Transportation Modeling Forum

December 9, 2015
Forum Agenda

- Series 13 Rollout
- San Diego Forward: The Regional Plan
- Skyway Modeling
Our Regional Plans
TODAY: Where People Live and Work

- 3.1 million people
- 1.5 million jobs
- 1.2 million homes
2050: Where People will Live and Work

- 4.1 million people
- 1.9 million jobs
- 1.5 million homes
More Travel Choices
TODAY:
Regional Transit
2050: More Transit Choices

- New Trolley lines
- New *Rapid* lines
- New SPRINTER express service and extension
- Continued COASTER double tracking
- New streetcar lines
- Increased frequencies on existing services to every 10 min all day
TODAY:
Managed Lanes and Highways
2050: More Managed Lane Choices

- Managed Lanes
- Operational improvements
- Highway lanes
- New HOV and highway connectors (not shown)
TODAY:
Regional Bikeways

Existing Population and Employment Densities with Bike Network
April 2015

- Regional Bike Plan Network
- Population Density: 1 dot = 100 people
- Employment Density: 1 dot = 100 people

[Map showing regional bikeways and population densities]
2050: More Biking and Walking Choices

- Complete the Regional Bike Network
- Additional investments (not shown)
  - Safe routes to transit projects
  - Safety improvements at highway interchanges
  - Safe routes to school programs
  - Local bike and pedestrian projects
Implementing the Plan: Where do we invest the money?

$203.4 billion in year of expenditure (YOE) dollars
Regional Plan Exceeds State Greenhouse Gas Emissions Reductions Targets

SB 375 Greenhouse Gas Targets* and Emissions Reductions

*Targets set by State for SANDAG to reduce Per Capita CO2 Emissions from Passenger Vehicles

ARB Emissions Reduction Targets
-2020 ARB Target: -7%
-2035 ARB Target: -13%

Additional Emissions reductions
-2020 SD Forward: -15%
-2035 SD Forward: -21%
Activity Based Travel Demand Model

• Simulates individual and household transportation decisions

• Predicts whether, where, when, and how people travel

• Based on travel surveys and vehicle counts, transit ridership data, and national census data
Regional Plan Vision and Goals

To provide innovative mobility choices and planning to support a sustainable and healthy region, a vibrant economy, and an outstanding quality of life for all.
Common Criteria Across Modes

- Accidents/safety
- Minimizes habitat and residential impacts
- GHG and smog forming pollutants
- Serves RCP Smart Growth areas
- Access to jobs
- Project cost effectiveness
- Physical activity
Project Evaluation Criteria Categories

- Highway corridors
- Transit services
- High occupancy vehicle (HOV) connectors and freeway connectors
- Rail grade separations
- Active transportation
Scenario Development Based on Revenue Constraints

Unconstrained Multimodal Network

- Bike/Pedestrian
  - 1.--
  - 2.--
  - 3.--

- Transit
  - 1.--
  - 2.--
  - 3.--

- Highway
  - 1.--
  - 2.--
  - 3.--

- HOV Connectors
  - 1.--
  - 2.--
  - 3.--

- Freeway Connectors
  - 1.--
  - 2.--
  - 3.--

- Rail Grade Separation
  - 1.--
  - 2.--
  - 3.--

Draft Scenario #1

Draft Scenario #2

2050 No-Build Network
Network Selection Based on Performance Measures

Draft Scenario #1

Blended Scenario

Draft Scenario #2

Performance Measures

Board Selects Draft Regional Plan Network
1. Are travel times reduced?
   – Average peak-period travel time to work
   – Daily vehicle delay per capita

2. Are more people walking, biking, using transit, and sharing rides?
   – Change in walk, bike, transit, and carpool mode share

3. Is the transportation system safer?
   – Annual projected number of vehicle injury/fatal collisions per vehicle mile traveled
   – Annual projected number of bicycle/pedestrian injury/fatal collisions per mile traveled
Performance Measures

- Strengthen the Economy
- Provide Mobility Choices
- Improve Access
- Preserve the Environment
Mid-City – UTC (Morning Peak)

- Drive Alone: 26
- Transit: 66
- Carpool: 26

Year 2012
Mid-City – UTC (Morning Peak)

- **2012**
  - Drive Alone: 26
  - Transit: 26
  - Carpool: 66

- **2050 No Build**
  - Drive Alone: 31
  - Transit: 72
  - Carpool: 31
Mid-City – UTC (Morning Peak)

- **2012**
  - Drive Alone: 26
  - Transit: 26
  - Carpool: 66

- **2050 Scenarios**
  - 1, 2, & Blended:
    - Drive Alone: 20
    - Transit: 31
    - Carpool: 72

- Mid-City – UTC (Morning Peak) Scenarios
  - **1, 2, & Blended**
### Revenue Constrained Network Performance Measures

#### Table N.2 (continued)

<table>
<thead>
<tr>
<th>Number</th>
<th>Performance Measure</th>
<th>2012</th>
<th>2020 No Build</th>
<th>2035 No Build</th>
<th>2050 No Build</th>
<th>2020 Regional Plan</th>
<th>2035 Regional Plan</th>
<th>2050 Regional Plan</th>
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<tbody>
<tr>
<td></td>
<td>Are connections to neighboring counties, Mexico, tribal lands, and military bases/installations improved? (continued)</td>
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<td>46</td>
<td>52</td>
<td>46</td>
<td>44</td>
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<tr>
<td>3C</td>
<td>Average travel times to/from neighboring counties (Imperial, Orange, Riverside) (minutes)</td>
<td>57</td>
<td>60</td>
<td>63</td>
<td>68</td>
<td>59</td>
<td>61</td>
<td>63</td>
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<td>3D</td>
<td>Average travel times to/from military bases/installations (minutes)</td>
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<td>23</td>
<td>23</td>
<td>23</td>
<td>23</td>
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<td>4</td>
<td>Are travel times reduced?</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>4A</td>
<td>Average peak-period travel time to work (minutes)</td>
<td>27</td>
<td>29</td>
<td>29</td>
<td>29</td>
<td>28</td>
<td>28</td>
<td>27</td>
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<td></td>
<td>drive alone</td>
<td>27</td>
<td>29</td>
<td>29</td>
<td>29</td>
<td>28</td>
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<td>27</td>
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<td>25</td>
<td>24</td>
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<td>transit</td>
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<td>47</td>
<td>45</td>
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<tr>
<td></td>
<td>bike</td>
<td>19</td>
<td>20</td>
<td>19</td>
<td>19</td>
<td>20</td>
<td>20</td>
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<tr>
<td></td>
<td>walk</td>
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<td>19</td>
<td>19</td>
<td>19</td>
<td>19</td>
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<tr>
<td>4B</td>
<td>Daily vehicle delay per capita (minutes)</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>11</td>
<td>11</td>
<td>10</td>
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<tr>
<td>5</td>
<td>Are more people walking, biking, using transit and sharing rides?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5A</td>
<td>Walk, bike, transit, and carpool mode share</td>
<td>56.6%</td>
<td>58.2%</td>
<td>58.1%</td>
<td>58.9%</td>
<td>58.4%</td>
<td>58.8%</td>
<td>60.1%</td>
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<tr>
<td></td>
<td>carpool</td>
<td>42.9%</td>
<td>44.0%</td>
<td>43.3%</td>
<td>42.1%</td>
<td>44.0%</td>
<td>43.0%</td>
<td>41.8%</td>
</tr>
<tr>
<td></td>
<td>transit</td>
<td>1.9%</td>
<td>2.2%</td>
<td>2.4%</td>
<td>2.6%</td>
<td>2.4%</td>
<td>3.3%</td>
<td>3.8%</td>
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<tr>
<td></td>
<td>bike &amp; walk</td>
<td>11.8%</td>
<td>12.0%</td>
<td>12.4%</td>
<td>14.3%</td>
<td>12.0%</td>
<td>12.5%</td>
<td>14.4%</td>
</tr>
</tbody>
</table>
Commute Destination by Mode (2050RC)
Commute Destination by Mode (2050RC)
VMT per Capita Concept Map (2012)
Getting Ready for the Next Plan

- Active Transportation (AT) Enhancement II
- How to address shared-use mobility
- Autonomous vehicles
- Model re-estimation based on 2016 HTS
Autonomous Vehicle

- **FULLY AUTOMATED**
  - Monitoring of the system not required
  - Driver does not need to be able to take over the driving task
  - Example: Highway driving up to 130 km/h

- **HIGHLY AUTOMATED**
  - Monitoring of the system required
  - Driver needs to be able to take over the driving task with lead time
  - Example: Stop-and-go (highway)

- **PARTIALLY AUTOMATED**
  - Monitoring of the system required
  - Driver needs to be able to take over the driving task at any moment
  - Example: Stop-and-go up to 30 km/h
The Region’s Future
Skyway Modeling

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Chris Wahl

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Skyway Modeling

- Unique Issues
  - No operating versions in the U.S. used for commuting
  - Which transit mode?
  - Effect of queueing
Skyway Modeling

- **Modeling Specs:**
  - Rapid Bus Mode
  - Average Speed 10 MPH
  - 1-Minute Headways
  - $3 Fares
  - Elevated Stations (20 feet)
Skyway Modeling

- **Market Assessment - Task Process**
  - Define Catchment Area and Market Segments
  - Identify Candidate Trips
  - Annualization of Model Trips
  - Planning-level Ridership Estimates
Skyway Modeling

- **Skyway Market Catchment Area**

  - Functional Activity Area Served by the Skyway
  - Divided into 25 “subareas” (aggregated TAZs) for more detailed analysis of travel patterns
Skyway Modeling

- **Key Market Segments**
  - Resident Commuter Trips
  - Resident Non-Work Trips
    - Shopping
    - Personal Business
    - Recreational Trips
  - Tourist / Visitor Trips
    - Local
    - Out-of-town

Another potential market: Mid-day trips by Downtown Employees
Skyway Modeling

- Navigating the Flight Path: Airport Approach Overlay Zone

**Juniper Street**
- Part 77 Surface: 281'
- Ground Elevation: 244'
- Max Allowable Height: 37'

**Ivy Street**
- Part 77 Surface: 280'
- Ground Elevation: 224'
- Max Allowable Height: 56'
# Skyway Modeling

- **Study Area Daily Trips (SANDAG Series 12 2020)**

<table>
<thead>
<tr>
<th>Trip Type</th>
<th>Resident Work</th>
<th>Resident Non-Work</th>
<th>Visitor</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal</td>
<td>21,700</td>
<td>247,200</td>
<td>54,600</td>
<td>323,500</td>
</tr>
<tr>
<td>External</td>
<td>123,400</td>
<td>586,900</td>
<td>98,600</td>
<td>808,900</td>
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<tr>
<td>Total</td>
<td>145,100</td>
<td>834,100</td>
<td>153,200</td>
<td>1,132,400</td>
</tr>
</tbody>
</table>
Skyway Modeling

- Market Assessment - Task Process
  - Define Catchment Area and Market Segments
  - Identify Candidate Trips
  - Annualization of Model Trips
  - Planning-level Ridership Estimates
Skyway Modeling

- Candidate Trips - Refinement Process

Internal Study Area Trips
Viable Trip Interchanges
Skyway Modeling

- Identification of Candidate Trips

**Internal Study Area Trips**

<table>
<thead>
<tr>
<th>Trip Type</th>
<th>Resident Work</th>
<th>Resident Non-Work</th>
<th>Visitor</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal</td>
<td>21,700</td>
<td>247,200</td>
<td>54,600</td>
<td>323,500</td>
</tr>
</tbody>
</table>

**Viable Trip Interchanges**

<table>
<thead>
<tr>
<th>Trip Type</th>
<th>Trips (daily)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resident Work</td>
<td>3,400</td>
</tr>
<tr>
<td>Resident Non-Work</td>
<td>29,800</td>
</tr>
<tr>
<td>Visitor/Tourist</td>
<td>8,500</td>
</tr>
<tr>
<td>Total</td>
<td>41,700</td>
</tr>
</tbody>
</table>
Skyway Modeling

- **Market Assessment - Task Process**
  - Define Catchment Area and Market Segments
  - Identify Candidate Trips
  - Annualization of Model Trips
  - Planning-level Ridership Estimates
## Skyway Modeling

### Annualization of Model Trips

- Tourist trips adjusted based on U.S.S. Midway data
- Work/Non-work trips adjusted (TCRP Report 73: Characteristics of Urban Travel Demand)
- Propensities from observed transit behavior across the U.S. (NCHRP Report 187: Quick-Response Urban Travel Estimation Techniques)
- Annual Ridership: **610,000 – 910,000**

<table>
<thead>
<tr>
<th>Ridership by Market Segment</th>
<th>2020 Person Trips</th>
<th>Propensity</th>
<th>Daily Trips</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Non-Peak Weekday</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resident Work</td>
<td>3,400</td>
<td>1% - 2%</td>
<td>34 - 68</td>
</tr>
<tr>
<td>Resident Non-Work</td>
<td>29,800</td>
<td>2% - 3%</td>
<td>596 - 894</td>
</tr>
<tr>
<td>Visitor</td>
<td>8,500</td>
<td>10% - 15%</td>
<td>850 - 1,275</td>
</tr>
<tr>
<td>Total Trips</td>
<td><strong>41,700</strong></td>
<td><strong>1,480 - 2,237</strong></td>
<td></td>
</tr>
</tbody>
</table>

| **Non-Peak Weekend**        |                   |            |             |
| Resident Work               | 1,100             | 1% - 2%    | 11 - 22     |
| Resident Non-Work           | 20,900            | 2% - 3%    | 418 - 627   |
| Visitor                     | 12,860            | 10% - 15%  | 1,286 - 1,929 |
| Total Trips                 | **34,860**        | **1,715 - 2,578** |

| **Peak Weekday**            |                   |            |             |
| Resident Work               | 3,400             | 1% - 2%    | 34 - 68     |
| Resident Non-Work           | 29,800            | 2% - 3%    | 596 - 894   |
| Visitor                     | 14,239            | 10% - 15%  | 1,424 - 2,136 |
| Total Trips                 | **47,439**        | **2,054 - 3,098** |

| **Peak Weekend**            |                   |            |             |
| Resident Work               | 1,100             | 1% - 2%    | 11 - 22     |
| Resident Non-Work           | 20,900            | 2% - 3%    | 418 - 627   |
| Visitor                     | 18,219            | 10% - 15%  | 1,822 - 2,733 |
| Total Trips                 | **40,219**        | **2,251 - 3,382** |
Skyway Modeling

- Market Assessment - Task Process
  - Define Catchment Area and Market Segments
  - Identify Candidate Trips
  - Annualization of Model Trips
  - Planning-level Ridership Estimates
Skyway Modeling

- **Planning-Level Ridership Estimates**
  - Base Trips
    - Series 12 Model Data
  - Special Event Trips
    - Historical Tourism Data
  - Novelty Trips
    - “Latent Demand”

<table>
<thead>
<tr>
<th>Skyway Ridership</th>
<th>Annual Trips</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>Base Annual Trips</td>
<td>610,000</td>
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<tr>
<td>Total Special Event Trips¹</td>
<td>72,500</td>
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<tr>
<td>Annual Trips with Special Events</td>
<td>682,500</td>
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<tr>
<td>Novelty Trips (10%)</td>
<td>68,250</td>
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<tr>
<td>Total Annual Trips</td>
<td>750,750</td>
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</tbody>
</table>

¹Special Event Trips include Comic Con, Petco Park Events, and December Nights
Skyway Cost Estimate

- **Capital Costs**
  - Prepared using FTA Standard Cost Category Format
    - Aerial Guideway and Elements
    - Station Infrastructure
    - Systems
  
  **Total Capital Cost:** $65-75 million

- **Operation and Maintenance Costs**
  - Labor
  - Energy
  - Major Repairs

  **Total O & M Cost:** $2.6-2.8 million (annual)
Skyway Modeling

- Additional Skyway Studies
  - Sorrento Valley/UCSD
  - Pacific Beach
  - Mission Valley
Forum Agenda Recap

- Series 13 Rollout
- 2015 Regional Transportation Plan
- Skyway Modeling

Next Transportation Modeling Forum:
June 8, 2016