



ENROLLMENT PROJECTION METHODOLOGY
SEPTEMBER 13, 2016

LOUDOUN COUNTY PUBLIC SCHOOLS
DEPARTMENT OF SUPPORT SERVICES, PLANNING SERVICES DIVISION

Objectives

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- Enrollment Projection Methodology
- Understanding Cohort Survival Terms
 - “Top Down” & “Bottom Up” Enrollment Projection Processes
 - How Enrollment Alternatives are Derived
 - Variables Influencing Student Enrollment

Definition of Terms

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➤ **Cohort**

- A group of people (unit of analysis) bound by time, circumstances, and/or characteristics, at a point in time, that is monitored over time.
 - 5th Grade Students at Arcola Elementary School
 - All LCPS 5th Grade Students

Definition of Terms

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- **Cohort** (continued)
 - What Students Are Included In A Cohort?
 - All Students, Kindergarten - Grade 12
 - Adjustments Made To Reassign To A “Home” School’s Cohort
 - “Overflowed” (Involuntarily Assigned) Students from Another School
 - Attendance Zone “Grandfathered” Students from Another School
 - Students Attending Regional Programs (e.g., Full Day Kindergarten)

Definition of Terms

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➤ **Survival**

- Changes to a Cohort Over Time
- Comparison of Students in a Particular Grade (or Cohort) to their Prior Year Numbers
- The Ratio or Rate of Change Reveals Enrollment Trends
 - Rate of 1.0 = Stable Enrollment
 - Rate Greater than 1.0 = Increasing (Growing) Enrollment
 - Rate Less than 1.0 = Decreasing (Declining) Enrollment

The Math – Cohort Survival Method

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Projecting Next Year's 2nd Grade Class at ABC Elementary School

ABC Elementary School	Prior Year	Current Year	1 Year Rate of Change	Next Year, Base Projection
			$(\text{Current Year 2}^{\text{nd}} \text{ Grade}) / (\text{Prior Year 1}^{\text{st}} \text{ Grade})$	$(\text{Current Year 1}^{\text{st}} \text{ Grade}) \times (\text{1 Year Rate of Change})$
1 st Grade	100	90		
2 nd Grade	112	110	1.10	$90 \times 1.10 = 99$

For detail, consult Addendum Slides 25-26.

If the 1 year rate of change is 1.10, and there are 100 1st grade students in the current year, how many 2nd grade students are projected for next year?

You are encouraged to work with a partner or two, helping each other find the solution.

The Math – Cohort Survival Method

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- The Most Recent Five Years of Enrollment Ratios (Rates of Change) are the Base for Eight Change Rate Options

		Hypothetical Enrollment Rates				
		2011-12	2012-13	2013-14	2014-15	2015-16
		1	1.1	1.2	1.3	1.4
		<hr/>				
		Hypothetical Enrollment Averages				
1	One Yr. Rate	1.4				
2	Two Yr. Rate Avg.	$(1.4+1.3) / 2 = 1.35$				
3	Three Yr. Rate Avg.	$(1.4+1.3+1.2) / 3 = 1.3$				
4	Four Yr. Rate Avg.	$(1.4+1.3+1.2+1.1) / 4 = 1.25$				
5	Five Yr. Rate Avg.	$(1.4+1.3+1.2+1.1+1) / 5 = 1.2$				
6	Low	1				
7	High	1.4				
8	Other					

- Other – applied to exceptional circumstances.

For detail, consult Addendum Slides 27-34.

3 Year Ratio Average

	Annual Cohort Ratios					Scenario
	2011-12	2012-13	2013-14	2014-15	2015-16	3 Yr. Avg.
Kindergarten	0.93	0.95	0.98	0.91	0.96	0.95
Grade 1	1.16	1.17	1.18	1.18	1.20	1.19
Grade 2	1.02	1.02	1.02	1.03	1.03	1.03
Grade 3	1.02	1.02	1.03	1.02	1.04	1.03
Grade 4	1.03	1.03	1.03	1.02	1.04	1.03
Grade 5	1.02	1.02	1.01	1.02	1.02	1.02
Grade 6	1.02	1.02	1.02	1.02	1.03	1.02
Grade 7	1.03	1.03	1.03	1.03	1.03	1.03
Grade 8	1.02	1.03	1.03	1.01	1.02	1.02
Grade 9	1.04	1.05	1.04	1.06	1.05	1.05
Grade 10	1.01	1.02	1.01	1.03	1.02	1.02
Grade 11	0.99	1.00	1.00	1.01	1.01	1.01
Grade 12	0.99	0.99	1.00	1.00	1.00	1.00

High Ratio

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	Annual Cohort Ratios					Scenario High
	2011-12	2012-13	2013-14	2014-15	2015-16	
Kindergarten	0.93	0.95	0.98	0.91	0.96	0.98
Grade 1	1.16	1.17	1.18	1.18	1.20	1.20
Grade 2	1.02	1.02	1.02	1.03	1.03	1.03
Grade 3	1.02	1.02	1.03	1.02	1.04	1.04
Grade 4	1.03	1.03	1.03	1.02	1.04	1.04
Grade 5	1.02	1.02	1.01	1.02	1.02	1.02
Grade 6	1.02	1.02	1.02	1.02	1.03	1.03
Grade 7	1.03	1.03	1.03	1.03	1.03	1.03
Grade 8	1.02	1.03	1.03	1.01	1.02	1.03
Grade 9	1.04	1.05	1.04	1.06	1.05	1.06
Grade 10	1.01	1.02	1.01	1.03	1.02	1.03
Grade 11	0.99	1.00	1.00	1.01	1.01	1.01
Grade 12	0.99	0.99	1.00	1.00	1.00	1.00

Definition of Terms

- **“Top Down” Scenario Analysis**
 - Entire LCPS Student Enrollment
 - Apply a cohort change rate to the division-wide student enrollment to estimate the next year(s) enrollment. Eight alternatives.
- **“Bottom Up” Scenario Analysis**
 - School by School Student Enrollment
 - Apply a cohort change rate to a school’s current student enrollment to estimate the next year(s) enrollment. Eight alternatives.
 - Calculate for every individual school.
 - Sum projected enrollments for all schools to determine the division-wide projected enrollment for the next year(s).

The “Top Down” & “Bottom Up” Projection Processes

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The division-wide “Top Down” projection analysis has eight (8) scenarios. One is selected.

Each school’s “Bottom Up” projection analysis has eight (8) scenarios.

For the 2015-16 school year, LCPS had 86 schools for a total of 688 alternatives.

Each “Top Down”/“Bottom Up” Projection Selection Is A Judgement Call, Based On History And Expectations.

The Projection Process - Professional Judgement

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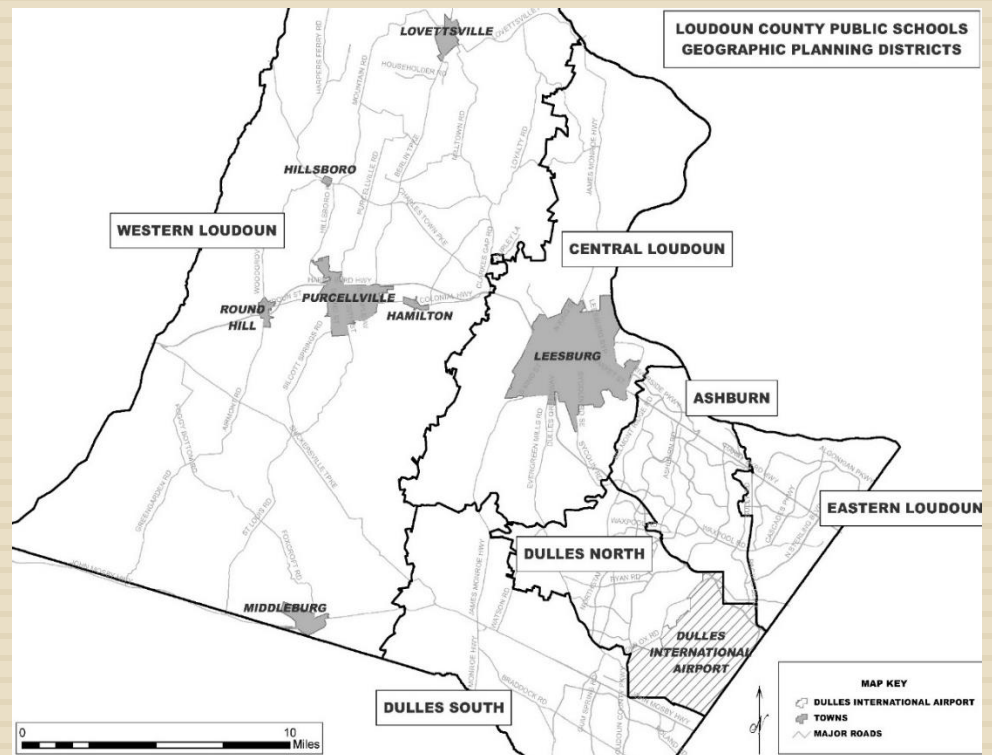
- Includes Enrollment History & Important Data Trends
- Knowledge of Unique Attendance Zone Factors
- Considerations
 - Regional/Cluster Patterns (Slide 14)
 - Student Generation Factors (Slide 15)
 - Residential Development (Slides 16-18)
 - Birth Rate Eligibility (Slide 19)

What is Considered?

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Regional/Cluster Patterns – Loudoun has growth areas, stable and declining regions/clusters.

- With “Top Down” analysis, if on balance the division has greater growth, staff is more likely to select a ratio with a higher change rate.
- With “Bottom Up” analysis, if a school is located in a high growth area (e.g., Dulles North), staff is more likely to select a change rate higher than others.



What is Considered?

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Student Generation Factors

Loudoun County Public Schools - Student Generation Factors, 2015

Code	Planning District by Utility Service Areas	Single Family Detached (SFD)	Single Family Attached (SFA)	Multi-Family (MF)
WU	LCPS Students	41107	19266	8737
	Total Housing Units	51501	35181	27585
	Student Generation Factors	0.80	0.55	0.32

Student Generation = LCPS Students/Housing Units

WU - With Utilities

What is Considered?

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Residential Development – All Approved, Unbuilt Residential Units are Tracked by Subdivision, Planning Zone, and/or School Attendance Zone

AS AN EXAMPLE:

The Grove at Willowsford

Approved Units SFD	628
Constructed to Date	387
Remaining Units	241

241 X .80 (SFD Student Generation) = **193**

Estimated Elementary Students (.47)	91
Estimated Middle Students (.24)	46
Estimated High Students (.29)	<u>56</u>
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If a residential development has 300 remaining units, how many remaining K-12 students are anticipated to be generated in this development? Hint: Refer to the SFD student generation factor.

Bonus: Given the number of anticipated K-12 students to be generated, how many are anticipated at each level?

Hint: Refer to the percentage of generated students associated with each level.

You are encouraged to work with a partner or two, helping each other find the solution.

What is Considered?

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Residential Development – Data Excerpt The Grove at Willowsford

STUDY AREA	ES	MS	HS	DISTRICT	UTILITIES	REFERENCE	STATUS	PROPOSE D SFD	PROPOSE D SFA	PROPOSE D MF	PROPOSE D TOTAL	DEVELOPMENT NAME
DS07.4	BUF	MMS	JCH	DS	WU	SBPL-2012-0003	APRD	628	0	0	628	GROVE AT WILLOWSFORD

ADDRESS ED SFD	ADDRESS ED SFA	ADDRESS ED MF	ADDRESS ED TOTAL	FUTURE SFD	FUTUR E SFA	FUTUR EMF	TOTAL	FUTURE ES Students	FUTURE MS Students	FUTURE HS Students	TOTAL STUDENTS
387	0	0	387	241	0	0	241	91	46	56	193

What is Considered?

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Birth Rate Eligibility

Eligible K YEAR	Eligible K Cohort	Actual K Students	K Ratio
2005-06*	3522	3964	1.13
2015-16	5092	4881	0.96

*Monthly births, October 1999 - September 2000

Kindergarten (K) Ratio = Actual K Students/Eligible K Cohort

In Loudoun County, the rate of growth has slowed.

Reconciliation

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ABC Elementary School

Grade 5 Enrollment	178
Bottom Up Grade 5 Cohort	6123
ABC Grade 5 Percent	2.9%

ABC Elementary School Reconciliation

ABC Elementary, Grade 5 Percent	2.9%
"Top Down" Division Grade 5 Cohort	6103

$$6103 \times 2.9\% = 177$$

ABC Elementary, Grade 5 Adjusted Final	177
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If the 5th grade projected enrollment for a school is 2.9% of the projected division enrollment per the “bottom up” analysis, and the projected division enrollment in 5th grade per the “top down” analysis is 7000 students, what is the adjusted number of projected 5th grade students at the school?

You are encouraged to work with a partner or two, helping each other find the solution.

Reconciliation

For the FY 2017-22 projection period, the reconciliation process was applied to 86 schools (excluding Madison's Trust ES, CS Monroe Technology Center, and Douglass School) in finalizing the enrollment projections for the division.



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Addendum

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Division Cohort Analysis

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Historic Enrollments are used to derive grade level ratios

	<u>2014-15</u>	<u>2015-16</u>
Birth Rate-Eligibility	5363	5064
Kindergarten	4891	4879
Grade 1	5901	5863
Grade 2	5893	6072
Grade 3	5764	6109
Grade 4	5871	6005
Grade 5	5954	5967

Cohort Analysis

	<u>2014-15</u>	<u>2015-16</u>
Birth Rate-Eligibility	5363	5064
Kindergarten	4891	4879
Grade 1	5901	5863
Grade 2	5893	6072

→ $6072 / 5901 = 1.028978$



This ratio is then multiplied by the current year (2015-16) Grade 1 students to predict the 2016-17 Grade 2 cohort: $5863 \times 1.028978 = 6033$

1 Yr.
0.963468
1.198732
1.028978

One Yr.	<u>2016-17</u>
Birth Rate-Eligibility	4988
Kindergarten	4806
Grade 1	5849
Grade 2	6033

Cohort Analysis

The cohort ratios are used to produce seven enrollment scenarios: one through five ratio averages, a high and a low ratio. An eighth alternative is applied in exceptional circumstances.

Annual Ratios					
	2011-12	2012-13	2013-14	2014-15	2015-16
Grade 2	1.02019	1.023871	1.019899	1.032773	1.028978

Enrollment Projection Ratios							
	High	Low	5 Yr. Avg.	4 Yr. Avg.	3 Yr. Avg.	2 Yr. Avg.	1 Yr.
Grade 2	1.032773	1.019899	1.025142	1.02638	1.027216	1.030875	1.028978

FY 2017-22 Enrollment Projection Summary

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Initial Division-Wide “Top Down” Enrollment Projection Summary

	<u>9/23/2015</u>	<u>2016-17</u>	<u>2017-18</u>	<u>2018-19</u>	<u>2019-20</u>	<u>2020-21</u>	<u>2021-22</u>
One Year							
Regular Ed (K-12).	75151	77557	79557	81189	82855	84133	85388
Two Year							
Regular Ed (K-12)	75151	77293	79003	80334	81668	82590	83508
Three Year							
Regular Ed (K-12)	75151	77195	78823	80086	81391	82326	83238
Four Year							
Regular Ed (K-12)	75151	77153	78748	79989	81278	82198	83085
Five Year							
Regular Ed (K-12)	75151	77049	78546	79706	80915	81762	82569
High							
Regular Ed (K-12)	75151	77809	80082	82001	83923	85446	86923
Low							
Regular Ed (K-12)	75151	76280	77012	77462	78005	78242	78484

2 Year Ratio Average

The ratios are recalculated to produce seven enrollment scenarios, **a two year average.**

Survival Ratios	Yearly Ratios					Enrollment Scenarios						
	2011-12	2012-13	2013-14	2014-15	2015-16	High	Low	5 Yr.	4 Yr.	3 Yr.	2 Yr.	1 Yr.
Kindergarten	0.92787	0.954941	0.975847	0.91199	0.963468	0.975847	0.91199	0.946823	0.951561	0.950435	0.937729	0.963468
Grade 1	1.15922	1.174172	1.180877	1.177844	1.198732	1.198732	1.159217	1.178168	1.182906	1.185818	1.188288	1.198732
Grade 2	1.02019	1.023871	1.019899	1.032773	1.028978	1.032773	1.019899	1.025142	1.02638	1.027216	1.030875	1.028978
Grade 3	1.01884	1.019791	1.027798	1.022348	1.036654	1.036654	1.018839	1.025086	1.026648	1.028933	1.029501	1.036654
Grade 4	1.02551	1.029031	1.03211	1.024429	1.041811	1.041811	1.024429	1.030577	1.031845	1.032783	1.03312	1.041811
Grade 5	1.02263	1.020666	1.013297	1.017778	1.016352	1.022629	1.013297	1.018144	1.017023	1.015809	1.017065	1.016352
Grade 6	1.0179	1.022321	1.015051	1.024472	1.029224	1.029224	1.015051	1.021794	1.022767	1.022916	1.026848	1.029224

3 Year Ratio Average

The ratios are recalculated to produce seven enrollment scenarios,
a three year average.

Survival Ratios	Yearly Ratios					Enrollment Scenarios						
	2011-12	2012-13	2013-14	2014-15	2015-16	High	Low	5 Yr.	4 Yr.	3 Yr.	2 Yr.	1 Yr.
Kindergarten	0.92787	0.954941	0.975847	0.91199	0.963468	0.975847	0.91199	0.946823	0.951561	0.950435	0.937729	0.963468
Grade 1	1.15922	1.174172	1.180877	1.177844	1.198732	1.198732	1.159217	1.178168	1.182906	1.185818	1.188288	1.198732
Grade 2	1.02019	1.023871	1.019899	1.032773	1.028978	1.032773	1.019899	1.025142	1.02638	1.027216	1.030875	1.028978
Grade 3	1.01884	1.019791	1.027798	1.022348	1.036654	1.036654	1.018839	1.025086	1.026648	1.028933	1.029501	1.036654
Grade 4	1.02551	1.029031	1.03211	1.024429	1.041811	1.041811	1.024429	1.030577	1.031845	1.032783	1.03312	1.041811
Grade 5	1.02263	1.020666	1.013297	1.017778	1.016352	1.022629	1.013297	1.018144	1.017023	1.015809	1.017065	1.016352
Grade 6	1.0179	1.022321	1.015051	1.024472	1.029224	1.029224	1.015051	1.021794	1.022767	1.022916	1.026848	1.029224

4 Year Ratio Average

The ratios are recalculated to produce seven enrollment scenarios,
a four year average.

Survival Ratios	Yearly Ratios					Enrollment Scenarios						
	2011-12	2012-13	2013-14	2014-15	2015-16	High	Low	5 Yr.	4 Yr.	3 Yr.	2 Yr.	1 Yr.
Kindergarten	0.92787	0.954941	0.975847	0.911199	0.963468	0.975847	0.911199	0.946823	0.951561	0.950435	0.937729	0.963468
Grade 1	1.15922	1.174172	1.180877	1.177844	1.198732	1.198732	1.159217	1.178168	1.182906	1.185818	1.188288	1.198732
Grade 2	1.02019	1.023871	1.019899	1.032773	1.028978	1.032773	1.019899	1.025142	1.02638	1.027216	1.030875	1.028978
Grade 3	1.01884	1.019791	1.027798	1.022348	1.036654	1.036654	1.018839	1.025086	1.026648	1.028933	1.029501	1.036654
Grade 4	1.02551	1.029031	1.03211	1.024429	1.041811	1.041811	1.024429	1.030577	1.031845	1.032783	1.03312	1.041811
Grade 5	1.02263	1.020666	1.013297	1.017778	1.016352	1.022629	1.013297	1.018144	1.017023	1.015809	1.017065	1.016352
Grade 6	1.0179	1.022321	1.015051	1.024472	1.029224	1.029224	1.015051	1.021794	1.022767	1.022916	1.026848	1.029224

5 Year Ratio Average

The ratios are recalculated to produce seven enrollment scenarios,
a five year average.

Survival Ratios	Yearly Ratios					Enrollment Scenarios						
	2011-12	2012-13	2013-14	2014-15	2015-16	High	Low	5 Yr.	4 Yr.	3 Yr.	2 Yr.	1 Yr.
Kindergarten	0.92787	0.954941	0.975847	0.91199	0.963468	0.975847	0.91199	0.946823	0.951561	0.950435	0.937729	0.963468
Grade 1	1.15922	1.174172	1.180877	1.177844	1.198732	1.198732	1.159217	1.178168	1.182906	1.185818	1.188288	1.198732
Grade 2	1.02019	1.023871	1.019899	1.032773	1.028978	1.032773	1.019899	1.025142	1.02638	1.027216	1.030875	1.028978
Grade 3	1.01884	1.019791	1.027798	1.022348	1.036654	1.036654	1.018839	1.025086	1.026648	1.028933	1.029501	1.036654
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Grade 5	1.02263	1.020666	1.013297	1.017778	1.016352	1.022629	1.013297	1.018144	1.017023	1.015809	1.017065	1.016352
Grade 6	1.0179	1.022321	1.015051	1.024472	1.029224	1.029224	1.015051	1.021794	1.022767	1.022916	1.026848	1.029224

Low Ratio

The ratios are recalculated to produce seven enrollment scenarios, **a low average.**

Survival Ratios	Yearly Ratios					Enrollment Scenarios						
	2011-12	2012-13	2013-14	2014-15	2015-16	High	Low	5 Yr.	4 Yr.	3 Yr.	2 Yr.	1 Yr.
Kindergarten	0.92787	0.954941	0.975847	0.91199	0.963468	0.975847	0.91199	0.946823	0.951561	0.950435	0.937729	0.963468
Grade 1	1.15922	1.174172	1.180877	1.177844	1.198732	1.198732	1.159217	1.178168	1.182906	1.185818	1.188288	1.198732
Grade 2	1.02019	1.023871	1.019899	1.032773	1.028978	1.032773	1.019899	1.025142	1.02638	1.027216	1.030875	1.028978
Grade 3	1.01884	1.019791	1.027798	1.022348	1.036654	1.036654	1.018839	1.025086	1.026648	1.028933	1.029501	1.036654
Grade 4	1.02551	1.029031	1.03211	1.024429	1.041811	1.041811	1.024429	1.030577	1.031845	1.032783	1.03312	1.041811
Grade 5	1.02263	1.020666	1.013297	1.017778	1.016352	1.022629	1.013297	1.018144	1.017023	1.015809	1.017065	1.016352
Grade 6	1.0179	1.022321	1.015051	1.024472	1.029224	1.029224	1.015051	1.021794	1.022767	1.022916	1.026848	1.029224

High Ratio

The ratios are recalculated to produce seven enrollment scenarios, **a high average.**

Survival Ratios	Yearly Ratios					Enrollment Scenarios						
	2011-12	2012-13	2013-14	2014-15	2015-16	High	Low	5 Yr.	4 Yr.	3 Yr.	2 Yr.	1 Yr.
Kindergarten	0.92787	0.954941	0.975847	0.91199	0.963468	0.975847	0.91199	0.946823	0.951561	0.950435	0.937729	0.963468
Grade 1	1.15922	1.174172	1.180877	1.177844	1.198732	1.198732	1.159217	1.178168	1.182906	1.185818	1.188288	1.198732
Grade 2	1.02019	1.023871	1.019899	1.032773	1.028978	1.032773	1.019899	1.025142	1.02638	1.027216	1.030875	1.028978
Grade 3	1.01884	1.019791	1.027798	1.022348	1.036654	1.036654	1.018839	1.025086	1.026648	1.028933	1.029501	1.036654
Grade 4	1.02551	1.029031	1.03211	1.024429	1.041811	1.041811	1.024429	1.030577	1.031845	1.032783	1.03312	1.041811
Grade 5	1.02263	1.020666	1.013297	1.017778	1.016352	1.022629	1.013297	1.018144	1.017023	1.015809	1.017065	1.016352
Grade 6	1.0179	1.022321	1.015051	1.024472	1.029224	1.029224	1.015051	1.021794	1.022767	1.022916	1.026848	1.029224

Reconciliation

- The bottom-up analysis and the top-down analysis yield different projections of K-12 enrollment.
- Given the historical accuracy of division-wide projections, using the top-down analysis, the grade-level projections at each school from the bottom-up analysis are adjusted through a reconciliation process.
- The sum of the adjusted grade-level projections constitute the projected school enrollment.

An Example of Reconciliation-Step One

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- The bottom-up analysis is used to determine a school's portion of division-wide enrollment at each grade level.
- The projected 5th grade enrollment at ABC elementary school, according to the bottom-up analysis, is 178.
- The projected grade 5 division-wide enrollment, according to the bottom-up analysis, is 6123.
- $178/6123=2.9\%$
- Thus, the projected 5th grade enrollment at ABC elementary school is 2.9% of projected grade 5 division-wide enrollment.

An Example of Reconciliation-Step Two

- The school's portion of the bottom-up enrollment at a grade level (2.9% - from step one) is applied to the division-wide "top down" projected enrollment for the grade level.
- In this example, the division-wide projected enrollment for 5th grade is 6103
- $2.9\% \times 6103 = 177$
- Thus, the adjusted projected enrollment for the 5th grade at ABC elementary school is 177, not 178, as initially suggested by the bottom-up approach.
- This reconciliation process is applied to every school and each grade level to generate the respective school's adjusted projected enrollment.

Reconciliation

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Grade Level Adjustments, by School

ABC Elementary School, 2016-17 Grade 5 Projection		
	<u>ABC's Gr 5</u>	<u>Division's Gr 5</u>
"Bottom Up" Projection	178	6123
"Top Down" Projection	177	6103
Difference	-1	-20

2016-17 School Year Projection

School Level "Bottom Up" Projection, ABC's 5th Grade = **178 Students**

Sum Total of All School Level "Bottom Up" Projections, 5th Grade = **6123 Students**

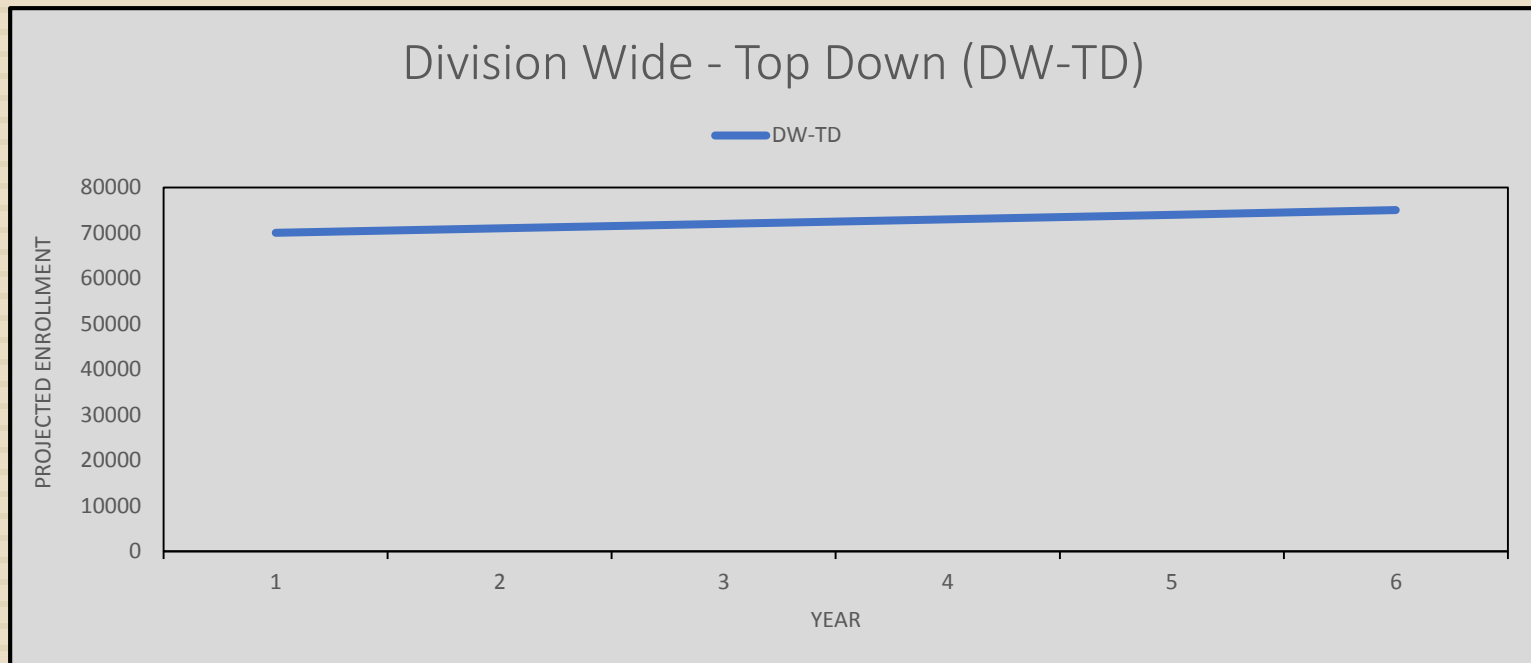
ABC's Proportion of Division 5th Grade Projection = **2.9%** (178/6123)

Division Level "Top Down" Projection , 5th Grade Cohort Control = **6103 Students**

ABC's Proportion Reduction for Final 5th Grade = **177 Students** (2.9% x 6103)

Division Wide – Top Down (DW-TD)

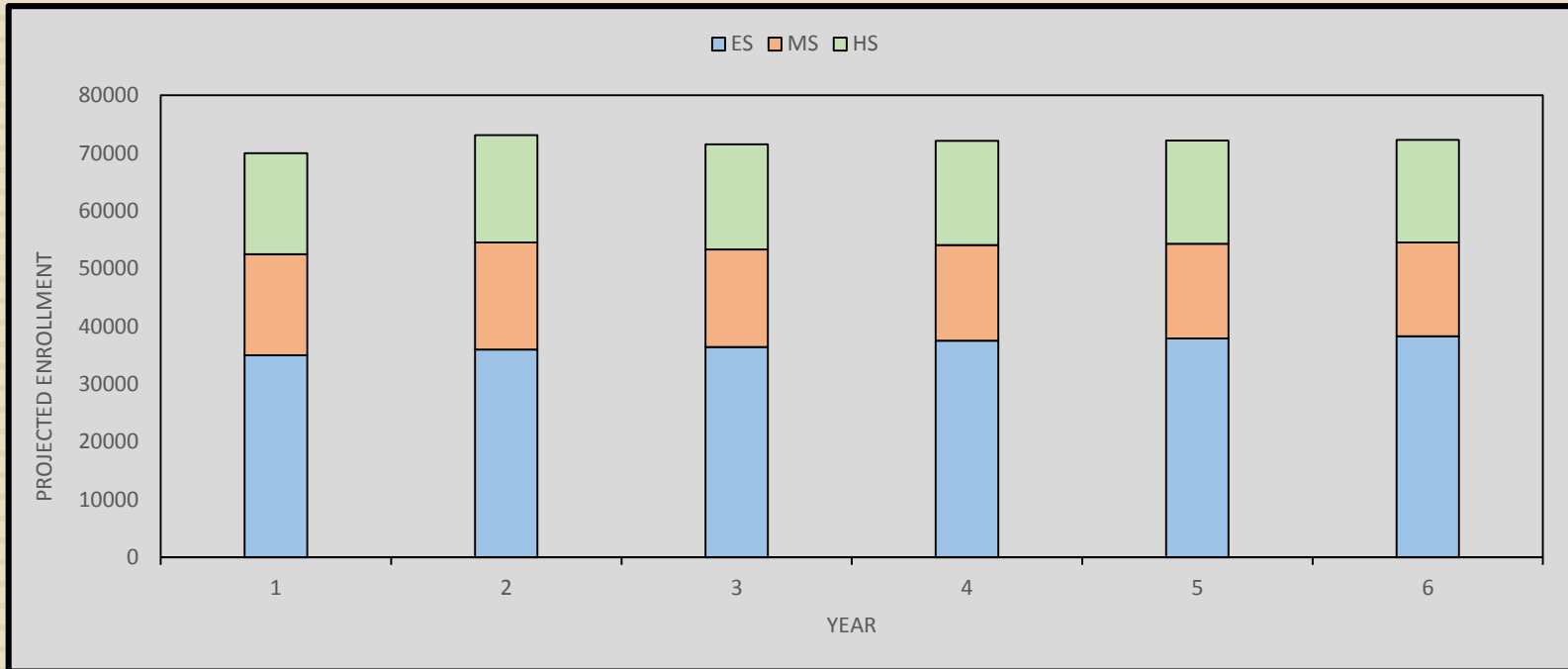
39



The Division Wide Top Down (DW-TD) projection is derived by applying one of the rates of change that best reflects the division wide growth for each of the 6 years studied.

School By School – Bottom Up

40



The School by School Bottom Up projection is derived by applying one of the rates of change that best reflects the anticipated growth in each grade in each school for each of the 6 years studied.

Reconciliation

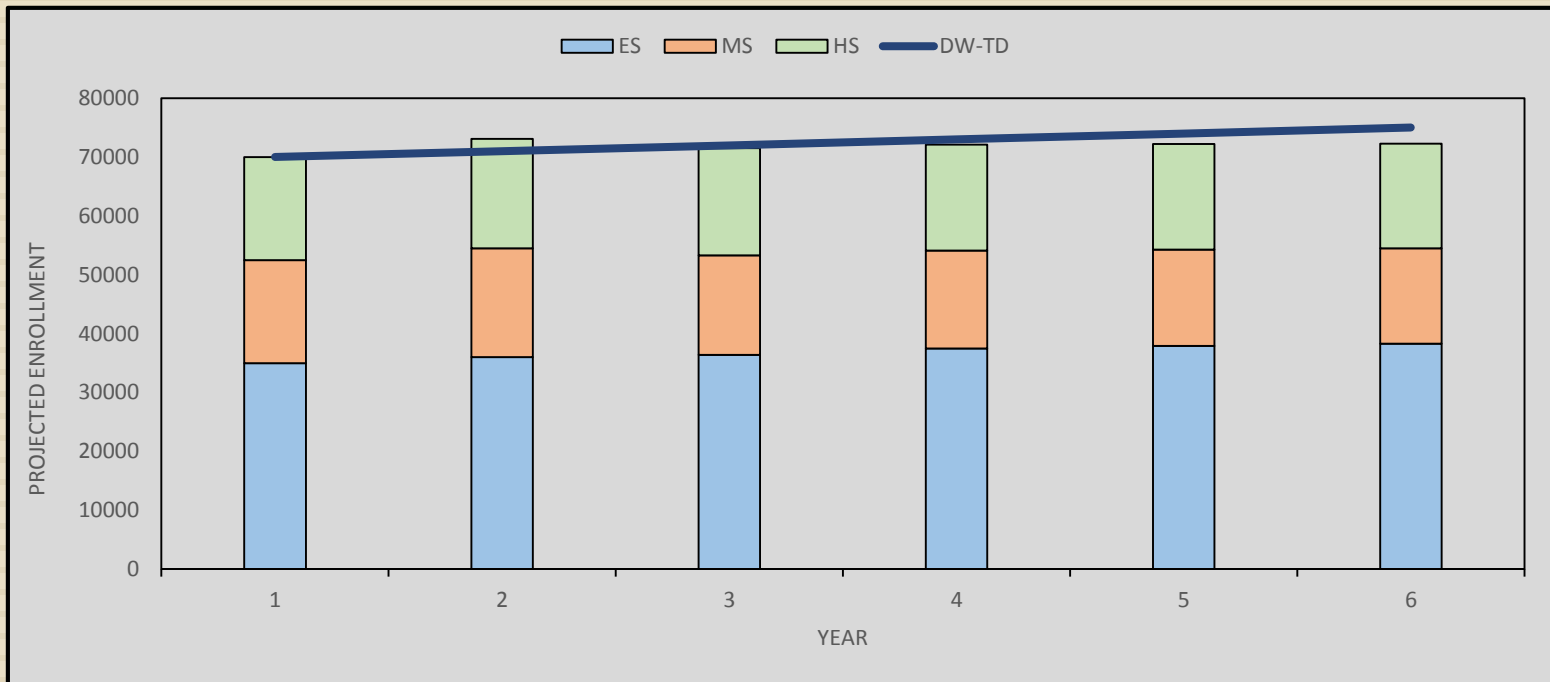
41

Confidence = Control

- The reconciliation process aligns the projections with the data set in which the most confidence exists. This data set becomes the “control” for the reconciliation process and provides guidance for the adjustment of the final projection
- If the division wide top down projection provides the most confidence, then the school by school bottom up is adjusted to match
- If the school by school bottom up projection provides the most confidence, then the division wide top down value is adjusted to match

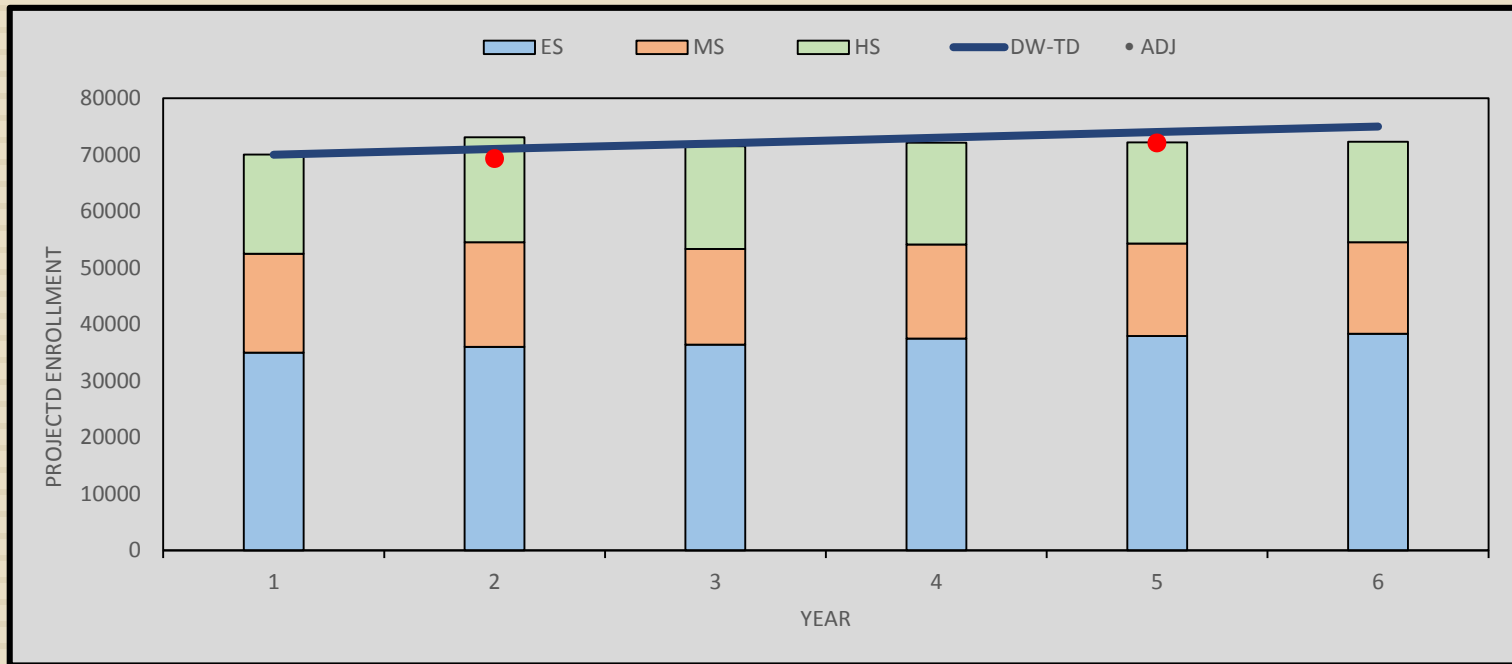
School by School Bottom Up & DW-TD

42



Reconciled and Adjusted Projection

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In this scenario, greater confidence is found in the division wide top down projection in year 2 and the school by school project in year 5.