BRUNSWICK COUNTY SCHOOLS

INTEGRATED PLANNING FOR SCHOOL AND COMMUNITY (IPSAC)

POTENTIAL ELEMENTARY AND MIDDLE SCHOOL SITES

PREPARED AND SUBMITTED BY
OPERATIONS RESEARCH AND EDUCATION LABORATORY
INSTITUTE FOR TRANSPORTATION RESEARCH AND EDUCATION
NORTH CAROLINA STATE UNIVERSITY

JANUARY 4, 2005

OR/Ed. Lab

OVERVIEW

This report outlines long range scenarios proposed by the Operations Research and Education (OR\Ed.) Lab as a portion of the Integrated Planning for School And Community (IPSAC) program. These scenarios describe the optimal sites and attendance boundaries for two new elementary schools and one new middle school in Brunswick County. This report is designed to provide Brunswick County Schools with a system-wide perspective on school enrollment growth and facilitate a long-range building plan.

This report is a revision of a previous study on Potential Elementary School Sites dated November 30, 2004. The revisions include updated school capacities and the new middle school scenario.

There are four maps accompanying this report; please refer to them as necessary.

KEY CONCEPTS/ASSUMPTIONS

The scenarios described in this report rely on several critical concepts and assumptions.

1. Planning Segments. Brunswick County is divided into 185 planning segments that are used to define school attendance boundaries. The planning segments were created jointly by the Lab and the school district for the 2003-04 IPSAC study and provide the finest useful resolution for analysis. Refer to the accompanying ***Current Attendance Boundaries*** map.

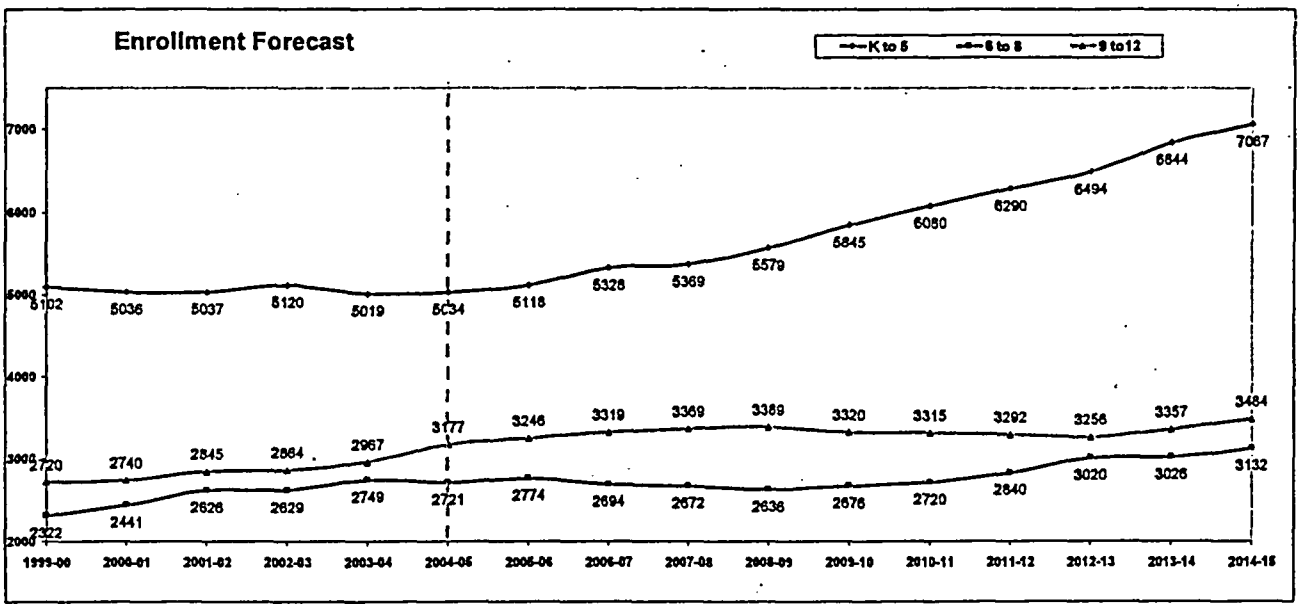
2. Geocoding. The Lab relied on the geocoded student database created for the 2003-04 IPSAC study. The planning segment populations were reconciled with the 2004-05 first-month ADM through a *markup* process.

3. Optimization. The OR/Ed. Lab uses an optimization algorithm that minimizes the student-weighted distance between the planning segment center and the impacted schools. The algorithm yields new school sites and attendance boundary solutions that are optimal system-wide.

4. Student Demographics. The optimization algorithm can also produce solutions yielding demographically balanced student populations, if so desired.

5. System-wide Perspective. The OR/Ed. Lab created these scenarios to address county-wide school capacity issues. The scenarios produced by the optimization algorithm can potentially impact every planning segment in the county.

6. System-wide Enrollment Projections. Using Brunswick County Resident Live Births from 1995 to 2002 and six years of Month One ADMs, the Lab constructed the ten-year enrollment forecast by level. The Lab uses a uniformly weighted cohort survival ratio method for this forecast.



7. Allocation of Gain. The projected enrollments used here are calculated according to a revised Allocation of Gain (AOG) distribution. In preparation of the 2003-04 IPSAC study, the Lab met with Board members to negotiate the initial AOG. When the Lab received 2004-05 student data, the AOG was reconciled to the ADM gains experienced from 2003-04 to 2004-05. The AOG values are shown in Table 1 and the details of the initial AOG calculations are in the January 7, 2004 IPSAC report.

Table 1: Allocation of Gain

High School Area	2003-04 AOG	2004-05 AOG
North Brunswick	38.6%	37.0%
South Brunswick	26.8%	26.0%
West Brunswick	34.6%	37.0%

OUT-OF-CAPACITY ANALYSIS

Distributing the ten-year enrollment forecast by the Allocation of Gain yielded the Out-of-Capacity (OOC) worksheet shown here. The table is color-coded red to indicate when a school is over capacity. The revised 2004-05 capacities on the OOC table were supplied by Brunswick County Schools. *Please note that the capacity values only affect the coloring of the table; they do not affect the enrolment projections.*

Brunswick County Schools Out-of-Capacity Worksheet (Revised Capacities)

The building capacities used in this table are for K-12 populations.

	Capacities	Month 1	Projected Enrollment									
	2004-05	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
Elementary Schools												
Lincoln Elem	663	610	629	675	684	731	790	842	889	934	1012	1061
Belville Elem	606	629	641	672	679	710	749	784	815	845	897	930
Bolivia Elem	763	647	649	654	655	660	667	673	678	683	691	697
Southport Elem	689	600	604	613	615	624	635	646	655	664	679	689
Jessie Mae Monroe Elem	507	410	416	430	433	448	466	483	497	512	536	551
Supply Elem	632	600	612	642	647	677	715	748	778	807	856	888
Union Elem	726	626	629	636	637	644	653	660	667	674	685	692
Virginia Williamson Elem	554	574	595	647	657	709	775	833	885	935	1022	1077
Waccamaw (K-8)	662	546	561	562	561	570	596	619	655	700	725	759
Totals	**5802**	**5242**	**5335**	**5531**	**5569**	**5772**	**6046**	**6287**	**6518**	**6753**	**7103**	**7344**
Middle Schools												
Leland Mid	789	631	651	621	613	600	614	631	675	742	744	783
South Brunswick Mid	789	907	921	900	894	885	895	907	938	985	986	1014
Shallote Mid	924	949	960	944	939	932	940	949	973	1009	1010	1031
Totals	**2502**	**2487**	**2531**	**2465**	**2446**	**2417**	**2450**	**2486**	**2585**	**2736**	**2740**	**2828**
High Schools												
North Brunswick High	845	779	805	831	850	858	832	830	822	808	846	893
South Brunswick High	1075	1048	1066	1085	1098	1103	1085	1084	1078	1069	1095	1128
West Brunswick High	1270	1280	1306	1332	1351	1359	1333	1331	1323	1309	1347	1394
Totals	**3190**	**3107**	**3176**	**3249**	**3299**	**3319**	**3250**	**3245**	**3222**	**3186**	**3287**	**3414**
Special												
Brunswick Learning Center	420	96	96	96	96	96	96	96	96	96	96	96
System Total	**11914**	**10932**	**11138**	**11341**	**11409**	**11604**	**11842**	**12114**	**12422**	**12771**	**13226**	**13682**

Adequate Capacity Two-year Warning Out of Capacity

OR/Ed. Laboratory
Institute for Transportation Research and Education
North Carolina State University

December 15, 2004

Although system-wide overcrowding will not occur for a number of years, there are several schools that must deal with capacity issues immediately. Specifically, Belville, and Virginia Williamson elementary schools, South Brunswick and Shallotte middle schools, and West Brunswick High School are currently over capacity. Of these schools, South Brunswick Middle school currently has the highest percentage over-utilization at about 15.0%.

A long-range view reveals a need for elementary schools to relieve overcrowding in the North and West Brunswick areas. There are also long-range capacity problems for the middle and high schools. At the maximum extent of this analysis, the Lab has forecasted the middle schools (6-8 grades) will be over capacity by 326 students or 13% and the high schools will be over capacity by 224 students, or about 7%. The district should also recognize that the accuracy of any population forecast decreases with time.

OPTIMAL SCENARIOS FOR NEW ELEMENTARY SCHOOLS

Based on the enrollment forecasts, the Lab has constructed scenarios for two new elementary schools opening by 2009-10. The scenarios depicted in the ***Two New Elementary Schools*** map are optimal school sites and attendance boundaries for two new elementary schools (capacity 500 each). The algorithm generates *x*- and *y*-coordinates for the location of each new site. However, there is currently no mechanism in the algorithm to determine the suitability for construction of the optimal locations. *The precise school sites generated by the algorithm should be considered the center of an area of potential locations. These areas are indicated by circles on the map.*

Note that for both the elementary and middle school scenarios, Waccamaw has been considered in a K-5 plus 6-8 configuration.

Although the scenarios illustrated by the map are optimally derived by minimizing the system-wide travel distance, they present several geographical and logistical challenges the Lab must address before feasible scenarios are achieved. Specific planning segment assignment changes will be negotiated with the district.

Note that any changes in planning segment assignment can potentially alter the optimal nature of the original scenarios.

The optimal site for New Elementary School A is located east of the Shallotte River inlet. The Lab recognizes that this site may not be a feasible location for a new school due to the geography of the region. The challenges presented by this area can be addressed with specific options, such as determining a suitable new school site first and then optimizing attendance boundaries.

In addition, the optimal attendance boundary for New Elementary School A is split by the Shallotte River and thus may present significant transportation problems. There are 515 students projected for this new school in 2009-10, while Virginia Williamson and Supply are forecasted under their current capacity. Therefore, the re-assignment of planning segments may provide a more balanced enrollment for these schools.

The Lab strongly recommends the assignment of final attendance areas occurs only after a suitable site is located and an opening date is determined.

Optimal Scenario for New Middle School

The map ***One New Middle School*** shows the optimal site and attendance boundaries for a new middle school, capacity 750. The Lab used the maximum extent of the enrollment projections (2014-15) for this scenario. Notice that this map also indicates the current elementary, middle, and high school attendance boundaries as well as the projected 2014-05 enrollment at each middle school.

The final map ***Optimal School Sites*** shows the location of both elementary sites and the middle school site with the current elementary, middle, and high school boundaries.

The Lab again strongly recommends the assignment of final attendance areas occurs only after a suitable site is located and an opening date is determined.

What's Next?

The scenarios presented here should be considered a starting point for determining suitable locations for new school sites. If these scenarios are accepted as templates for future building programs, further research may be required to provide scientific support for school site location and redistricting.

The OR/Ed. Lab hopes this information will enable Brunswick County Schools to develop a forward-looking and comprehensive building plan providing for the future growth of its student population.

Please feel free to contact the Lab with any questions you might have.

Michael A. Miller
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Brunswick County Schools Out-of-Capacity Worksheet (Revised Capacities)

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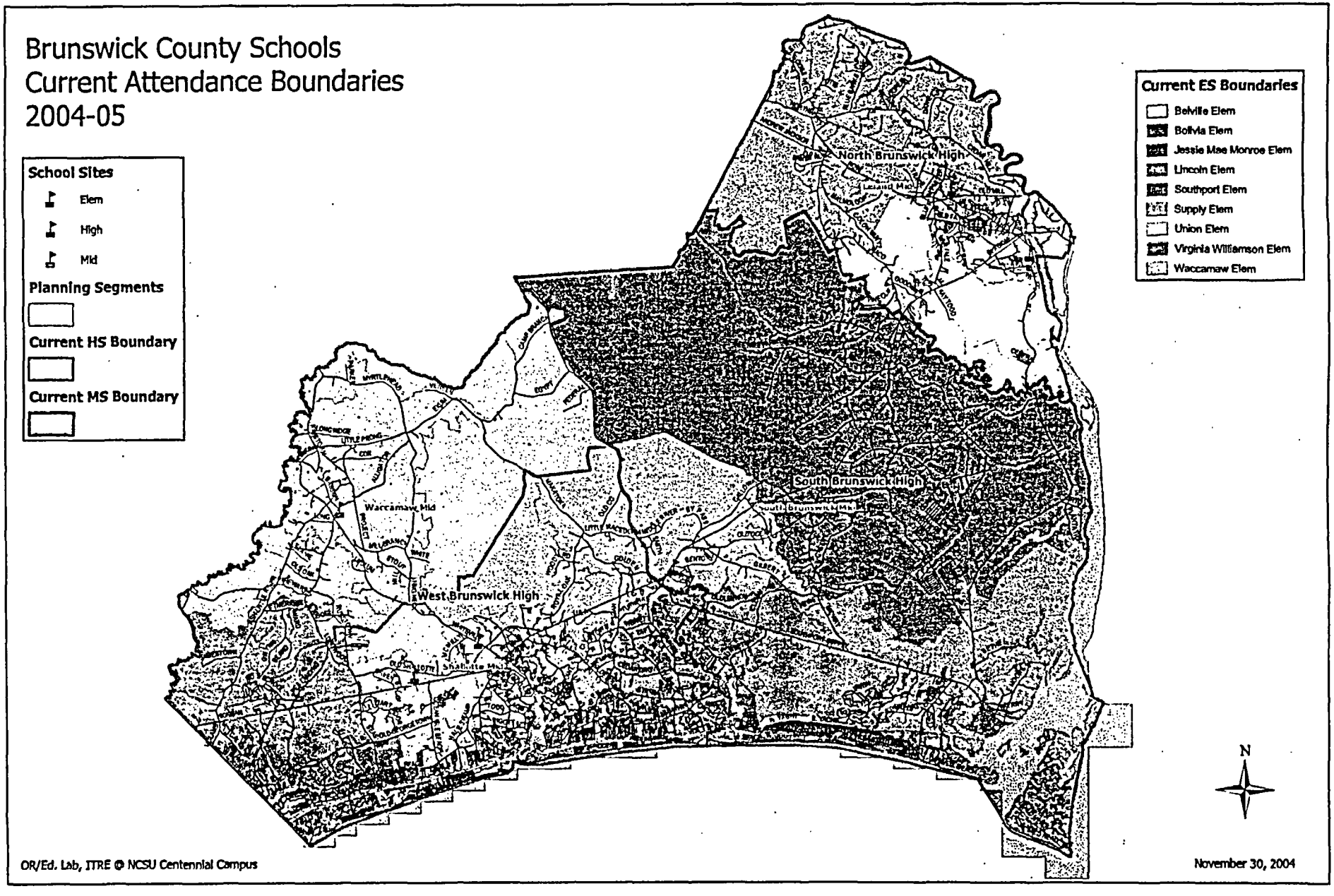
Adequate Capacity Two-year Warning Out of Capacity

OR/Ed. Laboratory
Institute for Transportation Research and Education
North Carolina State University

December 15, 2004

Brunswick County Schools
Current Attendance Boundaries
2004-05



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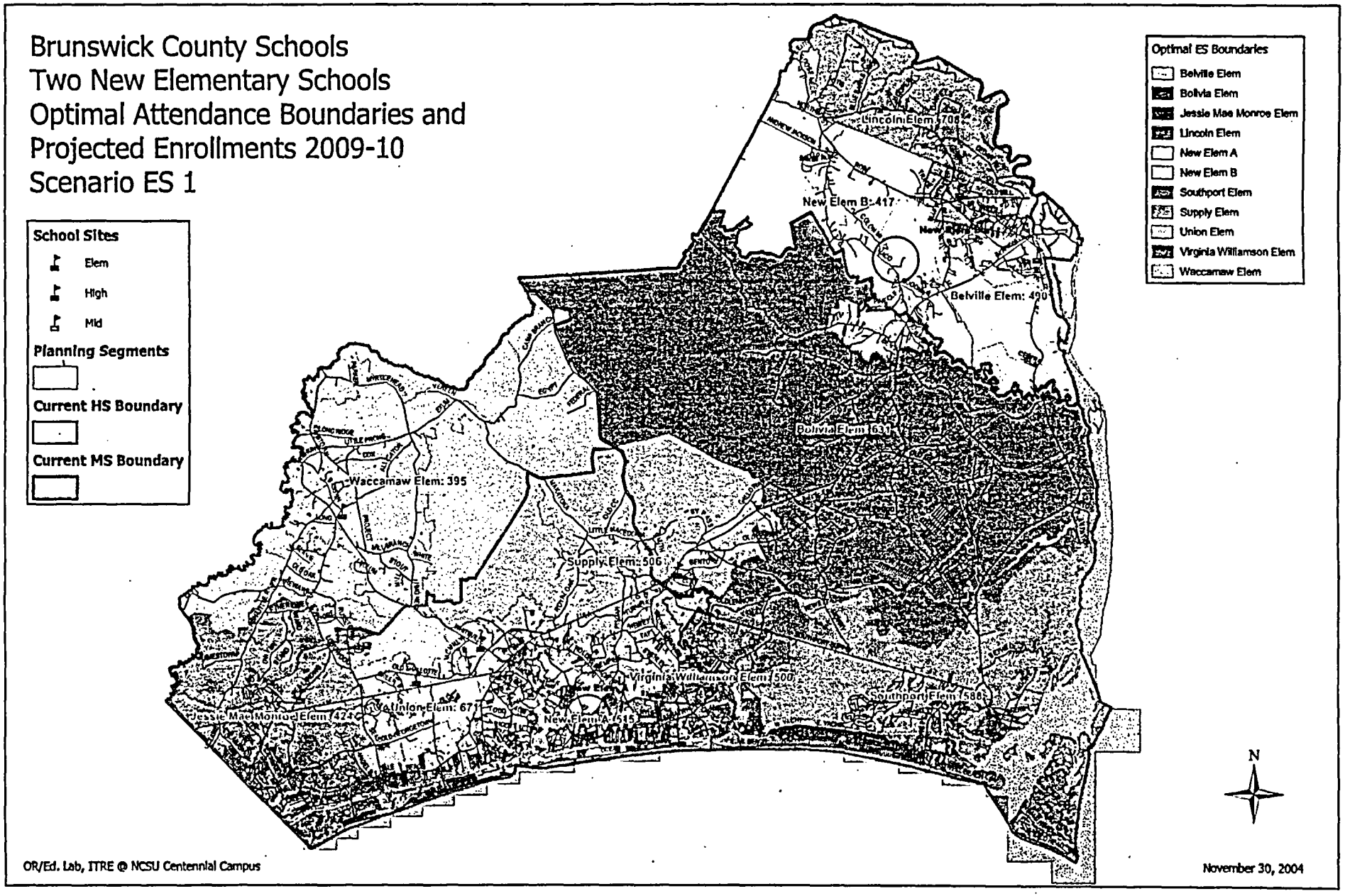
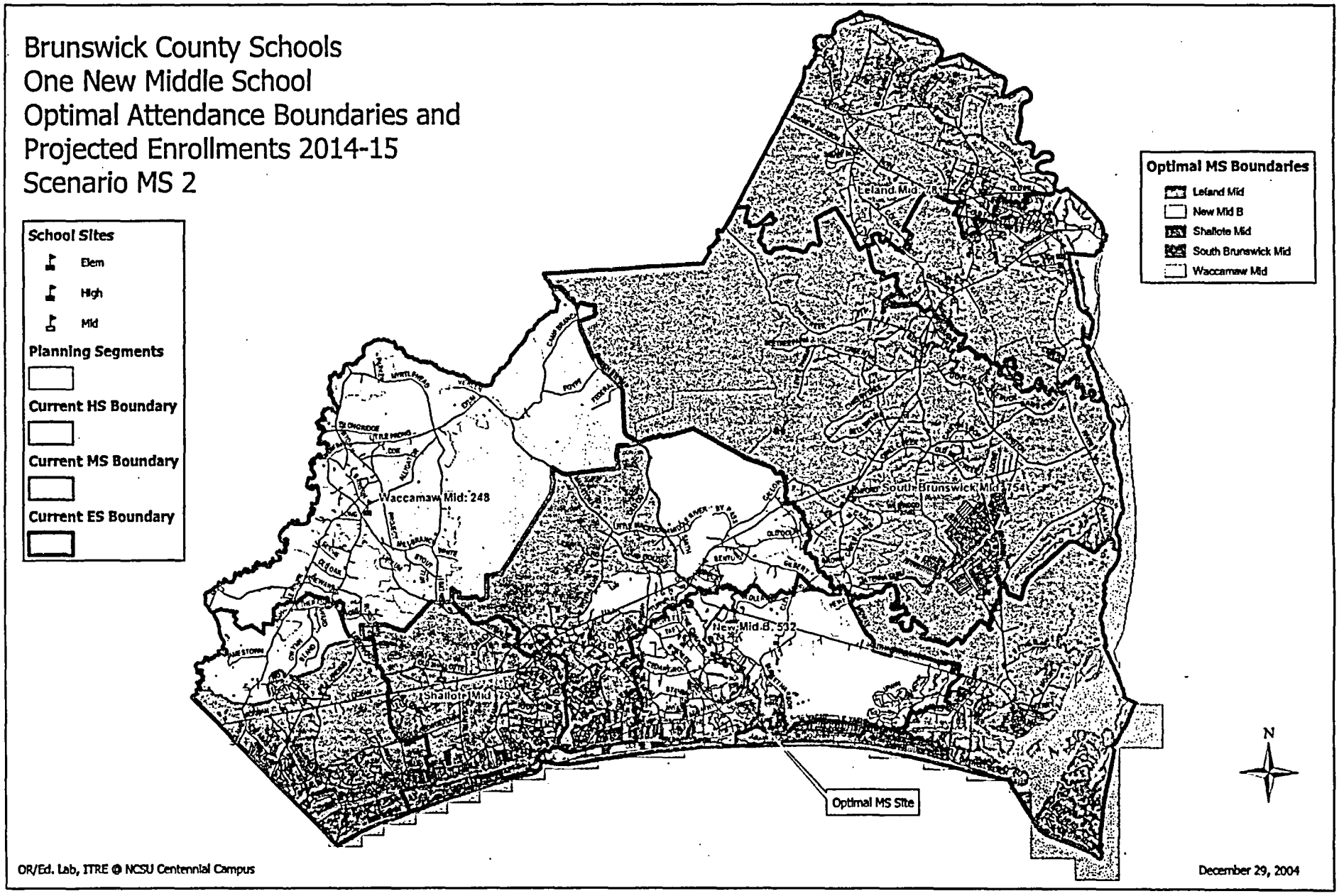
November 30, 2004

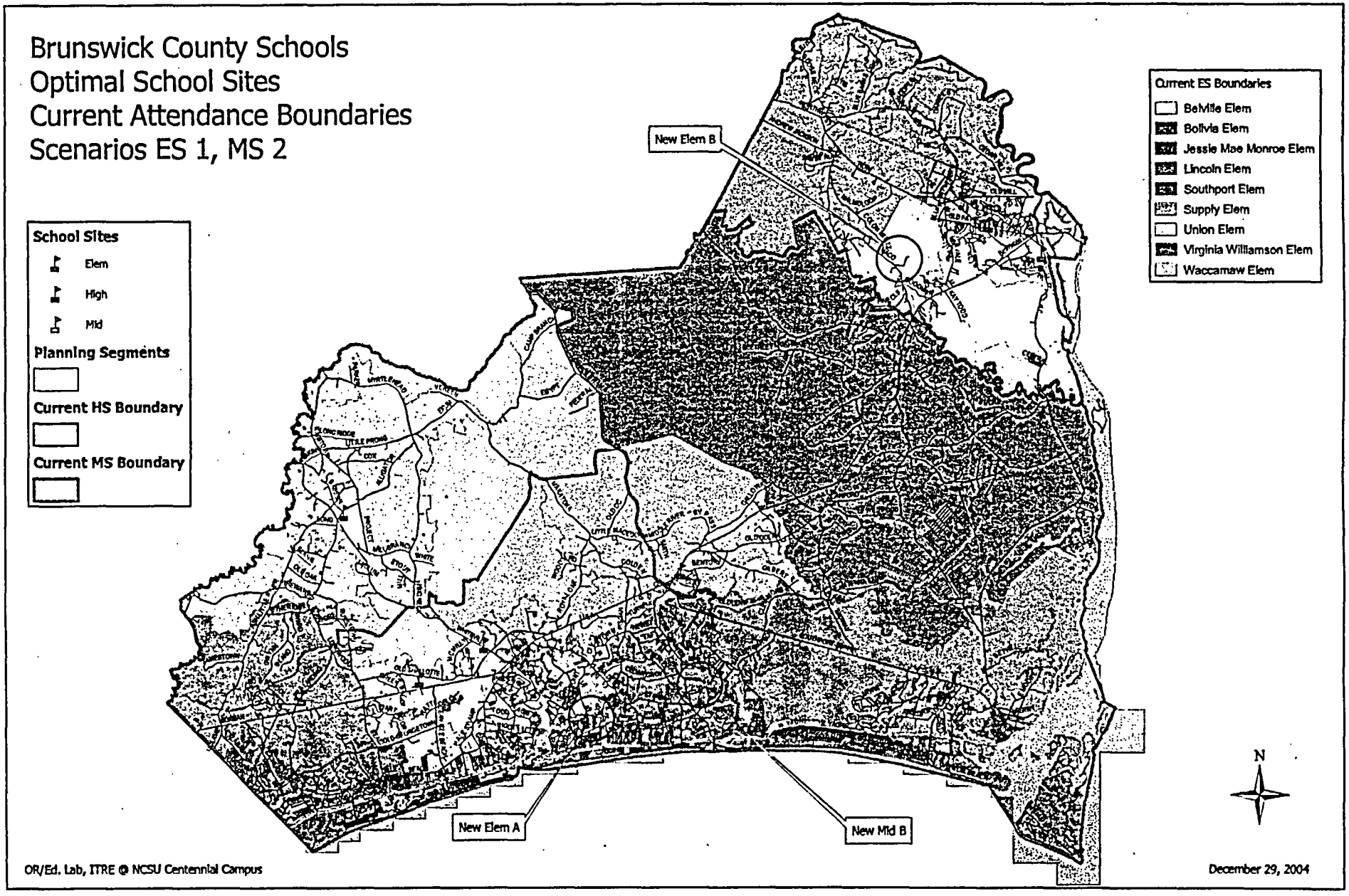
Brunswick County Schools
Two New Elementary Schools
Optimal Attendance Boundaries and Projected Enrollments 2009-10
Scenario ES 1



Brunswick County Schools
One New Middle School
Optimal Attendance Boundaries and Projected Enrollments 2014-15
Scenario MS 2



Brunswick County Schools
Optimal School Sites
Current Attendance Boundaries
Scenarios ES 1, MS 2



Brunswick County Schools
Capacity Summary Plan

Project Number	School Name	PK Capacity	Elem Capacity	Mid Capacity	High Capacity	K12 Capacity	Total Capacity	Core Capacity	Mobiles	Mobile Capacity	First Mo. 2004-2005 ADM K - 12	2005 ADM PK	Difference K-12 Capacity & 1st Mo. SY04-05 ADM
100-302	Belville Elem	18	606	0	0	606	624	791	1	20	629	49	(23)
100-304	Bolivia Elementary	18	763	0	0	763	781	740	3	60	647	17	116
100-310	Jessie M Monroe Elem	36	507	0	0	507	543	719	0	0	410	32	97
100-320	Lincoln Primary	54	663	0	0	663	717	903	1	20	610	54	53
100-336	Southport Elementary	36	689	0	0	689	725	746	2	40	600	6	89
100-338	Supply Elementary	0	632	0	0	632	632	791	3	60	600	26	32
100-340	Union Elementary	0	726	0	0	726	726	886	4	80	626		100
100-342	V Williamson Elem	36	554	0	0	554	590	660	0	0	574		(20)
100-344	Waccamaw School	0	454	208	0	662	662	708	2	40	546		116
100-316	Leland Middle	0	0	789	0	789	789	1119	1	20	631		158
100-332	Shallotte Middle	0	0	924	0	924	924	963	0	0	949		(25)
100-335	South Brunswick Mid	0	0	789	0	789	789	963	6	120	907		(118)
100-308	Brunswick Learn Ctr	0	0	170	250	420	420	250	1	20	96		324
100-326	North Brunswick High	0	0	0	845	845	845	994	7	140	779		66
100-334	South Brunswick High	0	0	0	1075	1075	1075	963	1	20	1048		27
100-348	West Brunswick High	0	0	0	1270	1270	1270	1621	1	20	1280		(10)
	Total System-wide	198	5594	2880	3440	11914	12112	13817	33	660	10932	184	982