

MEMORANDUM

TO: Connectivity Index Subcommittee

FROM: Ken Fogle, Transportation Planner
Camille Brown, Transportation Planning Intern

DATE: May 27, 2004

RE: Connectivity Index Report

The purpose of conducting the Roadway Connectivity Analysis is to determine the connection quality of several local subdivision street networks to the College Station thoroughfare network and recommend a standard. In this analysis, we used the Connectivity Index (CI) Method to determine the ratio of roadway links to roadway nodes (intersection of three or more links or dead end streets).

Example:

$$CI = \text{Nodes} \div \text{Links} = 44 \div 30 = 1.33$$

Connectivity indices range from 1.0 to 2.5. A minimum CI of 1.0 represents a single entrance/exit network with no interconnecting streets, and a maximum CI of 2.5 represents a multiple entrance/exit network with all interconnecting streets (i.e. 4 by 4 grid). The estimated average CI for College Station subdivisions is 1.43 with the proposed thoroughfare plan built out. The estimated average for U.S. cities using this method to determine connectivity is 1.40 and the recommended range is between 1.2 and 1.8.

We have provided a detailed summary of CI findings in College Station and other U S cities in the attached materials. I am also attaching a summary of general connection criteria that is used by several communities across the country. We can discuss all of this further at our meeting on Tuesday morning at 9am at the Chick-Fil-A on Briarcrest Drive in Bryan.

CONNECTIVITY INDEX REPORT

I. Identify Subdivisions

We began by identifying twenty-one subdivisions within the City of College Station and the extra-territorial jurisdiction that we wanted to include in our connectivity analysis. The subdivisions chosen are as follows:

- Alexandria
- Castlegate
- Cypress Meadow
- Eastgate
- Edelweiss Estates
- Edelweiss Gartens
- Emerald Forest
- Foxfire
- Nantucket
- Pebble Creek
- Raintree
- Reatta Meadows
- Shenandoah
- Southside
- Southwood Valley
- Stone Forest
- Westfield
- Westfield Village
- Windwood
- Woodcreek
- Woodlake

II. Calculate Connectivity Index

For each of these subdivisions, staff developed maps and marked the applicable nodes (red), links (green), and bonus links (blue) on the roadway network with planned thoroughfare connections as shown on the thoroughfare plan. Bonus links were given for pedestrian access ways and street section with single family homes fronting on parkland. The following table represents the connectivity index for these subdivisions.

Subdivision	Connectivity Index				
	Nodes	Links	Bonus	CI	CI w/ Bonus
Raintree	42	48	0	1.14	1.14
Cypress Meadow	35	42	0	1.20	1.20
Pebble Creek	133	159	2	1.20	1.21
Windwood	20	24	1	1.20	1.25
Foxfire	46	56	0	1.22	1.22
Castle Gate	67	83	9	1.24	1.37
Woodlake	18	22	0	1.22	1.22
Shenandoah	88	110	8	1.25	1.34
Stone Forest	19	24	0	1.26	1.26
Nantucket	43	55	1	1.28	1.30
Edeweiss Estates	54	72	0	1.33	1.33
Emerald Forest	65	89	0	1.37	1.37
Southwood Valley	186	257	0	1.38	1.38
Woodcreek	63	87	0	1.38	1.38
Alexandria	25	35	1	1.40	1.44
Westfield	20	29	4	1.45	1.65
Westfield Village	24	35	6	1.46	1.71
Eastgate	90	135	4	1.50	1.54
Southside	124	205	7	1.65	1.71
Edelweiss Gartens	19	32	1	1.68	1.74
Reatta Meadows	13	22	1	1.69	1.77
Average(s)	60	81	2.25	1.43	1.48

* Highlighted cells indicate subdivisions where planned thoroughfare extensions will improve connectivity.

III. Recalculate Connectivity Index

Staff identified several areas in College Station where connectivity was planned, but never implemented based on neighborhood integrity concerns. The two cases identified involve Raintree and Cypress Meadow.

In the Raintree subdivision, Appomattox Drive was planned to cross through the subdivision connecting each of the east bypass neighborhoods. If Appomattox Drive were connected through as planned, the connectivity index would increase from 1.14 to 1.20. Although this increase may seem insignificant it is a significant increase considering the size of the subdivision. Furthermore, the connection would have increased the external connections of the neighborhood from one to three. Since that time, Raintree Drive has been shown to extend to North Forest Parkway as a secondary access.

In the Cypress Meadow subdivision, Cardinal Lane was planned to connect the Cypress Meadow subdivision to the area to the west shown for single family residential use. This subdivision to the west became the Alexandria subdivision. When Alexandria was platted, there were once again perceived neighborhood integrity concerns if Cardinal Lane were connected. The Planning and Zoning Commission decided to disallow the connection, but require a pedestrian access way instead. Because of the bonus link that is provided to the Alexandria subdivision, this dead end street doesn't affect their connectivity index. For Cypress Meadows, Cardinal Lane is treated as a dead end street. If this connection were made, it would increase Cypress Meadow's connectivity index from 1.20 to 1.24.

IV. Research

Staff identified several municipalities that currently use the connectivity index to regulate connectivity. The municipalities and their associated connectivity indices are shown in the following table.

Sample Connectivity Index Standards			
City/ Agency	State	Minimum Connectivity Index	
Benbrook	TX	1.4	
Carrollton	GA	1.75	
Cary	NC	1.2	
Concord	NC	1.4	
Middleton	DE	1.4	
Orlando	FL	1.4	
Delaware Dept. of Transportation	DE	1.4	
Apalachicola	FL	1.69	
Dade City	FL	1.49	
Arcadia	FL	1.69	
Bluewater Bay	FL	1.19	
Haile Plantation	FL	1.19	
Hunter's Creek	FL	1.23	
Miami Lakes	FL	1.2	
Average		1.40	

	Contemporary Developments in Florida
	Traditional Developments in Florida

V. Connectivity Index Recommendation

Based on the connectivity levels that currently exist in College Station and the levels that other communities across the country require, staff recommends that College Station consider a minimum connectivity index of 1.4.

VI. Identify Street Modifications

Finally, staff identified modifications that could have been included to reach a recommended connectivity index of 1.40. Each subdivision that needed five or less improvements was studied to see if and where it was possible to make any improvements. These improvements are shown as additional links and nodes and marked with triangles. The connectivity index was then recalculated based on the identified modifications. These values are shown below. Staff found that it is difficult to retrofit connections into a subdivision that make logical sense. If a minimum connectivity index were required, it is likely that developers would lay out subdivisions to meet these standards as opposed to retrofitting current designs.

Improved					
<u>Subdivision</u>	<u>Ad'tl Nodes</u>	<u>Ad'tl Links</u>	<u>Ad'tl Bonus</u>	<u>CI</u>	<u>CI w/ Bonus</u>
Raintree	0	0.0	0.0	1.14	1.14
Cypress Meadow	0	0.0	0.0	1.20	1.20
Pebble Creek	0	0.0	3.0	1.20	1.23
Foxfire	0	0.0	0.0	1.22	1.22
Shenandoah	0	0.0	0.0	1.25	1.34
Castlegate	0	0.0	0.0	1.24	1.37
Windwood	0	2.0	2.0	1.30	1.45
Woodlake	0	2.0	2.0	1.33	1.44
Nantucket	3	7.0	1.0	1.35	1.39
Edeweiss Estates	0	2.0	2.0	1.37	1.41
Southwood Valley	0	0.0	0.0	1.38	1.38
Woodcreek	0	0.0	0.0	1.38	1.38
Emerald Forest	0	1.0	2.0	1.38	1.42
Alexandria	0	0.0	0.0	1.40	1.44
Westfield	0	0.0	0.0	1.45	1.65
Westfield Village	0	0.0	0.0	1.46	1.71
Stone Forest	0	2.0	0.0	1.47	1.47
Eastgate	0	0.0	0.0	1.50	1.54
Edelweiss Gartens	0	0.0	0.0	1.68	1.74
Southside	0	0.0	0.0	1.65	1.71
Reatta Meadows	0	0.0	0.0	1.69	1.77
Average(s)	0.15	0.8	0.6	1.45	1.52

* Highlighted cells indicate subdivisions where connectivity improvements were made.