TRANSPORTATION IMPACT ANALYSIS
CAROLINA NORTH DEVELOPMENT

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Kumar Neppalli – Engineering Services Manager
Town of Chapel Hill

Christopher Conklin, PE – Principal
VHB/Vanasse Hangen Brustlin, Inc.
Introduction

• A Transportation Impact Analysis (TIA) has been completed by VHB on behalf of the Town:

  – The Scope was developed
  – The Consultant was selected
  – The University funded the TIA effort
  – The University participated in the development of the TIA
  – The TIA will be finalized after this review period

• Two reports are available on the Town website

  – Draft TIA Executive Summary (+/- 50 pages)
  – Draft TIA Main Report (+/- 300 pages)
Introduction

• Future Scenario Definition

  – Two development scenarios were defined by the University:
    • An 800,000 square foot scenario for early phase analysis (2015)
    • A 3,000,000 square foot scenario as a longer-term phase of development (2025)

  – These horizon years were selected testing of impacts, but are not predictions of specific development levels for these two years.
Introduction

• Issues addressed by the TIA

  – Existing and future conditions assessment (without the project)
  – Trip generation, mode split, and trip distribution
  – Assessment of parking supply on transportation impacts
  – Traffic impacts (traffic operations and neighborhood impacts)
  – Transit impacts
  – Pedestrian and bicycle facility needs
  – Review of crash history near Carolina North
  – Potential mitigation measures
  – Air quality and greenhouse gas analysis
TIA DEVELOPMENT PLAN
2025 TIA Phase 2
(3 million square foot program)

- 2015 TIA Phase 1 Building Sites
  800,000 sf
# TRANSPORTATION IMPACT ANALYSIS (TIA)  
**CAROLINA NORTH DEVELOPMENT**

## TIA DEVELOPMENT PLAN

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Short-Term (2015)</th>
<th>Longer Term Increment</th>
<th>Total TIA Development (2025)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic</td>
<td>410,000</td>
<td>870,000</td>
<td>1,280,000</td>
</tr>
<tr>
<td>Private*</td>
<td>180,000</td>
<td>520,000</td>
<td>700,000</td>
</tr>
<tr>
<td>Civic/Retail</td>
<td>10,000</td>
<td>60,000</td>
<td>70,000</td>
</tr>
<tr>
<td>Housing**</td>
<td>200,000</td>
<td>550,000</td>
<td>750,000</td>
</tr>
<tr>
<td>Health Care</td>
<td>0</td>
<td>200,000</td>
<td>200,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>800,000</strong></td>
<td><strong>2,200,000</strong></td>
<td><strong>3,000,000</strong></td>
</tr>
</tbody>
</table>

* Includes Innovation Center approved at 85,000 sf  
** 1,000 gsf/unit results in 200 units for Short-Term and 750 total housing units
Existing Traffic Volumes

Martin Luther King, Jr. Blvd.  +/- 28,000 vpd  
(near Homestead Road)

Estes Drive  +/- 13,000 vpd  
(near Caswell Road)

Homestead Road  +/- 9,500 vpd  
(west of Martin Luther King, Jr. Blvd)

Hillsborough Street  +/- 7,800 vpd  
(east of Martin Luther King, Jr. Blvd)

Seawell School Road  +/- 4,500 vpd  
(west of Martin Estes Drive)

Piney Mountain Road  +/- 2,900 vpd  
(east of Martin Luther King, Jr. Blvd)
1. Eubanks Road @
2. Martin Luther King, Jr.
3. Martin Luther King, Jr. Blvd @ Northwoods Dr
4. Weaver Dairy Road @ Timberlyne Road
5. N. Estes Drive @ Halifax Road
6. N. Estes Drive @ Airport Drive
7. Estes Drive Ext @ Seawell School Road
8. Hillsborough Street @ Rosemary Street
9. Homestead Road @ Seawell School Road

Existing Conditions: Links Exceeding Town Threshold Capacity
Existing Available Transit Capacity to & from Carolina North

- **Morning Peak Hour**
  - Northbound: 510 315
  - Southbound: 150 235

- **Midday**
  - Northbound: 315 250
  - Southbound: 365 370

- **Evening Peak Hour**
  - Northbound: 150 105
  - Southbound: 205 370

* Combined Capacity of six routes serving Carolina North
Pedestrian Facilities
Bicycle Facilities

- Signalized Intersections
- Existing Bicycle Network
- Existing Bicycle Network - Paved Striped Shoulders
- Existing Bicycle Network - Shared Lane Pavement Markings
- Access Points
Impact Assessment

- Travel Forecasting Methodology
- Traffic Impacts
- Transit Impacts
- Pedestrian and Bicycle Facility Needs
- Potential Mitigation Measures
TRIP GENERATION METHODOLOGY

1. Development Program [ksf]
2. Population Estimate [people]
3. Parking Ratio [spaces/KSF or spaces/people]
4. # Parking Spaces [spaces]
5. Vehicle Trip Generation Ratio [trips/spaces]
6. Vehicle Trips [trips]
7. Mode Split [%]
8. Vehicle Occupancy Ratio [%]
9. Person Trips [%]
10. Mode Split [%]
11. Transit, Park & Ride, Walk, Bike Trips [trips]
TRIP DISTRIBUTION METHODOLOGY

- CN Students
  - UNC Geo-coded Data [person/TAZ]
  - Internal Distribution Trips [trips]
  - Site Generated Trips [trips]

- Triangle Region Travel Demand Model
  - External Distribution [% by Gateway]
  - Distribution Assignment [%]

- CN Employees
  - CN Residents

# Parking Spaces [spaces]
MODE SPLIT METHODOLOGY
2015 (800,000 sf) Parking Ratios

<table>
<thead>
<tr>
<th>Use</th>
<th>Early Phase</th>
<th>Baseline</th>
<th>-10 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>University/ Employee</td>
<td>0.65/ employee</td>
<td>0.50/ employee</td>
<td>0.45/ employee</td>
</tr>
<tr>
<td>University/ Student</td>
<td>0.33/student</td>
<td>0.25/student</td>
<td>0.23/student</td>
</tr>
<tr>
<td>University/ Visitors</td>
<td>0.20/1,000 sf</td>
<td>0.20/1,000 sf</td>
<td>0.18/1,000 sf</td>
</tr>
<tr>
<td>Private R&amp;D</td>
<td>2.65/1,000 sf</td>
<td>2.50/1,000 sf</td>
<td>2.25/1,000 sf</td>
</tr>
<tr>
<td>Housing</td>
<td>1.25/unit</td>
<td>1.25/unit</td>
<td>1.13/unit</td>
</tr>
<tr>
<td>Civic/Retail</td>
<td>1.50/1,000 sf</td>
<td>1.50/1,000 sf</td>
<td>1.35/1,000 sf</td>
</tr>
<tr>
<td>Fields</td>
<td>35/field</td>
<td>35/field</td>
<td>32/field</td>
</tr>
<tr>
<td><strong>Total Spaces</strong></td>
<td><strong>1,743</strong></td>
<td><strong>1,526</strong></td>
<td><strong>1,373</strong></td>
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</table>
## 2025 (3,000,000 sf) Parking Ratios

<table>
<thead>
<tr>
<th>Use</th>
<th>Baseline</th>
<th>-10 % Ratio</th>
<th>-20 % Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>University/ Employee</td>
<td>0.50/employee</td>
<td>0.45/employee</td>
<td>0.40/employee</td>
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<tr>
<td>University/ Student</td>
<td>0.25/student</td>
<td>0.23/student</td>
<td>0.20/student</td>
</tr>
<tr>
<td>University/ Visitors</td>
<td>0.20/1,000 sf</td>
<td>0.18/1,000 sf</td>
<td>0.16/1,000 sf</td>
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<tr>
<td>Private R&amp;D</td>
<td>2.50/1,000 sf</td>
<td>2.25/1,000 sf</td>
<td>2.00/1,000 sf</td>
</tr>
<tr>
<td>Housing</td>
<td>1.25/ unit</td>
<td>1.13/ unit</td>
<td>1.00/ unit</td>
</tr>
<tr>
<td>Civic/Retail</td>
<td>1.50/1,000 sf</td>
<td>1.35/1,000 sf</td>
<td>1.20/1,000 sf</td>
</tr>
<tr>
<td>Medical/Employee</td>
<td>0.50/employee</td>
<td>0.45/employee</td>
<td>0.40/employee</td>
</tr>
<tr>
<td>Medical/Patient -Visitor</td>
<td>2.50/1,000 sf</td>
<td>2.25/1,000 sf</td>
<td>2.00/1,000 sf</td>
</tr>
<tr>
<td>Fields</td>
<td>35/field</td>
<td>32/field</td>
<td>28/field</td>
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<tr>
<td>Total Spaces</td>
<td>5,834</td>
<td>5,254</td>
<td>4,668</td>
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</table>
## Mode Split

### 2007 University and Town-wide Data

<table>
<thead>
<tr>
<th>Mode</th>
<th>Univ. Employee</th>
<th>Univ. Student</th>
<th>Other</th>
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</thead>
<tbody>
<tr>
<td>Drive to Site</td>
<td>67 %</td>
<td>36 %</td>
<td>92 %</td>
</tr>
<tr>
<td>Transit</td>
<td>9 %</td>
<td>32 %</td>
<td>3 %</td>
</tr>
<tr>
<td>Park &amp; Ride</td>
<td>15 %</td>
<td>9 %</td>
<td>4 %</td>
</tr>
<tr>
<td>Walk/Bike</td>
<td>9 %</td>
<td>23 %</td>
<td>1 %</td>
</tr>
<tr>
<td>Total</td>
<td>100 %</td>
<td>100 %</td>
<td>100 %</td>
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</tbody>
</table>
### Trip Generation

#### Table 5: Carolina North Trip Generation 2015 (TIA Phase One) – 800,000 sf

<table>
<thead>
<tr>
<th>Trip Type</th>
<th>Daily</th>
<th>AM Peak Hour</th>
<th></th>
<th></th>
<th>PM Peak Hour</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>In</td>
<td>Out</td>
<td>Total</td>
<td>In</td>
<td>Out</td>
</tr>
<tr>
<td>Vehicle</td>
<td>5,049</td>
<td>420</td>
<td>115</td>
<td>535</td>
<td>265</td>
<td>399</td>
</tr>
<tr>
<td>Park &amp; Ride</td>
<td>1,248</td>
<td>120</td>
<td>22</td>
<td>141</td>
<td>65</td>
<td>109</td>
</tr>
<tr>
<td>Transit</td>
<td>1,941</td>
<td>126</td>
<td>84</td>
<td>210</td>
<td>124</td>
<td>135</td>
</tr>
<tr>
<td>Walk/Bike/Other</td>
<td>1,497</td>
<td>57</td>
<td>71</td>
<td>128</td>
<td>87</td>
<td>84</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>9,734</strong></td>
<td><strong>722</strong></td>
<td><strong>292</strong></td>
<td><strong>1,014</strong></td>
<td><strong>542</strong></td>
<td><strong>727</strong></td>
</tr>
</tbody>
</table>

#### Table 6: Carolina North Trip Generation 2025 (TIA Phase Two) – 3,000,000 sf

<table>
<thead>
<tr>
<th>Trip Type</th>
<th>Daily</th>
<th>AM Peak Hour</th>
<th></th>
<th></th>
<th>PM Peak Hour</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>In</td>
<td>Out</td>
<td>Total</td>
<td>In</td>
<td>Out</td>
</tr>
<tr>
<td>Vehicle</td>
<td>23,261</td>
<td>1,929</td>
<td>554</td>
<td>2,484</td>
<td>990</td>
<td>1,736</td>
</tr>
<tr>
<td>Park &amp; Ride</td>
<td>4,089</td>
<td>398</td>
<td>73</td>
<td>471</td>
<td>197</td>
<td>355</td>
</tr>
<tr>
<td>Transit</td>
<td>6,438</td>
<td>416</td>
<td>310</td>
<td>726</td>
<td>347</td>
<td>417</td>
</tr>
<tr>
<td>Walk/Bike/Other</td>
<td>5,957</td>
<td>186</td>
<td>260</td>
<td>446</td>
<td>255</td>
<td>272</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>39,746</strong></td>
<td><strong>2,929</strong></td>
<td><strong>1,197</strong></td>
<td><strong>4,127</strong></td>
<td><strong>1,788</strong></td>
<td><strong>2,781</strong></td>
</tr>
</tbody>
</table>
Trip Distribution

40% within Chapel Hill – Carrboro

60% external to Chapel Hill - Carrboro
Employee Trip Distribution
2015 Intersection Impacts and Potential Mitigation
2025 Intersection Impacts and Potential Mitigation
Streets Evaluated for Traffic Calming Implementation

**Carolina North Traffic Expected**
- Piney Mountain Road
- Hillsborough Street (Chapel Hill)
- Seawell School Road
- North Elliott/Curtis/Caswell Roads

**Carolina North Traffic Possible**
- Northwoods Road
- North Lakeshore Drive
- Barclay Road
Transit Impacts

2015 (800,000 SF) Phase 1

- Route NS reaches capacity
- 2 additional vehicles needed
- 400 to 500 additional park & ride spaces needed
- Other service adjustments may be needed
Transit Impacts

2025 (3,000,000 SF) Phase 2

- More service needed on Routes NS, A, T, G
- +/- 10 additional vehicles needed
- Approximately 1,500 additional park & ride spaces
- Route structure may need to change
Pedestrian Facility Needs

- Signalized Intersections
- Existing Sidewalk
- Proposed Sidewalk
- Existing Crosswalk
- Proposed Crosswalk
- Access Points
- Existing Bus Stop
Bicycle Facility Needs

Signalized Intersections
- Existing Sidewalk
- Proposed Sidewalk
- Existing Crosswalk
- Proposed Crosswalk
- Access Points
- Existing Bus Stop
Sensitivity Analysis
Different Parking Ratios

- TIA Phase 1 (800,000 sf)
  - Early Phase Ratios (15% more parking)
  - Constrained Ratios (10% less parking)

- TIA Phase 2 (3,000,000 sf)
  - Constrained Ratios (A) 10% less parking
  - Constrained Ratios (B) 20% less parking
Sensitivity Analysis
Different Parking Ratios

• TIA Phase 1 (800,000 sf)
  - No substantial change in traffic findings
  - Fewer park & ride spaces (reduced from 460 to 290) with early phase parking ratios
  - More park & ride spaces (increased from 460 to 570) with 10% reduction in on-site parking
  - One additional bus needed
Sensitivity Analysis
Different Parking Ratios

• TIA Phase 2 (3,000,000 sf)
  – Site-generated volumes are reduced through study area intersections, but does not change mitigation measures
  – More park & ride spaces needed
    • Increased from 1,520 to 2,030 with 10 % reduction in on-site parking
    • Increased from 1,520 to 2,540 with 20 % reduction in on-site parking
  – More transit service needed
    • 14 additional buses in service with 10 % reduction
    • 20 additional buses in service with 20 % reduction
2015 Mitigation Summary

- Traffic Mitigation
  - Lane designation and signal system changes
  - Additional turn lane at Martin Luther King, Jr. Blvd and Estes Drive
  - Signalize Martin Luther King, Jr. Blvd and Airport Drive (for transit connection)
  - Signalized site access from Estes Drive aligned with Airport Drive

- Traffic Calming
  - Further exploration with neighborhoods on roadways expected to carry Carolina North traffic
2015 Mitigation Summary

- Pedestrian and Bicycle Facilities
  - Complete sidewalk network near Carolina North
  - Provide more crossing opportunities
  - Complete bicycle lane network near Carolina North

- Transit
  - Route adjustments to provide stops within the site
  - Fleet increases to support additional ridership and longer travel times
  - Signal priority & potential bus lanes on Martin Luther King, Jr. Blvd.
  - Park & ride increases
2025 Mitigation Summary

• Traffic Mitigation
  – Reconstruct Martin Luther King, Jr. Blvd from north of Piney Mountain Road to south of Airport Drive
  – Reconstruct Estes Drive from west of Airport Drive to east of Martin Luther King, Jr. Blvd
  – Evaluate potential signalization/roundabout at:
    • Homestead Road at Weaver Dairy Road Extension
    • Homestead Road at Rogers Road
  – Turn lane additions at several other intersections (see map)

• Traffic Calming
  – Monitor traffic conditions in residential neighborhoods for traffic calming implementation
2025 Mitigation Summary

- Pedestrian and Bicycle Facilities
  - Provide improved pedestrian and bicycle facilities with reconstruction of Martin Luther King Jr Blvd and Estes Drive

- Transit
  - Additional route adjustments to provide stops within the site
  - Additional fleet increases to support additional ridership and longer travel times
  - Additional park & ride increases
  - Potential route restructuring to provide more direct routes to Carolina North
MLK Intersection configuration and long-term feasibility
Crosswalk location may not be feasible
Sight distance and traffic control concerns
Alignment with Airport Road and Intersection configuration
On-site transit route for 3,000,000ft² phase
TRANSPORTATION IMPACT ANALYSIS
CAROLINA NORTH DEVELOPMENT

Question and Comments
2015
No-Build
Intersection
Level-of-Service
2025
No-Build
Intersection
Level-of-Service

Town of Chapel Hill | 405 Martin Luther King Jr. Blvd. | www.townofchapelhill.org
# Air Quality/Greenhouse Gas

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>2009 Existing Condition</th>
<th>2015 No-Build Condition</th>
<th>2015 Build Condition</th>
<th>2015 Build with Mitigation</th>
<th>2015 “Early Phase Ratio” Build</th>
<th>2015 “Constrained Ratio” Build (10%)</th>
<th>2015 “Constrained Ratio” Build (20%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Dioxide (CO₂)¹</td>
<td>94,096.7</td>
<td>114,600.3</td>
<td>152,322.3</td>
<td>152,297.1</td>
<td>158,427.2</td>
<td>152,216.3</td>
<td></td>
</tr>
<tr>
<td>Build vs. Mitigation Scenario Difference</td>
<td></td>
<td>-25.20</td>
<td>+6,104.90</td>
<td></td>
<td></td>
<td>-80.80³</td>
<td></td>
</tr>
<tr>
<td>Pollutant</td>
<td>2025 No-Build Condition</td>
<td>2025 Build Condition</td>
<td>2025 Build with Mitigation</td>
<td>2025 “Constrained Ratio” Build (10%)</td>
<td>2025 “Constrained Ratio” Build (20%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carbon Dioxide (CO₂)</td>
<td>112,143.1</td>
<td>191,460.0</td>
<td>191,017.6</td>
<td>191,157.0</td>
<td>190,912.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Build vs. Mitigation Scenario Difference</td>
<td></td>
<td>-442.40</td>
<td>-303.00</td>
<td></td>
<td></td>
<td>-548.00</td>
<td></td>
</tr>
</tbody>
</table>

¹ Tons per Day

The proposed improvements are described in Chapter 5 – Mitigation Measures/Recommendations.

3 Scaled based on 3 msf output due to model inconsistency

Mobile source improvements include the proposed roadway/traffic improvements and parking constraint scenarios.