William Entriken
410 Keats Rd
Huntingdon Vy, PA 19006

4 January 2014

SEPTA Operations
ATTN: Mike Zaleski
1234 Market Street
10th Floor
Philadelphia, PA 19107

Dear Mike:

I have been riding the Regional Rail for many years and always appreciate the ability to ride with SEPTA directly to a large number of places that I may want to go. Over the past five years, I have collected data on all Regional Rail trains and analyzed road blocks to On-Time Performance achievement and potential solutions. In this third biennial report to SEPTA, please find attached my humble recommendations to further improve performance.

SEPTA regional rail has been made significant improvements to its official OTP goals since my last report (November 2011). Joseph Casey attributes this largely to SEPTA's equipment upgrades and the resulting increase in reliability and reduction in overcrowding. For fiscal year 2013, there is solid achievement in the 90-plus percentage range and 2014 is off to a good start. It is even, perhaps, time to increase the goal.

Thanks again for all your effort in keeping SEPTA running safely and conveniently.

Best regards,

William Entriken

entriken@phor.net
267-738-4201

encl.

CC: Ronald Hopkins

An analysis of SEPTA Regional Rail On-Time Performance

Presented by William Entriken
4 January 2014

Executive Overview

Publicly available On-Time Performance data was collected from SEPTA and analyzed over the past five years. Trains on particular lines with consistently poor On-Time Performance are notable for their tardiness <u>as well as their regularity</u>. In the interest of exceeding SEPTA's goal of 90% OTP, timetables for these trains should be corrected. Specific recommendations and methodology are given to fix the problem.

Introduction

Rail performance is a function of rail equipment, operating capabilities, ridership, acts of God, and expectations set forth in the timetable. Following is a review of SEPTA's Regional Rail timetables and specific recommendations to improve performance through schedule management.

SEPTA's rail scheduling process uses multivariate modeling of demographics, climate, speed limits, equipment capabilities, and much more. This is great for designing new service and predicting the impact of large changes like equipment replacement. My analysis is strictly incremental and is based solely on SEPTA's historical performance.

Definitions

On-Time Performance (OTP) is defined by SEPTA as the percentage of trains on a line which are 5:59 minutes late or less in reaching their destination of Suburban Station or a system extremity.

Lateness is the time a train departs a given stop versus the scheduled departure time for that stop.

A **percentile**, for example, of 90% at 3 minutes means 18 or more trains are late by at least 3 minutes (for a weekday schedule and a 4-week month).

Analysis

I created a data collection and reporting tool in 2008 and run it continuously to monitor all SEPTA Regional Rail trains. Although SEPTA updates its schedules regularly, many trains have run continuous service for a decade or more. This provides a strong basis for understanding trends.

It is trivial to achieve 100% OTP by managing the timetable – simply leave a huge gap between each stop. Naturally, any changes to the timetable should be made carefully and should be weighed against these consequences:

* Passenger delays – trains wont leave before the departure time
* Simplicity – the airport trains are hourly, even though we could schedule more accurately

Even still, there are plenty of easy improvements to be made. **For example, although the new Manayunk/Norristown outbound train #2739 has always arrived at the destination on time it has NEVER departed the Ivy Ridge stop on schedule (it is usually 4 minutes late).**

Following are recommendations to fix big, easy problems like #2739, a methodology to fix smaller problems, and a proposed set of new timetables for all rail lines.

Recommendations

Update the timetable at the next opportunity for these problem stops:

Manayunk/Norristown #2739	Change Ivy Ridge from 14:26 to 14:28	Train in service 4 months, not once on time. Was 3+ minutes late all except one day.
Manayunk/Norristown #2739	Change Manayunk from 14:28 to 14:29	Always 1+ minutes late, usually 4 or more.
Manayunk/Norristown #2739	Change Wissahickon from 14:31 to 14:33	Always 2+ minutes late, usually 4 or more.
Manayunk/Norristown #207	Change Manayunk from 06:10 to 06:11	Train not once on time, is always 2+ minutes late.
Manayunk/Norristown #207	Change Wissahickon from 06:13 to 06:14	Train not once on time, is always 2+ minutes late.
Manayunk/Norristown #2367	Change Ivy Ridge from 16:56 to 16:57	For every month except February, this is usually (90%+) over 2 minutes late.
Manayunk/Norristown #2367	Change Manayunk from 16:58 to 16:59	For every month except February, this is usually (90%+) over 2 minutes late.
Manayunk/Norristown #2367	Change Wissahickon from 17:01 to 17:02	For every month except February, this is usually (90%+) over 2 minutes late.
Paoli/Thorndale #585, #587	Change Downingtown from xx:27 to xx:25	The final stop is hurting OTP metrics but the penultimate stop is rarely contributing
Paoli/Thorndale #2555	Completely reevaluate	
Cynwyd #1062	30th Street & Suburban Station early 1 minute	In 2013, was not once on time. Alternatively, move Wynnefield early a minute.
Cynwyd #1072, #1058	30th Street early 1 minute	Final stop in Suburban Station at risk of hurting OTP. Possibly other operation solution.
Wilmington #3223	Delay stops after Crum Lynne 3+ minutes	Given continuous failure to meet schedule in 2013, this target is unreasonable.
Wilmington #9245	Change U City from 16:33 to 16:35	Not once on time in 2013.
Wilmington #9245	Change Wilmington from 17:26 to 17:28	Train actually arrived before 17:28 once in 2013.
West Trenton #330	Change Philmont 07:57 to 08:00	Train actually arrived before 08:00 twice in 2013.
West Trenton #330	Change Forest Hills 08:00 to 08:02	Almost as bad as Philmont
West Trenton #330	Change Somerton 08:01 to 08:03	Almost as bad as Philmont

Conclusion

Many of these recommendations are modest. The recommended approach is to move a little in the right direction, and then repeat. My reporting system recommends a change to the timetable only when 90% or more of trains are late for a particular stop. This tool can be run any time and provide recommended changes. **Any proposed changes must be ignored for trains with significant equipment upgrades.**

Enclosed are additional proposed timetable changes. Those reports were generated automatically using calendar year 2013 data. The online version of the report also includes drill-down functionality.

> ONLINE VERSION: http://phor.net/apps/septa/

Although SEPTA has improved on-time performance considerably in the past 10 years, there is room for continuous improvement to match its competitors in other cities.

Airport Line — Proposed Schedule

Report using data from **2013-01-01** to **2013-12-31** with service schedule **S1**

★ Changes are proposed when 90%+ of trains are 1+ minutes late for any stop.

Outbound service

Train Number	Suburban Station	30th Street Station	University City	Eastwick	Airport Terminal A	Airport Terminal B	Airport Terminal C D	Airport Terminal E F
401	04:30	04:34	04:36	04:44	04:49	04:50	04:52	04:55 ★
499	05:00	05:04	05:06	05:14	05:19	05:20	05:22	05:26 ★
403	05:30	05:34	05:36	05:44	05:50 ★	05:51 ★	05:53 ★	05:56 ★
405	06:00	06:04	06:06	06:14	06:19	06:20	06:22	06:25 ★
407	06:30	06:34	06:36	06:44	06:49	06:50	06:52	06:55 ★
409	07:00	07:04	07:06	07:14	07:19	07:20	07:22	07:25 ★
7411	07:30	07:34	07:36	07:45 ★	07:50 ★	07:51 ★	07:53 ★	07:56 ★
7413	08:00	08:04	08:06	08:15 ★	08:20 ★	08:21 ★	08:23 ★	08:26 ★
415	08:30	08:34	08:36	08:44	08:49	08:50	08:52	08:56 ★
9417	09:00	09:04	09:06	09:15 ★	09:20 ★	09:21 ★	09:23 ★	09:26 ★
9419	09:30	09:34	09:36	09:44	09:49	09:50	09:53 ★	09:56 ★
3421	10:00	10:04	10:06	10:14	10:19	10:20	10:22	10:26 ★
423	10:30	10:34	10:36	10:44	10:49	10:50	10:52	10:56 ★
3425	11:00	11:04	11:06	11:14	11:19	11:20	11:23 ★	11:26 ★
427	11:30	11:34	11:36	11:44	11:49	11:50	11:53 ★	11:55 ★
3429	12:00	12:04	12:06	12:14	12:19	12:20	12:22	12:25 ★
431	12:30	12:34	12:36	12:44	12:49	12:50	12:52	12:55 ★

3433	13:00	13:04	13:06	13:14	13:19	13:20	13:22	13:25 ★
435	13:30	13:34	13:36	13:44	13:49	13:50	13:52	13:55 ★
3437	14:00	14:04	14:06	14:14	14:19	14:20	14:22	14:25 ★
439	14:30	14:34	14:36	14:44	14:50 ★	14:51 ★	14:53 ★	14:55 ★
3441	15:00	15:04	15:06	15:14	15:19	15:20	15:22	15:25 ★
443	15:30	15:34	15:36	15:44	15:49	15:50	15:52	15:56 ★
3445	16:00	16:04	16:06	16:14	16:19	16:20	16:22	16:25 ★
447	16:30	16:34	16:36	16:44	16:50 ★	16:51 ★	16:53 ★	16:56 ★
3449	17:00	17:04	17:06	17:14	17:19	17:20	17:22	17:26 ★
451	17:30	17:34	17:36	17:44	17:49	17:50	17:52	17:56 ★
8453	18:00	18:04	18:06	18:15 ★	18:20 ★	18:21 ★	18:23 ★	18:26 ★
455	18:30	18:34	18:36	18:44	18:49	18:50	18:52	18:55 ★
5457	19:00	19:04	19:06		19:19	19:20	19:22	19:25 ★
459	19:30	19:34	19:36	19:44	19:49	19:50	19:52	19:56 ★
1461	20:00	20:04	20:06	20:14	20:19	20:20	20:23 ★	20:26 ★
463	20:30	20:34	20:36	20:44	20:49	20:50	20:52	20:56 ★
465	21:00	21:04	21:06	21:14	21:19	21:20	21:22	21:26 ★
9467	21:30	21:34	21:36	21:44	21:49	21:50	21:52	21:56 ★
469	22:00	22:04	22:06	22:14	22:19	22:20	22:23 ★	22:27 ★
9471	22:30	22:34	22:36	22:44	22:49	22:50	22:52	22:56 ★
473	23:00	23:04	23:06	23:14	23:19	23:20	23:22	23:26 ★
9475	23:30	23:34	23:36	23:44	23:49	23:50	23:52	23:56 ★

Created by William Entriken — Report generated 2014-01-04 02:48:18 — 31.965 seconds

Cynwyd Line — Proposed Schedule

Report using data from **2013-01-01** to **2013-12-31** with service schedule **S1**

★ Changes are proposed when 90%+ of trains are 1+ minutes late for any stop.

Inbound service

Train Number	Cynwyd	Bala	Wynnefield Avenue	30th Street Station	Suburban Station
1054	06:28	06:29	06:31	06:43	06:48
1056	07:11	07:12	07:14	07:26	07:33 ★
1058	07:57	07:58	08:00	08:12	08:19 ★
1060	08:27	08:28	08:30	08:42	08:49 ★
1062	09:04	09:05	09:07	09:17 ★	09:23 ★
1072	12:54	12:55	12:57	13:10 ★	13:19 ★
1082	17:16	17:17	17:19	17:31	17:37 ★
1084	17:51	17:52	17:54	18:06	18:13 ★
1086	18:26	18:27	18:29	18:41	18:47 ★
1088	19:04	19:05	19:07	19:19	19:25 ★

Created by William Entriken — Report generated 2014-01-04 02:42:02 — 1.914 seconds

Lansdale/Doylestown Line — Proposed Schedule

Report using data from **2013-01-01** to **2013-12-31** with service schedule **S1**

★ Changes are proposed when 90%+ of trains are 1+ minutes late for any stop.

Outbound service

Train Number	Suburban Station	Market East	Temple University	North Broad	Wayne Junction	Fern Rock T C	Melrose Park	Elkins Park	Jenkintown Wyncote	Glenside	North Hills	Oreland	Fort Washington	Ambler	Penllyn	Gwynedd Valley	North Wales	Pennbrook	Lansdale	Fortuna	Colmar	Link Belt	Chalfont	New Britain	Delaware Valley College	Doylestown
6512	05:30	05:35	05:39	05:41	05:46	05:51 ★			05:57 ★	06:00 ★	06:02 ★	06:03	06:07	06:10	06:13	06:16	06:19	06:21	06:25							
514	06:07	06:12	06:16	06:18	06:24	06:28	06:31		06:35	06:39 ★	06:40	06:42	06:45	06:48	06:51	06:54	06:57	06:59	07:02	07:09	07:11	07:13	07:22	07:26	07:28	07:32
516	06:38	06:43	06:47	06:49	06:54	06:59			07:05	07:08			07:15	07:18			07:26	07:28	07:33 ★							
4520	07:08	07:13	07:18		07:25	07:30	07:33	07:36	07:40	07:43	07:45	07:47	07:50	07:53	07:56	07:59	08:03	08:06	08:18	08:22	08:24	08:26	08:30	08:34	08:36	08:42 ★
3524	07:41	07:46	07:51	07:53	07:59	08:02	08:06 ★		08:10	08:14 ★	08:16 ★	08:18 ★	08:21 ★	08:24 ★	08:26	08:29	08:33	08:35	08:41 ★							
7534	08:02	08:07	08:11		08:18	08:21	08:24		08:28	08:31	08:33	08:35	08:38	08:41	08:44	08:47	08:51	08:54	09:00	09:04	09:06	09:08	09:18	09:22	09:24	09:28
540	08:50	08:55	08:59	09:01	09:07	09:11			09:17	09:20	09:22	09:24	09:27	09:30	09:33	09:36	09:40	09:42	09:45	09:52 ★	09:53	09:55				
542	09:18	09:23	09:27		09:34	09:38			09:44	09:47	09:49	09:51	09:54	09:57	10:00	10:03	10:07	10:09	10:18		10:23		10:30	10:34	10:36	10:40
544	09:50	09:55	09:59	10:01	10:07	10:11			10:17	10:20	10:22	10:24	10:27	10:30	10:33	10:36	10:40	10:42	10:46	10:51	10:53	10:55				
546	10:20	10:25	10:29		10:36	10:40			10:46	10:49	10:51	10:53	10:56	10:59	11:02	11:05	11:09	11:11	11:18		11:23		11:30	11:34	11:36	11:40
548	10:50	10:55	10:59	11:01	11:07	11:11			11:17	11:20	11:22	11:24	11:27	11:30	11:33	11:36	11:40	11:42	11:46	11:52 ★	11:53	11:55				
550	11:20	11:25	11:29		11:36	11:40			11:46	11:49	11:52	11:54	11:57	12:00	12:03	12:06	12:09	12:11	12:18		12:23		12:30	12:34	12:36	12:40
552	11:45	11:50	11:54	11:56	12:02	12:06			12:12	12:15	12:17	12:19	12:22	12:25	12:28	12:31	12:35	12:37	12:41	12:51	12:53	12:55				
554	12:20	12:25	12:29		12:36	12:40			12:46	12:49	12:51	12:53	12:56	12:59	13:02	13:05	13:09	13:11	13:18		13:23		13:30	13:34	13:36	13:40
556	12:50	12:55	12:59	13:01	13:07	13:11			13:17	13:20	13:22	13:24	13:27	13:30	13:33	13:36	13:40	13:42	13:46	13:51	13:53	13:55				
558	13:20	13:25	13:29		13:36	13:40			13:46	13:49	13:51	13:53	13:56	13:59	14:02	14:05	14:09	14:11	14:18		14:23		14:30	14:34	14:36	14:40
560	13:54	13:59	14:03	14:05	14:11	14:15			14:21	14:24	14:26	14:28	14:31	14:34	14:37	14:40	14:44	14:46	14:51	14:55	14:57	14:59				
562	14:17	14:22	14:26		14:33	14:37			14:43	14:46	14:48	14:50	14:53	14:56	14:59	15:02	15:06	15:08	15:18		15:23		15:30	15:34	15:36	15:40
564	14:47	14:52	14:56	14:58	15:04	15:08			15:14	15:17	15:19	15:21	15:24	15:27	15:30	15:33	15:37	15:39	15:45	15:49	15:51	15:53				
6566	15:18	15:23	15:27		15:34	15:38			15:44	15:47	15:49	15:51	15:54	15:57	16:00	16:03	16:07	16:09	16:19		16:24		16:31	16:35	16:37	16:42 ★
568	15:50	15:55	15:59	16:01	16:07	16:12 ★			16:17	16:20	16:22	16:24	16:27	16:30	16:33	16:36	16:40	16:42	16:46	16:52	16:55	16:57				
3596	16:13	16:18	16:22										16:43	16:47		16:51	16:54	16:56	17:00	17:05	17:08		17:15	17:19	17:21	17:26
570	16:21	16:26	16:30		16:38	16:42	16:45		16:49	16:52	16:54	16:56	16:59	17:02	17:05	17:08	17:12	17:14	17:18							
6572	16:44	16:49	16:53										17:14	17:18		17:22	17:25	17:27	17:33	17:36	17:40		17:46	17:50	17:52	17:58 ★
574	16:50	16:55	16:59		17:06	17:10	17:13		17:17	17:20	17:22	17:24	17:27	17:30	17:33	17:36	17:40	17:42	17:46							

Train																										
6576	17:17	17:22	17:27							17:47	17:51		18:00						18:09	18:12	18:17	18:18	18:23	18:28	18:30	18:37 ★
578	17:21	17:26	17:30						17:48	17:50	17:52	17:55	17:57	18:01	18:04	18:08	18:10	18:17								
6598	17:47	17:52	17:56										18:17	18:21	18:23	18:25	18:29	18:31	18:36	18:39	18:43	18:44	18:49	18:53	18:55	19:01
580	17:51	17:56	18:00	18:02	18:08	18:12	18:15		18:19	18:22	18:24	18:26	18:29	18:32	18:35	18:38	18:42	18:44	18:49 ★							
582	18:22	18:27	18:31		18:37	18:41	18:45		18:49	18:52	18:54	18:56	18:59	19:02	19:05	19:08	19:12	19:14	19:19 ★							
584	18:50	18:55	18:59		19:06	19:10	19:13		19:17	19:20	19:22	19:24	19:27	19:30	19:33	19:36	19:40	19:42	19:47	19:51	19:53	19:55	20:00	20:04	20:06	20:10
586	19:20	19:25	19:29	19:31	19:36	19:40	19:43	19:46	19:49	19:52	19:54	19:56	19:59	20:02	20:05	20:08	20:12	20:14	20:18							
588	19:50	19:55	19:59		20:05	20:09			20:15	20:18	20:20	20:22	20:25	20:28	20:31	20:34	20:38	20:40	20:46	20:50	20:52	20:54	21:00	21:04	21:06	21:10
592	20:50	20:55	20:59		21:05	21:09	21:12		21:16	21:19	21:21	21:23	21:26	21:29	21:32	21:35	21:39	21:41	21:47	21:51	21:53	21:55	22:01	22:05	22:07	22:12 ★
594	21:50	21:55	21:59	22:01	22:06	22:10			22:16	22:19	22:21	22:23	22:26	22:29	22:32	22:35	22:39	22:41	22:47	22:51	22:53	22:55	23:02	23:06	23:08	23:12
596	22:55	23:00	23:04		23:10	23:14			23:20	23:23	23:25	23:27	23:30	23:33	23:36	23:38	23:43	23:45	23:48							
598	00:20	00:25	00:29	00:31	00:37	00:41			00:47	00:50	00:52	00:54	00:57	19:00	19:00	19:00	19:00	19:00	19:00							

Created by William Entriken — Report generated 2014-01-04 02:47:51 — 54.945 seconds

Manayunk/Norristown Line — Proposed Schedule

Report using data from **2013-01-01** to **2013-12-31** with service schedule **S1**

★ Changes are proposed when 90%+ of trains are 1+ minutes late for any stop.

Inbound service

Train Number	Norristown	Main Street	Norristown T.C.	Conshohocken	Spring Mill	Miquon	Ivy Ridge	Manayunk	Wissahickon	East Falls	Allegheny	North Broad	Temple University	Market East	Suburban Station
207	05:47	05:49	05:53	05:58	06:01	06:05 ★	06:09 ★	06:13 ★	06:16 ★	06:17 ★	06:19 ★	06:23 ★	06:25 ★	06:30 ★	06:34
6211	06:23	06:25	06:29	06:34	06:37	06:40	06:46 ★	06:48 ★	06:51 ★	06:53		06:59	07:01	07:07	07:12
2301	06:55	06:58	07:04	07:09	07:12	07:15	07:20						07:30	07:36	07:41
2509	07:02	07:04	07:08	07:13	07:16	07:19	07:25 ★	07:27 ★	07:29 ★	07:33 ★	07:35 ★	07:38	07:40	07:46	07:51
6217			07:35	07:40	07:43	07:46	07:52	07:54					08:04	08:10	08:15
6219	07:33	07:35	07:40	07:45	07:48	07:51	07:56	07:58	08:01	08:05		08:11	08:13	08:19	08:24
6221	08:04	08:06	08:11	08:16	08:19	08:22	08:28 ★	08:30 ★	08:32	08:36	08:39	08:42	08:44	08:50	08:55
6223	08:36	08:38	08:42	08:47	08:50	08:53	08:59 ★	09:01 ★	09:04 ★	09:06		09:13	09:15	09:21	09:26
6225	09:05	09:07	09:11	09:16	09:19	09:22	09:28	09:30	09:33	09:37	09:40	09:49	09:51	09:57	10:02
6227	10:05	10:07	10:11	10:16	10:19	10:22	10:29 ★	10:31 ★	10:35 ★	10:37	10:40	10:49	10:51	10:57	11:02
6229	11:05	11:07	11:11	11:16	11:19	11:22	11:29 ★	11:31 ★	11:33	11:37	11:40	11:49	11:51	11:57	12:02

6231	12:05	12:07	12:11	12:16	12:19	12:22	12:30 ★	12:32 ★	12:35 ★	12:37	12:40	12:49	12:51	12:57	13:02
6235	13:05	13:07	13:11	13:16	13:19	13:22	13:29 ★	13:31 ★	13:34 ★	13:37	13:40	13:49	13:51	13:57	14:02
2739	14:03	14:05	14:09	14:14	14:17	14:20	14:29 ★	14:31 ★	14:34 ★	14:37 ★	14:38	14:47	14:49	14:55	15:00
6239	14:57	14:59	15:03	15:08	15:11	15:14	15:19 ★	15:21 ★	15:24 ★	15:26	15:29	15:35	15:37	15:43	15:48
2555	15:56	15:59	16:01	16:09	16:12	16:15	16:20 ★	16:22 ★	16:25 ★	16:27	16:30		16:35	16:42	16:47
2367	16:36	16:38	16:42	16:46	16:49	16:52	16:57 ★	16:59 ★	17:02 ★	17:04	17:07	17:11	17:14	17:22	17:27
2751	17:06	17:08	17:12	17:17	17:20	17:23	17:27	17:29	17:32	17:35	17:38	17:42	17:45	17:51	17:56
6263	17:40	17:42	17:47	17:53	17:56	17:59	18:03	18:05	18:08	18:10	18:13	18:16	18:18	18:25	18:30
6267			18:15	18:20	18:23	18:26	18:30	18:32	18:35	18:38	18:41	18:44	18:46	18:52	18:57
6271	19:15	19:17	19:21	19:26	19:29	19:32	19:36	19:39	19:42	19:45	19:48	19:51	19:53	19:59	20:04
273	19:47	19:49	19:53	19:58	20:01	20:04	20:08	20:10	20:13	20:16	20:19	20:22	20:24	20:30	20:35
275	20:48	20:50	20:54	20:59	21:02	21:05	21:09	21:11	21:14	21:17	21:20	21:23	21:25	21:31	21:36
277	21:45	21:47	21:51	21:56	21:59	22:02	22:06	22:08	22:11	22:14	22:17	22:20	22:22	22:28	22:33
279	22:45	22:47	22:51	22:56	22:59	23:02	23:07 ★	23:08	23:11	23:14	23:17	23:20	23:22	23:28	23:33
6281	00:39	00:41	00:45	00:50	00:53	00:56	01:00	01:02	01:05	01:07	01:10	01:12	01:14	01:20	01:25

Created by William Entriken — Report generated 2014-01-04 02:45:21 — 24.955 seconds

Manayunk/Norristown Line — Proposed Schedule

Report using data from **2013-01-01** to **2013-12-31** with service schedule **S1**

★ Changes are proposed when 90%+ of trains are 1+ minutes late for any stop.

Outbound service

Train Number	Suburban Station	Market East	Temple University	North Broad	Allegheny	East Falls	Wissahickon	Manayunk	Ivy Ridge	Miquon	Spring Mill	Conshohocken	Norristown T.C.	Main Street	Norristown
6212	05:48	05:53	05:57	05:59	06:01	06:04	06:06	06:09	06:11	06:15	06:18	06:24	06:31	06:37	06:40 ★
216	06:29	06:34	06:38	06:40	06:42	06:46 ★	06:48 ★	06:51 ★	06:53 ★	06:56	07:01 ★	07:04 ★	07:13	07:16	07:18
220	07:02	07:07	07:11	07:13	07:15	07:18	07:20	07:23	07:25	07:29	07:32	07:35	07:44	07:50	07:52
4222	07:35	07:40	07:44	07:46	07:49	07:52	07:54	07:57	07:59	08:04	08:07	08:10	08:17	08:23	08:26 ★
3224	07:59	08:04	08:08	08:10	08:13	08:16	08:18	08:21	08:23	08:28	08:31	08:34	08:41	08:49	08:52 ★
3226	08:39	08:44	08:48	08:50	08:54	08:57	08:59	09:02	09:04	09:09	09:12	09:15	09:22	09:28	09:30
8230	09:40	09:45	09:49	09:51	09:55	09:58	10:00	10:03	10:05	10:16	10:21	10:24	10:30	10:33	10:35
6232	10:40	10:45	10:49	10:51	10:55	10:58	11:00	11:03	11:05	11:16	11:21	11:24	11:30	11:33	11:35
6234	11:40	11:45	11:49	11:51	11:55	11:58	12:00	12:03	12:05	12:16	12:21	12:24	12:30	12:33	12:35
6236	12:40	12:45	12:49	12:51	12:55	12:58	13:00	13:03	13:05	13:16	13:21	13:24	13:30	13:33	13:35
6238	13:40	13:45	13:49	13:51	13:55	13:58	14:00	14:03	14:05	14:16	14:21	14:24	14:30	14:33	14:35
240	14:40	14:45	14:49	14:51	14:55	14:58	15:00	15:03	15:05	15:09	15:12	15:15	15:21	15:28	15:30
3242	15:22	15:27	15:31	15:33	15:37	15:40	15:42	15:45	15:47	15:52	15:55	15:58	16:04	16:10	16:14 ★
6244	16:02	16:07	16:11	16:13	16:16	16:19	16:21	16:24	16:26	16:31	16:34	16:37	16:44	16:50	16:52
6246	16:35	16:40	16:44	16:46	16:49	16:53	16:55	16:58	17:01	17:06	17:09	17:12	17:19	17:25	17:28 ★

Paoli/Thorndale Line — Proposed Schedule

Report using data from **2013-01-01** to **2013-12-31** with service schedule **S1**

★ Changes are proposed when 90%+ of trains are 1+ minutes late for any stop.

Outbound service

Train Number	Suburban Station	30th Street Station	Overbrook	Merion	Narberth	Wynnewood	Ardmore	Haverford	Bryn Mawr	Rosemont	Villanova	Radnor	St. Davids	Wayne	Strafford	Devon	Berwyn	Daylesford	Paoli	Malvern	Exton	Whitford	Downingtown	Thorndale
9597	05:43	05:47	05:56				06:00	06:02	06:04	06:05	06:07	06:09	06:11	06:13	06:15	06:17	06:19		06:22	06:25	06:31	06:33	06:38	06:43
501	06:11	06:15	06:25	06:27	06:29	06:30	06:32	06:34	06:36	06:38	06:40	06:42	06:44	06:46	06:48	06:50	06:52	06:54	06:59					
503	06:45	06:49	06:59	07:01	07:03	07:04	07:06	07:08	07:10	07:12	07:14	07:16	07:18	07:20	07:22	07:24	07:26	07:28	07:31	07:34	07:40	07:42	07:47	07:58 ★
3505	07:10	07:14	07:24	07:26					07:32			07:37			07:41				07:53					
507	07:25	07:29	07:39	07:41	07:43	07:45	07:47	07:49	07:51	07:53	07:55	07:57	07:59	08:01	08:03	08:05	08:07	08:09	08:12	08:15				
509	07:42	07:46	07:56	07:58	08:00	08:01	08:04	08:05	08:07	08:09	08:11	08:13	08:15	08:17	08:19	08:21	08:23	08:25	08:28	08:31	08:37	08:39	08:44	08:50 ★
513	08:12	08:16	08:26	08:28	08:30	08:32	08:34	08:36	08:38	08:40	08:42	08:44	08:46	08:48	08:50	08:52	08:54	08:56	08:59	09:02				
515	08:41	08:45	08:55	08:57	08:59	09:01	09:03	09:05	09:07	09:09	09:11	09:13	09:15	09:17	09:20	09:22	09:24	09:26	09:29	09:32	09:40	09:42	09:47	09:52
8517	09:18	09:22	09:32	09:34	09:36	09:37	09:39	09:41	09:43	09:45	09:47	09:49	09:51	09:53	09:55	09:57	09:59	10:01	10:04	10:07	10:13	10:15	10:20	10:26 ★
519	09:45	09:49	09:59	10:01	10:03	10:04	10:06	10:08	10:10	10:12	10:14	10:16	10:18	10:20	10:22	10:24	10:26	10:28	10:31	10:34				
521	10:15	10:19	10:29	10:31	10:33	10:34	10:36	10:38	10:40	10:42	10:44	10:46	10:48	10:50	10:52	10:54	10:56	10:58	11:01	11:04	11:10	11:12	11:17	11:28 ★
523	10:45	10:49	10:59	11:01	11:03	11:04	11:06	11:08	11:10	11:12	11:14	11:16	11:18	11:20	11:22	11:24	11:26	11:28	11:31	11:34				
525	11:15	11:19	11:29	11:31	11:33	11:34	11:36	11:38	11:40	11:42	11:44	11:46	11:48	11:50	11:52	11:54	11:56	11:58	12:01	12:04	12:10	12:12	12:17	12:28 ★
527	11:45	11:49	11:59	12:01	12:03	12:04	12:06	12:08	12:10	12:12	12:14	12:16	12:18	12:20	12:22	12:24	12:26	12:28	12:31	12:34				
529	12:15	12:19	12:29	12:31	12:33	12:34	12:36	12:38	12:40	12:42	12:44	12:46	12:48	12:50	12:52	12:54	12:56	12:58	13:01	13:04	13:10	13:12	13:17	13:27
531	12:45	12:49	12:59	13:01	13:03	13:04	13:06	13:08	13:10	13:12	13:14	13:16	13:18	13:20	13:22	13:24	13:26	13:28	13:31	13:34				
533	13:15	13:19	13:29	13:31	13:33	13:34	13:36	13:38	13:40	13:42	13:44	13:46	13:48	13:50	13:52	13:54	13:56	13:58	14:01	14:04	14:10	14:12	14:17	14:27
535	13:45	13:49	13:59	14:01	14:03	14:04	14:06	14:08	14:10	14:12	14:14	14:16	14:18	14:20	14:22	14:24	14:26	14:29	14:31	14:34				
537	14:15	14:19	14:29	14:31	14:33	14:34	14:36	14:38	14:40	14:42	14:44	14:46	14:48	14:50	14:52	14:54	14:56	14:58	15:01	15:04	15:10	15:12	15:17	15:28 ★
539	14:45	14:49	14:59	15:01	15:03	15:04	15:06	15:08	15:10	15:12	15:14	15:16	15:18	15:20	15:22	15:24	15:26	15:28	15:31	15:34				
541	15:15	15:19							15:34	15:36	15:38	15:40	15:42	15:44	15:46	15:48	15:50	15:52	15:55	15:58	16:04	16:06	16:11	16:16
9543	15:21	15:25	15:35	15:37	15:39	15:40	15:42	15:44	15:46															
545	15:54	15:59	16:09	16:11	16:13	16:14	16:16	16:18	16:20	16:22	16:24	16:26	16:28	16:30	16:32	16:34	16:36	16:38	16:41	16:44				
9547	16:11	16:15							16:28	16:30	16:33	16:35	16:37	16:39	16:41	16:43	16:45	16:47	16:50	16:53	16:59	17:01	17:06	17:13
551	16:21	16:25	16:35	16:37	16:39	16:41	16:43	16:45	16:47					16:53	16:55	16:57	16:59	17:01	17:05	17:08				
553	16:44	16:48							17:03	17:05	17:08	17:10	17:12	17:14	17:16	17:18	17:20	17:22	17:25	17:30 ★	17:37	17:39 ★	17:44 ★	17:51 ★

West Trenton Line — Proposed Schedule

Report using data from **2013-01-01** to **2013-12-31** with service schedule **S1**

★ Changes are proposed when 90%+ of trains are 1+ minutes late for any stop.

Outbound service

Train Number	Suburban Station	Market East	Temple University	Wayne Junction	Fern Rock T C	Melrose Park	Elkins Park	Jenkintown Wyncote	Noble	Rydal	Meadowbrook	Bethayres	Philmont	Forest Hills	Somerton	Trevose	Neshaminy	Langhorne	Woodbourne	Yardley	West Trenton
6322	05:30	05:35	05:39	05:44	05:47		05:50	05:53	05:55	05:57	05:59		06:03	06:06	06:07	06:09	06:12	06:16	06:20	06:26	06:31
326	06:21	06:26	06:30	06:37	06:41		06:45	06:48	06:50	06:52	06:54	06:56	06:58	07:01	07:02	07:05	07:08	07:11	07:15	07:20	07:25
328	06:52	06:57	07:01	07:06	07:10		07:13	07:15	07:18	07:20	07:22	07:24	07:26	07:29	07:30	07:32	07:34	07:38	07:42	07:48	07:54
330	07:20	07:25	07:29	07:36	07:40		07:44	07:46	07:50 ★	07:52 ★	07:54 ★	07:57 ★	07:59 ★	08:02 ★	08:03 ★	08:06 ★	08:08 ★	08:10	08:14	08:20	08:24
338	08:17	08:22	08:26		08:36		08:39	08:43	08:45	08:47	08:49	08:51	08:53	08:56	08:57	09:00	09:03	09:06	09:10	09:15	09:19
4346	09:05	09:10	09:14	09:21	09:25	09:28	09:30	09:33	09:35	09:37	09:39	09:41	09:43	09:46	09:47	09:50	09:53	09:56	10:00	10:05	10:09
4348	10:05	10:10	10:14	10:21	10:25	10:28	10:30	10:33	10:35	10:37	10:39	10:41	10:43	10:46	10:47	10:50	10:53	10:56	11:00	11:05	11:09
4350	11:05	11:10	11:14	11:21	11:25	11:28	11:30	11:33	11:35	11:37	11:39	11:41	11:43	11:46	11:47	11:50	11:53	11:56	12:00	12:05	12:09
4352	12:05	12:10	12:14	12:21	12:25	12:28	12:30	12:33	12:35	12:37	12:39	12:41	12:43	12:46	12:47	12:50	12:53	12:56	13:00	13:05	13:09
4354	13:05	13:10	13:14	13:21	13:25	13:28	13:30	13:33	13:35	13:37	13:39	13:41	13:43	13:46	13:47	13:50	13:53	13:56	14:00	14:05	14:09
4356	14:05	14:10	14:14	14:21	14:25	14:28	14:30	14:33	14:35	14:37	14:39	14:41	14:43	14:46	14:47	14:50	14:53	14:56	15:00	15:05	15:09
6358	14:57	15:02	15:06		15:16			15:22	15:24	15:26	15:28	15:30	15:32	15:35	15:36	15:39	15:42	15:45	15:49	15:54	15:58
5368	15:27	15:32	15:36	15:43	15:46			15:53	15:55	15:57	15:59	16:01	16:03	16:06	16:07	16:10	16:12	16:16	16:20	16:26 ★	16:30
6370	15:55	16:00	16:04	16:11	16:15			16:21	16:23	16:24	16:27	16:29	16:31	16:35	16:37	16:40	16:42	16:46	16:51	16:57	17:02
2372	16:27	16:32	16:36		16:46			16:53	16:55	16:57	17:00	17:02	17:05	17:08	17:10	17:13	17:15	17:19	17:25	17:31	17:36
6374	16:47	16:52											17:16	17:19	17:22	17:25	17:28	17:32	17:36	17:42	17:48	17:53
376	16:55	17:00	17:04		17:13		17:17	17:21	17:23	17:25	17:28	17:30	17:32	17:36	17:38	17:41	17:43	17:47	17:52	17:58	18:03
6378	17:14	17:19											17:43	17:46	17:49	17:52	17:55	17:59	18:03	18:09	18:15	18:20
380	17:24	17:29	17:33		17:43	17:47	17:49	17:52	17:54	17:56	17:59	18:01	18:03	18:07	18:09	18:12	18:14	18:18	18:23	18:29	18:34
4382	17:39	17:44											18:08	18:11	18:14	18:16	18:18	18:20	18:23	18:27	18:33	18:37
384	17:49	17:54	17:58		18:07		18:11	18:15	18:17	18:18	18:21	18:23	18:25	18:29	18:31	18:34	18:36	18:40	18:45	18:51	18:56

386	18:28	18:33	18:37	18:46	18:50	18:54	18:56	18:57	19:00	19:03 ✈	19:05 ✈	19:09 ★	19:10 ✈	19:13 ★	19:14	19:18	19:22	19:28	19:33
388	19:17	19:22	19:26	19:35		19:42	19:44	19:46	19:48	19:50	19:52	19:55	19:56	19:59	20:02	20:05	20:09	20:14	20:18
390	19:59	20:04	20:08	20:17		20:24	20:26	20:28	20:30	20:32	20:34	20:37	20:38	20:41	20:44	20:47	20:51	20:56	21:00
392	20:46	20:51	20:55	21:04	21:08	21:12	21:14	21:16	21:18	21:20	21:22	21:25	21:26	21:29	21:32	21:35	21:39	21:45 ★	21:48
394	21:46	21:51	21:55	22:04	22:08	22:11	22:13	22:15	22:17	22:19	22:21	22:24	22:25	22:28	22:31	22:34	22:38	22:43	22:47
396	22:46	22:51	22:55	23:04		23:11	23:13	23:15	23:17	23:19	23:21	23:24	23:25	23:28	23:31	23:34	23:38	23:43	23:47
398	23:46	23:51	23:55	00:04		00:11	00:13	00:15	00:17	00:19	00:21	00:24	00:25	00:28	00:31	00:34	00:38	00:43	00:47

Created by William Entriken — Report generated 2014-01-04 02:40:22 — 34.345 seconds

																					^			
2555	16:47	16:51	17:02 ★	17:05 ★	17:07 ★	17:09 ★	17:11 ★	17:13 ★	17:16 ★															
9559	17:05	17:09							17:24	17:26	17:28	17:31	17:33	17:35	17:38	17:41	17:44	17:46	17:50					
9561	17:08	17:13																	17:38	17:42	17:49	17:52	17:57	18:07
9563	17:14	17:18	17:28	17:30	17:32	17:34	17:36	17:38	17:41															
1565	17:34	17:39							17:55	17:57	18:00	18:03	18:05	18:08	18:11	18:14	18:17	18:19	18:24	18:29	18:36	18:38	18:44	18:54
567	17:44	17:48	17:58	18:00	18:02	18:04	18:06	18:08	18:11															
9569	18:03	18:07							18:23	18:25	18:28	18:31	18:33	18:36	18:39	18:42	18:45	18:47	18:52	18:56				
9571	18:07	18:12																	18:37	18:40	18:47	18:49	18:54	19:04
573	18:16	18:21	18:31	18:33	18:35	18:37	18:39	18:41	18:43	18:45	18:48	18:51	18:54	18:57	18:59	19:01	19:03	19:06	19:10	19:13				
575	18:45	18:49	18:58	19:00	19:02	19:03	19:05	19:07	19:09	19:11	19:13	19:15	19:17	19:19	19:21	19:23	19:25	19:27	19:30	19:33	19:40	19:42	19:47	19:57
577	19:15	19:19	19:28	19:30	19:32	19:33	19:35	19:37	19:39	19:41	19:43	19:45	19:47	19:49	19:51	19:53	19:55	19:57	20:00	20:03	20:09	20:11	20:16	20:26
579	19:45	19:49	19:58	20:00	20:02	20:03	20:05	20:07	20:09	20:11	20:13	20:15	20:17	20:19	20:21	20:23	20:25	20:27	20:30	20:33				
581	20:25	20:29	20:38	20:40	20:42	20:43	20:45	20:47	20:49	20:51	20:53	20:55	20:57	20:59	21:01	21:03	21:05	21:07	21:10	21:13	21:19	21:21	21:26	21:31
583	20:45	20:49	20:58	21:00	21:02	21:03	21:05	21:07	21:09	21:11	21:13	21:15	21:17	21:19	21:21	21:23	21:25	21:27	21:30	21:33				
585	21:26	21:30	21:39	21:41	21:43	21:44	21:46	21:48	21:50	21:52	21:54	21:56	21:58	22:00	22:02	22:04	22:06	22:08	22:11	22:14	22:20	22:22	22:28 ★	22:41 ★
587	22:26	22:30	22:39	22:41	22:43	22:44	22:46	22:48	22:50	22:52	22:54	22:56	22:58	23:00	23:02	23:04	23:06	23:08	23:11	23:14	23:20	23:22	23:28 ★	23:41 ★
589	23:26	23:29	23:39	23:41	23:43	23:44	23:46	23:48	23:50	23:52	23:54	23:56	23:58	00:00	00:02	00:04	00:06	00:08	00:11	00:14				
591	00:26	00:30	00:39	00:41	00:43	00:44	00:46	00:48	00:50	00:52	00:54	00:56	00:58	19:00	19:00	19:00	19:00	19:00	19:00	19:00				

Created by William Entriken — Report generated 2014-01-04 02:43:43 — 61.905 seconds

Wilmington/Newark Line — Proposed Schedule

Report using data from **2013-01-01** to **2013-12-31** with service schedule **S1**

★ Changes are proposed when 90%+ of trains are 1+ minutes late for any stop.

Outbound service

Train Number	Suburban Station	30th Street Station	University City	Darby	Curtis Park	Sharon Hill	Folcroft	Glenolden	Norwood	Prospect Park - Moore	Ridley Park	Crum Lynne	Eddystone	Chester	Highland Avenue	Marcus Hook	Claymont	Wilmington	Churchman\'s Crossing	Newark
1293	04:51	04:56	04:58	05:05	05:07	05:08	05:10	05:11	05:13	05:14	05:16	05:18		05:21	05:24	05:27	05:30	05:39		
1295	05:26	05:31	05:33								05:45			05:49		05:54	05:57	06:06		06:26
1203	05:38	05:43	05:45	05:52	05:54	05:55	05:57	05:59	06:01	06:02	06:04	06:06	06:08	06:10	06:13	06:16	06:19	06:28		06:51
207	06:34	06:38	06:41	06:49	06:51	06:52	06:54	06:56	06:58	06:59	<u>07:01</u>	07:03		07:06	07:09	07:12	07:15	07:25		07:46
4211	07:05	07:09	07:11	07:18	07:20	07:21	07:23	07:24	07:26	07:27	07:29	07:31	07:33	07:35	07:38	07:41				
4213	07:39	07:43	07:45											07:59		08:06 ★	08:09 ★	08:22 ★		08:42 ★
4215	08:07	08:11	08:14	08:22 ★	08:24 ★	08:25 ★	08:27 ★	08:28 ★	08:30 ★	08:31 ★	08:33 ★	08:35 ★	08:37 ★	08:39 ★	08:42 ★	08:45 ★				
3223	09:22	09:26	09:29 ★	09:38 ★	09:40 ★	09:41 ★	09:43 ★	09:44 ★	09:46 ★	09:47 ★	09:49 ★	09:51 ★	09:53 ★	09:55 ★	09:58 ★	10:02 ★	10:05 ★	10:21 ★		
9227	10:35	10:39	10:41	10:48	10:50	10:51	10:53	10:54	10:56	10:57	10:59	11:01	11:03	11:05	11:08	11:11				
9229	11:40	11:44	11:47	11:54	11:56	11:57	11:59	12:00	12:02	12:03	12:05	12:07	12:09	12:11	12:14	12:18	12:21	12:32		
9231	12:35	12:39	12:41	12:48	12:50	12:51	12:53	12:54	12:56	12:57	12:59	13:01	13:03	13:05	13:08	13:11				
9235	13:35	13:39	13:41	13:48	13:50	13:51	13:53	13:54	13:56	13:57	13:59	14:01	14:03	14:05	14:08	14:12	14:15	14:28		
9237	14:35	14:39	14:42	14:49	14:51	14:52	14:54	14:55	14:57	14:58	15:00	15:02	15:04	15:06	15:09	15:12				
7241	15:17	15:21	15:23	15:30	15:32	15:33	15:35	15:36	15:38	15:39	15:41	15:43	15:45	15:47	15:50	15:54	15:57	16:10		16:30
9243	16:09	16:13	16:16	16:23	16:25	16:26	16:28	16:30	16:32	16:34	16:36	16:38	16:41	16:44	16:48	16:51	16:55	17:05		17:24
9245	16:25	16:31 ★	16:35 ★	16:42 ★	16:44 ★	16:45 ★	16:47 ★	16:49 ★	16:51 ★	16:53 ★	16:55 ★	16:57 ★	16:59 ★	17:02 ★	17:05 ★	17:08 ★	17:10 ★	17:26 ★		
4249	16:50	16:54	16:56	17:03	17:05	17:06	17:08	17:10	17:12	17:14	17:16	17:18	17:20	17:23	17:26	17:30	17:33			
9251	17:09	17:14	17:18								17:30			17:35		17:41	17:49	18:00		18:21

5253	17:14	17:18	17:21	17:28	17:30	17:31	17:33	17:35	17:38	17:40	17:42	17:44	17:46	17:49	17:52	17:55			
9257	17:38	17:42	17:44	17:52	17:54	17:56	17:58	18:00	18:02	18:04	18:06	18:08	18:10	18:13	18:16	18:19	18:22	18:33	18:55
9261	18:11	18:15	18:18	18:25	18:27	18:28	18:30	18:32	18:34	18:36	18:38	18:40	18:42	18:45	18:48	18:51			
4269	19:37	19:41	19:44	19:51	19:53	19:54	19:56	19:57	19:59	20:00	20:02	20:04	20:06	20:08	20:11	20:15	20:18	20:36	
273	20:35	20:39	20:41	20:48	20:50	20:51	20:53	20:54	20:56	20:57	20:59	21:01	21:03	21:05	21:08	21:11			
275	21:36	21:40	21:42	21:49	21:51	21:52	21:54	21:55	21:57	21:58	22:00	22:02		22:05	22:08	22:12	22:15	22:26	
277	22:33	22:37	22:39	22:46	22:48	22:49	22:51	22:52	22:54	22:55	22:57	22:59	23:01	23:03	23:06	23:09			
279	23:33	23:37	23:39	23:46	23:48	23:49	23:51	23:52	23:54	23:55	23:57	23:59	00:01	00:03	00:06	00:10 ★			

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