Fairfax County Public Schools

Bell Time Study

Presentation of Preliminary Results

October 26, 2005

Meeting Agenda

1. **Review progress to date and approach**
   - ✓ Summary of current system performance
   - ✓ Performance in context of operational constraints
   - ✓ Approach in context of system structure
   - ✓ Example: Mt. Vernon Pyramid
2. **Review results and their meaning**
   - ✓ Isolate on Mt. Vernon pyramid first
   - ✓ Compare scenario A-C with D & E
   - ✓ Extend analysis to include buses required
   - ✓ Extend analysis to include schools outside pyramid

Performance of the Current System
Cost Effectiveness

Cost of Service Analysis	***Total***	***Regular Education***	***Special Education***
Vehicle Equivalents	6,252		
M&R Costs	$12,710,814		
M&R Cost per VE	$2,033		
Guideline Range	*$1,000 - $1,400*		
Annual Cost per Student	**$744**	$549	$3,377
Guideline Range	*$600 - $700*		
Annual cost per Bus	**$63,808**	$58,118	$81,372
Guideline Range	*$38,000 - $41,000*		
Annual Cost per Run	$11,941	$11,960	$11,899

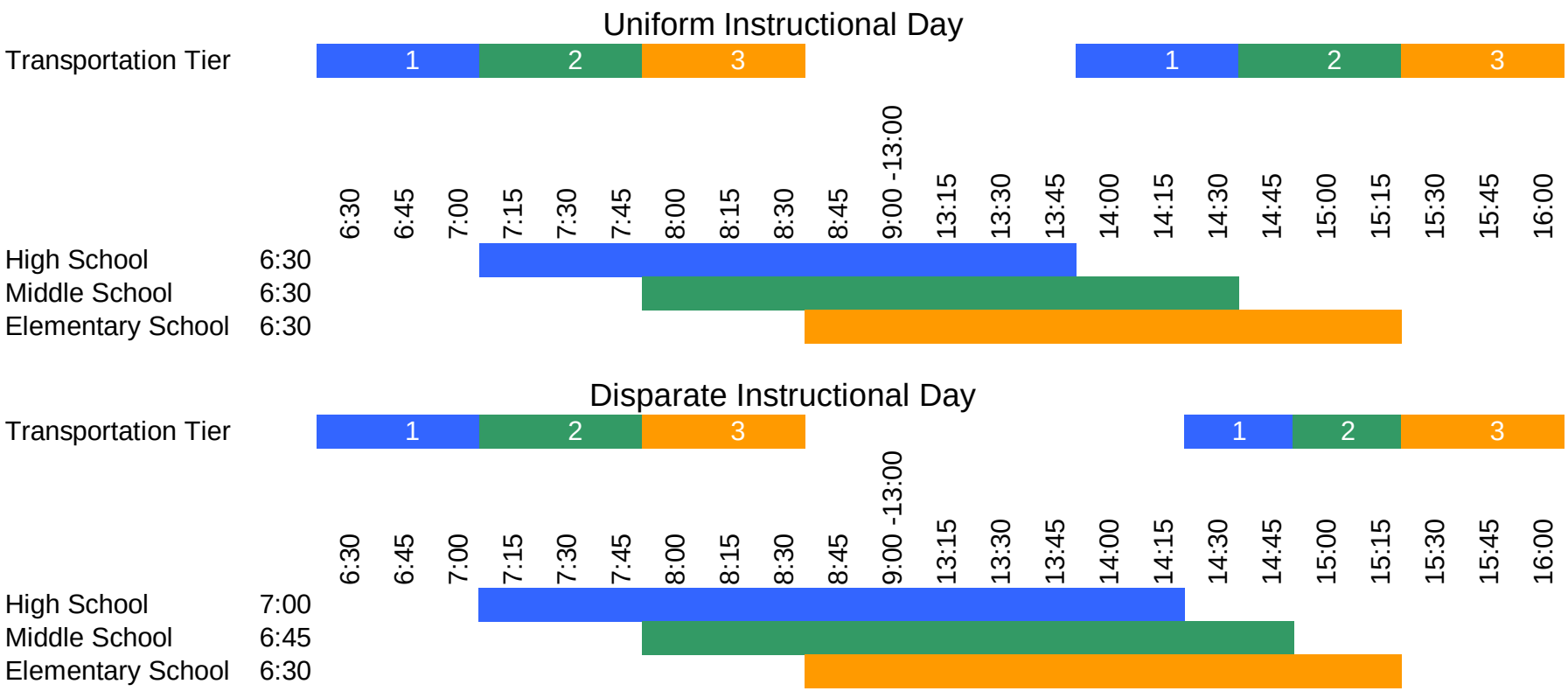
Performance of the Current System
Performance Measures

WHAT IS BEING MEASURED	***CALCULATION***	***PERFORMANCE GUIDELINE***	***FCPS VALUE***
Avg. Buses per 100 Students Transported	Total Buses/ (total students/100)	1.00 - 1.30	**1.00 morning** **0.96 afternoon**
Percent of planned capacity being utilized	Actual passengers/ Planned bus capacity	60% - 70%	**ES 48%** **HS 84%** **MS 74%** **SpEd 26%**
Avg. daily runs per bus	Total runs / total buses	3.0	**3.2 morning** **3.4 afternoon**

Why Are These Indicators Impressive?

1. **Service demands are extremely high**
   - ✓ Variability in length of the instructional day
   - ✓ Numerous special schools and programs
   - ✓ District-wide and cross-boundary attendance at schools & programs
2. **District Topography is Complex**
   - ✓ Long travel time & distances for some schools & programs
   - ✓ Extremely high traffic congestion
   - ✓ Complex school boundary & transportation configurations

Impact of Instructional Day Length on Transportation (Example for Illustration)



Impact of Bell Time & Run Length Variability

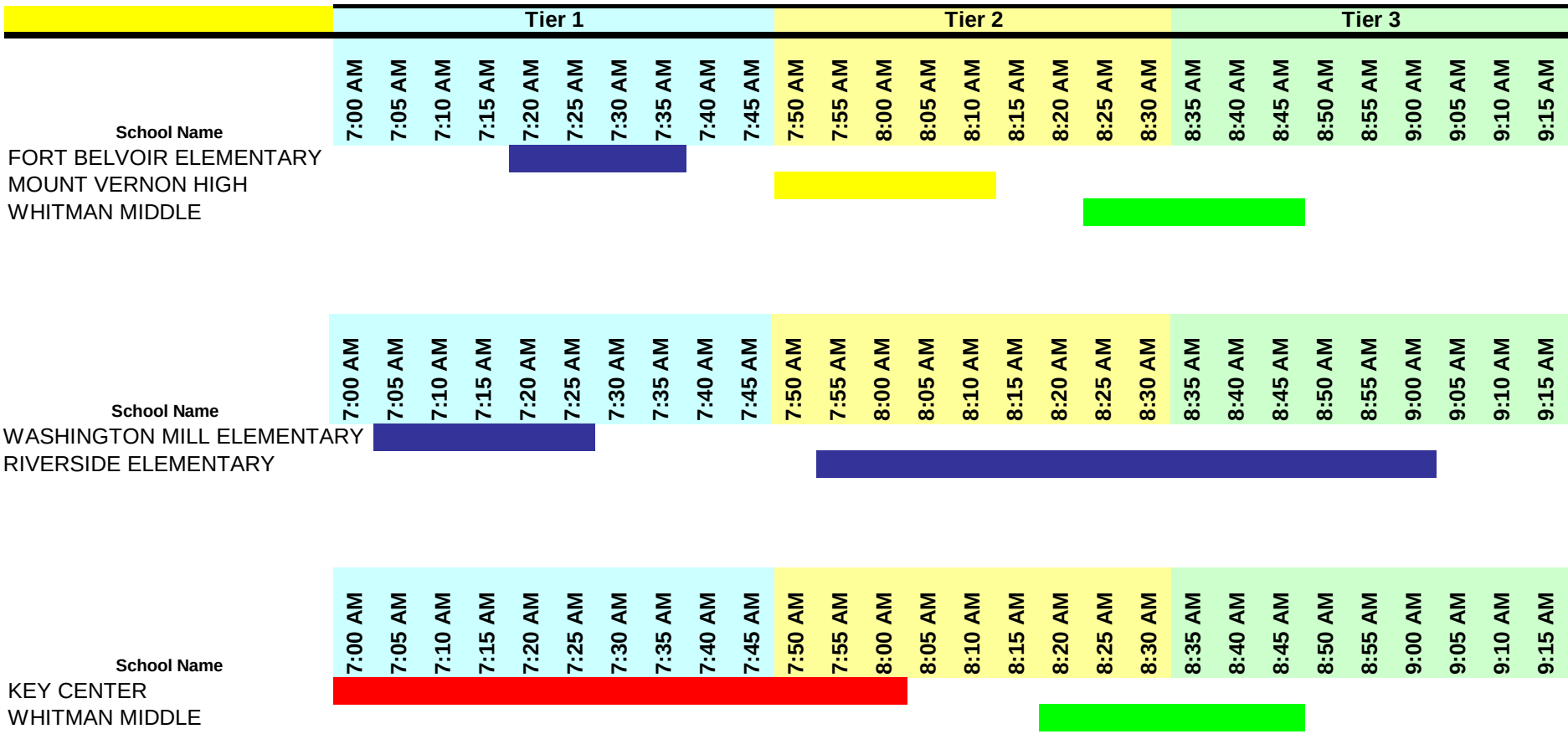
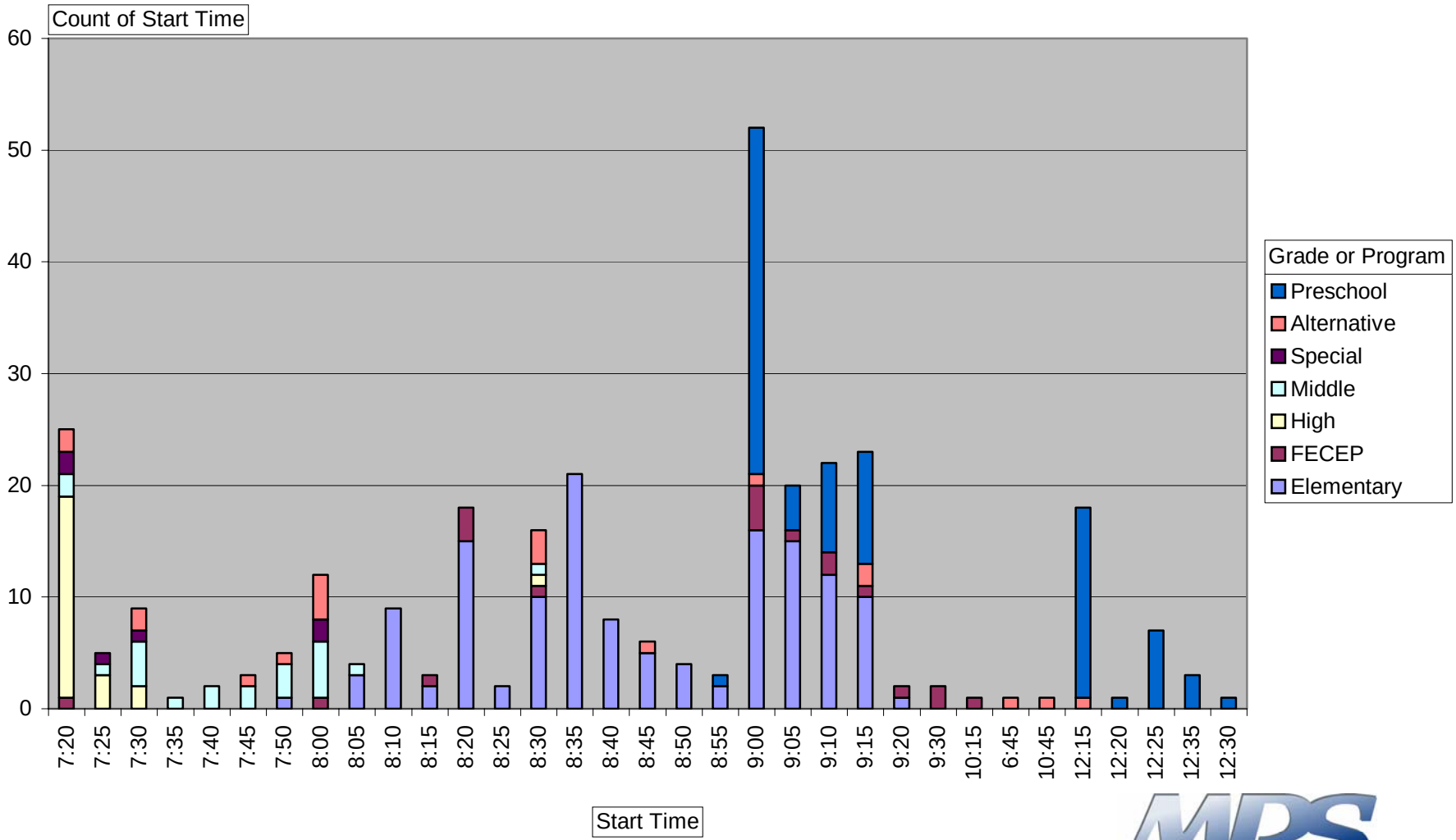


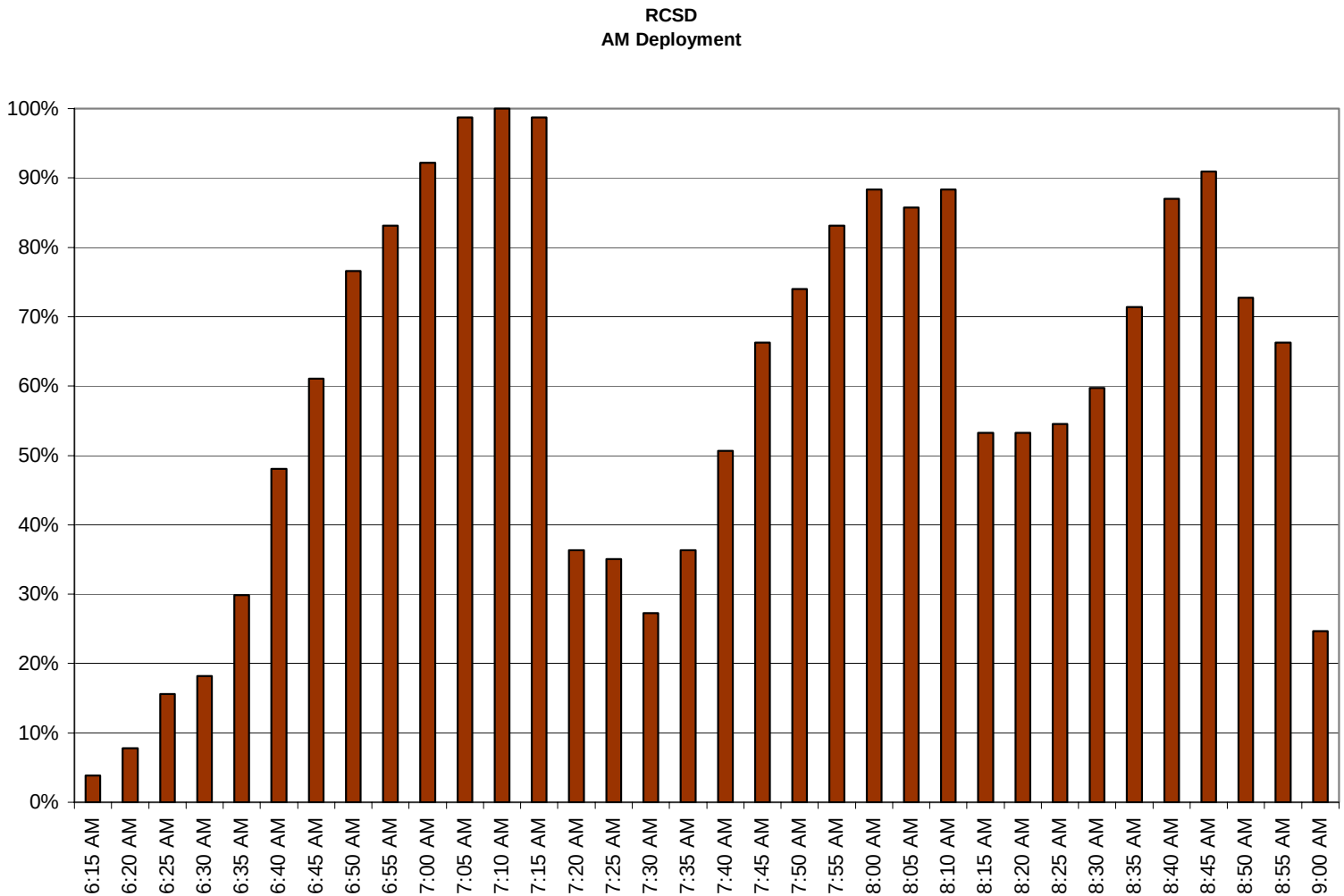
Illustration of Current Rolling Bell Times

Count of Programs by Start Time



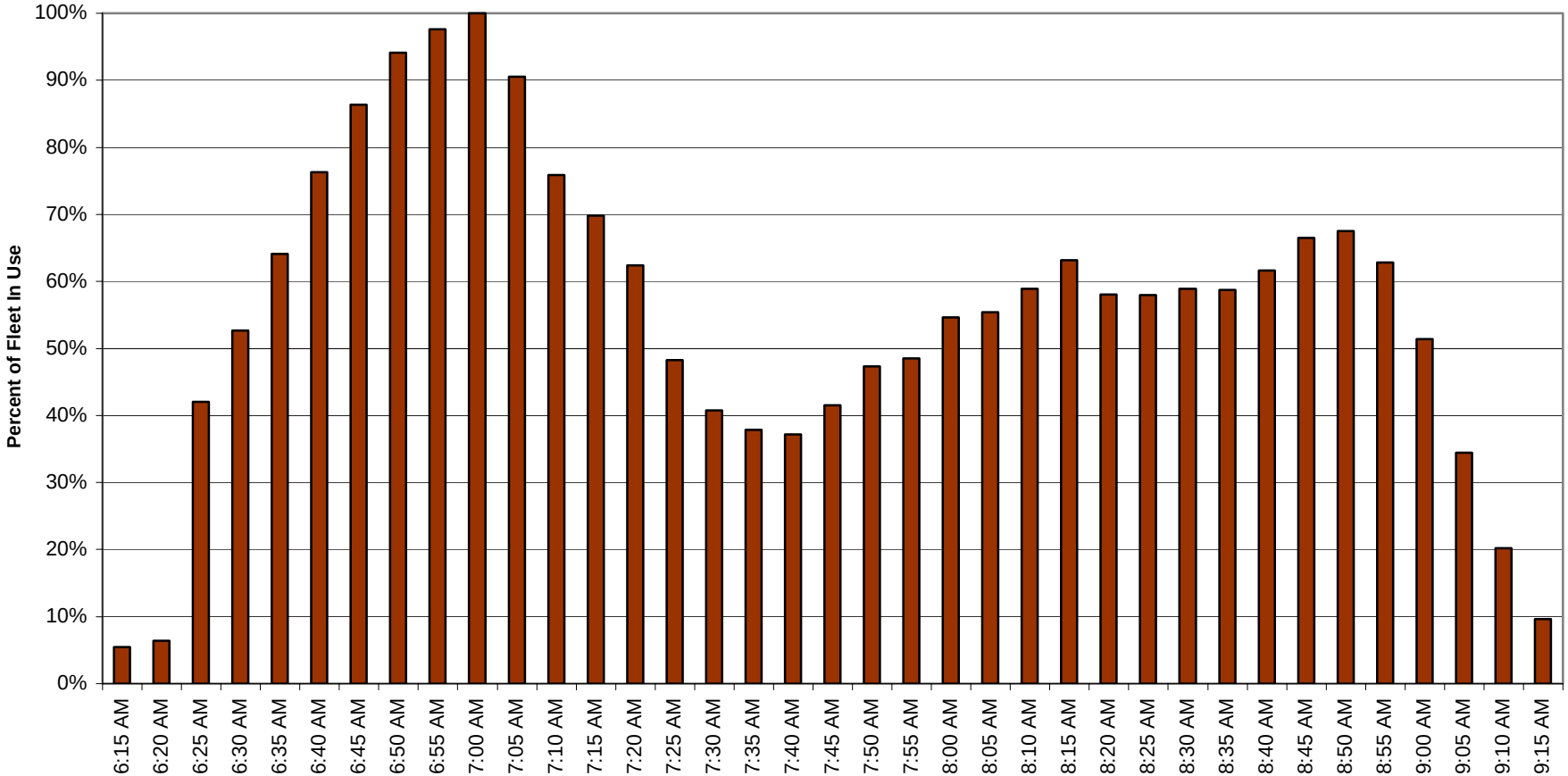
Impact on Overall Fleet Deployment

Example of Typical Deployment Pattern



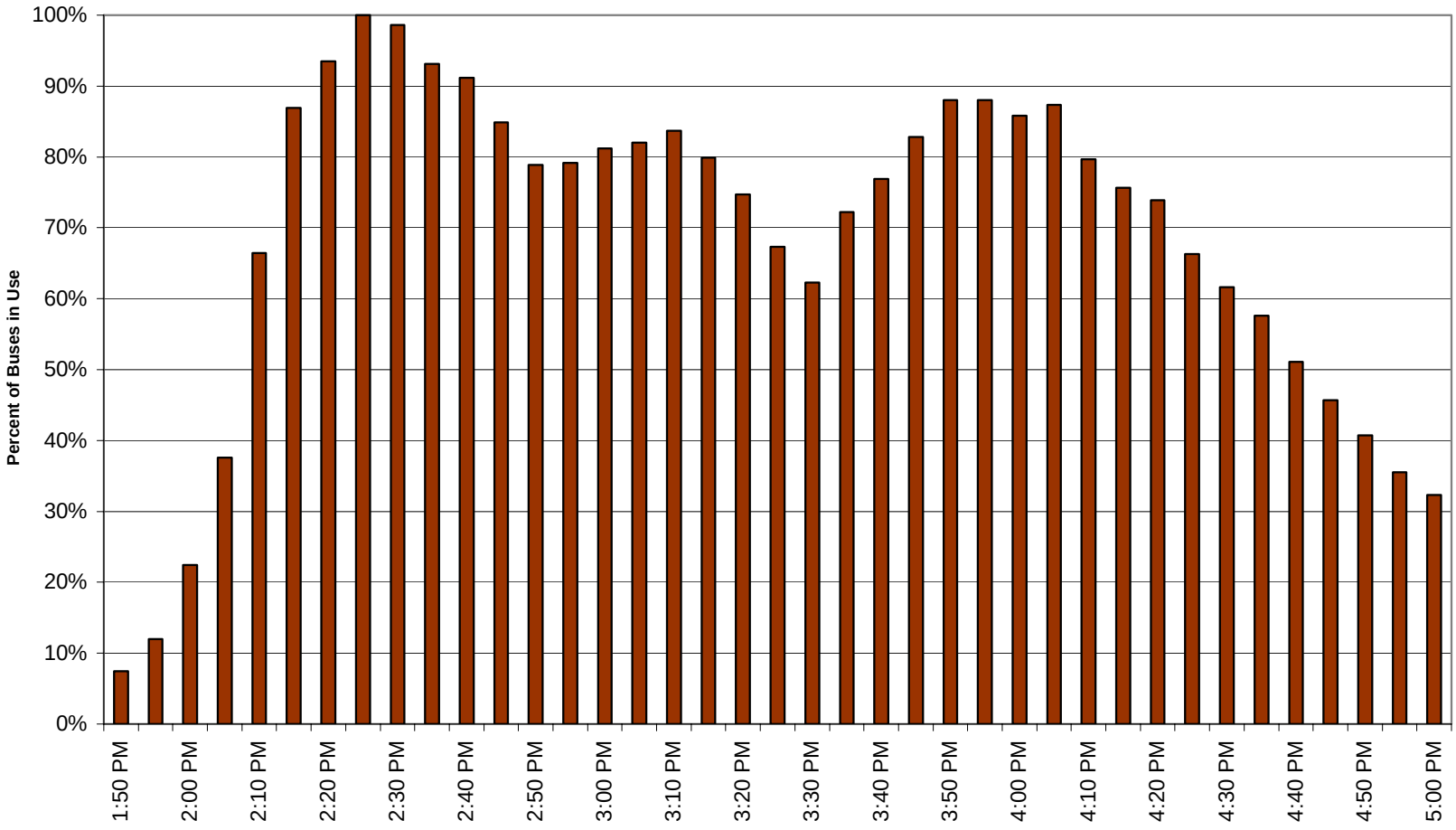
Actual FCPS AM Deployment Pattern

Morning Fleet Deployment
Percent of Fleet Deployed



Actual FCPS PM Deployment Pattern

Afternoon Fleet Deployment
Percent of Buses in Use



What Challenges Does This Pose?

- The system is already being pushed very hard
- There is no slack in terms of underutilized capacity (combination of buses and time)
- Variances in length of instructional day complicate bell time alignment
- Cross-boundary and district-wide programs = long run times and core pyramid bell times coordination difficulties
- “Domino Effect” - Indistinct feeder patterns & time tiers limit route linkage combinations

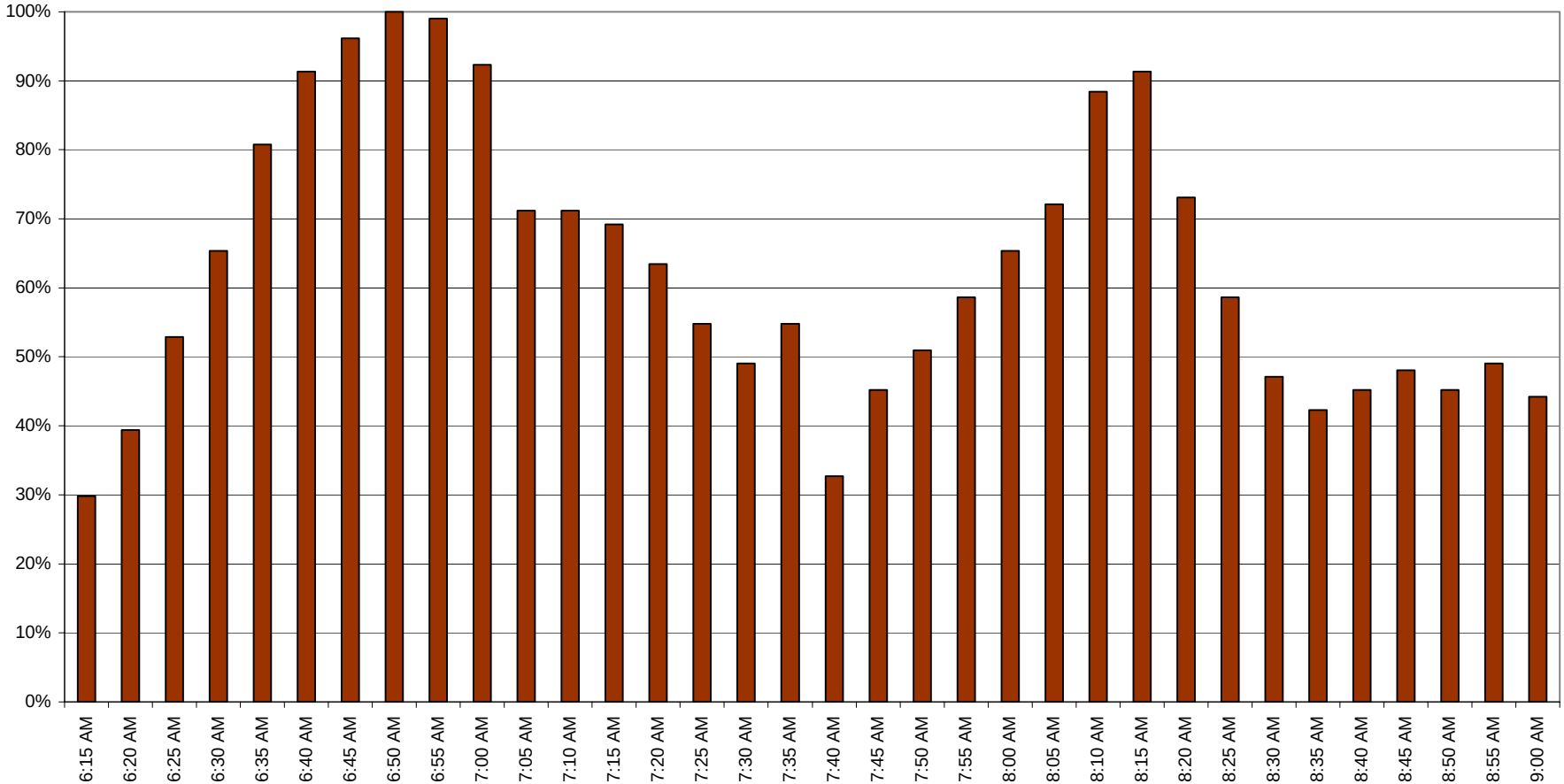
Example: Mt. Vernon Pyramid
Basic Pyramid Statistics

MT. VERNON PYRAMID - CURRENT FLEET DEPLOYMENT	Count of Runs	
	Morning	Afternoon
Total of All Buses Serving Pyramid	94	94
Total of All Runs for Buses Serving Pyramid	299	357
Total of all Runs Within Pyramid	169	204
	57%	*57%*

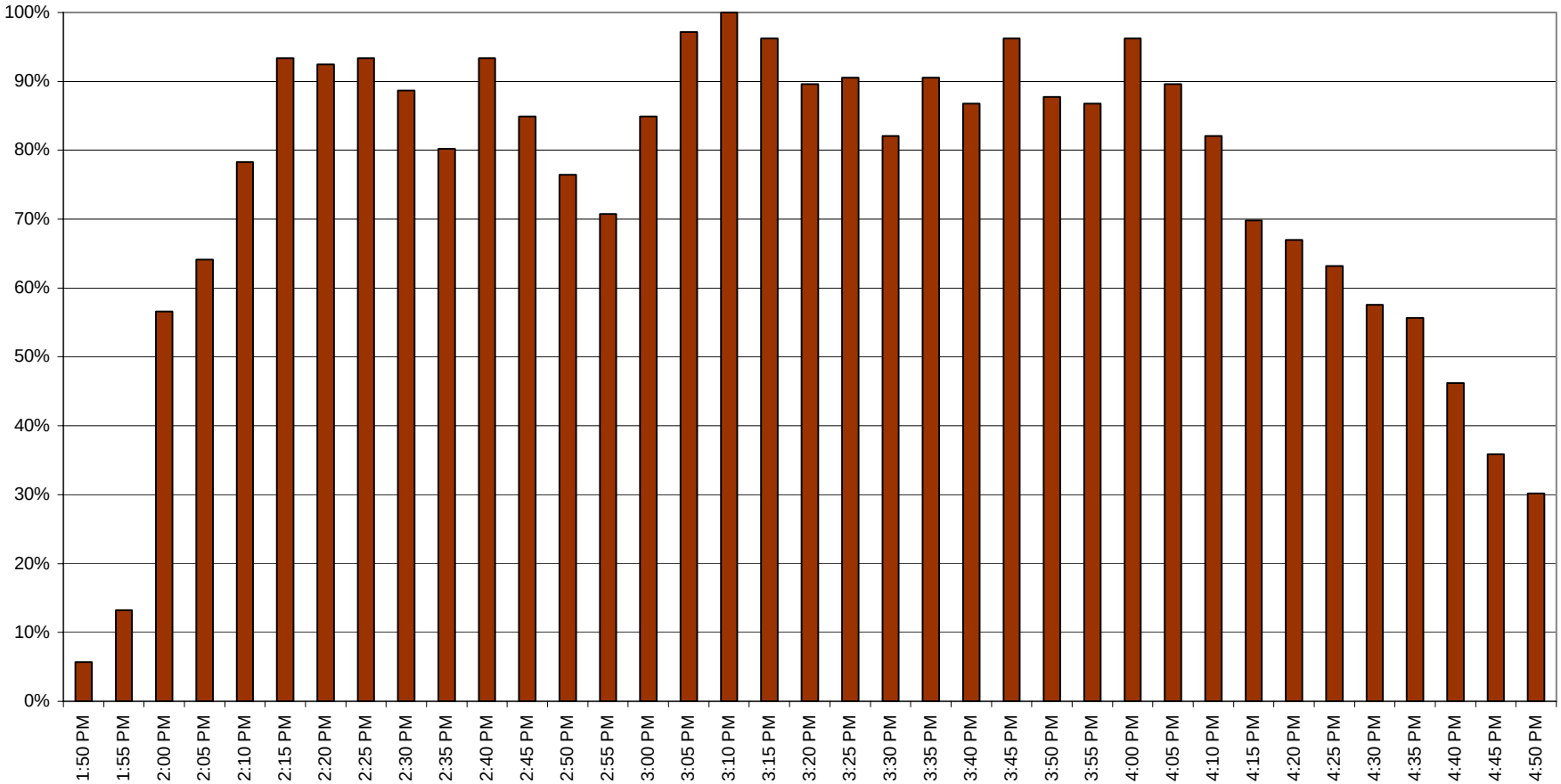
MT. VERNON PYRAMID - CURRENT BELL TIMES

School Name	Program	Instr Day	Current Start	Current Dismiss
Mt. Vernon HS/Ctr	H	6:45	7:20 AM	2:05 PM
Whitman MS	M	6:55	7:45 AM	2:40 PM
Gunston Alternative	A	5:00	8:00 AM	1:00 PM
Mt.Vernon Wds ES	E	6:30	8:10 AM	2:40 PM
Gunston ES – FECEP	F	6:40	8:20 AM	3:00 PM
Bryant Ctr – II – PO	A	6:40	8:30 AM	3:10 PM
Bryant Ctr – III – PO	A	6:40	8:30 AM	3:10 PM
Bryant HS – PO/FECEP	A	6:40	8:30 AM	3:10 PM
Bryant/Bucknell ES - FECEP	F	6:40	8:30 AM	3:10 PM
Washington Mill ES	E	6:35	8:35 AM	3:10 PM
Woodlawn ES	E	6:30	8:40 AM	3:10 PM
Woodley Hills ES	E	6:30	8:40 AM	3:10 PM
Riverside ES	E	6:30	8:50 AM	3:20 PM
Bryant MS – ALC	A	4:00	9:00 AM	1:00 PM
Mt. Vernon Woods El	P	3:15	9:10 AM	12:25 PM
Fort Belvoir ES	E	6:30	9:20 AM	3:50 PM
Bryant HS – ALC	A	4:00	10:45 AM	2:45 PM
Mt. Vernon Woods El	P	3:15	12:25 PM	3:40 PM

Example: Mt. Vernon Pyramid
Current Morning Deployment



Example: Mt. Vernon Pyramid
Current Afternoon Deployment



Example: Mt. Vernon Pyramid
Results Comparison
Change In-Pyramid Bell Times Only (Low-end Solution)

Scenario B:

- HS start time 8:10
- MS start time 7:20
- ES start 7:45 – 9:20
- Route conflicts:
  - 9% morning
  - 14% afternoon

Scenario D:

- HS start time 8:30
- MS start time 8:55
- ES start 7:45 or 9:15
- Route conflicts:
  - 12% morning
  - 15% afternoon

Example: Mt. Vernon Pyramid Results

Change In-Pyramid Bell Times Only (Low-end Solution)

- Conversion of route conflicts to buses required:
  - One route does not equal one bus because of route linkage opportunities
  - Service considerations (e.g., instructional day) limit the number of linkage opportunities available
- Results:
  - 66 route conflicts resolved using existing buses
  - 32 route conflicts resolved by adding buses
  - 16 new buses required (17% increase)
  - Average of only 2 daily routes assigned to each new bus (leaving excess capacity)

Mt. Vernon Pyramid - Extending the Analysis

Change Times for <u>All</u> Schools Served by Pyramid Buses (Reflects Highest Potential Resource Demand)

- Align all out-of-pyramid school bell times to match Scenario D (Scenario D Revised)
- More reflective of overall project goal (move all HS to a later start time)
- Issues this creates:
  - Clustering of bell times impacts route linkages (change from current rolling bell times)
  - More schools in Tier 1 required to reduce “bunching” of dismissal times between Tier 2 HS and Tier 3 ES

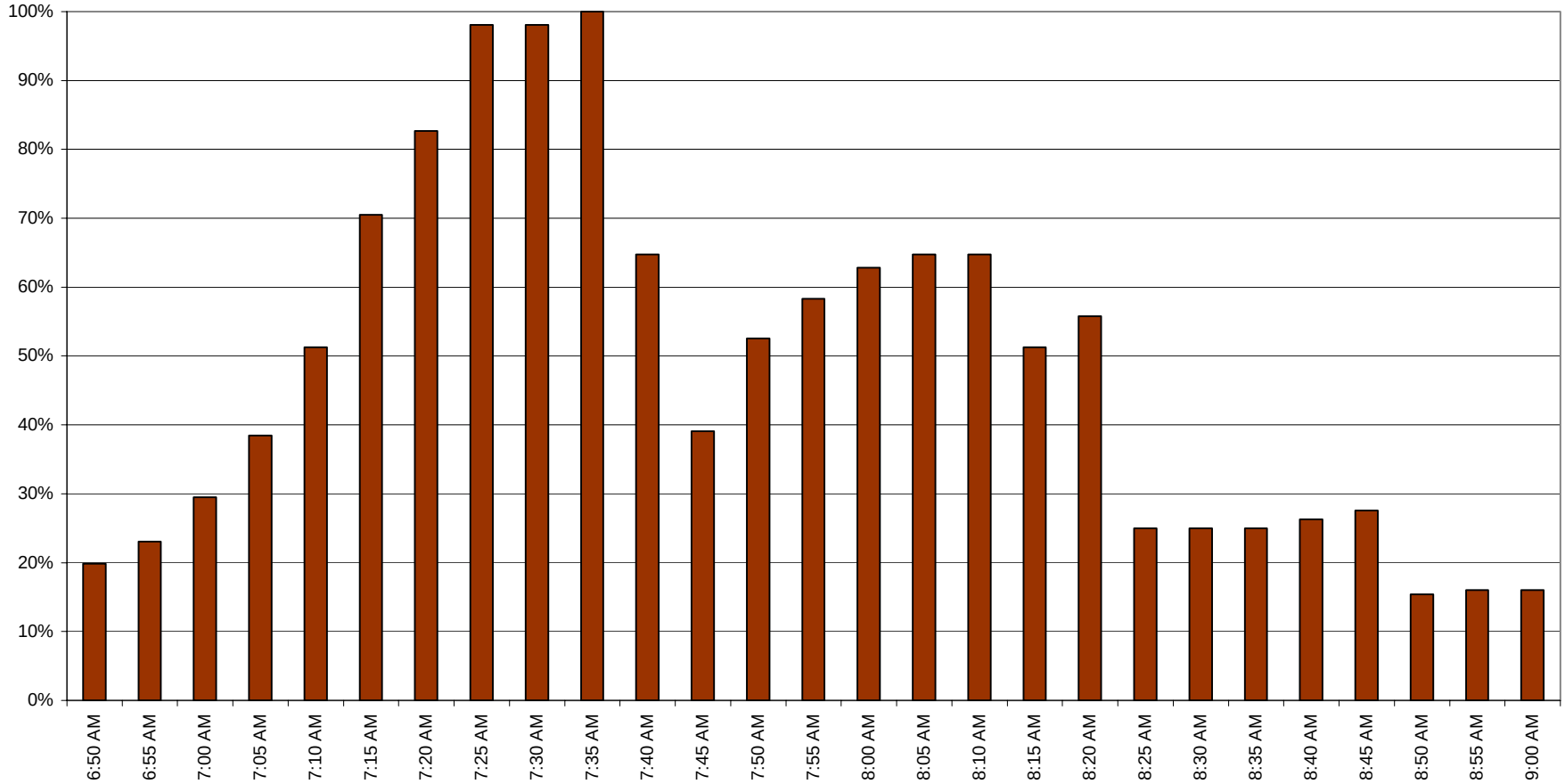
Example: Mt. Vernon Pyramid
Results & Resource Impacts
Change Times for <u>All</u> Schools Served by Pyramid Buses

- Key Elements & Adjustments:
  - Most ES placed on Tier 1 (7:45 AM start)
  - Several ES routes require split to avoid twilight constraint violations
  - Several ES routes start between 7:00 and 7:15 A.M.
  - Current 25 minute separation between HS and MS maintained

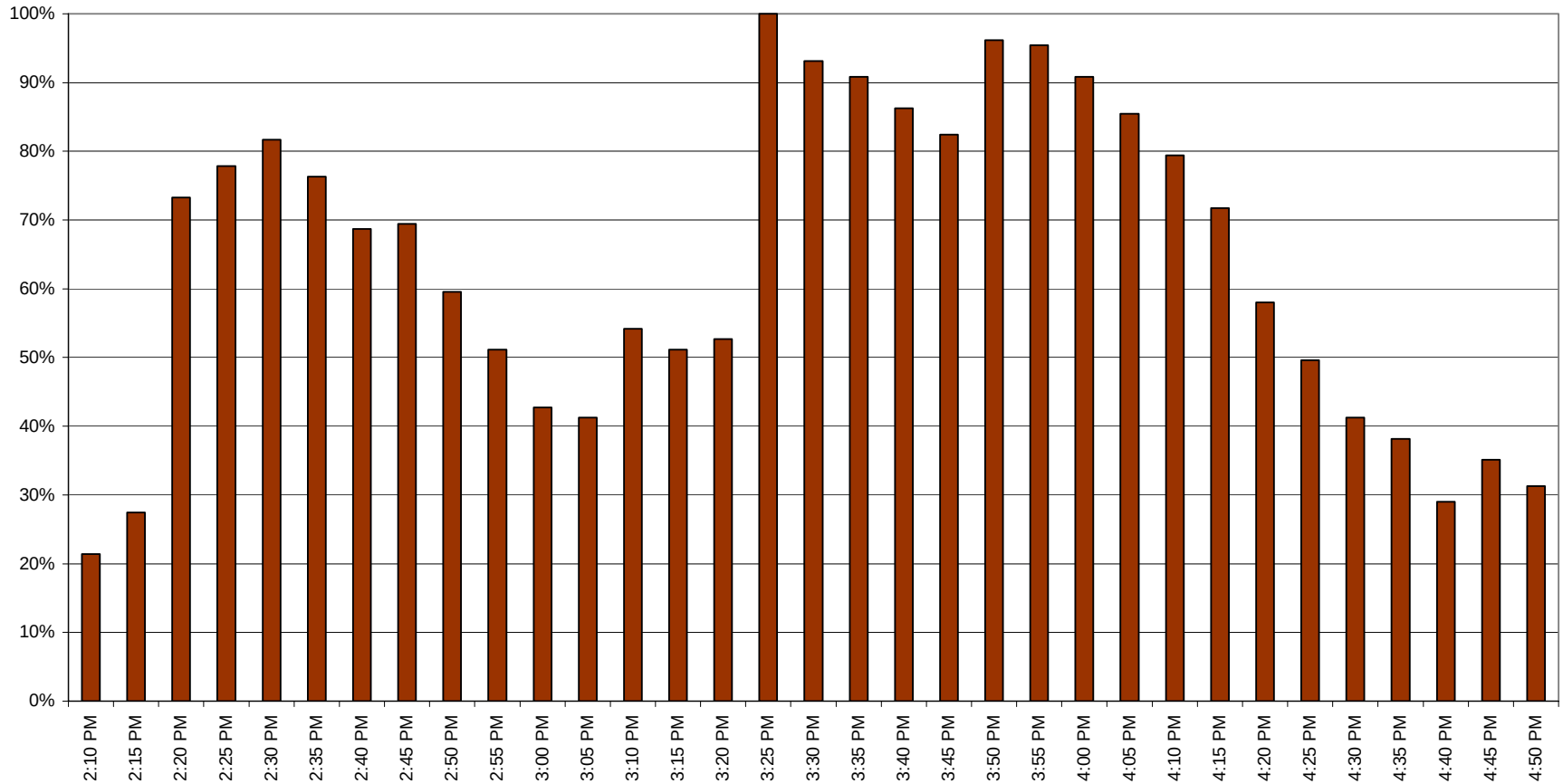
Example: Mt. Vernon Pyramid
Scenario D Revised – Core Bell Times

School Name	Current Start	Inst Day	New Start	New End	Tier
FORT BELVOIR ELEMENTARY	9:20	6:30	7:45	14:15	1
GUNSTON ELEMENTARY	8:20	6:40	7:45	14:25	1
RIVERSIDE ELEMENTARY	8:50	6:30	7:45	14:15	1
WASHINGTON MILL ELEMENTARY	8:35	6:35	7:45	14:20	1
WOODLEY HILLS ELEMENTARY	8:40	6:30	7:45	14:15	1
GUNSTON ALTERNATIVE SCHOOL	8:00	5:00	8:00	13:00	1
MOUNT VERNON HIGH	7:20	6:45	8:30	15:15	2
WHITMAN MIDDLE	7:45	6:55	8:55	15:50	2
MOUNT VERNON WOODS ELEMENTARY	8:10	6:30	9:15	15:45	3
WOODLAWN ELEMENTARY	8:40	6:30	9:15	15:45	3

Example: Mt. Vernon Pyramid
Scenario D Revised - Morning Deployment



Example: Mt. Vernon Pyramid
Scenario D - Revised Afternoon Deployment



Mt. Vernon Pyramid
Scenario D Revised
Results & Resource Impacts

- 54 additional buses required (57% increase)
- Marginal cost of additional buses = $3,417,160

Summary of Bell Times
Scenario D & E Revised

Scenario D

Mt Vernon Pyramid

- HS – 8:30
- MS – 8:55
- ES – 7:45 or 9:15

Woodson Pyramid

- HS – 8:30
- MS – 8:35
- ES – 7:40, 7:45, or 9:15

Scenario E

Mt Vernon Pyramid

- HS – 8:30
- MS – 9:15
- ES – 7:50, 8:15, 9:15

Woodson Pyramid

- HS – 8:30
- MS – 8:35
- ES – 7:40, 7:45, or 9:15

Fleet Deployment Comparison
Scenario D & E Revised

Measure	Mt. Vernon	Woodson
Buses in Use		
Current	94	124
Scenario D	148	190
Scenario E	141	179
Daily Runs per Bus		
Current	7.0	5.0
Scenario D	4.3	3.5
Scenario E	4.8	3.7
Average Bus Running Time		
Current	6:14	
Scenario D	3:51	
Scenario E	4:18	

Summary of Results
Scenario D & E Revised
Reflects <u>Highest</u> Potential Resource Impact

Scenario D

Mt Vernon Pyramid

- 54 Additional Buses
- 57% increase

Woodson Pyramid

- 66 Additional Buses
- 53% increase

Scenario E

Mt Vernon Pyramid

- 47 Additional Buses
- 50% increase

Woodson Pyramid

- 55 Additional Buses
- 44% increase

Discussion

Key Factors Influencing Current Results

- Influence of cross-boundary and district-wide programs
- Influence of non-linear instructional day lengths
- Influence of indistinct tier structure
- Absence of logistical buffers (slack) in the current system
- Influence of indistinct feeder patterns
- Reduction in morning & afternoon transportation window from 1:45 to 1:30
- Significant morning twilight conflicts for ES causing split routes

Discussion

Potential Options for Reducing High-End Impact

- Utilize Scenario “D” or “E” HS start/end, but revert to a rolling schedule for other schools
- Opening the transportation time window
- Instructional day changes to achieve more uniformity
- Phased implementation of bell time changes

Discussion
Options for

- Significant programmatic and/or transportation service delivery compromises necessary to reduce cost impact
- Problem is bracketed by length of morning and afternoon route series
- Lack capacity to absorb additional resource demands; need more buses or more time
- Viability of mixing early and late start high schools?
- Viability of a pilot program at one or two pyramids?
- Others?

Final Steps

1. Gather comments & finalize analysis by Tuesday, November 1
2. Develop and submit presentation of results to SB by Thursday, November 3
3. Conduct presentation of results to SB during work session of November 7
4. Draft and submit final project report by Friday, November 18