Roadway Connectivity in Chapel Hill – White Paper

September 2022

Town of Chapel Hill

Defining Roadway Network Connectivity

Roadway network connectivity is conventionally defined by the number of links divided by the number of nodes in a roadway network. That is, the number of roads that converge at each intersection and the directness of travel between destinations.[1] A gridded street network would have a high connectivity rating while features like dead ends and cul-de-sacs lead to lower connectivity.

Introduction

Benefits of roadway connectivity include more direct access to amenities, more free-flow of travel resulting from increased freedom of choice, quicker emergency response times, decreases in vehicle miles traveled through more direct routes, and dispersed traffic through the entire roadway network.[2] For these reasons, the Town of Chapel Hill Town Council has identified connectivity as a goal in a number of adopted long-range plans, including: Chapel Hill 2020, the Mobility and Connectivity Plan, the Future Land Use Map, the Climate Action and Response Plan, and the Northern Area Task Force Report. The Town's Planning Department is dedicated to increasing roadway connectivity as a planning best practice and upholding the Town's goals of more equitable and safer communities, as well as addressing climate change concerns and emergency response times.

How Connectivity Aligns with Town Policy and Plans

As noted above, many of the Town's adopted long-range plans cite connectivity as a goal for reasons associated with climate change, access to residential and commercial destinations, and options for safe transportation.

Plan	Connectivity Goals
Chapel Hill 2020	• Emphasizes the need to promote connectivity for bicycles, transit, pedestrians, and vehicles using complete streets. • Big Idea for 2020 Plan was to create a more connected, walkable, bikeable, green community with safe connections between neighborhoods, schools, commercial areas, parks, rural bikways, and farms that promote exercise and enviornmentally friendly modes of transportation. • Within its definition, connectivity is described as physical connections (such as sidewalks, streets, transportation, or transit

[1] https://www.vtpi.org/access.pdf

[2] https://wfrc.org/PublicInvolvement/InTheNews/AssessmentOfEffectsOfStreetConnectivity.pdf

	systems).
Chapel Hill Bike Plan (2014)	• Chapel Hill residents interested in greater connectivity. • Describes the low level of street connectivity as "a major barrier to making bicycling a convenient choice, as bicyclists must travel on high stress arterials with inadequate bike accommodations for portions of a trip." • Need to fill gaps in the bicycle network to "create a safer, connected transportation system."
Mobility & Connectivity Plan	• "By connecting neighborhoods to destinations, residents will be able to access these priority corridors and travel to the places they live, shop, work, and play." • One of the goals is to reduce barriers by improving crossing between networks and to destinations, and integrate land use development.
Future Land Use Map (North Martin Luther King, Jr. Boulevard Focus Area)	• Connectivity between commercial destinations and residential areas east of Martin Luther King Jr. Boulevard should be a priority. • Bicycle, pedestrian, and multimodal links from existing development and new development/redevelopment should be emphasized to fully leverage transit service. • The map shows a future connection to this property by extending Cabernet Drive east to Homestead Park.
Climate Action and Response Plan	• The plan recognizes that the transportation sector is the second largest source of greenhouse gas (GHG) emissions in Chapel Hill. To reduce GHG emissions, it recommends creating walkable, bikeable, transit-served neighborhoods. It also calls for reducing Vehicle Miles Traveled (VMT) through high density development and connectivity. • To increase walking, biking, and transit use, it encourages better connectivity for all transportation modes. • It also proposes expanding transit availability and connectivity, wherever possible.
Northern Area Task Force Report (Focus Area 4, Homestead Road)	• Proposes an extension of Cabernet Drive along the southern edge of Stanat's Place to connect Vineyard Square to Homestead Park. • The public comments received at the time of this plan also express interest in preventing deadend streets and promoting street connections. • Goal 6 of the plan proposes improving the road network to provide more connections and safer turning options (e.g. Perkins and Weaver Dairy Road, Westminster and Martin Luther King, Jr. Boulevard).

The Town of Chapel Hill Design Manual notes that street connections are encouraged if traffic calming measures are implemented on the connector. Additionally, gaps in the street network are noted as a deficiency for the Town.[3]

The Town's Future Land Use Map includes connectivity as a guiding statement, stating that "connections can integrate and knit together all parts of the Town, reduce vehicle miles traveled, and support additional housing units and more intense land uses, like office and retail uses, so that community members may shop and work in their community thereby potentially reducing the carbon footprint attributable to the Town." [4]

Article 5 section 8 of the Town's Land Use Management Ordinance (LUMO) states that "where necessary to the neighborhood pattern, existing streets in adjoining areas shall be continued and shall be at least as wide as such existing streets and in alignment therewith." It also notes that "Streets, public alleys, bicycle circulation systems and bike lanes, pedestrian circulation systems and sidewalks, and bus stop amenities shall be provided and designed in accordance with the design manual," which encourages the construction of connectors where gaps exist in the street network. Lastly, it notes that when connecting to adjoining areas that are not subdivided, parcels shall be arranged to allow the opening of future streets. [5]

Article 3 Section 5 of the Town's LUMO for development standards states that connections, both vehicular and not, shall be offered in LI-CZD districts. Furthermore, it states that applicants for development in R-SS-CZD districts must encourage "a balanced private and public transportation system that promotes connectivity and safety for vehicles, bicycles, and pedestrians including direct and/or indirect improvements to the community's transportation systems."[6]

Discussion of Opposition to Roadway Connectivity

Many developments in Chapel Hill were constructed with stub-outs with the intent of connecting existing developments to future developments. Opponents of these connections note concerns of safety due to non-residents of either of the developments using the connection as a cut-through. Additional arguments are that road connectivity projects are contradictory to the Town's Vision Zero initiative. While it is certain that neighborhood connections will be used for through travel occasionally, traffic impact assessments (TIA) often indicate that increased traffic on these roads does not decrease the level of service on the road. The TIAs also predict that there will be limited travel through existing neighborhoods as a result of the new connection.

Research on the impact of street connectivity on crashes of all kinds noted lower overall crash rates when comparing neighborhoods with higher connectivity ratings to those with lower

[3] https://www.townofchapelhill.org/home/showpublisheddocument/36232/636766805252330000
[4] https://online.flippingbook.com/view/26191/4-5/
[5] https://library.municode.com/nc/chapel_hill/codes/code_of_ordinances?nodeId=CO_APXALAUSMA_ART5DEDEST_5.8ACCI
[6] https://library.municode.com/nc/chapel_hill/codes/code_of_ordinances?nodeId=CO_APXALAUSMA_ART3ZODIUSDIST

connectivity ratings.[7,8] This is due to the fact that connectivity mitigates congestion on major arterials by distributing the trips. Residential connector roads are built with the intent of providing more direct routes for community members to access places to work, play or visit. They create more cohesive neighborhoods rather than forcing residents out of the neighborhood to major arterials. Congestion mitigation, more direct paths, and increased accessibility not only help community members get around, but can facilitate more efficient emergency response as well as lowered vehicle emissions. Recent research has even found that homes in more connected communities are valued 16 to 18% higher than homes of the same size and condition in less connected communities.[9]

Conclusion

Connector roads create more direct routes of travel for community members, subsequently alleviating, or at least minimizing, new developments' contributions to congestion on arterial roads. In many cases, this leads to fewer vehicle miles traveled per capita, as well as more free-flow travel. These factors can lead to lower CO2 emissions attributed to vehicular travel.[10] Connectors also provide more expeditious routes for emergency services to access developments when necessary. They provide greater access to amenities and community points of interest, and can increase the value of surrounding residences. This aligns with the Town's Vision Zero goals, as well as the Town's plans, design manuals, ordinances and strategic goals and objectives.

[7] https://drive.google.com/file/d/1BLQvpPjPrbNzLbHrGCUz1Lqw0mVZqjS-/view
[8] http://library.oregonmetro.gov/files/connectivityreport.pdf
[9] https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.197.7545&rep=rep1&type=pdf
[10] https://escholarship.org/uc/item/07n946vd

Street Connectivity at Stanat's Place

The town's planning department suggests a connection be made between the site at Stanat's Place and Cabernet Drive - the transportation impact analysis (TIA) **does not indicate excessive additional traffic** traveling **through Vineyard Square**. The TIA suggests the development will induce **314 trips** (entering or exiting) the study area every day. This connection would lead to the following benefits and impacts for residents of Stanat's Place and Vineyard Square.

Impacts

13 Vehicles Entering

The TIA suggests only **13 additional vehicles** will **turn into Vineyard Square via Napa Valley Way** from Weaver Dairy Extension during peak hours in 2026 per day (year of estimated completion of development).

19 Vehicles Exiting

The TIA suggests **19 additional vehicles** will use the connection to **exit onto Weaver Dairy Extension** during peak hours in 2026 per day.

Benefits

Distribution of Traffic

The TIA suggests **40% of exit trips** would exit onto Weaver Dairy. 35% would enter from Weaver Dairy to Vineyard Square. It would allow residents to **avoid travel on high crash network roads** if not necessary for their trip.

Emergency Response

If a connection to Cabernet Drive **is not constructed**, fire engines would have to travel **an additional 1.1 miles** from the nearest station to **access Stanat's Place.**

If the connection to Cabernet Drive is constructed, residents would have more options for travel. Particularly, residents who need to access Weaver Dairy Extension would significantly **reduce** the amount of **time** and **distance** they would need to travel. This **reduces** the amount of **traffic on Homestead Road**, which has been identified as a street in the town's high crash network (**HCN**). The benefits of this connection can best be distilled into **3 categories:**

Equity

An additional connection for Stanat's Place would...

- Allow emergency service vehicles to more easily access the development.
- Provide more direct access to amenities for all residents in both Stanat's Place and Vineyard Square.
- Reduce the risk of severe auto crashes by distributing traffic away from roads on the identified HCN.

Climate Change

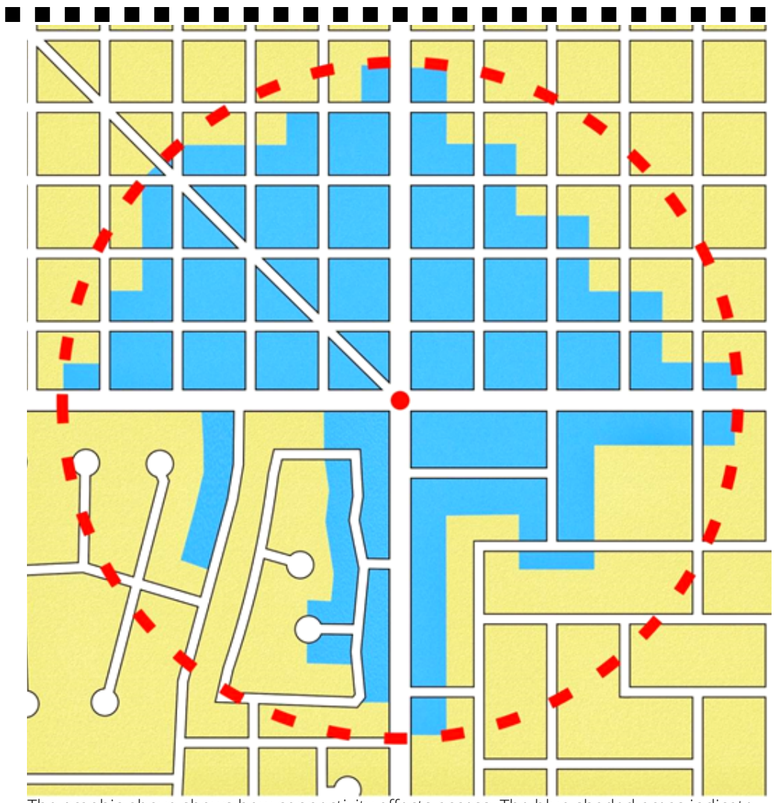
This connection could also...

- Lead to reduced vehicle miles traveled by providing more direct routes for residents.
- Reduce standstill traffic and idling by distributing vehicles across the network and away from major arterials.
- Encourage residents to bike or walk for shorter trips due to increased connectivity.

Safety

Increasing connectivity at Stanat's Place means...

- Fewer vehicles on HCN roads, less traffic at the Homestead Road and MLK Blvd intersection, which has a higher crash rate than any other intersection in the study.
- Fewer vehicles taking left turns onto Homestead Road to MLK.
- Residents have options to exit the developments if roads are closed due to emergency.



The graphic above shows how connectivity affects access. The blue shaded areas indicate accessible areas via a 5 minute walk - more gridded, connected networks provide greater access to amenities/facilities in the area.

Source: https://smartgrowth.org/great-idea-interconnected-street-networks

Below is the proposed traffic flow with two site connection for Stanat's Place, including a speed table for traffic calming measures created for the development transportation impact analysis.