	Bellevue	0.32	0.27

* Moved to Central Base due to dieselization for long-term construction project