North Lake Shore Drive
Corridor Planning Committee/Task Force Meeting #4
December 8, 2015
Welcome
• Introductions & Purpose of the Meeting

• Alternatives Development & Evaluation Process Progress
  – Public Meeting #2
  – Purpose & Need & EIS Process
  – Evaluation Process
  – Travel Demand Modeling

• Building an Improvement Alternative
  – Junction Treatments
  – Transit Treatments
  – Non-Motorized Travel Considerations
  – Shoreline Considerations
  – Example: Chicago Avenue Junction Concepts

• Next Steps
Public Meeting #2

• 330 people attended
• 750 comments received which included 1,600 ideas
• Variety of methods to collect input:
  – Share your ideas worksheet
  – Comment cards
  – Online mapping comment tool
  – Online comment form/project email
Environmental Impact Study (EIS) Process

Data Collection

Purpose & Need

Alternatives Development & Evaluation
  - Initial Alternatives
  - Alternatives Carried Forward
  - Finalist Alternatives

Preferred Alternative

Stakeholder Involvement and Agency Input
NLSD Purpose and Need

- Improve safety for all users
- Improve mobility for all users
- Address infrastructure deficiencies
- Improve access and circulation
Alternatives Development & Evaluation

Stakeholder Involvement and Agency Input

- Data Collection
- Purpose & Need
- Alternatives Development & Evaluation
- Initial Alternatives
- Alternatives Carried Forward
- Finalist Alternatives
- Preferred Alternative

Initial Alternatives

- Establish transportation performance criteria
- Identify existing environmental constraints
- Sketch alternatives
- Eliminate alternatives and combinations that do not address Purpose & Need
- Compare transportation benefits of alternatives — eliminate underperforming alternatives
Alternatives Development & Evaluation

**Initial Alternatives**
- Qualitative evaluation for:
  - Major Flaws
  - Purpose & Need agreement
- Qualitative and Quantitative assessment of:
  - Safety
  - Mobility
  - Access/Circulation
  - Planning level costs

**Alternatives to Be Carried Forward**
- Refine alternative features
- Quantitative assessment of criteria in greater detail
- Assess environmental impacts

**Finalist Alternatives**
- Refine alternative features
- Perform detailed environmental analysis & review
- Develop cost estimates
- Evaluate performance impacts and costs
- Develop mitigation plans

**Preferred Alternative**
- Select Preferred Alternative based on public input and technical analysis

**Full Range of Alternatives**

**ONGOING PUBLIC OUTREACH**

- Public Meeting
- Public Meeting
- Public Meeting
- Public Meeting
- Public Hearing
Alternatives Development & Evaluation

Iterative Process of Evaluation

- **Initial Alternatives**
  - Major Flaws
  - Purpose and Need Agreement
  - Performance Assessment
  - Planning Level Cost Estimate

- **Alternatives to be Carried Forward**
  - Revise and Refine Features
  - More Detailed Performance Assessment
  - Assess Environmental Impacts

- **Finalist Alternatives**
  - Refine Features of Finalists
  - Further Performance Review and Evaluation
  - More Detailed Environmental Analysis and Review

- **Preferred Alternative**
  - Prepare Draft EIS
  - Address DEIS and Public Hearing Comments
  - Identify Preferred Alternative
  - Develop Mitigation Strategies
  - Prepare Final EIS and ROD

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Increasing Level of Alternative Refinement and Analysis

PSG/Agency Coordination and Public Involvement
What is Travel Demand Forecasting?

- Process of estimating the number of vehicles or people that will use a specific transportation facility and modes in the future
- A mathematical model (computer based) that will evaluate trip making characteristics and travel choices
- Model validated to existing conditions
- Chicago Metropolitan Agency for Planning (CMAP) maintains the regional travel demand model for the Chicago Metropolitan Region
- The project team is utilizing CMAP data and model inputs to evaluate travel demand and travel performance for the NLSD corridor
The study area for the North Lake Shore Drive travel demand modeling analysis is bounded by major expressways or natural features.

- **North**: Touhy Avenue
- **West**: I-94 (Edens Expy) and I-90 (Kennedy Expy)
- **South**: I-55 (Stevenson Expy)
- **East**: Lake Michigan
Data Inputs & Assumptions

- Existing and future population and employment projections to estimate future travel behavior and trip patterns
- Planned and funded projects (roadway and transit) included in the CMAP 2040 Conformity Analysis
- Planned and committed supporting improvements such as Bike/Ped, Intelligent Transportation Systems (ITS) and Americans with Disabilities Act (ADA), etc.
Known Results:

- Most of roadway network is oversaturated during peak periods
- Nominal or no-growth in auto traffic within the study area
- Average of 15% - 20% growth in population and employment within the travel demand study area
- Significant attraction and utilization of transit service by the future design year (2040)

Ongoing Analysis:

- How do the alternatives being considered affect travel performance in the study area?
- To what extent would those results influence trip making patterns and mode choice?
- Do the analysis results indicate any major flaws with the alternatives?
Building an Improvement Alternative

• Each improvement alternative represents a proposed solution to a complex set of competing needs related to:
  - Roadway
  - Transit
  - Bikes and Pedestrians
  - Park land and facilities
  - Environmental and historic resources
  - Shoreline protection

• To craft a potential solution, improvement alternatives are built from the ground up, much like building a home.
Blueprint for an Improvement Alternative

- Shoreline
- Transit
- Park Access
- Bike/Ped Park Space
- Junctions & Alignments
- North Lake Shore Drive Alternatives Process
Building Block:
Junctions & Alignments
Importance of Junctions

• Confluence of many modes: pedestrian, cyclists, transit & motorists
• Affect safety & mobility for all
• Affect transit service & reliability
• Act as gateways to neighborhoods
Junction Toolbox Considerations

- North Lake Shore Drive is a *Boulevard through a Park*, junctions must reflect this characteristic

- *Grade-Separated* (bridges and ramps) vs. *At-Grade* (traffic signal, for example)

- Junctions may or may not have fourth leg extending the cross-street east of mainline

- One junction type and/or size does not fit all

- Pedestrian, bicycle, and transit accommodations
Toolbox of Junction Treatments

• Partial Cloverleaf
• Conventional Diamond
• Compressed Diamond
• Split Diamond Junction with Frontage Roads
• Diverging Diamond
• Single Point Urban Diamond
• Roundabout (Standard, Bow-Tie and Double)
• Split Junction
• Other Treatments & Elements
Full Cloverleaf Junctions - The “Old Way”

Full Cloverleaf Junctions are not applicable on North Lake Shore Drive.

- Large Footprint
- Not Pedestrian/Cyclist Friendly
- Poor Operation (Weaving, etc.)

Chicago, c. 1941
Partial Cloverleaf Junction

- Diagonal Ramp
- Graded Embankment or Retaining Wall
- Cloverleaf/Loop Ramp
- Bike/Ped Accommodation
- Traffic Signal Here, in Some Cases
- “Constraint in this Quadrant”
Conventional Diamond Junction

- Ped/Bike Accommodation At Traffic Signals or Separate Underpass
- Greater Spacing between Signals
- All Diagonal Ramps
- Graded Embankments
Compressed Diamond Junction

Smaller Spacing between Signals

Retaining Walls vs. Embankments
Compressed Diamond Junction

Belmont Avenue

Embankments

Retaining Walls

North Lake Shore Drive

Chicago/Lincoln Park
Split Junction with Frontage Roads

At-Grade Overpasses of Mainline at Select Cross-Streets; Peds/Bikes Also Cross Here

At-Grade One-Way Frontage Roads

Mainline NLSD Depressed Below Grade
Split Junction with Frontage Roads

- Garfield Park
- Pedestrian Crossing
- Boulevard
- Park

Garfield Park/Chicago
Half Diverging Diamond Junction

Un-Conflicted Left Turns From South, To North

Only One Ramp Traffic Signal

Can Provide Unimpeded Lake Access for Peds/Bikes After Signal
Half Diverging Diamond Junction

Ramps on Overpass Can Be Split Apart To Allow For Ped/Bike Corridor

Jessup, Maryland
Single Point Diamond Junction

- Only One Ramp Traffic Signal
- Different Pedestrian/Bicycle Tunnel Treatments
Pedestrian Underpass is Preferable

Pedestrians Need to Cross Free-Flow Traffic Stream if At-Grade Crossing is Desired (Law: Vehicles Yield to Peds)

No Traffic Signals

Two Bridges, Or One Large Land Bridge
Bow-Tie Roundabout Junction

“Pinched” Roundabout, Therefore Single Structure vs. Two
Double Roundabout Junction

U-Turn/Bus Turn-Around at Ramp Intersection

Diamond Junction, But With Roundabouts at Ramp Intersections
Split Junction

Ramps To/From South at One Location...

Bike/Ped Access Unimpeded

...Ramps To/From North at Another Location
Split Junction

Bridgeport, Connecticut

Ramps To/From North at One Location...

...Ramps To/From South South at Another Location
Braided Ramps

Traditional Weaving Area

Braided Ramps

Bridge Required

Weaving/Conflict Area Eliminated
Braided Ramps

Nashville, Tennessee
Other Junction Treatments

- At-Grade Junctions (Traffic Signalized Intersection)
- Relocated or Removed Junction
- New Junctions to Better Distribute Local Access
- Others
Selection of Junction Treatments

• Not One-Size-Fits-All
• Designs dependent on:
  – Traffic operations
  – Right-of-way or physical constraints
  – Non-motorized travel within corridor
  – Transit facilities
• Junction type and footprint is a critical element that affects the corridor alignment
• Continue development and analysis of alternatives at individual junctions
Building Block: Transit Treatments
Transit Ridership Facts

- Approximately 70,000 transit trips on 9 bus routes every weekday

- Transit trips account for approximately 1 in 5 of all passenger trips on NLSD

- Most transit trips take place in peak periods when speed and reliability experience the greatest variability
Transit: Dedicated Lane

I-35 BRT (Minneapolis, MN)

Planned Van Ness BRT (San Francisco, CA)

Trans Milenio BRT (Bogotà, Columbia)
Transit: Bus-on-Shoulder

Bus on Right Shoulder (North Carolina)

PACE Bus on Left Shoulder (Chicago)
Transit: Managed Lanes

I-35 Multi-Purpose Lane (Minneapolis, MN)

High Occupancy Vehicle (HOV) Lanes (King County, WA)
Transit: Light Rail

Lynx (Charlotte, SC)

Metro (Minneapolis, MN)
Transit: Queue Jumps

At Cross-Street or Ramp Intersections
Transit: Queue Jumps

To/From Mainline

- Bus-Only Entrance Ramp
- Standard Entrance Ramp
- Bus-Only Exit Ramp
- Standard Exit Ramp
- Additional Traffic Signal
Transit: Ramp Meters

Arizona

Milwaukee, WI
Building Block: Non-Motorized Travel Considerations
• Volumes through each of the Lakefront Trail access points range from 1,800 users per day at the north end to nearly 22,000 users per day at Oak Street.

• Some Lakefront Trail segments between Oak Street and North Avenue can carry over 31,000 users on a Saturday in the summer.
There are currently **22 access points** to the Lakefront Trail across North Lake Shore Drive within the project study limits. These include:

- 9 cross-street underpass locations
- 12 tunnels or underpasses for exclusive non-motorized use
- The Passerelle overpass
Non-Motorized Travel Opportunities

All Initial Alternatives will include the following non-motorized travel features where practicable:

- Add new Lakefront Trail/Lincoln Park access facilities over or under mainline Lake Shore Drive
- Increase access frequency and spacing along corridor
Non-Motorized Travel Opportunities

All Initial Alternatives will include the following non-motorized travel features where practicable:

• Reconstruct and widen pedestrian tunnels to:
  – Meet non-motorized travel demands
  – Provide separate lanes for bikes and pedestrians
  – Satisfy ADA accessibility standards

“OLD”

“NEW”
Non-Motorized Travel Opportunities

All Initial Alternatives will include the following non-motorized travel features where practicable:

• Provide separate facilities for bikes and pedestrians on the Lakefront Trail

• Reconstruct Inner Drive to accommodate all users in accordance with applicable complete streets standards/guidelines.
All Initial Alternatives will include the following non-motorized travel features where practicable:

- Build overpasses or underpasses to carry the Lakefront Trail over or under *cross-streets*.
- Build overpasses or underpasses to carry the mainline Lakefront Trail bike lanes over or under the *Lakefront Trail access points*. 
Lakefront Trail Considerations

Separate Bicycle Trail and Pedestrian Trail

North-South Through Movements Under (or Over) East-West Access AND Under (or Over) Cross-Street
Questions?

10 Minute Break
Building Block:
Shoreline Considerations
Where water meets land, dynamic environmental forces are hard at work
- Wind, Waves, Water Levels & Currents
- Over-topping & Flooding
- Erosion & Damage to Site Improvements & Nearshore Infrastructure

Shoreline Protection Overview
- Many forms of protection (natural & built)
- Withstand environmental forces
- Create safe, stable, & functional shorelines
- Complex design process
Shoreline Protection Treatments

Various Treatments to consider on this project.... “toolbox”

- Beaches
- Stone Revetments
- Stepped Concrete Revetments
- Vertical Steel Sheet Pile Walls
- Offshore Islands
- Breakwaters
- Submerged Reefs
Shoreline Protection Treatments

Beaches
Shoreline Protection Treatments

Stone Revetments
Shoreline Protection Treatments

Stepped Concrete Revetment
Shoreline Protection Treatments

Vertical Steel Sheet Pile Wall
Shoreline Protection Treatments

Offshore Islands

Burnham Plan 1909
Shoreline Protection Treatments

Breakwaters
Lake Bottom Coverage

Stepped Stone Revetment  Rubble Mound Breakwater

Sand Beach
Recent Shoreline Protection Projects

- Various shoreline project types:
  - Vertical Steel Sheet Pile Wall
  - Stepped Concrete Revetment
  - Stacked Stone Revetment
  - Beach Nourishment/ Stabilization
  - Breakwaters
Shoreline Protection Improvement Opportunities

Grand Avenue to Fullerton Parkway

1. Chicago Avenue (intersection improvements)
2. Oak Street Beach (horizontal alignment improvements)
3. Oak Street to North Avenue (minimize overtopping & flooding)
4. North Avenue Beach (alignment and beach expansion improvements)
Key Design Challenges

- Flooding
- Safety
- Site Improvements
Wave Overtopping and Flooding

October 31, 2014

September 30, 2011

September, 1987

1950’s
Safety Concerns

- Vehicular & Pedestrian Safety
- Damage to Site Improvements
Wave Characteristics

East Banks Street Extended

Stepped Concrete Revetment

Wave Height
65% - 100% x water depth
70% above SWL – 30% below
Simulation

Existing Conditions – Diversey to Fullerton

Low Water +1.0 (Halloween 2012)
Simulation

Existing Conditions – Diversey to Fullerton

High Water +7.0 (100-year Event)
Site Investigations
Numerical Modeling
Shore Protection Summary

- Water Level & Waves
- Revetment Width
- Crest Elevation
- Setback

**East Chicago Avenue: Stepped Concrete Revetment**

Wave Height
65% - 100% x water depth
70% above SWL – 30% below
Junction Toolbox Example:

**Chicago Avenue Junction Area**

(Grand Avenue to Oak Street Curve)
Deficiencies & Needs

- Only signalized Outer Drive intersection
- Severe daily congestion alongOuter Drive and Chicago Avenue
- Restricted traffic movements
- Traffic conflicts with northbound CTA bus access from Wacker Drive
- Long desired improvements to lakefront access and the Lakefront Trail
- Lakefront Trail and pedestrian tunnel do not meet accessibility guidelines and are prone to flooding
Traffic Movements to/from NLSD

Movements Prohibited During Weekday A.M. Peak Period
Environmental Resources Map (ERM)

- Identifies Environmental and Historic Resources within Project Limits
- Establishes constraints to improvement alternatives
Environmental Resources at Chicago Avenue

Relatively Few Environmental Resources/Constraints

Historic Resources  Park Resources
Of the alternative treatments shown in the “Junction Toolbox”, the following may be considered at the Chicago Avenue Junction Area:

- Compressed Diamond Junction
- Split Junction with Frontage Roads
- Half Diverging Diamond Junction
- Bow-Tie Roundabout Junction
- At-Grade Intersection
Compressed Diamond Junction

Example Application at Chicago Avenue

- Preliminary Concept Only
- One of Many Alternatives from Full Range
- Not to Scale
Split Junction with Frontage Roads

Example Application at Chicago Avenue

- Preliminary Concept Only
- One of Many Alternatives from Full Range
- Not to Scale
Split Junction with Frontage Roads

Example Application at Chicago Avenue

Alternate Concept: Ramps To/From North at East Lake Shore Drive

- Preliminary Concept Only
- One of Many Alternatives from Full Range
- Not to Scale
Half Diverging Diamond Junction

Example Application at Chicago Avenue

- Preliminary Concept Only
- One of Many Alternatives from Full Range
- Not to Scale
Bow-Tie Roundabout Junction

Example Application at Chicago Avenue

- Preliminary Concept Only
- One of Many Alternatives from Full Range
- Not to Scale

Landscaped Buffer

“Pinched” Roundabout
At-Grade Intersection

Example Application at Chicago Avenue

- Preliminary Concept Only
- One of Many Alternatives from Full Range
- Not to Scale

- Increased Distance
- Turns Occur To/From Slip Ramps

NB NLSD Bypasses Signal
Transit and Non-Motorized Travel Building Block Examples:

*Chicago Avenue Junction Area*

(Grand Avenue to Oak Street Curve)
Transit – Right Side

Example Application at Chicago Avenue

- Preliminary Concept Only
- One of Many Alternatives from Full Range
- Not to Scale
Transit – Left Side

Example Application at Chicago Avenue

- Preliminary Concept Only
- One of Many Alternatives from Full Range
- Not to Scale

Transit on Left Side of Mainline North Lake Shore Drive
Non-Motorized Access – Conventional

Example Application at Chicago Avenue

- Preliminary Concept Only
- One of Many Alternatives from Full Range
- Not to Scale

Existing Access to be Maintained and/or Improved

Pedestrians Cross at Signals

Existing Access to be Maintained and/or Improved

Oak Street Beach
Non-Motorized Access: Pedestrian Bridge

Example Application at Chicago Avenue

- Pedestrian Bridge at Grade-Level
- Spans Outer Drive Only
- North Lake Shore Drive Depressed

Existing Access to be Maintained and/or Improved

- Preliminary Concept Only
- One of Many Alternatives from Full Range
- Not to Scale
Non-Motorized Access: Signature Pedestrian Bridge

Example Application at Chicago Avenue

- Pedestrian Bridge Partially Elevated
- Spans inner and Outer Drives
- North Lake Shore Drive Depressed

Existing Access to be Maintained and/or Improved

- Preliminary Concept Only
- One of Many Alternatives from Full Range
- Not to Scale
Non-Motorized Access: Pedestrian Land Bridge

Example Application at Chicago Avenue

- Land Bridge Partially Elevated
- Spans Inner and Outer Drives
- Ramp Intersections Partially Lowered
- Mainline Substantially Lowered

Existing Access to be Maintained and/or Improved

- Preliminary Concept Only
- One of Many Alternatives from Full Range
- Not to Scale
Environmental Resources at Chicago Avenue

Relatively Few Environmental Resources/Constraints

- Historic Resources
- Park Resources
Many Environmental Resources/Constraints
This Chicago Junction footprint is not feasible at Belmont Avenue.
• Chicago Avenue Junction Case Study
• Environmental Resources Considerations
• Transit and Non-Motorized Travel Considerations
• Shoreline Considerations
Next Steps

• **Continue initial range of feasible alternatives development**
  – Building block approach
  – Complete Travel Demand Modeling for corridor

• **Evaluate initial alternatives:**
  – Qualitative evaluation for major flaws and P&N agreement
  – Qualitative and quantitative assessment of safety, mobility, access/circulation and planning level costs

• **Continue to work with CPC/TF on alternatives creation**
  – Task Force #5 anticipated 2016
North Lake Shore Drive
Corridor Planning Committee/Task Force Meeting #4
December 8, 2015
Thank You
www.northlakeshoredrive.org