LAND USE MODEL UPDATE

Planning and Land Use Advisory Committee Meeting #2 – September 4, 2014
Presentation Outline

- Introduction and Recap
- Model Process
- Study Design
- Place Types
- Suitability Factors
Summary of Previous PLAC Meeting

• Model Background
• Project Scope
• Study Design
  • Current Model Limitations
  • Best Practices
  • Model Enhancements and Recommendations
• Group Discussion
• Data Collection
• Next Steps
Model Process

Legend

- LUM Process
- Input
- Output
- TDM Process

Geospatial Data

Carrying Capacity Analysis:
Identifies potential constraints and determines where future growth may occur

Land Suitability Analysis:
Measures the attractiveness of areas for accommodating new development

Control Totals:
- Future growth in population and employment for the region

Model Allocation:
Model will assign population and employment growth

Population:
Number of Households

Traffic Analysis Zone (TAZ) Aggregation

Employment:
Retail, Office, Service, Industrial /Manufacturing, Wholesale, and Government

Transportation Facilities

Regional Travel Demand Model

Place Types:
- Represents the various development categories
- Describe, measure, and evaluate the built environment

Suitability Factors:
- Rate different locations
- Help measure the appropriateness of an area for a specific condition or use
How does the Model Use Place Types?

• Represents various development forms in the region
• Estimates land use potential for undeveloped or potentially redeveloped areas
• Describes the form and function takes place
  • Context and Design
  • Character and Purpose
How does the Model Use Place Types?

• Categories that describe, measure, and evaluate the built environment
• Each Place Type is assigned specific attributes
  • “Place Type DNA”
• Current model uses 18 place types
Assigning the “DNA” of a place

- Residential density
- Floor area ratio (FAR)
- Occupancy
- Land use mix
- Building height
- Trip generation rates
- Water consumption rates
- Etc.
### Central Hamilton County Scenario Planning Study

#### Summary of Placetypes

<table>
<thead>
<tr>
<th>Placetype</th>
<th>Rural Residential</th>
<th>Suburban Residential (Low Density)</th>
<th>Suburban Residential (Moderate Density)</th>
<th>Suburban Apt</th>
<th>Strip Commercial</th>
<th>Community Activity Center</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Character/Description</strong></td>
<td>Large lot, single-family home sites within a rural setting. Each lot typically has direct access to the main arterial.</td>
<td>Low-density, suburban-style home sites characterized by larger lots/yards, curvilinear cul-de-sac street networks with few access points.</td>
<td>Similar in character to the Low Density placetype, but at slightly higher densities and with some attached dwelling units (e.g., townhomes).</td>
<td>Single use apartment communities, gated with an informal circulation system. Generally located in proximity to commercial areas.</td>
<td>Strip-style commercial development adjacent to arterials, characterized by single lot depth and large setbacks.</td>
<td>Suburban-style, internally-oriented ‘power center’ typically anchored by a national tenant and includes out-parcels. Located at the intersection of major arterials.</td>
</tr>
<tr>
<td><strong>Acreage</strong></td>
<td>10 acres</td>
<td>60 acres</td>
<td>60 acres</td>
<td>10 acres</td>
<td>60 acres</td>
<td>60 acres</td>
</tr>
<tr>
<td><strong>Primary Uses</strong></td>
<td>Single-family homes</td>
<td>Single-family homes</td>
<td>Single-family homes</td>
<td>Multi-family residential (townhomes and apartments)</td>
<td>Commercial</td>
<td>Commercial</td>
</tr>
<tr>
<td><strong>Secondary Uses</strong></td>
<td>None</td>
<td>None</td>
<td>Townhomes</td>
<td>None</td>
<td>Office</td>
<td>None</td>
</tr>
<tr>
<td><strong>Residential Density</strong></td>
<td>2 du/acs (single-family)</td>
<td>3 du/acs (single-family)</td>
<td>4 du/acs (single-family)</td>
<td>18 du/acs (multi-family)</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td><strong>Non-residential Intensity</strong></td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>0.20 - 0.25 FAR</td>
<td>0.2 FAR</td>
</tr>
<tr>
<td><strong>Building Heights</strong></td>
<td>1-2 stories</td>
<td>1-2 stories</td>
<td>1-2 stories</td>
<td>1-2 stories</td>
<td>1-2 stories</td>
<td>1-2 stories</td>
</tr>
<tr>
<td><strong>Open Space</strong></td>
<td>10% Passive</td>
<td>10%, Active (pocket parks, regional parks)</td>
<td>5%, Active (pocket parks, regional parks) and Passive</td>
<td>5% Passive</td>
<td>5% Passive</td>
<td>5% Passive</td>
</tr>
<tr>
<td><strong>Connectivity</strong></td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td><strong>Current Zoning</strong></td>
<td>A-1</td>
<td>R-1</td>
<td>R-3</td>
<td>C-2, C-3, C-5</td>
<td>C-2, C-3</td>
<td>C-2, C-3</td>
</tr>
<tr>
<td><strong>Primary Modes</strong></td>
<td>Automobile</td>
<td>Automobile</td>
<td>Automobile</td>
<td>Automobile</td>
<td>Automobile</td>
<td>Automobile</td>
</tr>
<tr>
<td><strong>Secondary Modes</strong></td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Walking</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

#### Representative Photos
Placetypes in Practice
Placetypes in Practice

Suburban Residential Moderate
Polygons characteristics:
0.25 mile (40 acres)
0% existing development
0% undevelopable
40 acres developable land

Suburban Res. Mod. Placetype:
- MF Res.: 0%
- SF Res.: 75%
- Comm.: 0%
- Off.: 0%
- Ind.: 0%
- Civc/Inst.: 0%
- Park/Open: 5%
- ROW/Inf.: 20%
Placetypes in Practice

Polygon Characteristics:
- MF Res.: 0 acres
- SF Res.: 30 acres
- Comm.: 0 acres
- Off.: 0 acres
- Ind.: 0 acres
- Civc/Inst.: 0 acres
- Park/Open: 2 acres
- ROW/Inf.: 8 acres

Dwelling Units:
- SF res. density: 4 du/ac
- SF res. LU: 30 acres
- SF res. du’s: 120 du’s
Placetypes in Practice

Polygon characteristics:
¼ mile (40 acres)
0% existing development
50% undevelopable (water)
20 acres developable land

Suburban Res. Mod. Placetype:
MF Res. 0%
SF Res. 75%
Comm. 0%
Off. 0%
Ind. 0%
Civic/Inst. 0%
Park/Open 5%
ROW/Inf. 20%
Placetypes in Practice

Polygon Characteristics:
- MF Res.: 0 acres
- SF Res.: 15 acres
- Comm.: 0 acres
- Off.: 0 acres
- Ind.: 0 acres
- Civc/Inst.: 0 acres
- Park/Open: 1 acre
- ROW/Inf.: 4 acres

Dwelling Units:
- SF res. density: 4 du/ac
- SF res. LU: 15 acres
- SF res. du’s: 60 du’s
# Example: Impervious surface

<table>
<thead>
<tr>
<th>Components</th>
<th>Placetype DNA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building area</td>
<td>• Land use</td>
</tr>
<tr>
<td></td>
<td>• Density</td>
</tr>
<tr>
<td></td>
<td>• FAR</td>
</tr>
<tr>
<td></td>
<td>• Occupancy rates</td>
</tr>
<tr>
<td></td>
<td>• Avg. home sq. ft.</td>
</tr>
<tr>
<td></td>
<td>• Avg. bldg. height</td>
</tr>
<tr>
<td>Parking area</td>
<td>• Spaces per home</td>
</tr>
<tr>
<td></td>
<td>• Spaces per employee</td>
</tr>
<tr>
<td></td>
<td>• Avg. parking space size</td>
</tr>
<tr>
<td>Pavement</td>
<td>• % streets and driveways</td>
</tr>
</tbody>
</table>
PRIORITY: NEW IMPERVIOUS SURFACE

- Trend: 15,300
- Dispersed: 16,100
- Highway: 14,800
- Cities and Towns: 13,100
- New Centers: 12,200
## Example: Water consumed

<table>
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<th>Placetype DNA</th>
</tr>
</thead>
</table>
| Dwelling units by density (gallons consumed per DU)  | • Land use  
• Density                            |
| Commercial square footage (gallons consumed per 1KSF)| • Land use  
• FAR                                |
| Office/professional employment (gallons consumed per emp.) | • Land use  
• FAR  
• Employment rates (employees per 1KSF) |
| Etc.                                                 |                                         |
Water Demand Trend

Existing water service area.

Unserved water demand.

Water Demand TREND
PRIORITY: NEW INFRASTRUCTURE

Acres of new development outside of water service areas.
Place Type Attributes

- Land use %
- Density/intensity
- Average living area (sq. ft.)
- Occupancy rate (emp./s.f.)
- Building height
- Parking rate/size/height
- Student rates

- Trip generation rates
- Water consumption rate
- Wastewater generation rate
- Solid waste generation rate
- Network density
- Water/sewer infrastructure
Model Indicators

- Total residents
- Total dwelling units
- Total employment
  - Commercial
  - Office
  - Industrial
- Proximity of people/jobs to:
  - Work
  - Transit
  - Shopping
  - Etc.
- Land consumption
- Impervious surface
- Water/wastewater demand
- Green infrastructure impacts
- Trips generated
- Total students (K-12)
- Police/fire demand
- Infrastructure cost
Redevelopment

• Growth is allocated to vacant land
• What about redevelopment?
  • Intensification of existing places
  • Example: Mid-town
PlanET redevelopment approach

20.8 acres are redevelopable

50% redevelopment rate for Mixed Use Corridor

50% of this polygon (10.4 ac) will redevelop as a MUC placetype.
Rural
Residential
Rural Neighborhood
Rural Highway
Suburban Apt.
Strip Commercial
Industrial/Bus. Park
Office Park
Regional Commercial Center
Community Commercial Center
Regional Mixed Use Center
Small Town Mixed Use
Community Mixed Use
Traditional Neigh.
Urban Neigh.
Mixed Use Center/Corr.

Lowest (0-10%)
Redevelopment rate

Highest (70-80%)
Southeast Area Corridor Study

- Property values
- Non-residential
- Improved-to-property ratio
  - General Urban - < 0.75
  - Town Center - < 1.25
  - TOD - < 2.00
Different approaches to redevelopment potential

- All non-residential land
- Improved-to-land value ratio
- Dilapidated/poor housing stock
- What else?
PLACE TYPES

Discussion
Grid Framework

• Uniform polygon structure.
• Uniform data visualization.
• More precise application of placetypes.
• Examples: PlanET, Imagine Central Arkansas, DeSoto Discovery.
PlanET

- Five-county region
- \( \frac{1}{4} \) mile (40-acre) grid
Integrated Regional Model

• One model run per scenario
• Regional systems modeling
• Less than 50,000 polygons (ideally closer to 30,000)
• Examples: PlanET; Imagine Central Arkansas
¼ Mile Grid

- ¼ Mile (40-acre) grid
- Typical definition of “place”
Study Area with ¼ Mile Grid

- 76,000 records
- Too many
Refinements

- TAZs (80 acres or less)
Refinements

- TAZs (80 acres or less)
- Water bodies
Refinements

- TAZs (80 acres or less)
- Water bodies
- One-mile grid
  - Non-MPO
Refinements

- TAZs (80 acres or less)
- Water bodies
- One-mile grid
  - Non-MPO
  - Non-urban
Proposed polygon structure

- 34,380 total records
- 31,450 ¼ Mile grid
- 2,930 One-mile grid
Suitability Factors

• Measures the attractiveness of areas for accommodating new development
• Rates different locations in the region based on different geographical factors
• Assists in measuring the level of development or redevelopment of an area
How does the Model Use Suitability Factors?

- Uses geographical layers to determine desirable locations for development or constraints for development
- Weights the suitability factors based on preference
Various Suitability Factors to Consider

• Regional data coverage

• Focus on data that provides:
  • Development potential
  • Development constraints
Example: DeSoto Discovery Plan
Example: 100-Year Floodplain
Example: 100-Year Floodplain
Example: New Parks
Example: I-269 Interchanges
Example: I-269 Interchanges
Suitability Factors

Natural Systems
- Topography
- Proximity to existing hospitals
- Farmland soils

Community Services
- Proximity to parks
- Proximity to proposed parks, bike paths, greenways
- Proximity to emergency response

Infrastructure/Accessibility
- Proximity to major roads
- Proximity to secondary roads
- Proximity to interchanges
- Proximity to rail
- Proximity to sewer
- Proximity to gas
- Proximity to water
- Proximity to broadband

Other
- Redevelopment (penalty)
- Residential (penalty)
- Proximity to employment centers
- Proximity to retail centers
- Parcel size
- Cemeteries (penalty)
Suitability: Proposed Conditions
## Peer comparison

|             | Topography | Floodplains | Farmland Soils | Wetlands | Proximity to major roads | Proximity to secondary roads | Proximity to interchanges | Proximity to transit | Proximity to rail lines | Proximity to sewer | Proximity to gas lines | Proximity to water | Proximity to broadband infrastructure | Proximity to parks | Proximity to schools | Proximity to proposed bike routes | Proximity to proposed greenways | Proximity to emergency response | Redevelopment | Redevelopment potential | Proximity to employment centers | Proximity to retail centers | Proximity to existing residential | Regional accessibility | Residential | Parcel size | Zoning compatibility | Future land use policy | Growth hotspot | Approved development | Airport landing routes |
|-------------|------------|-------------|----------------|----------|--------------------------|------------------------------|----------------------------|--------------------|------------------------|-----------------|------------------------|-----------------|-------------------------------------------------------------|-----------------|---------------------|-------------------------------|------------------------|-----------------------------|---------------------|-----------------|---------------------|------------------------|-----------------|---------------------|------------------------|
| Chattanooga (CHCSPS) | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● |
| DeSoto Discovery | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● |
| PlanET (Knoxville) | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● |
| Imagine Central Arkansas | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● | ● ● ● ● ● ● |

Memphis MPO
METROPOLITAN PLANNING ORGANIZATION

Strengthening Regional Transportation
# Current Suitability Factors

- **Residential**

<table>
<thead>
<tr>
<th>Suitability Factor</th>
<th>On/Off</th>
<th>+/- relationship</th>
<th>Current Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appraised Value of Land</td>
<td>on</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>Availability of Water and Sewer</td>
<td>on</td>
<td>+</td>
<td>10</td>
</tr>
<tr>
<td>Distance to Airport</td>
<td>off</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Distance to Congested Corridors</td>
<td>on</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Distance to Employment Centers</td>
<td>on</td>
<td>+</td>
<td>6</td>
</tr>
<tr>
<td>Distance to Intermodal Facility</td>
<td>off</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Distance to Major Road</td>
<td>on</td>
<td>+</td>
<td>6</td>
</tr>
<tr>
<td>Distance to Retail Centers</td>
<td>on</td>
<td>+</td>
<td>6</td>
</tr>
<tr>
<td>Distance to Roads</td>
<td>on</td>
<td>+</td>
<td>0</td>
</tr>
<tr>
<td>Livability / Walkability</td>
<td>on</td>
<td>+</td>
<td>3</td>
</tr>
<tr>
<td>Perception of Crime</td>
<td>on</td>
<td>-</td>
<td>10</td>
</tr>
<tr>
<td>Perception of Public School System</td>
<td>on</td>
<td>-</td>
<td>10</td>
</tr>
<tr>
<td>Property Tax Rate</td>
<td>on</td>
<td>-</td>
<td>10</td>
</tr>
<tr>
<td>Within Block groups with Skilled Workforce</td>
<td>off</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Within Half Mile of Railroad</td>
<td>off</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Within Floodplain</td>
<td>on</td>
<td>-</td>
<td>10</td>
</tr>
<tr>
<td>Within High-Income Block groups</td>
<td>off</td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>
## Current Suitability Factors

- **Non-Residential**

<table>
<thead>
<tr>
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<td>10</td>
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<tr>
<td>Perception of Crime</td>
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<td>-</td>
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</tr>
<tr>
<td>Perception of Public School System</td>
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</tr>
<tr>
<td>Property Tax Rate</td>
<td>on</td>
<td>-</td>
<td>10</td>
</tr>
<tr>
<td>Within Block groups with Skilled Workforce</td>
<td>on</td>
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</tr>
<tr>
<td>Within Half Mile of Railroad</td>
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<td></td>
<td>0</td>
</tr>
<tr>
<td>Within Floodplain</td>
<td>on</td>
<td>-</td>
<td>10</td>
</tr>
<tr>
<td>Within High-Income Block groups</td>
<td>on</td>
<td>+</td>
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</table>
## Current Suitability Factors

- **Industrial**

<table>
<thead>
<tr>
<th>Suitability Factor</th>
<th>On/Off</th>
<th>+/- relationship</th>
<th>Current Weight</th>
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<tr>
<td>Appraised Value of Land</td>
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<tr>
<td>Availability of Water and Sewer</td>
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<td>10</td>
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<tr>
<td>Distance to Airport</td>
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</tr>
<tr>
<td>Distance to Congested Corridors</td>
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<tr>
<td>Distance to Employment Centers</td>
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<td></td>
<td>0</td>
</tr>
<tr>
<td>Distance to Intermodal Facility</td>
<td>on</td>
<td>+</td>
<td>10</td>
</tr>
<tr>
<td>Distance to Major Road</td>
<td>on</td>
<td>+</td>
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</tr>
<tr>
<td>Distance to Retail Centers</td>
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</tr>
<tr>
<td>Distance to Roads</td>
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<td>Livability / Walkability</td>
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Suitability Factors - Survey

- [https://www.surveymonkey.com/s/LJTQR8Z](https://www.surveymonkey.com/s/LJTQR8Z)

<table>
<thead>
<tr>
<th>Suitability Factors Survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential Suitability Factors</td>
</tr>
</tbody>
</table>

1 through 10 rating with 1 being the least important for residential growth and development and 10 being the most important.

1. Cost of Land
   - 1
   - 2
   - 3
   - 4
   - 5
   - 6
   - 7
   - 8
   - 9
   - 10

2. Proximity to Water and Sewer Services
   - 1
   - 2
   - 3
   - 4
   - 5
   - 6
   - 7
   - 8
   - 9
   - 10

3. Proximity to Airport Service
   - 1
   - 2
   - 3
   - 4
   - 5
   - 6
   - 7
   - 8
   - 9
   - 10

4. Regional Accessibility to Employment and Services
   - 1
   - 2
   - 3
   - 4
   - 5
   - 6
   - 7
   - 8
   - 9
   - 10

5. Proximity to Intermodal Facility
   - 1
   - 2
   - 3
   - 4
   - 5
   - 6
   - 7
   - 8
   - 9
   - 10

6. Proximity to Major Road/Interchange
   - 1
   - 2
   - 3
   - 4
   - 5
   - 6
   - 7
   - 8
   - 9
   - 10

7. Proximity to Retail/Commercial Centers
   - 1
   - 2
   - 3
   - 4
   - 5
   - 6
   - 7
   - 8
   - 9
   - 10
Suitability Factors - Survey

- Cost of Land
- Proximity to Water and Sewer Services
- Proximity to Airport Service
- Regional Accessibility to Employment and Services
- Proximity to Intermodal Facility
- Proximity to Major Road/Interchange
- Proximity to Retail/Commercial Centers
- Proximity to Schools
- Proximity to Livability Corridors throughout Region
- Avoiding Floodplain
- Proximity to Active Transportation Modes
- Proximity to Civic, Recreational and Mid-South Greenprint Assets
- Zoning and Land Use Compatibility
- Redevelopment Potential
SUITABILITY FACTORS

Discussion
Next Steps

- Refine Suitability Factors and Place Types for Model
- Provide the PLAC with a Draft of the LUM Study Design
- Update Model
  - Existing Conditions Scenario
- Run Allocation (2017, 2020, 2030, 2040)
- Present Initial Results for Comments
  - PLAC Meeting #3 - October 9th
  - ETC Work Session - October 9th
- Refine Allocation
- Present Final Allocation Results
- ETC and TPB Approval (November)
Timeline

Data Collection

Study Design

Model Development

Model Validation

ETC and TPB Meeting (August)

PLUAC Meeting #1 (July)

PLUAC Meeting #2 (September)

PLUAC Meeting #3 (October)

Transportation Policy Board Approval (November)

Training

Memphis MPO
METROPOLITAN PLANNING ORGANIZATION
Strengthening Regional Transportation

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QUESTIONS?

Thanks for your time!