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New Fairfield Public Schools
New Bell Time Model Analysis

DRAFT

Provided by

First Planning Solutions

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This report was prepared by First Planning Solutions

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Student Transportation Terms & Definitions

This page contains definitions of transportation terms used frequently throughout this report:

Bus Run - A sequence of bus stops where the bus begins at zero load and ends at zero load. A bus run terminates at a school or facility on an inbound run and begins at a school or facility on an outbound run

Bus Route, Bus or Vehicle - A combination or series of bus runs and/or shuttle runs that make up a driver's daily work package

Tier - A group of bus runs operating at the same time based on school bell schedule. A multi-tiered system seeks to leverage the bell schedule to maximize the operation of multiple bus runs by a single bus route

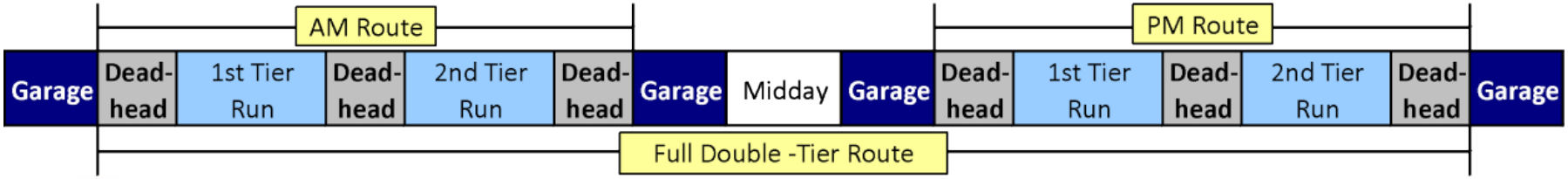
Single, Double, Triple - Refers to the number of bus runs assigned to a bus route in the AM or PM time period

Deadhead - Refers to travel between bus runs when a bus is empty

Operating Window - The time between tier bell times

Live Run Time - Operating Window less unload (AM) or load (PM) less tier deadhead

Typical Double-Tier Route



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Additional Notes

We will be using the following Abbreviations throughout this PowerPoint:

- MS – Middle School; specifically New Fairfield Middle School
- HS – High School; specifically New Fairfield High School
- CONS – Consolidated School
- MHHS – Meeting House Hill School
- ES – Elementary School
- In this report we may sometimes use ES to refer to both CONS and MHHS at the same time.
- HAT – Henry Abbott Technical High School
- It is also worth noting that because there was no change to the KA & KP Routes (using buses A,B,C,D,E, and F), so we are not including them in our route/run/bus counts for this report.

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Executive Summary

Executive Summary

New Fairfield Public Schools is considering a change in bell schedules in order for HS students to have a later start time. This change will move the current transportation model from a 3-Tier system to a 2-Tier system and ride MS and HS students on the same buses at the same time. To assist with this process, First Planning Solutions was asked to model two different suggested scenarios.

Parameters of the Analysis

1. Students at MHHS and CONS will continue to ride the bus together – no change to current practice.
2. We first considered a model (Model B) with:
    1. HS and MS bell times 8:00 am – 2:30 pm
    2. MHHS bell times 8:45 am – 3:25 pm
    3. CONS bell times 8:55 am – 3:35 pm
3. Next we considered a model (Model C) with:
    1. HS and MS bell times 8:30 am – 3:10 pm
    2. MHHS bell times 7:35 am – 2:25 pm
    3. CONS bell times 7:45 am – 2:35 pm

Executive Summary Continued

General Findings:

1. We determined model B is feasible at the current bus count. Our findings are that Model C will require at least two additional buses beyond current operations.
2. Since we did not have actual rider counts, a potential issue may arise if more eligible MS and HS students ride the bus than were predicted in our models.
    - We assumed 100% of MS students and 9th graders as riders
    - We assumed 75% of 10th graders as riders. 11th and 12th graders were assumed at 25%
    - Using this weighted load of eligible students, bus runs created in the model show an average ~50 likely riders per run on the combined HS/MS runs
    - In the analysis detail (slide 12), student load counts in the data table are based on all eligible ES students, and the weighted load for MS/HS students
3. It is worth noting that we created one set of optimal runs for the combined MS and HS for use in both models. The only variant between Model B and C is the bell schedule.
4. We determined that the current ES runs are appropriate for both models. Re-routing and reducing the number of ES runs would not change the bus count in Model B and would have a detrimental effect in the PM on Model C.

Executive Summary Continued

5. In both models Henry Abbott Tech will require its own bus to both drop off and pickup students at bus stops (as opposed to riding with HS students in the AM and shuttling to HAT – current model). The shift in bell times in both scenarios would make the Abbott students late if they continued to ride with HS.
6. We did not utilize the two vans (v30 and v28) which are currently taking HS students home in the PM so that bus 18 can take HAT students directly home. If they are required for a specific purpose, they can be put back into the solution.
7. **Model B**
    1. Requires 20 buses in total
    2. Every bus is double tiered in both the AM and PM
    3. 1st-Tier is comprised of 19 HS/MS runs + 1 HAT. The 2nd-Tier, 20 ES
    4. There are two very minor time conflicts in the PM. Both less than five minutes
8. **Model C**
    1. Requires 22 buses in total. In the solution there are still 10 time conflicts (late arrival at MS/HS between 2-10 minutes after bell).
    2. 18 of the buses are double tiered and 4 are singles both AM and PM
    3. 1st-Tier is comprised of 20 ES runs + 1 HAT. The 2nd-Tier, 19 HS/MS. One ES is too long and would arrive at MS/HS 20 minutes after bell, therefore it became a single.

ANALYSIS DETAIL

Run Summaries – Both Models

AM Metric	MHHS/CONS	MS/HS	Henry Abbott
Buses Used	20	19	1
Avg Load/Weighted load	43.3	50.21	33
Avg Route Length (min)	29:35	26:10	70:48
Avg Route dist (mi)	6.32	5.94	29.23
PM Metric	**MHHS/CONS**	**MS/HS**	**Henry Abbott**
Buses Used	20	19	1
Avg Load/Weighted load	43.2	50.34	33
Avg Route Length (min)	33:21	26:26	66:55
Avg Route dist (mi)	5.77	5.46	27.27

Observations/Notes:

- We tried to acheive a weighted load on HS/MS runs of less than or equal to 48-52 students (48 students equates to 2 students per seat on a 72 passenger bus). The largest weighted load on any run was 58 students.
- There are more HS students than MS students on every run, so even though many of the weighted loads are a little higher than 48, with non-riders we believe it is still a feasible solution.
    - There are an average of 26.7 MS students per run, and 42.7 HS students per run.

Run Data for ES and HS/MS Combined

ELEM AM Run Statistics				
Route #	Bus #	Actual Load	Route Dist (miles)	Route Time
1	1	21	5.28	19:26
2	2	48	7.51	26:21
3	3	53	13.51	45:14
4	4	40	4.62	25:09
5	5	29	6.96	30:45
6	6	38	11.01	34:28
7	7	41	6.03	30:52
8	8	48	6.77	33:54
9	9	39	4.73	22:24
10	10	47	4.31	23:45
11	11	48	3.91	25:38
12	12	37	7.81	33:17
13	13	52	3.23	26:39
14	14	41	8.79	37:58
15	15	43	6.35	30:44
16	16	41	6.38	30:25
17	17	42	3.91	27:05
18	18	49	1.53	13:53
19	19	60	7.71	38:30
21	21	49	6.05	35:18
	Average	**43.3**	**6.32**	**29:35**

MH/MS AM Run Statistics					
Route #	Bus #	Actual Load	Weighted Load	Route Dist (miles)	Route Time
MS001	1	66	50	2.38	17:55
MS002	2	62	43.25	3.67	19:22
MS003	3*	74	54.5	7.58	30:45
MS004	4	71	49.5	2.49	20:45
MS005	5	75	56	3.57	21:44
MS006	6	79	53.25	3.69	24:14
MS007	7	72	52	8.32	29:43
MS008	8	63	47.25	4.98	25:28
MS009	9	66	48.5	5.46	26:08
MS010	10	60	42.5	7.21	29:17
MS011	11	61	48.5	5.5	25:28
MS012	12	72	46.25	4.21	26:01
MS013	13	69	52.75	7.42	25:38
MS014	14	61	45.5	5.29	23:46
MS015	15	64	46.5	8.62	28:13
MS016	16	72	54	5.5	25:16
MS017	17	81	53.25	6.4	30:58
HS18	18	73	52.25	15.38	39:48
MS021	21	88	58.25	5.2	26:48
	Average	**69.95**	**50.21**	**5.94**	**26:10**

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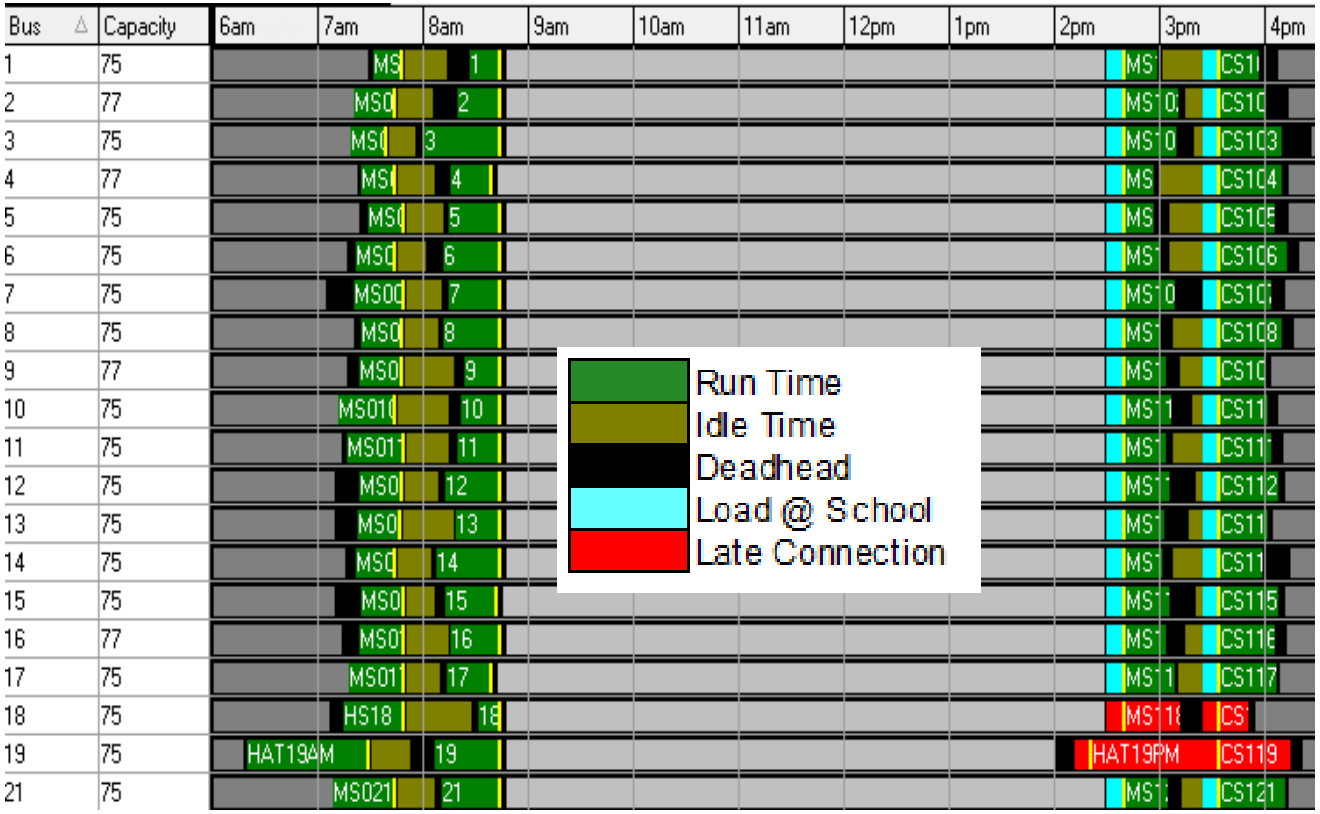
*The tables are data from Model B, the only difference in Model C is that run MS003 uses bus 20 rather than bus 3.

Run Summaries – Model B Continued



- All 20 buses have 2-Tier routes.
- The one Abbott bus (19) is paired with an ES AM and PM. The PM shows a slight time conflict with the ES, but it is 5 minutes or less.
- One MS/HS run (bus 18) also shows a slight time conflict with the ES pair. It is less than 5 minutes and is within margin of error.

Route Config	Count
Single	0
Double	20

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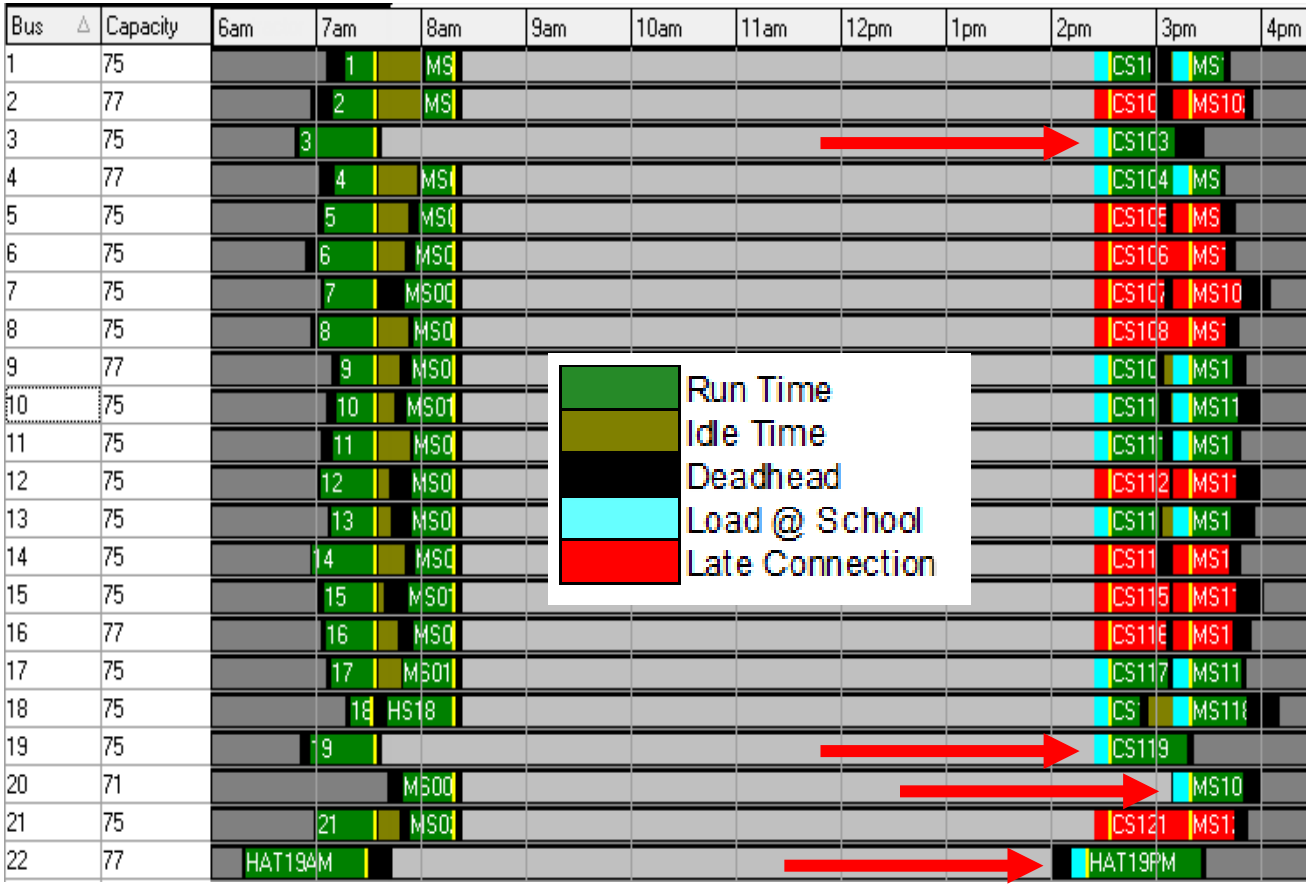
Run Summaries – Model C Continued



Route Config	Count
Single	4
Double	18

- PM schedule is much tighter and more difficult than the AM.
- Route CS103 (bus 3), CS119 (bus19) and HAT19PM (bus 22) are all too long and end too far from the MS/HS to pair. These therefore become singles.
- There is one HS/MS left without a pair and it too becomes a single route.
- There are 10 schedule conflicts ranging between 2-10 minutes.
- If the MS/HS were moved 10 minutes later to 3:20 dismissal, Model C could be achieved with 21 buses.

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CURRENT STATE

Current State

Observations:

- Currently New Fairfield operates a 3-Tier bus system with HS at the first tier, MS at the second tier, and ES at the third tier.
- There are 20 buses in use, and 2 vans being used in the PM.
- The ES uses all 20 buses. This is the controlling tier. It is not possible to reduce the number of buses below 20 without reducing the number of ES runs.
- Based on experience with other districts, bus utilization over 100 is a solid number.
- There are six midday kindergarten runs. These were not included in the analysis.

Metric	AM	PM
Routes	**20**	**22**
Runs	49	51
Runs/Route	2.45	2.32
Singles	0	2
Doubles	11	11
Triples	9	9
Eligible Riders	2,233	2,243
Elg Riders/Run	45.6	44.0
Riders/Bus	111.7	102.0
Avg Run Length	31.6 mins	31.1 mins

Tier	# Runs AM	# Runs PM
1	13	15*
2	16	15
3	20	20

*There are 2 vans doing single runs in the PM

Current Fleet Schedule

Route Config	Count
Single	0/2
Double	11
Triple	9

- The ES tier (3rd) controls the number of buses required to operate. Every bus is engaged during this time period.
- It appears that all buses have plenty of time to connect to 2nd and 3rd schools. However Versatrans load time at schools is not being utilized in the PM. The vertical time in the graphic for MS and ES is school depart time and not arrive. If load time was employed you would see a much tighter (realistic) PM schedule.

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Current Bell Schedule and Effect on Transportation

Tier	Operating Window
AM1	60*
AM2	50
AM3	45
PM1	30
PM2	26
PM3	60*

*The first tier in the AM and the last tier in the PM can operate to district maximum ride limits.

School	Tier	AM Arr.	AM Bell	PM Bell	PM Dep.
High	1	6:55 AM	7:19 AM	1:58 PM	2:10 PM
Middle	2	7:45 AM	7:50 AM	2:40 PM	2:49 PM
MHHS	3	8:30 AM	8:35 AM	3:15 PM	3:35 PM
CONS	3	8:35 PM	8:45 AM	3:25 PM	3:35 PM
HAT	1.5	7:20 AM	7:30 AM	2:27 PM	2:12 PM

Observations

- With reduced operating time in the PM this becomes the time of day that controls the number of buses in operation. What can be achieved in the PM can be replicated in the AM.
- 30 minutes for 1st-Tier operation and 26 minutes for 2nd-Tier operation in the PM is further reduced by deadhead from the last stop on the run to the 2nd or 3rd school.
- The current system shows no timing conflicts, but school times in Versatrans are set to depart time and not bell time. If arrive at bell were considered, some buses would show late arrival at 2nd and 3rd schools.
- Bus 18 makes a HS run, then picks up Henry Abbot students from the HS and brings them to HAT. In the PM bus 18 takes these students from HAT directly home.
- There are 2 vans in Versatrans in the PM only. One has 6 HS students assigned, and one has 22 HS students assigned – all 28 of these students are in the same area. Neither van is in use in the AM.