North Lake Shore Drive

Corridor Planning Committee/ Task Force Meeting #4

December 8, 2015

Welcome

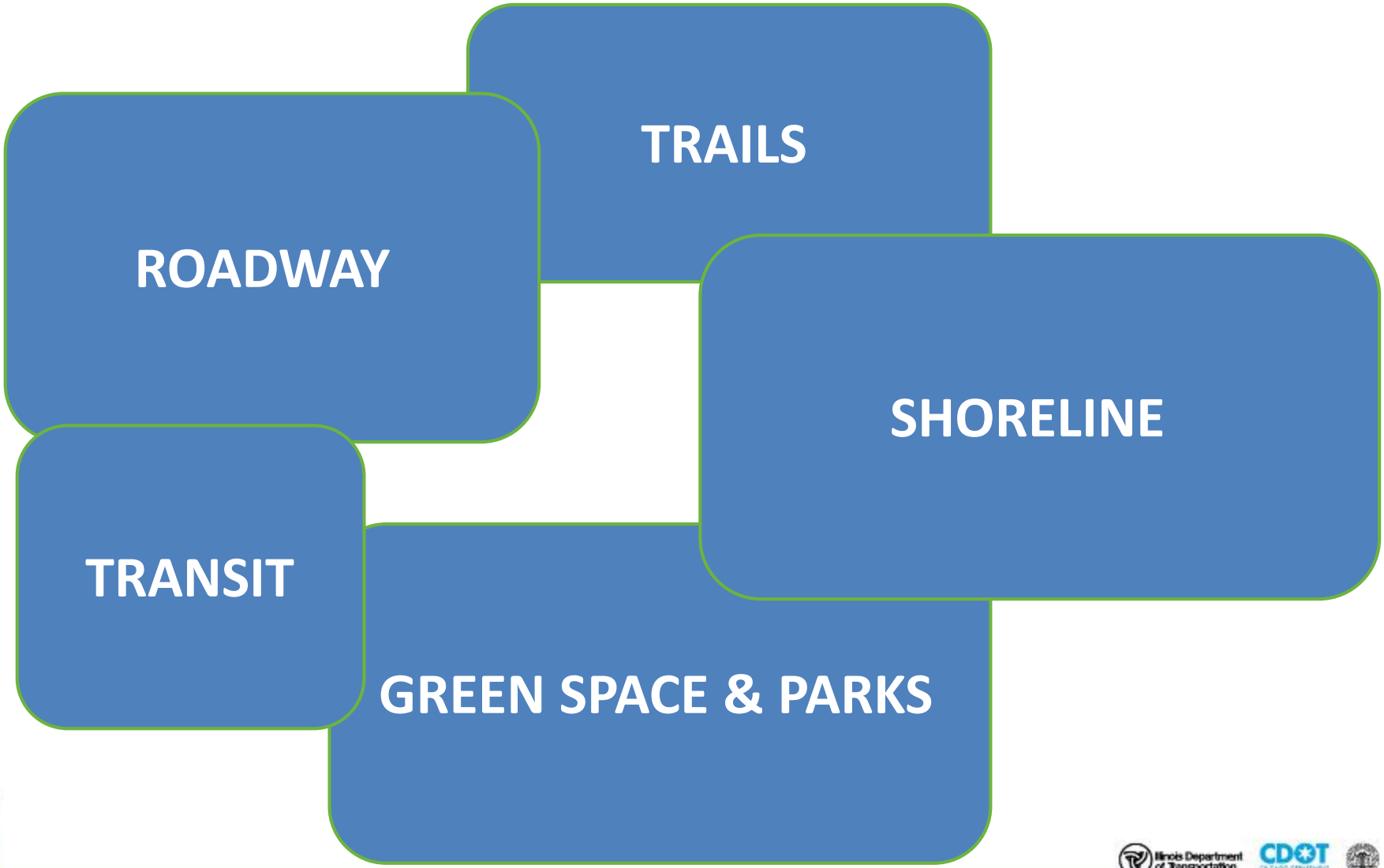
Meeting Agenda

- **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

Topic Areas



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

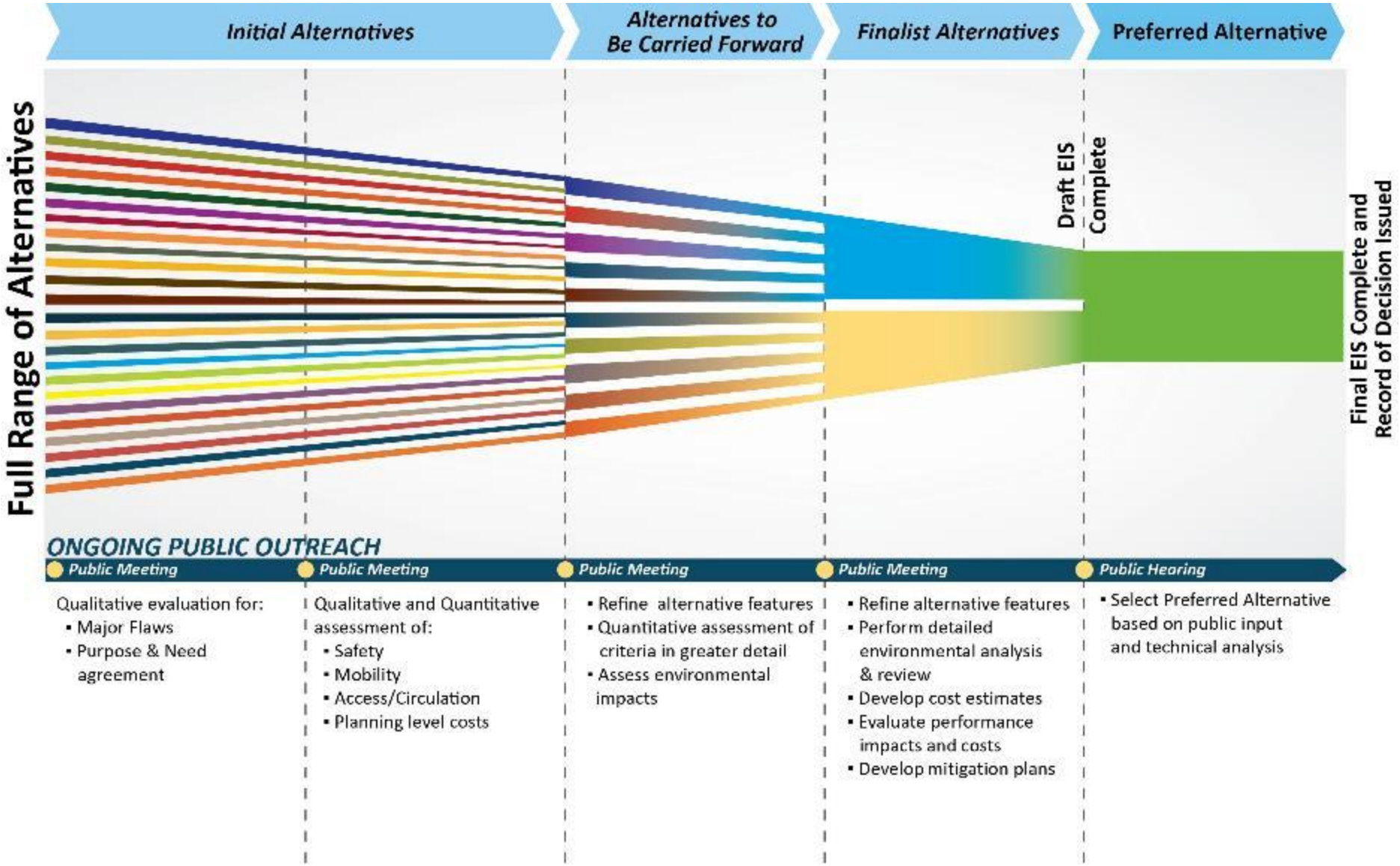
- Improve safety for all users
- Improve mobility for all users
- Address infrastructure deficiencies
- Improve access and circulation

Alternatives Development & Evaluation

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



Alternatives Development & Evaluation

Iterative Process of Evaluation

Travel Demand Forecasting

What is Travel Demand Forecasting?

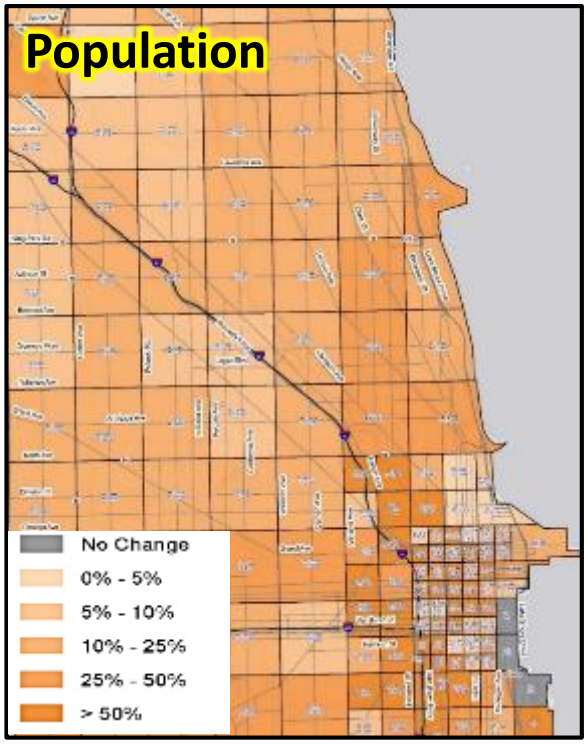
- Process of estimating the number of vehicles or people that will use a specific transportation facility and modes in the future
- A mathematical model (computer based) that will evaluate trip making characteristics and travel choices
- Model validated to existing conditions
- Chicago Metropolitan Agency 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

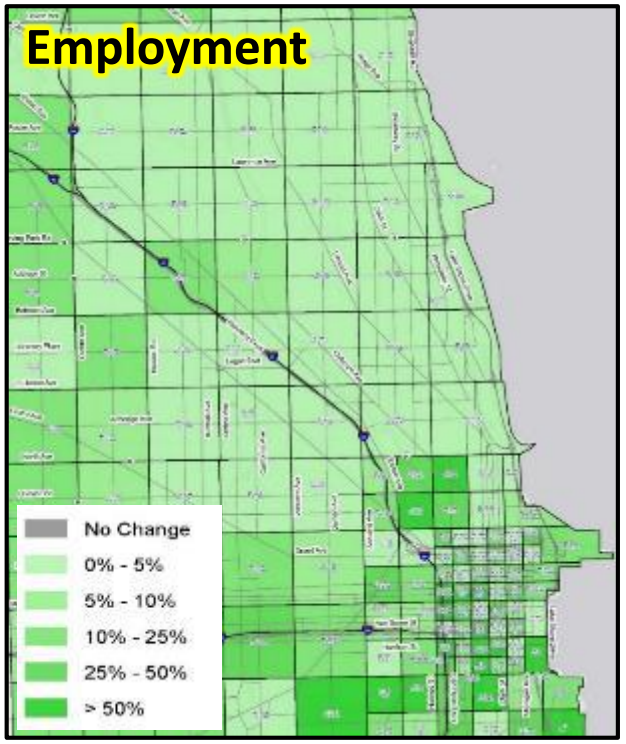
Traffic Modeling

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.

Results Fundamental to Alternatives Evaluation

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)

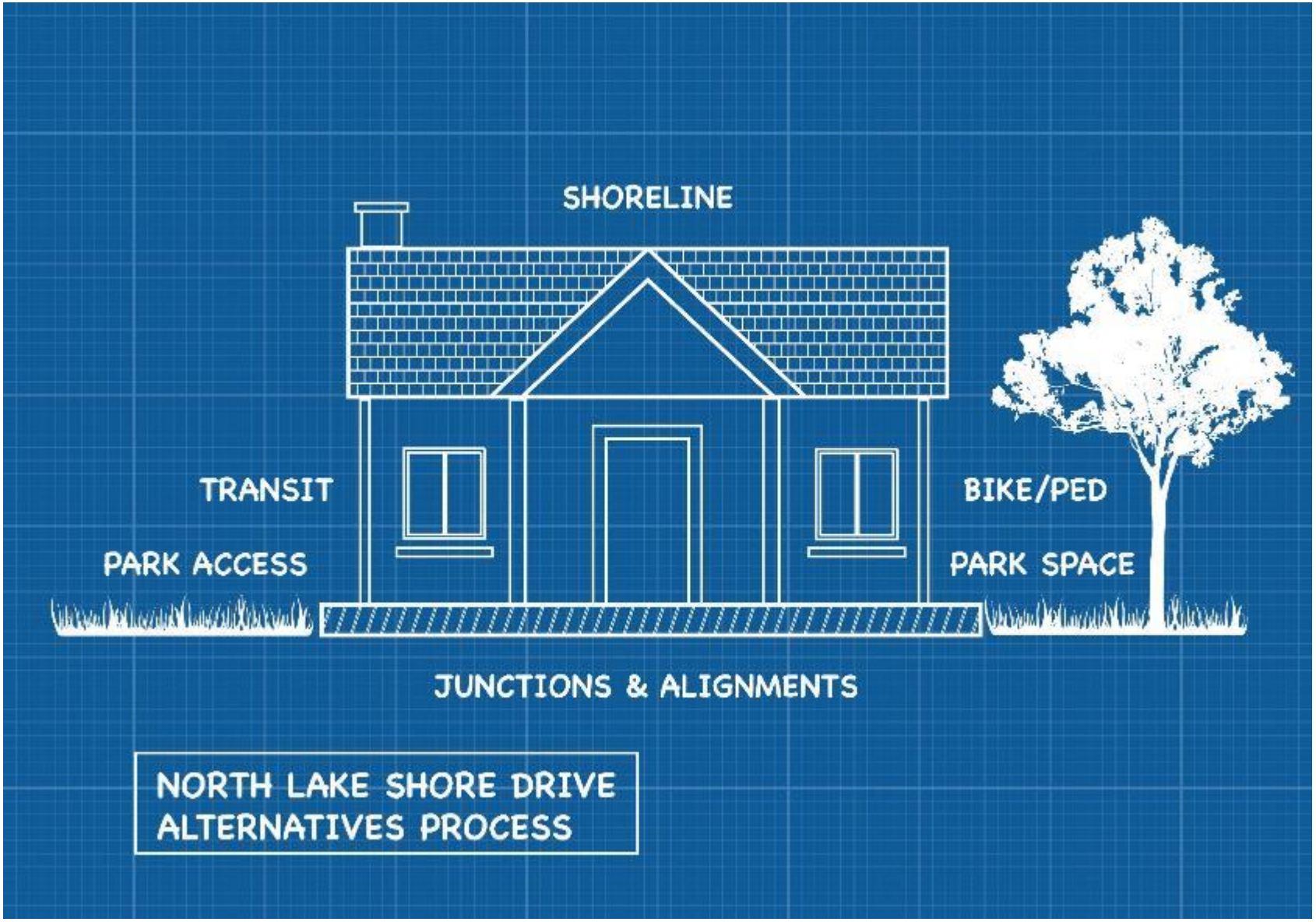
Ongoing Analysis:

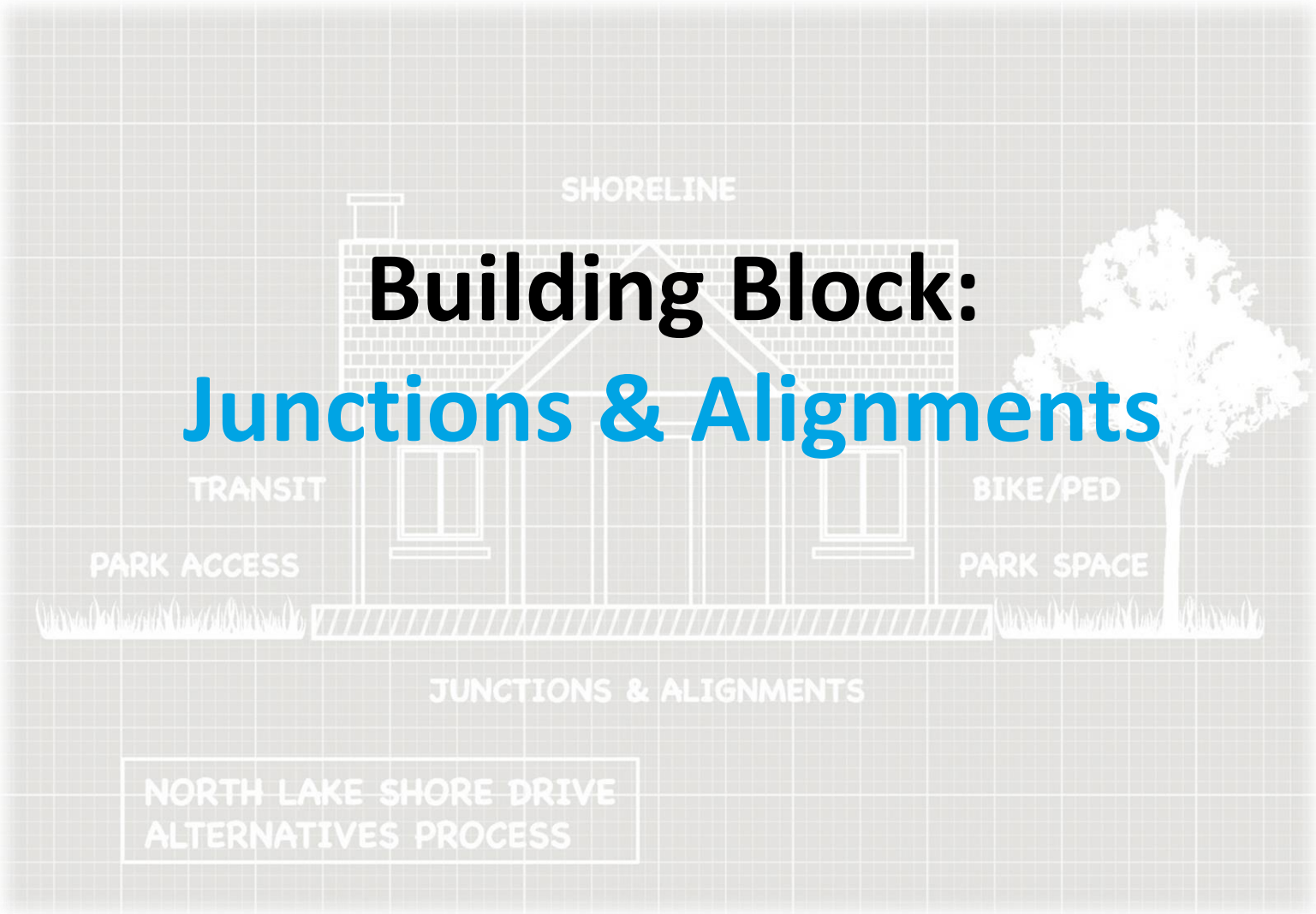
- How do the alternatives being considered affect travel performance in the study area?
- To what extent would those results influence trip making patterns and mode choice?
- Do the analysis results indicate any major flaws with the alternatives?

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





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

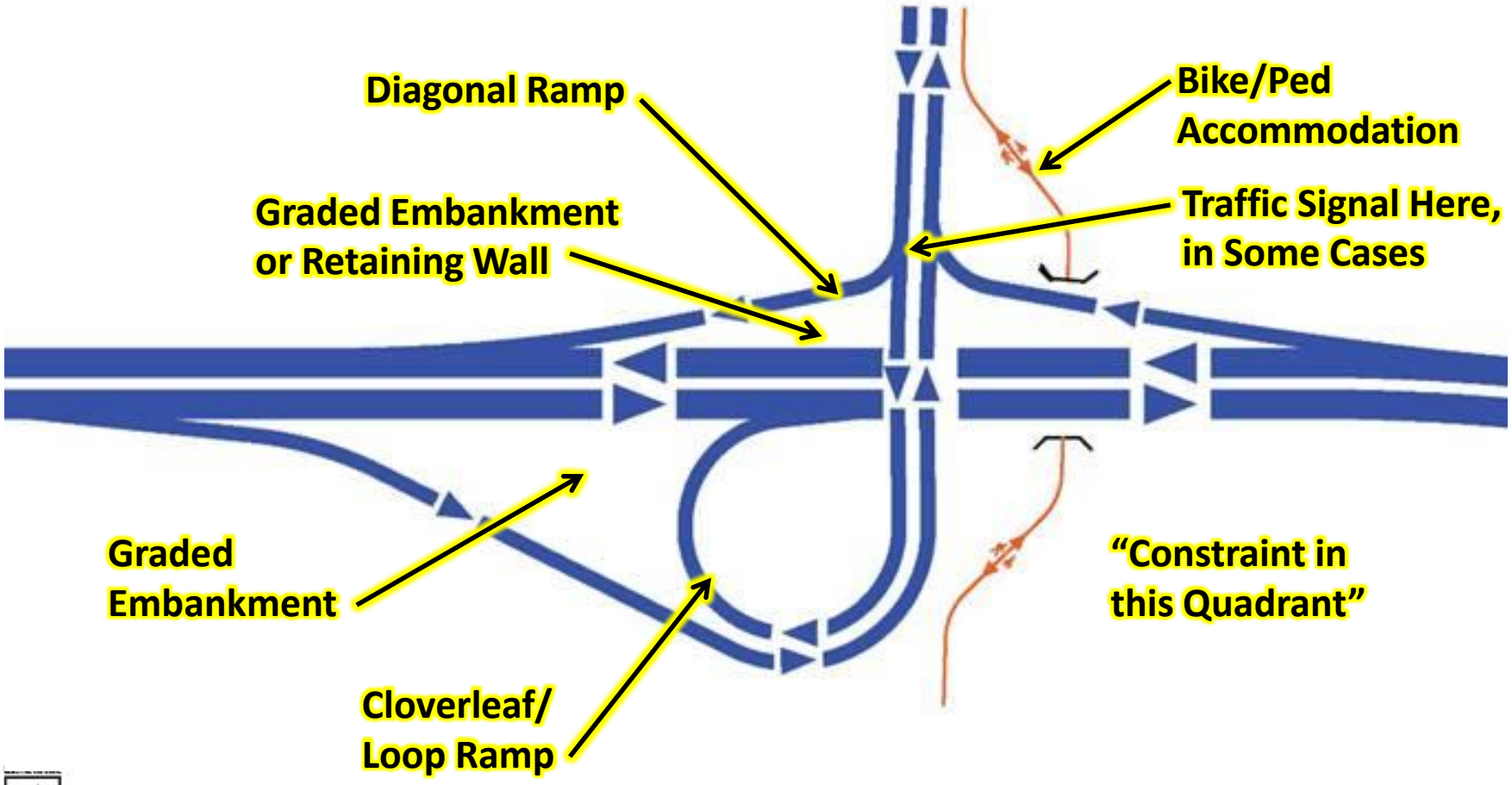
Full Cloverleaf Junctions - The "Old Way"

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

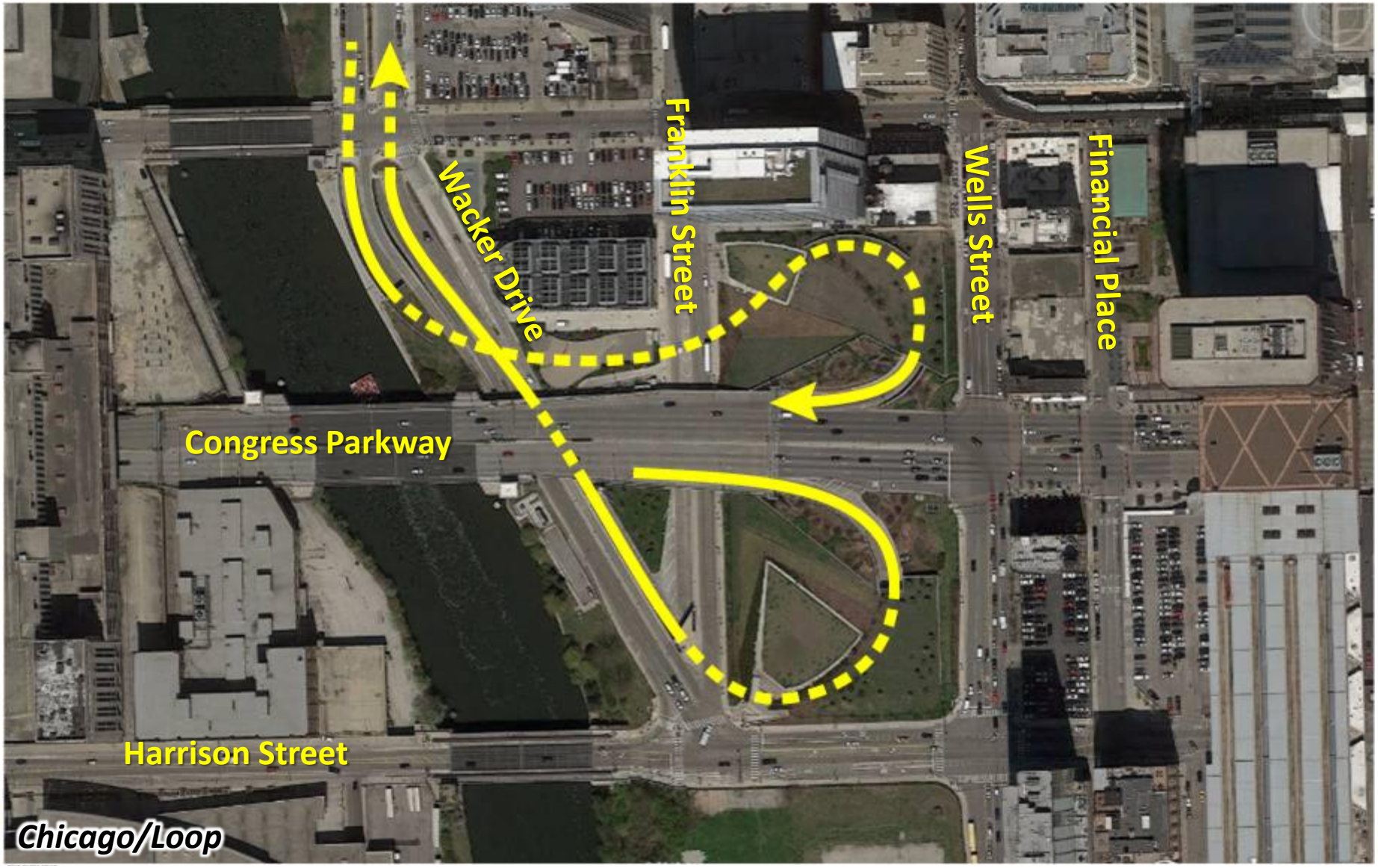
- *Large Footprint*
- *Not Pedestrian/ Cyclist Friendly*
- *Poor Operation (Weaving, etc.)*

Chicago, c. 1941

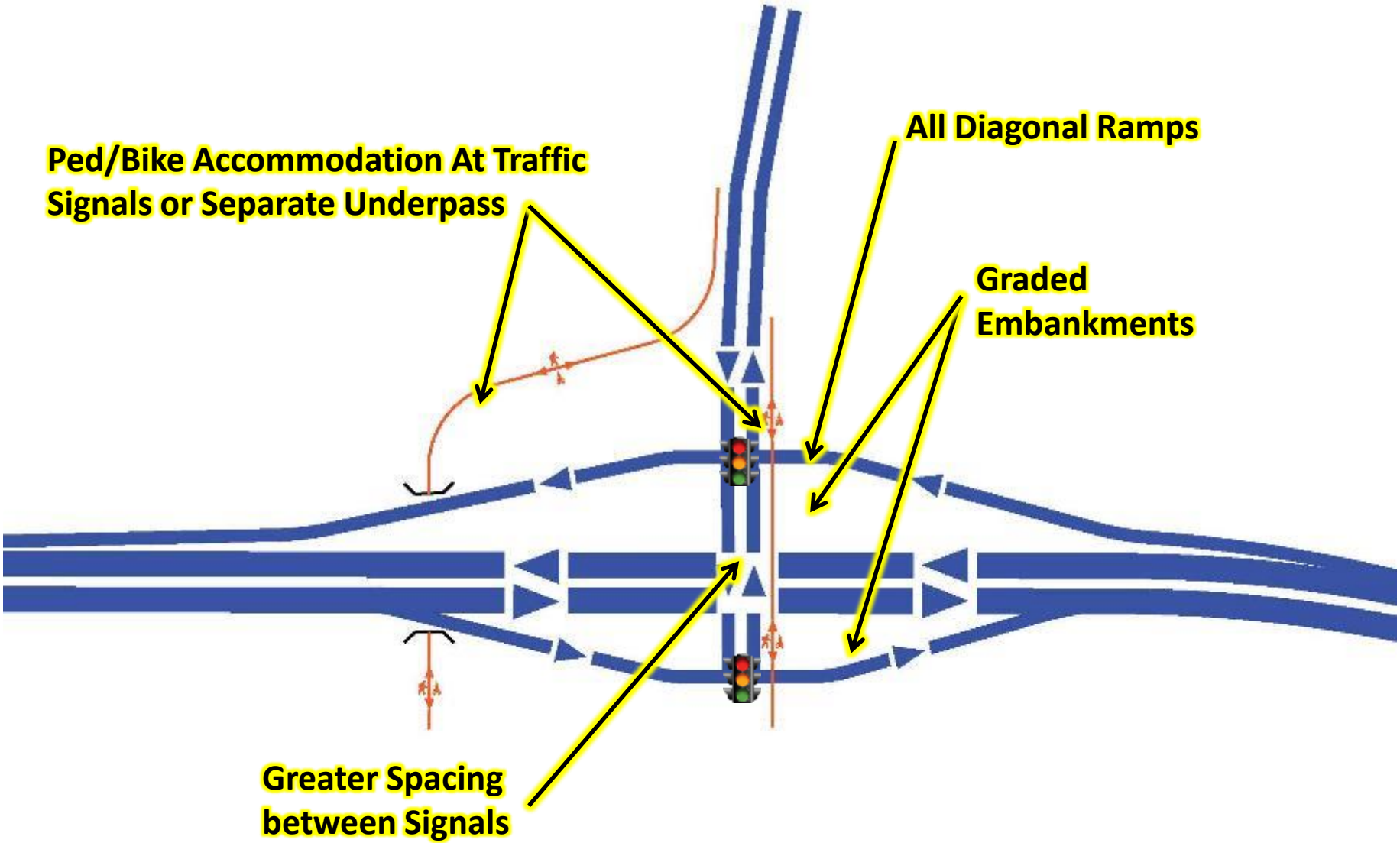
Partial Cloverleaf Junction



Partial Cloverleaf Junction

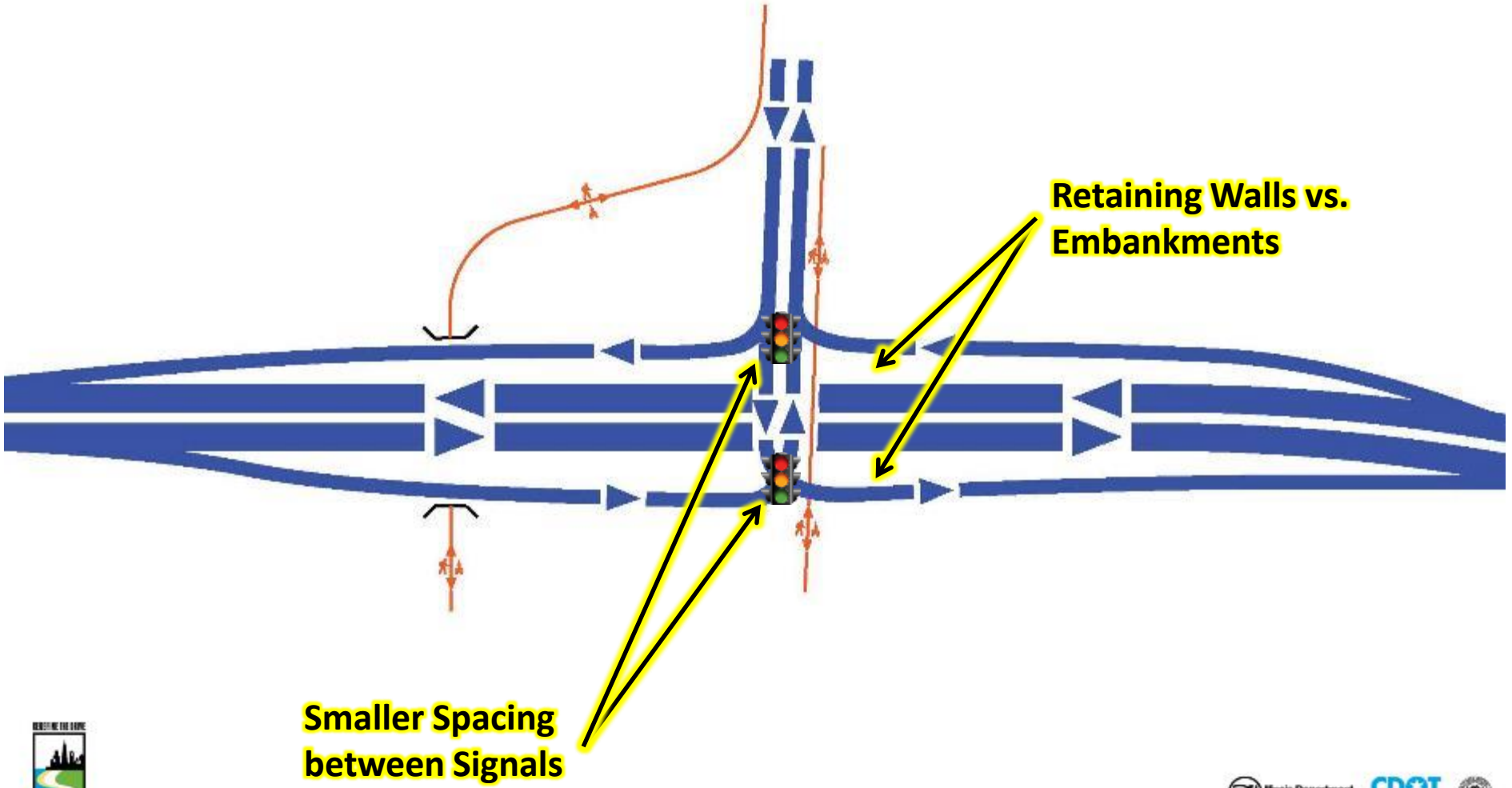


Conventional Diamond Junction

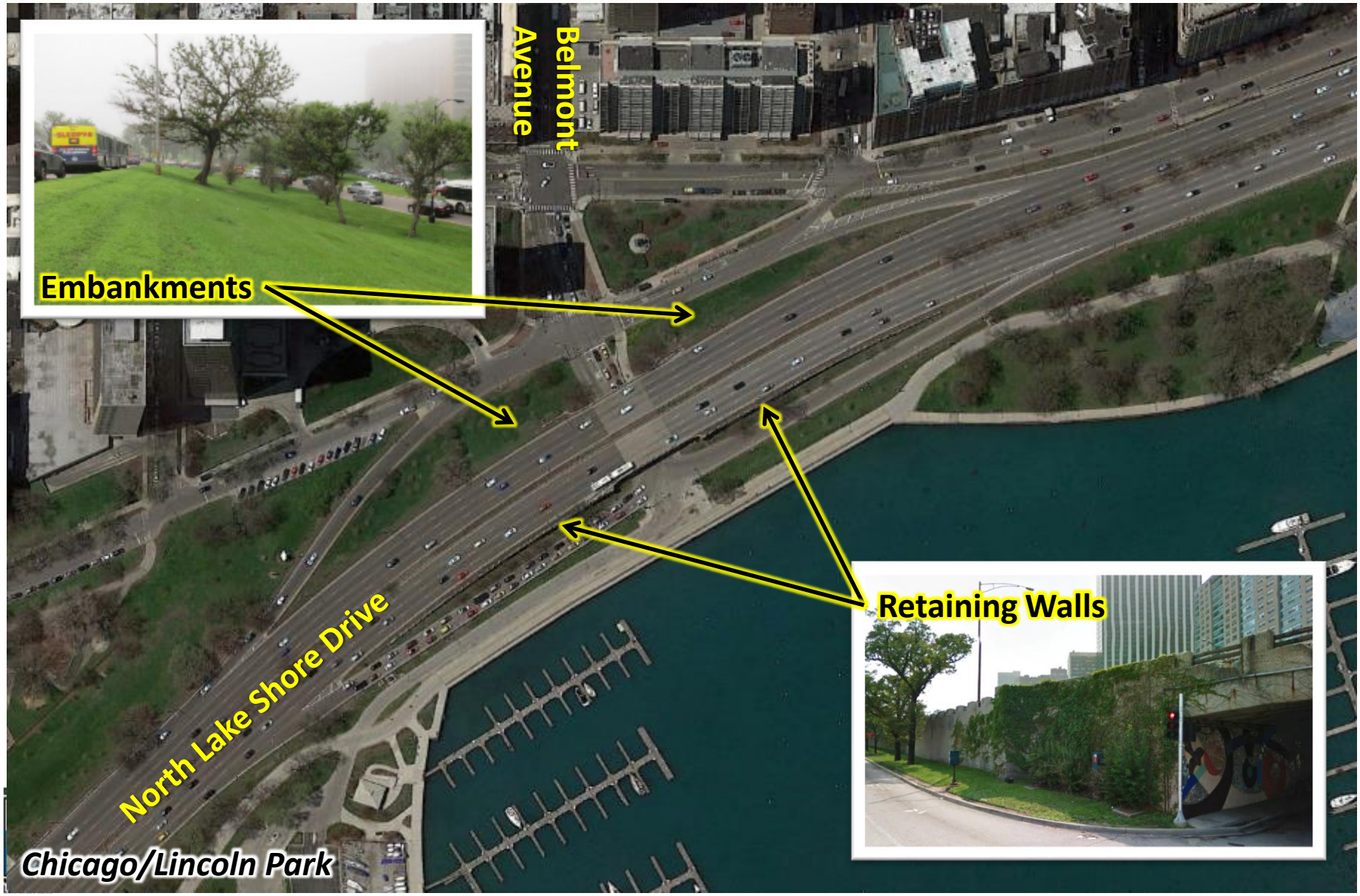


Conventional Diamond Junction

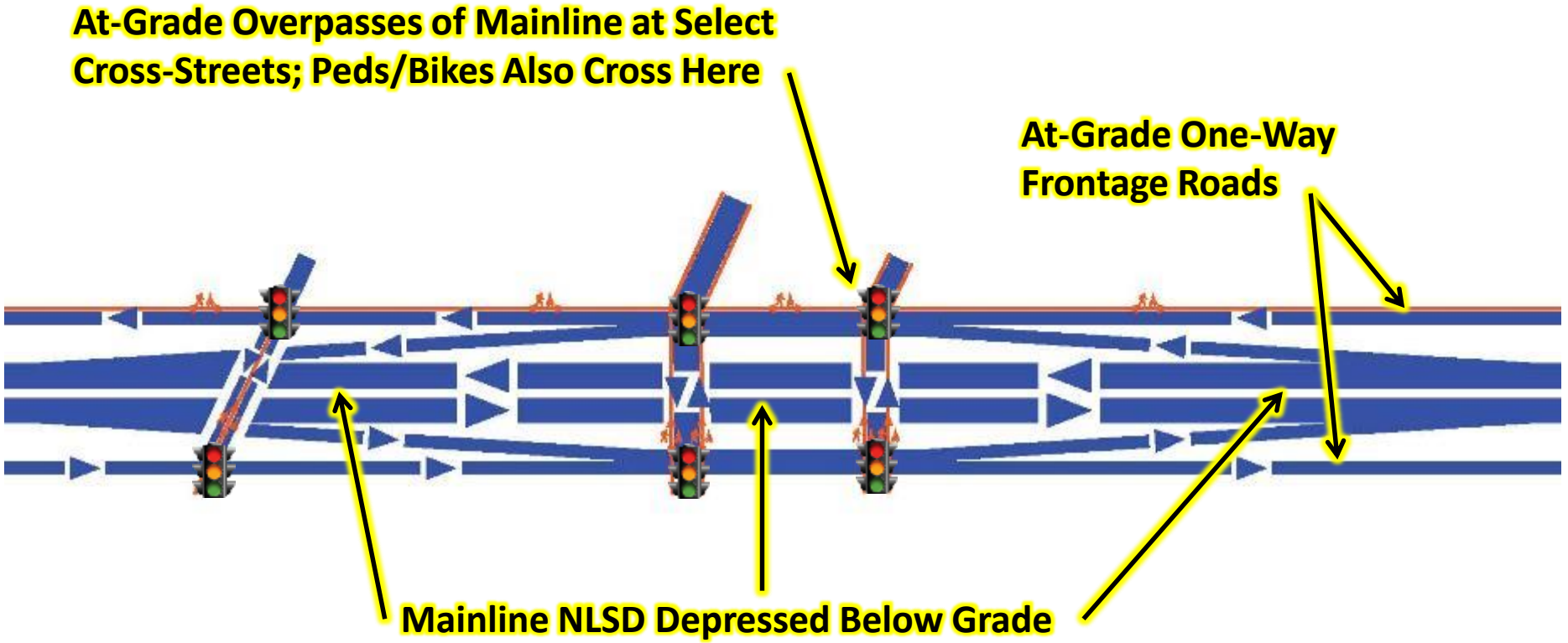
Compressed Diamond Junction



Compressed Diamond Junction

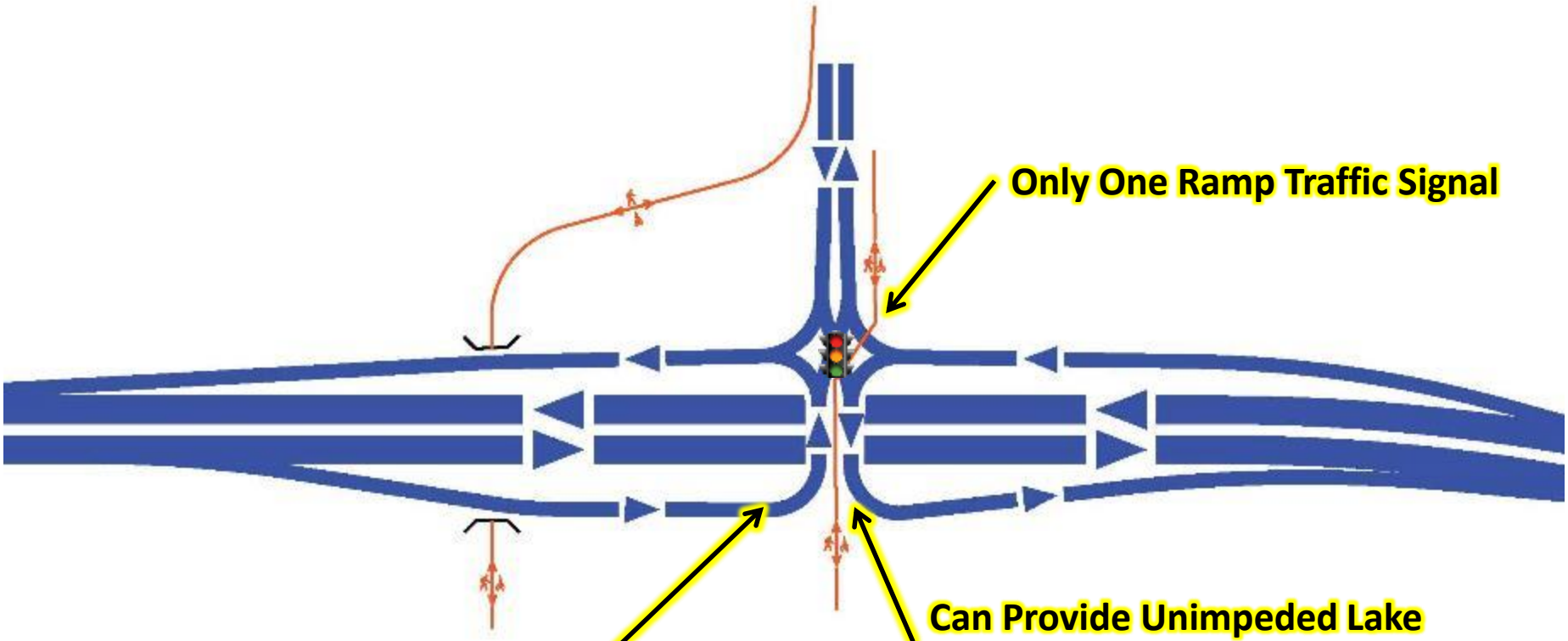


Split Junction with Frontage Roads



Split Junction with Frontage Roads

Half Diverging Diamond Junction



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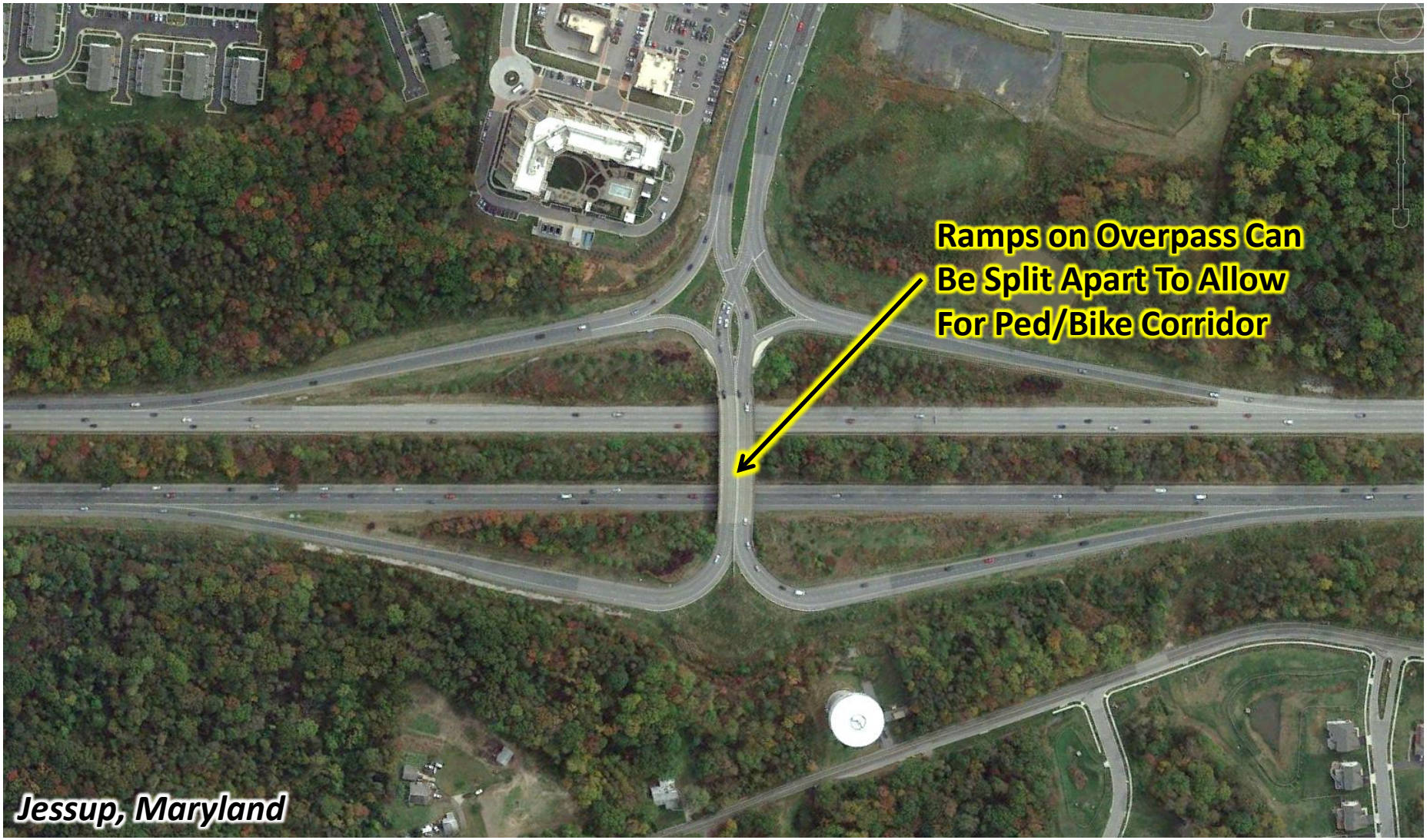
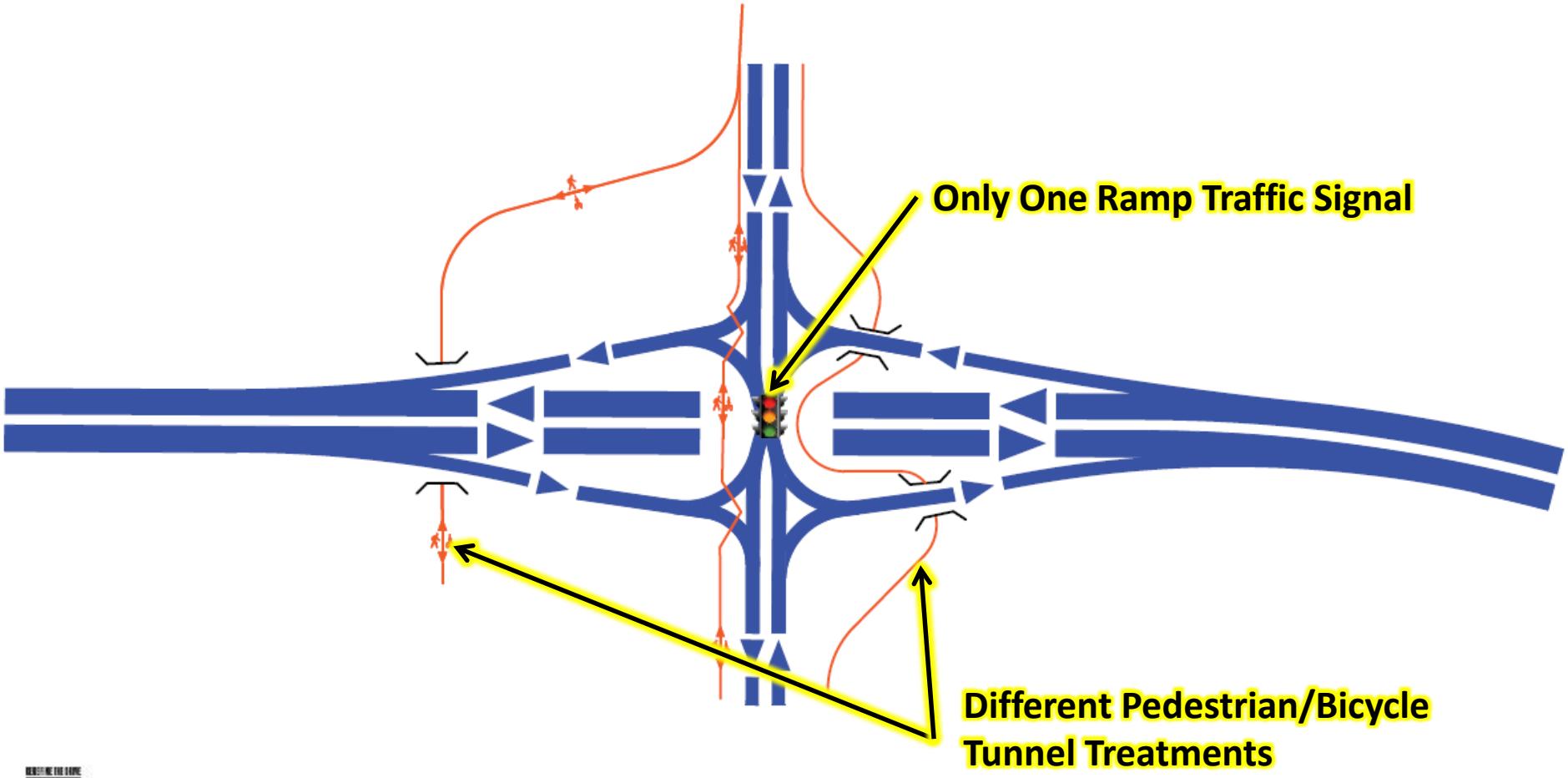


Single Point Diamond Junction



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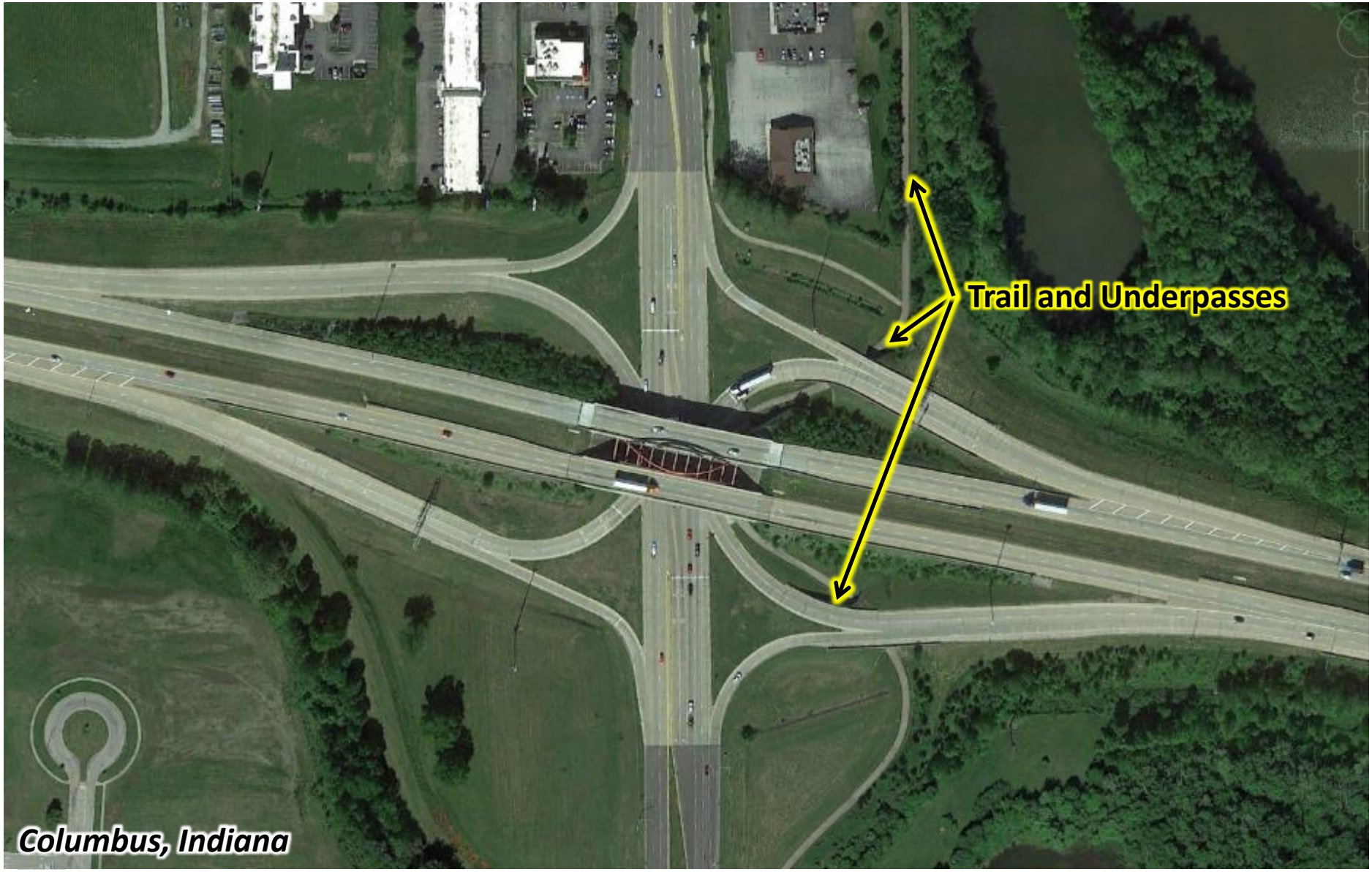
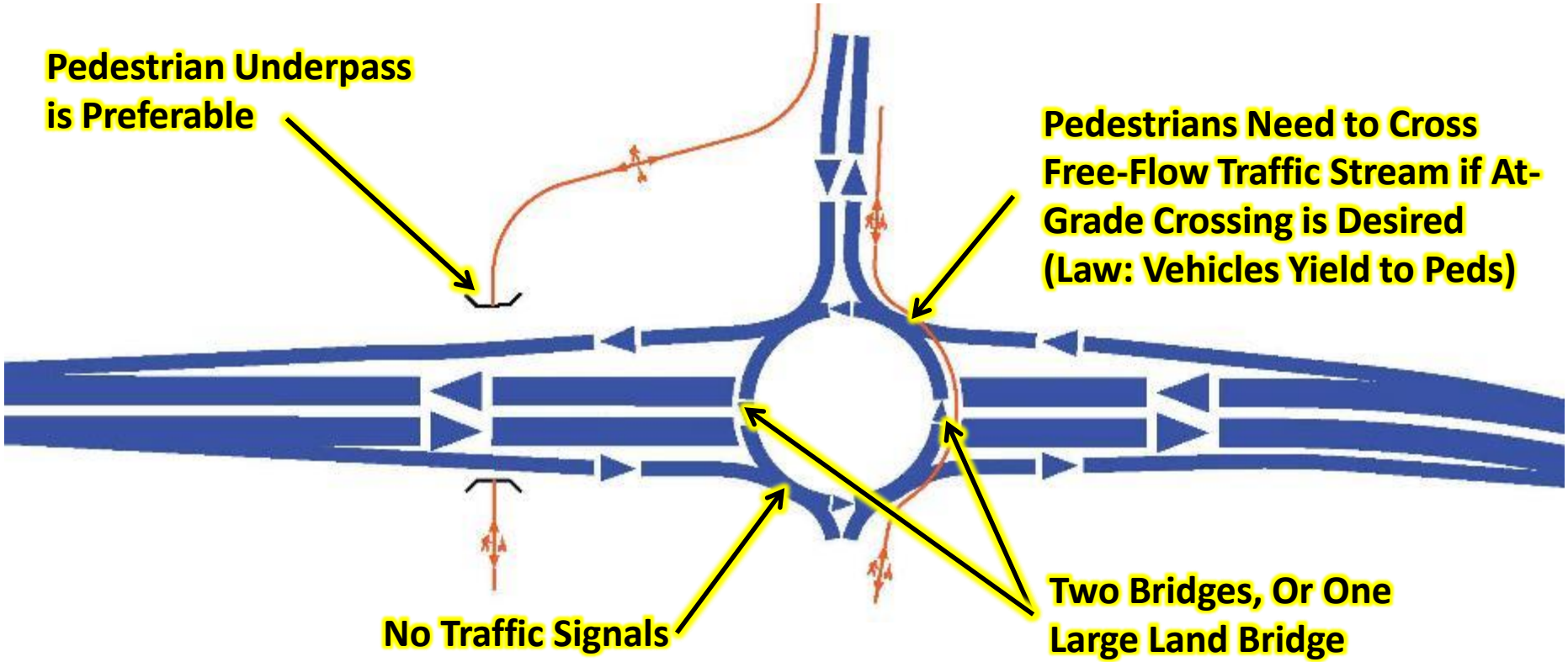
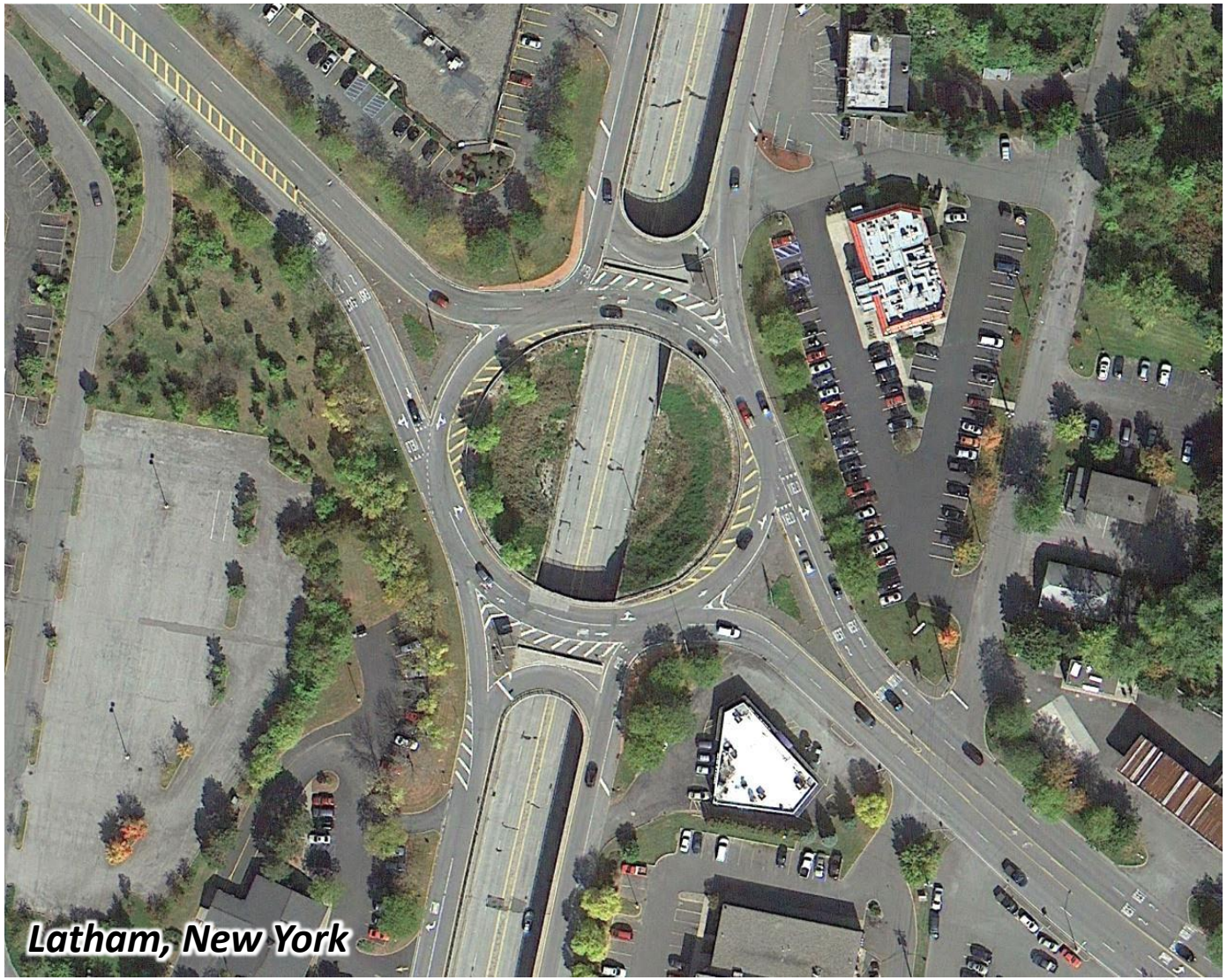


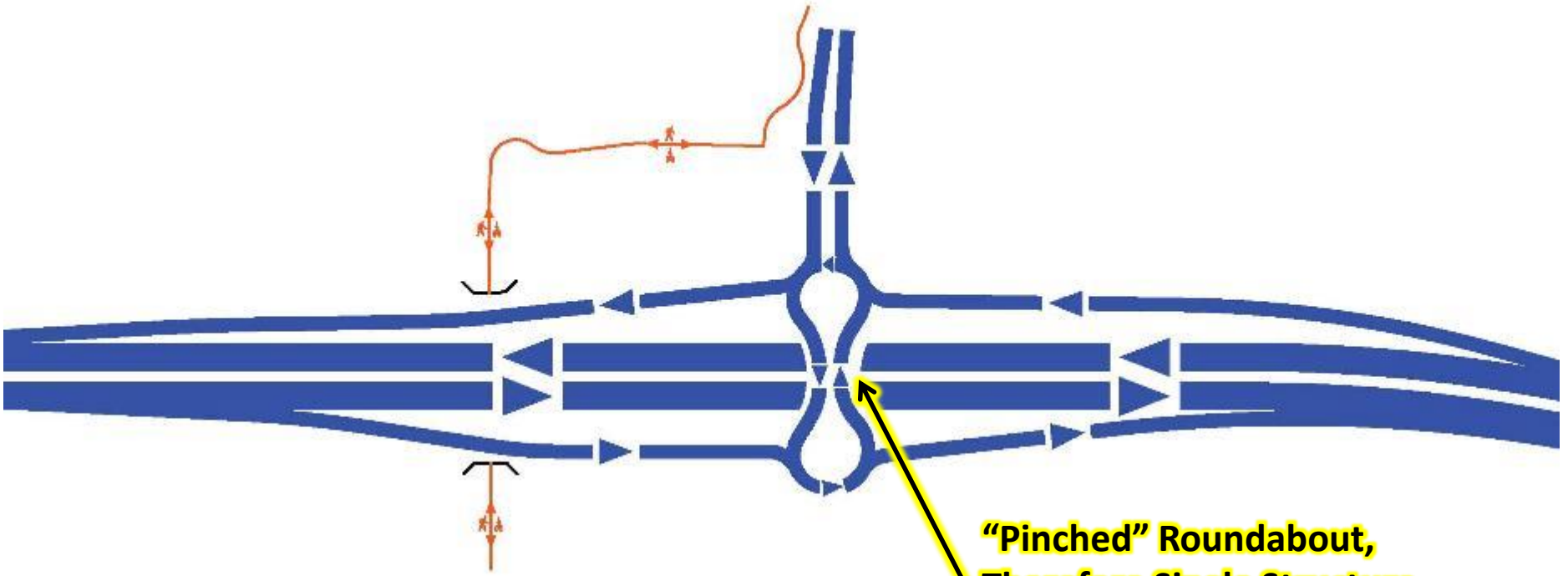
Roundabout Junction



Roundabout Junction

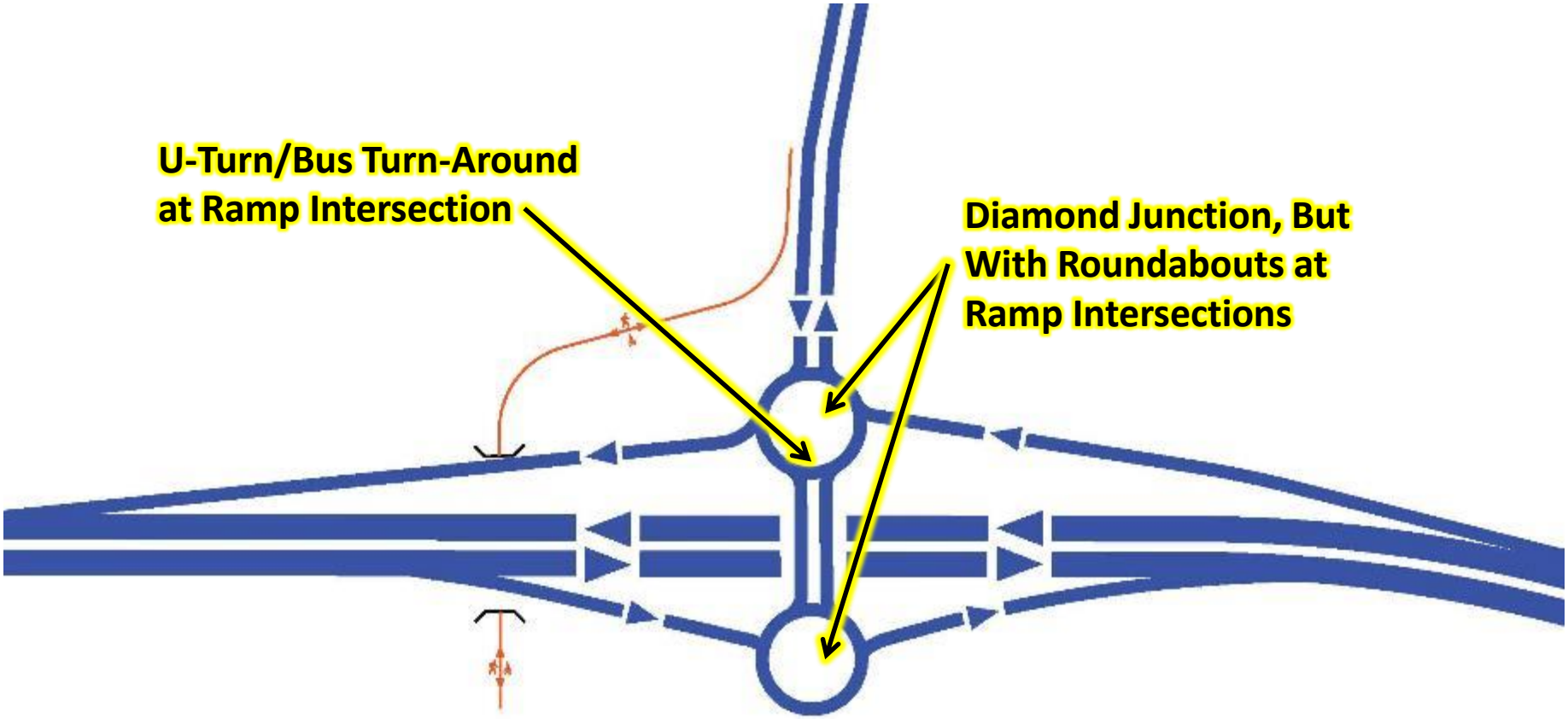


Bow-Tie Roundabout Junction

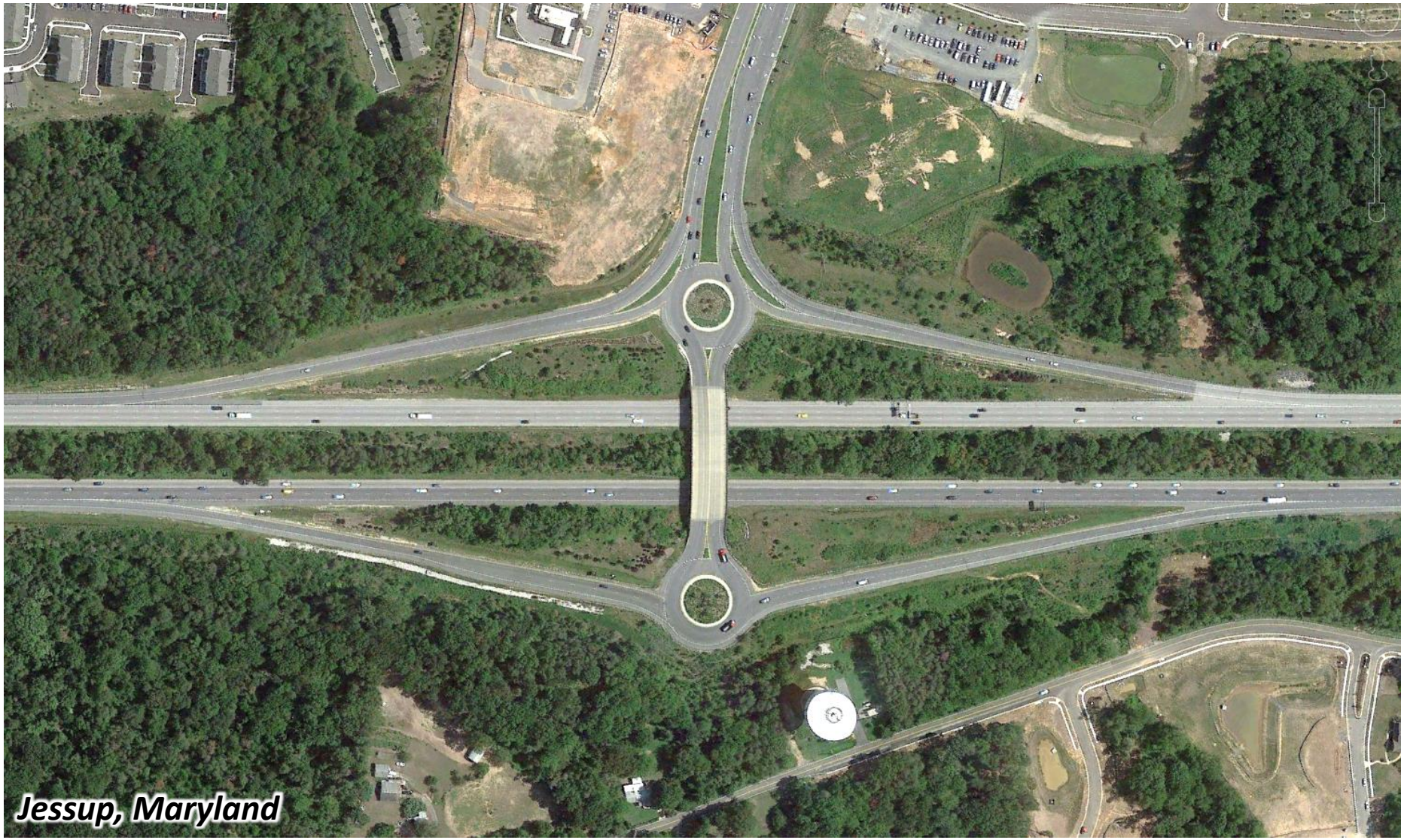


Bow-Tie Roundabout Junction

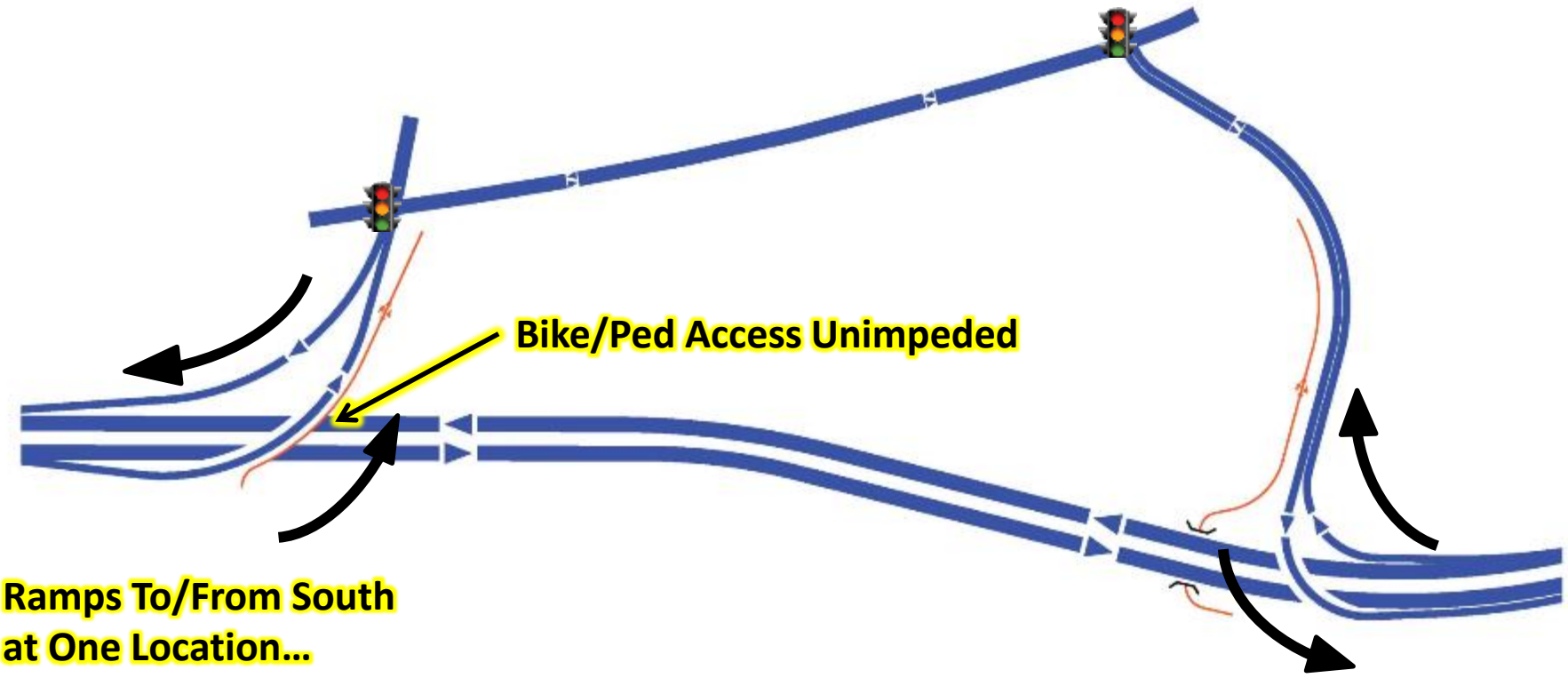
Double Roundabout Junction



Double Roundabout Junction



Split Junction



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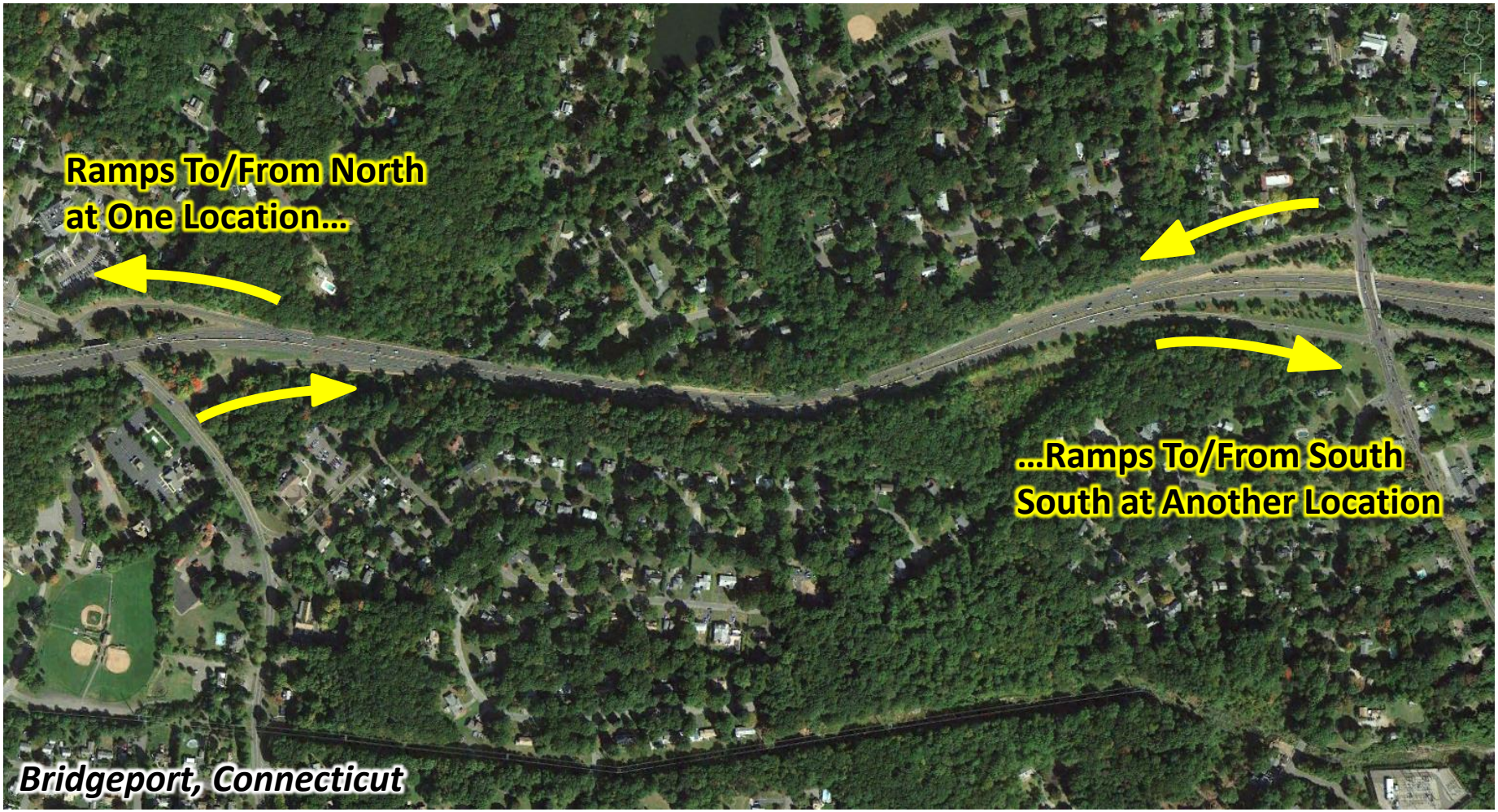
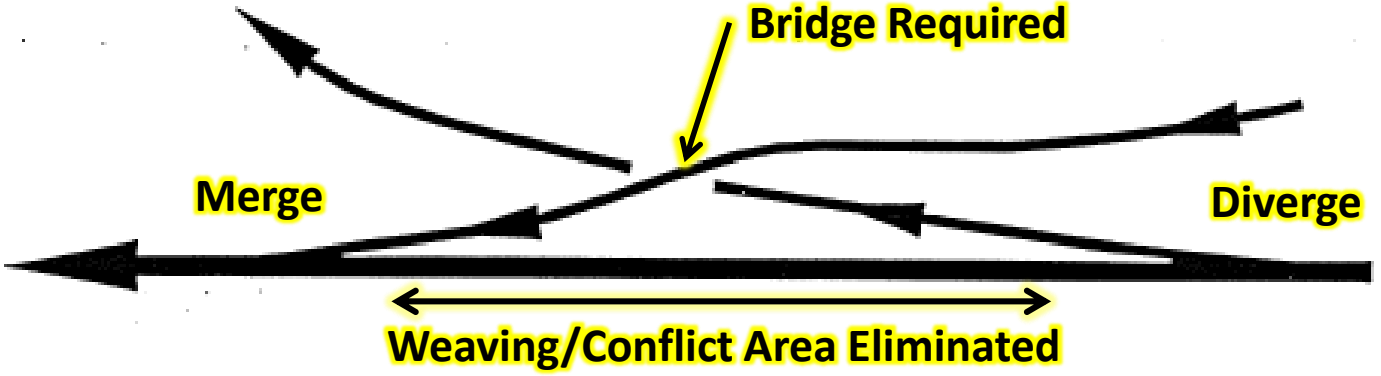


Braided Ramps

Traditional Weaving Area

Braided Ramps



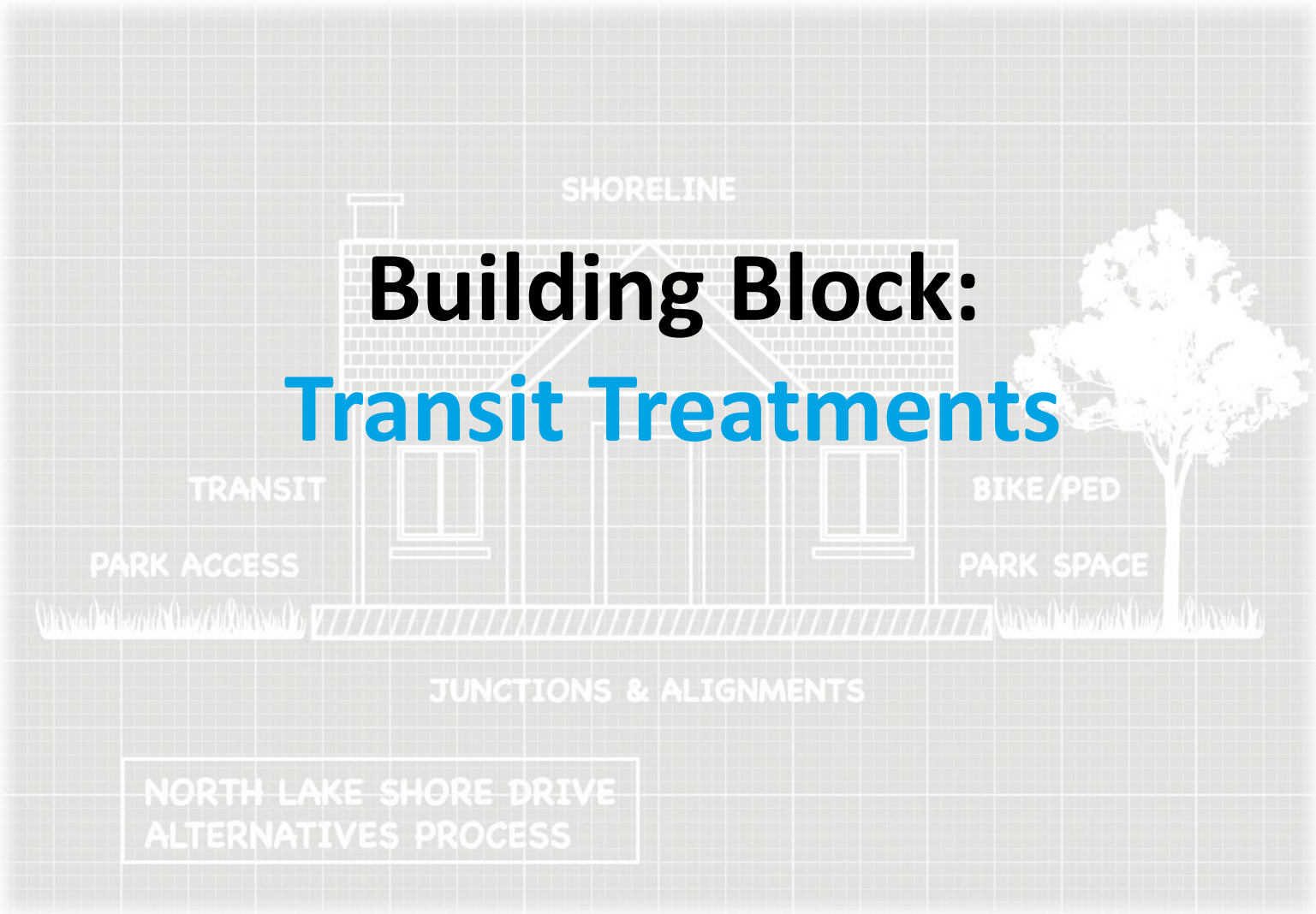
Braided Ramps

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

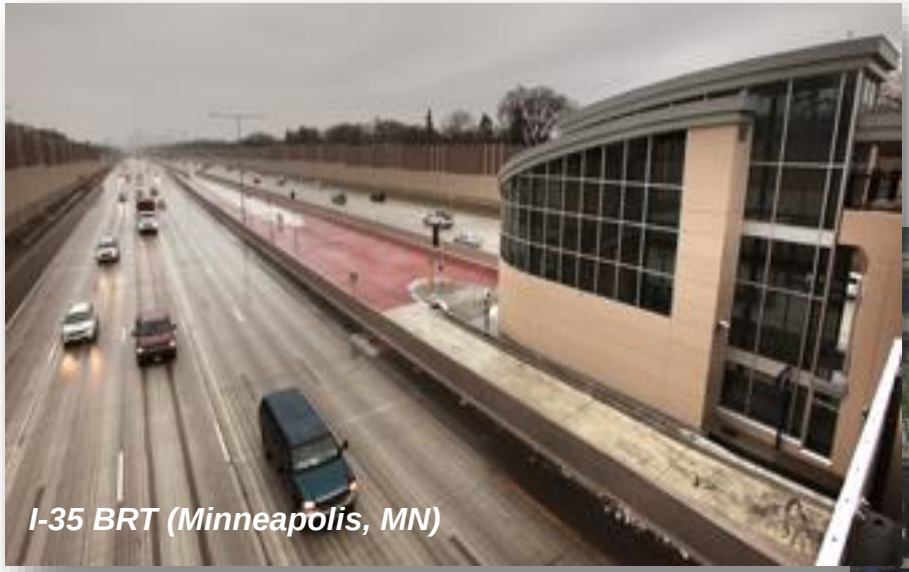


Building Block:
Transit Treatments

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)

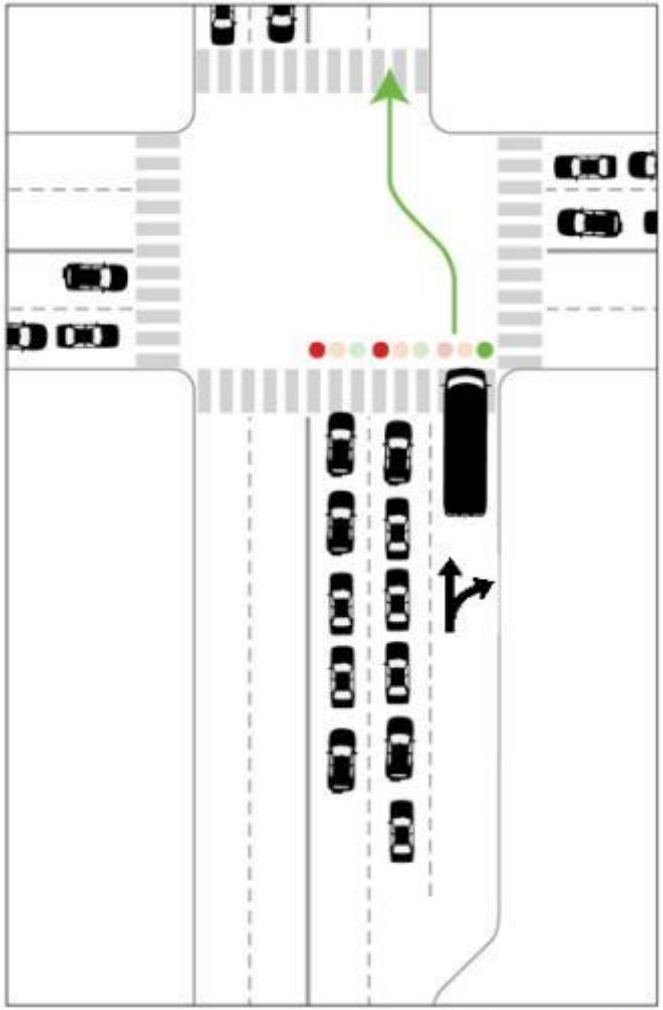
Transit: Light Rail

Lynx (Charlotte, SC)

Metro (Minneapolis, MN)

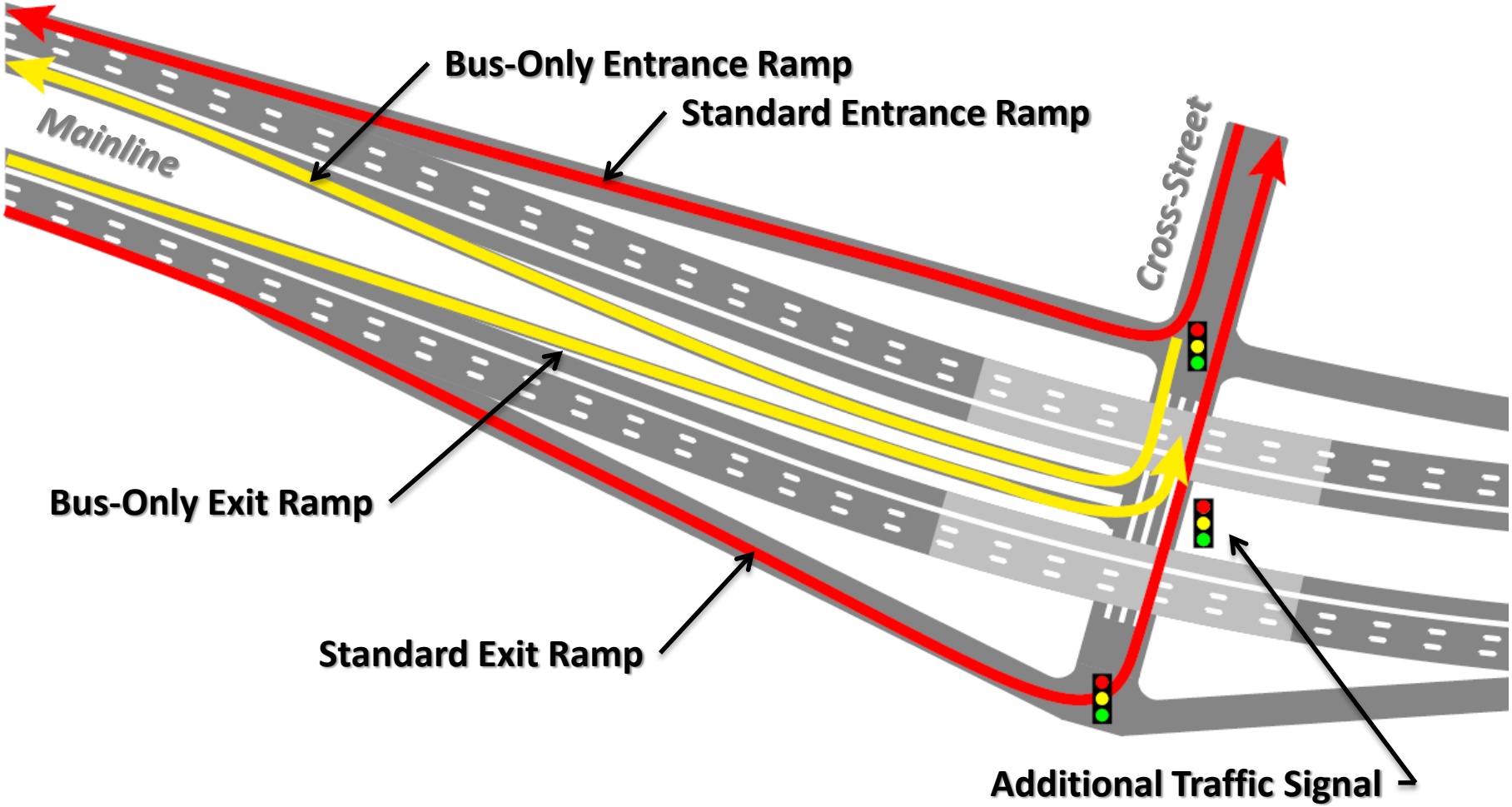
Transit: Queue Jumps

At Cross-Street or Ramp Intersections



Transit: Queue Jumps

To/From Mainline

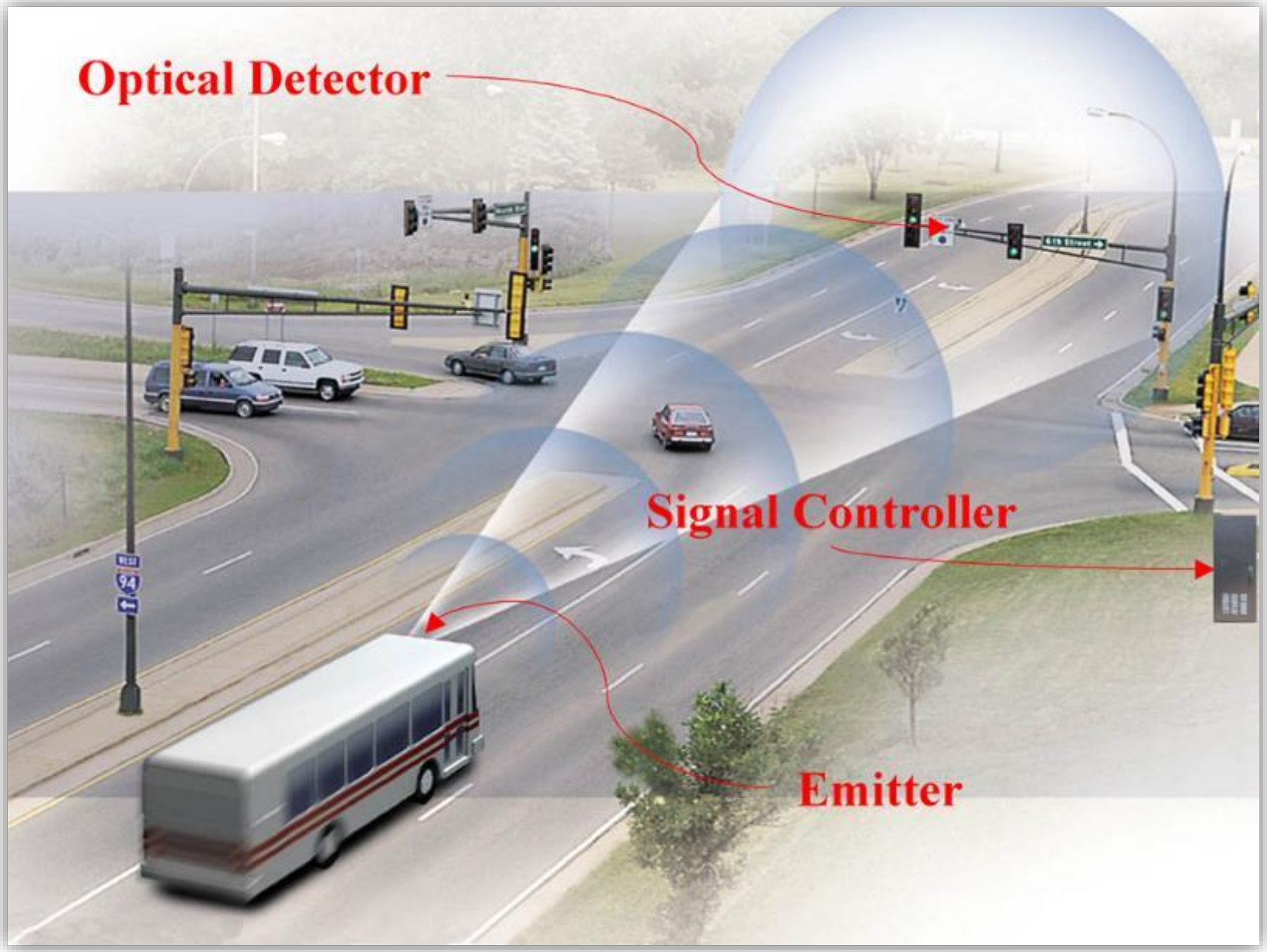


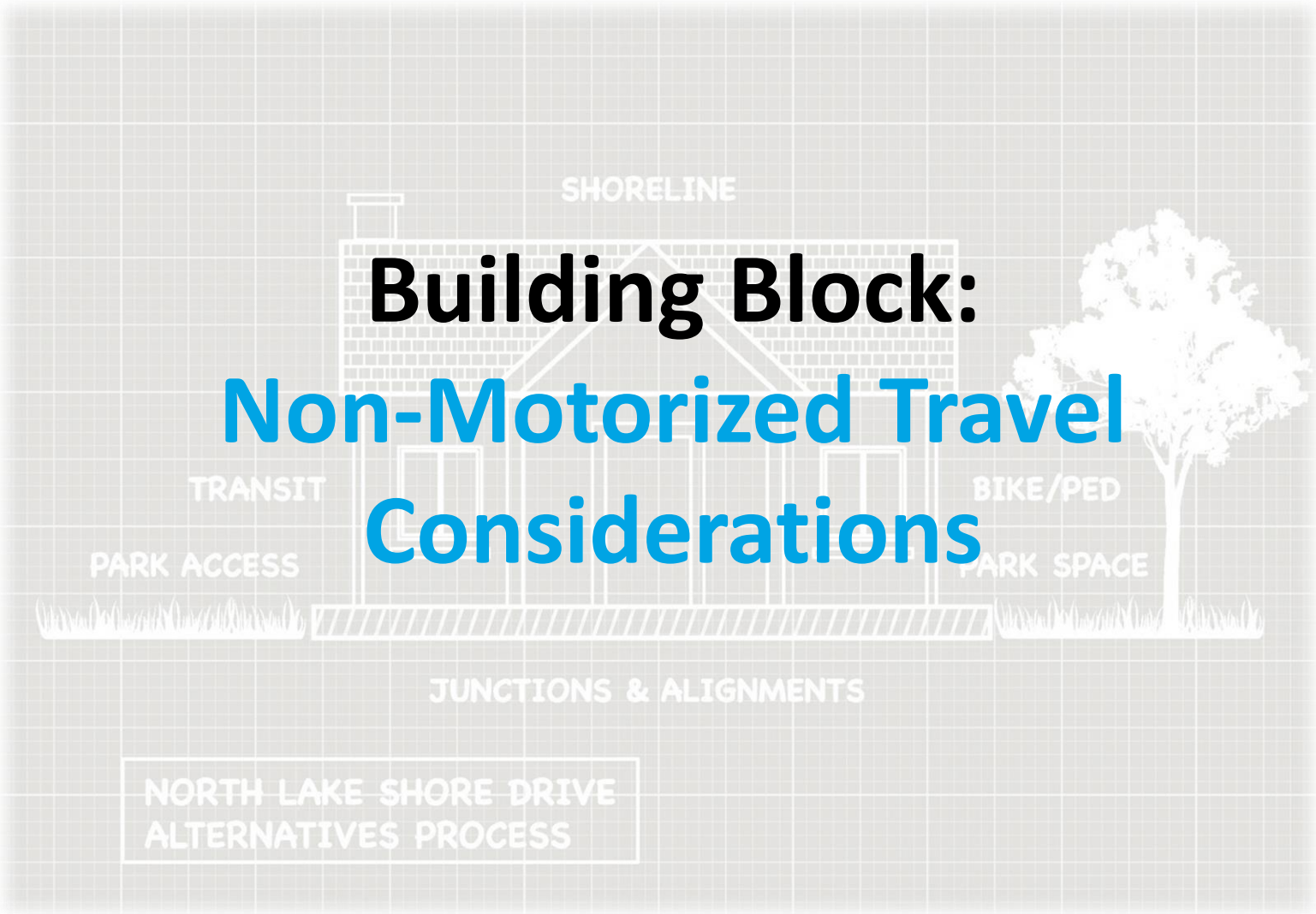
Transit: Ramp Meters

Arizona

Milwaukee, WI

Transit: Traffic Signal Priority (TSP)

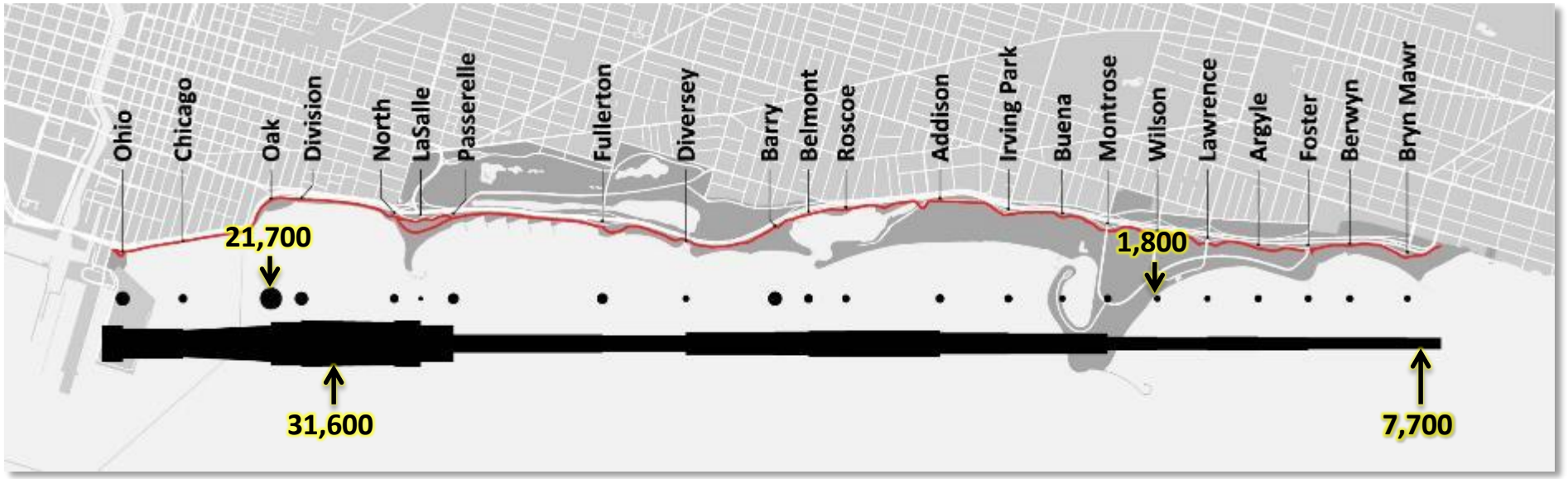




Building Block:
Non-Motorized Travel Considerations

Trail Usage

Saturday in July



- 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.

Current Trail Access Points

- 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:

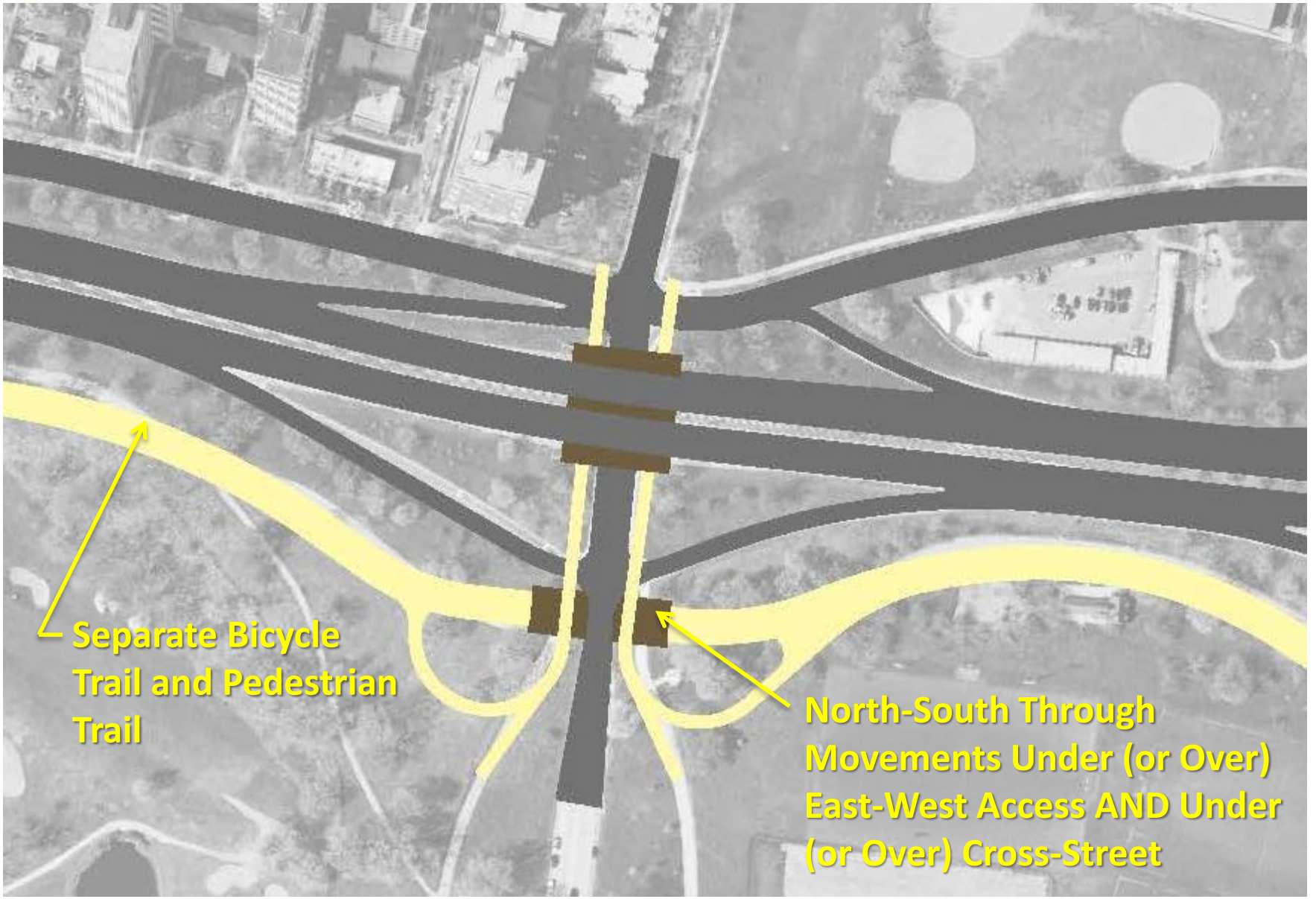
- Provide separate facilities for bikes and pedestrians on the Lakefront Trail
- Reconstruct Inner Drive to accommodate all users in accordance with applicable complete streets standards/guidelines.

Non-Motorized Travel Opportunities

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

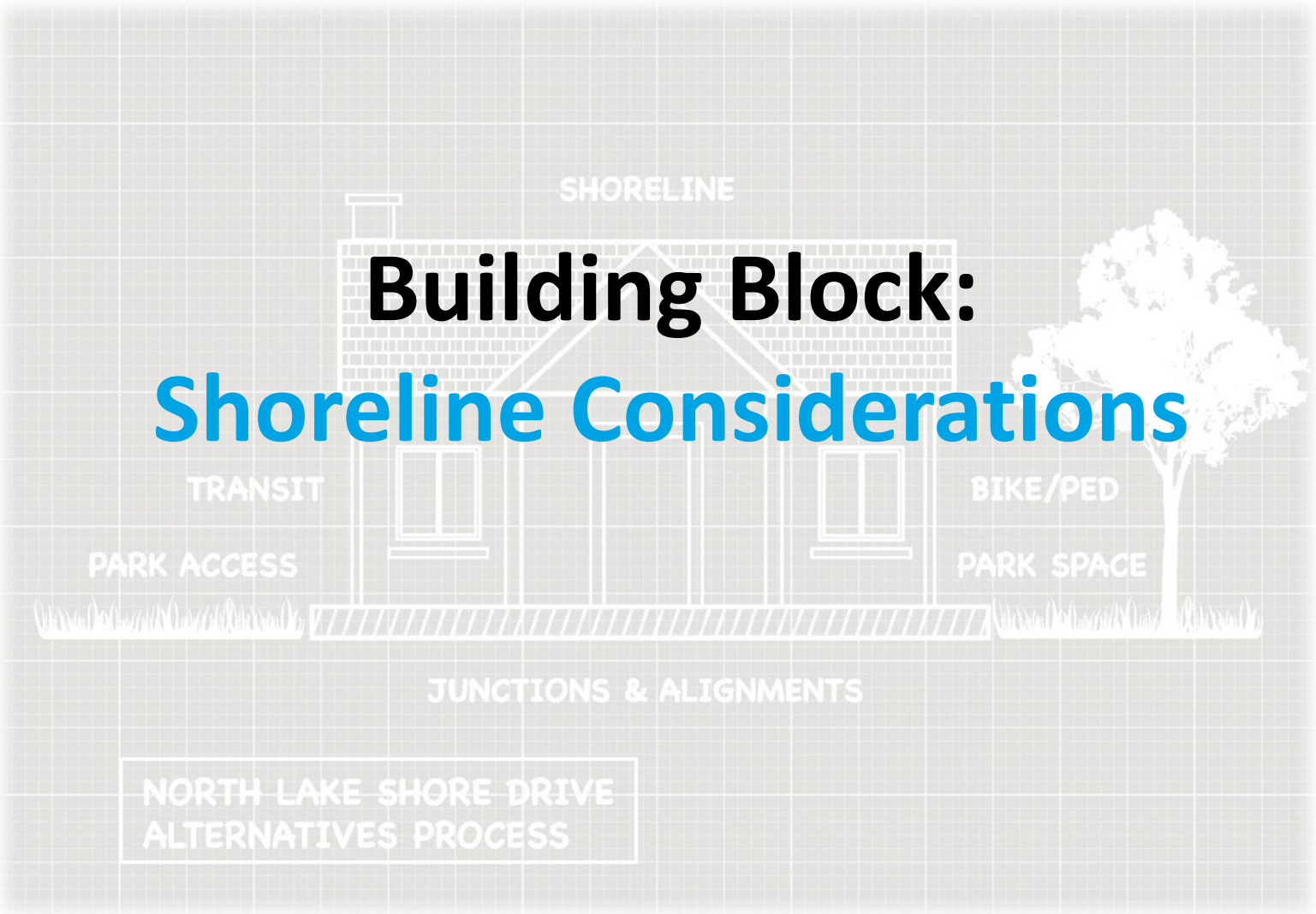
- Build overpasses or underpasses to carry the Lakefront Trail over or under *cross-streets*.
- Build overpasses or underpasses to carry the mainline Lakefront Trail bike lanes over or under the *Lakefront Trail access points*.

Lakefront Trail Considerations



Questions?

10 Minute Break



Building Block:
Shoreline Considerations

Shoreline Protection

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

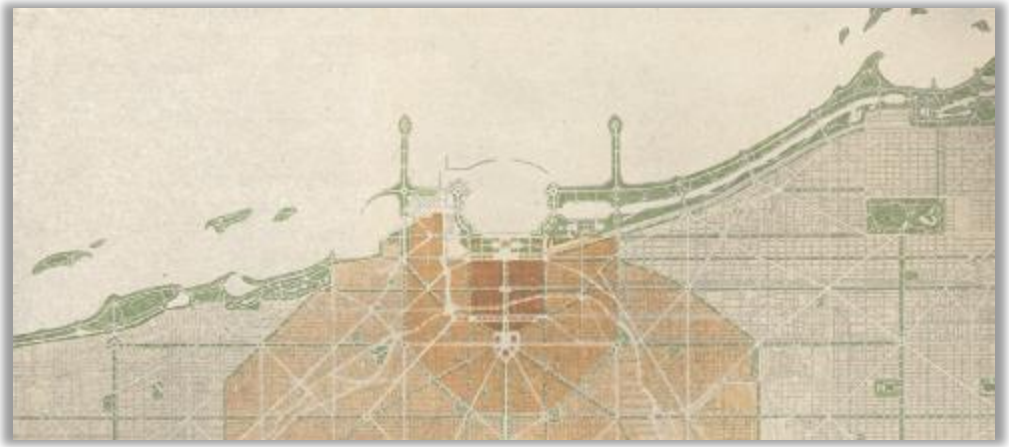
Shoreline Protection Overview

- 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

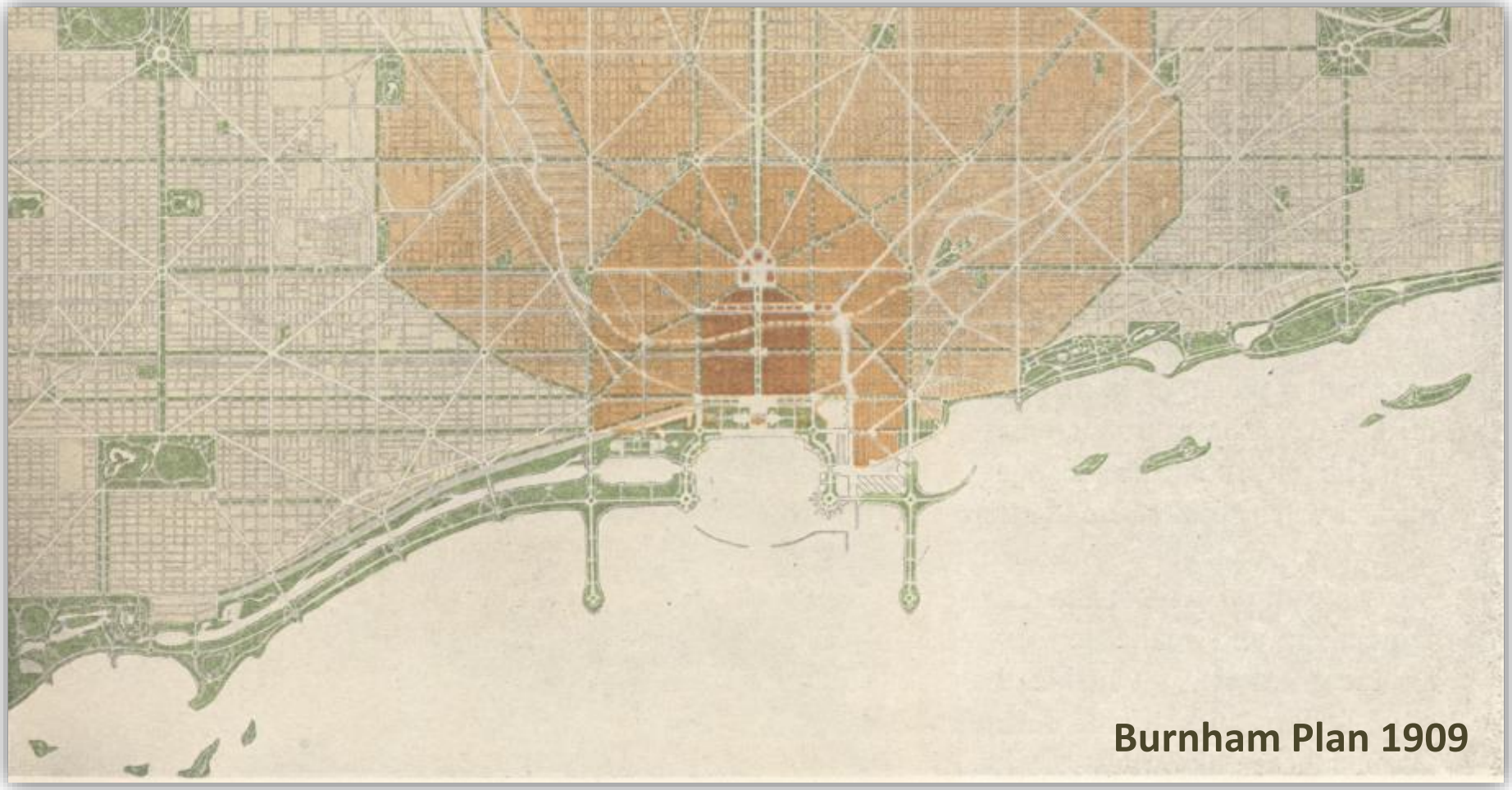
Stepped Concrete Revetment

Shoreline Protection Treatments

Vertical Steel Sheet Pile Wall

Shoreline Protection Treatments

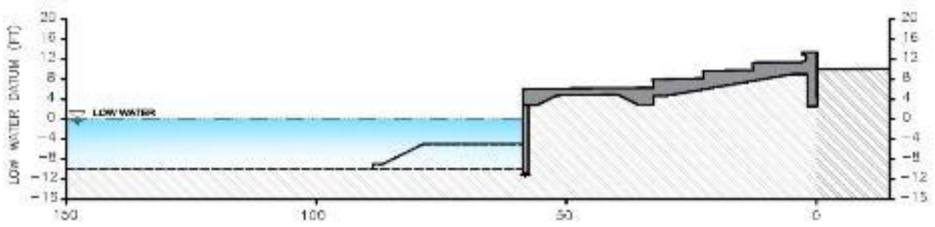
Offshore Islands



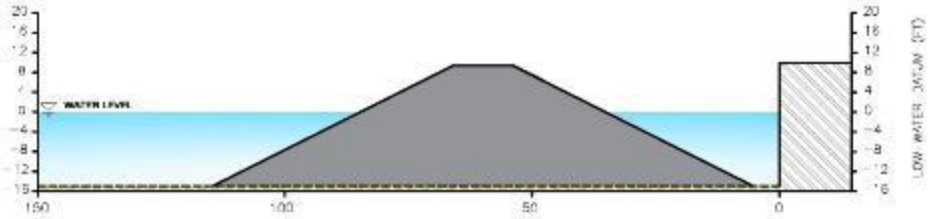
Shoreline Protection Treatments

Breakwaters

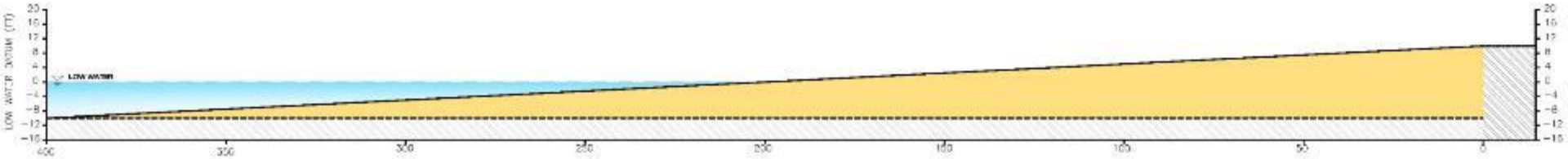
Lake Bottom Coverage



Stepped Stone Revetment



Rubble Mound Breakwater

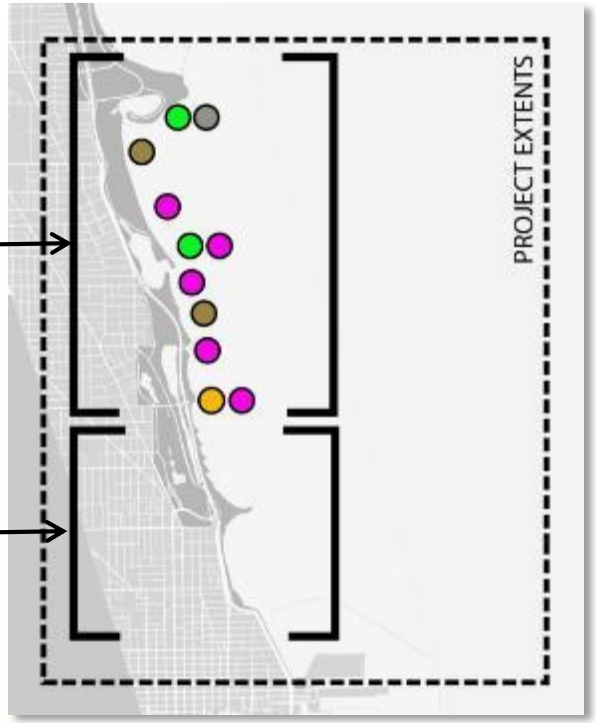


Sand Beach

Chicago Shoreline Protection Projects

Recent Shoreline Protection Projects

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

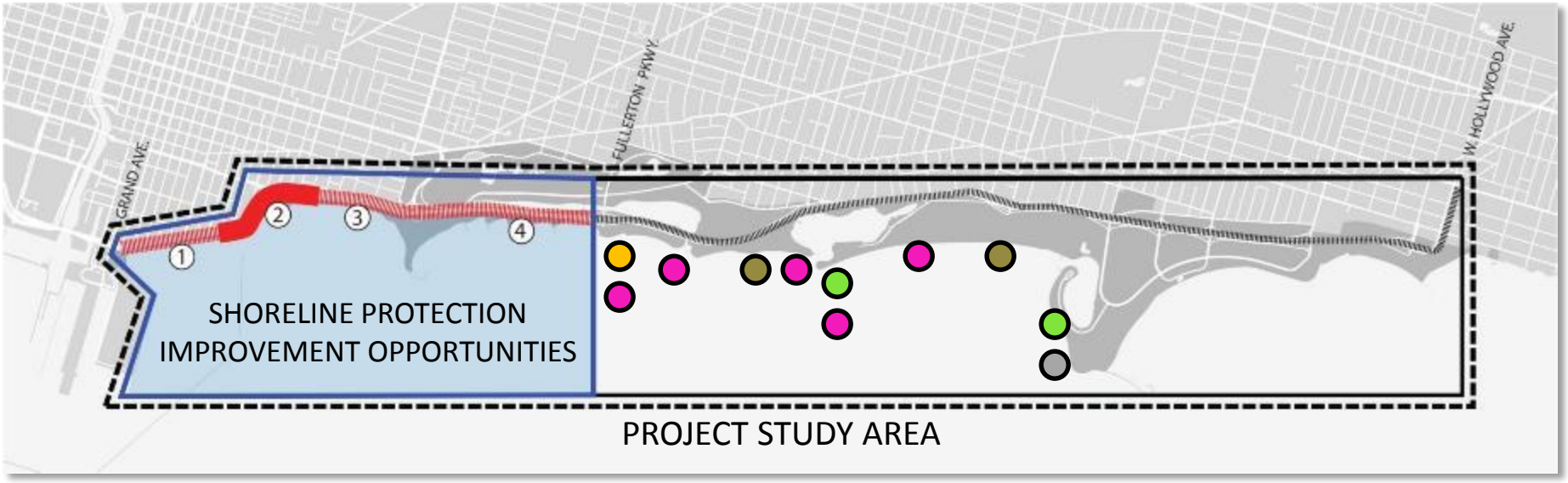


Chicago Shoreline Analysis

Shoreline Protection Improvement Opportunities

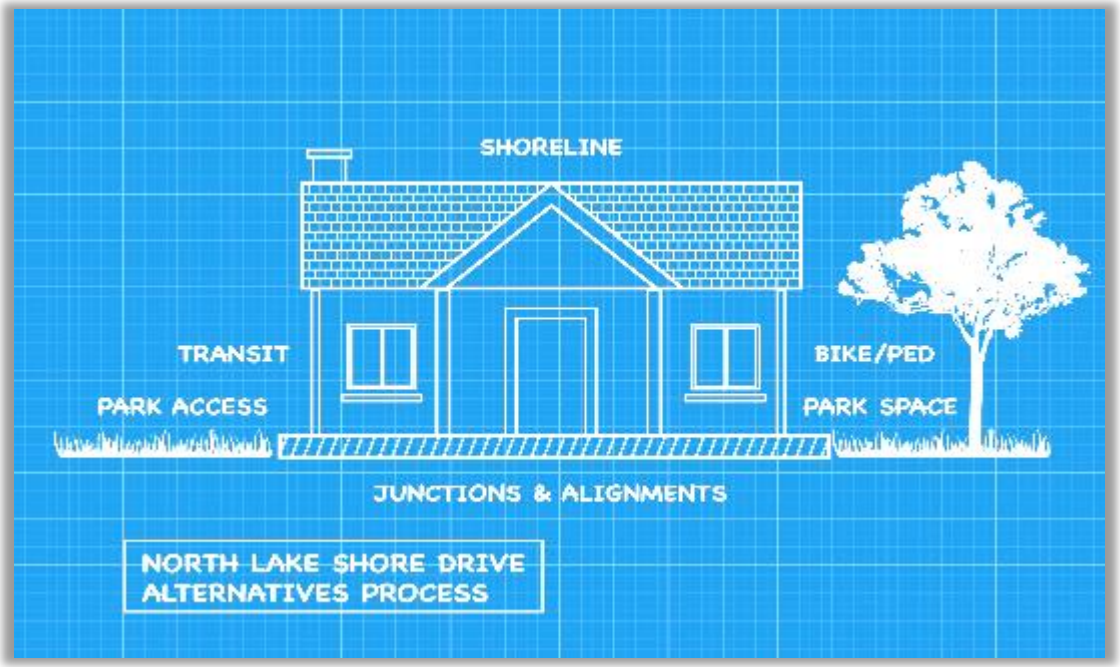
Grand Avenue to Fullerton Parkway

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

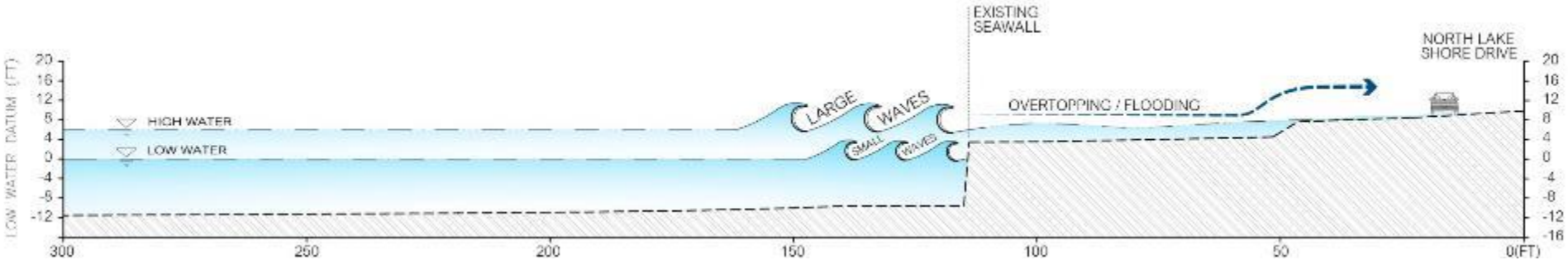
September, 1987

1950's

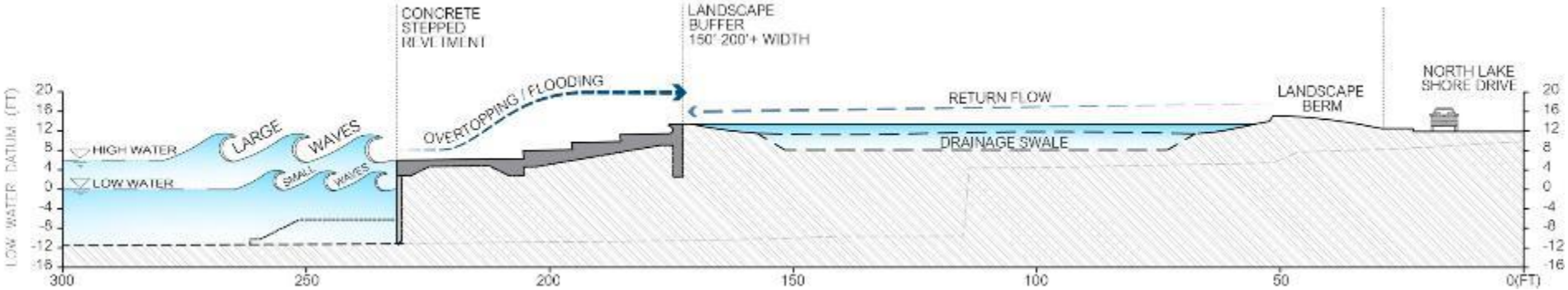
Safety Concerns

- Vehicular & Pedestrian Safety
- Damage to Site Improvements

Wave Characteristics



East Banks Street Extended

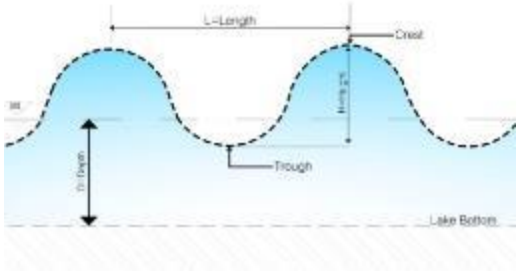


Stepped Concrete Revetment

Wave Height

65% - 100% x water depth

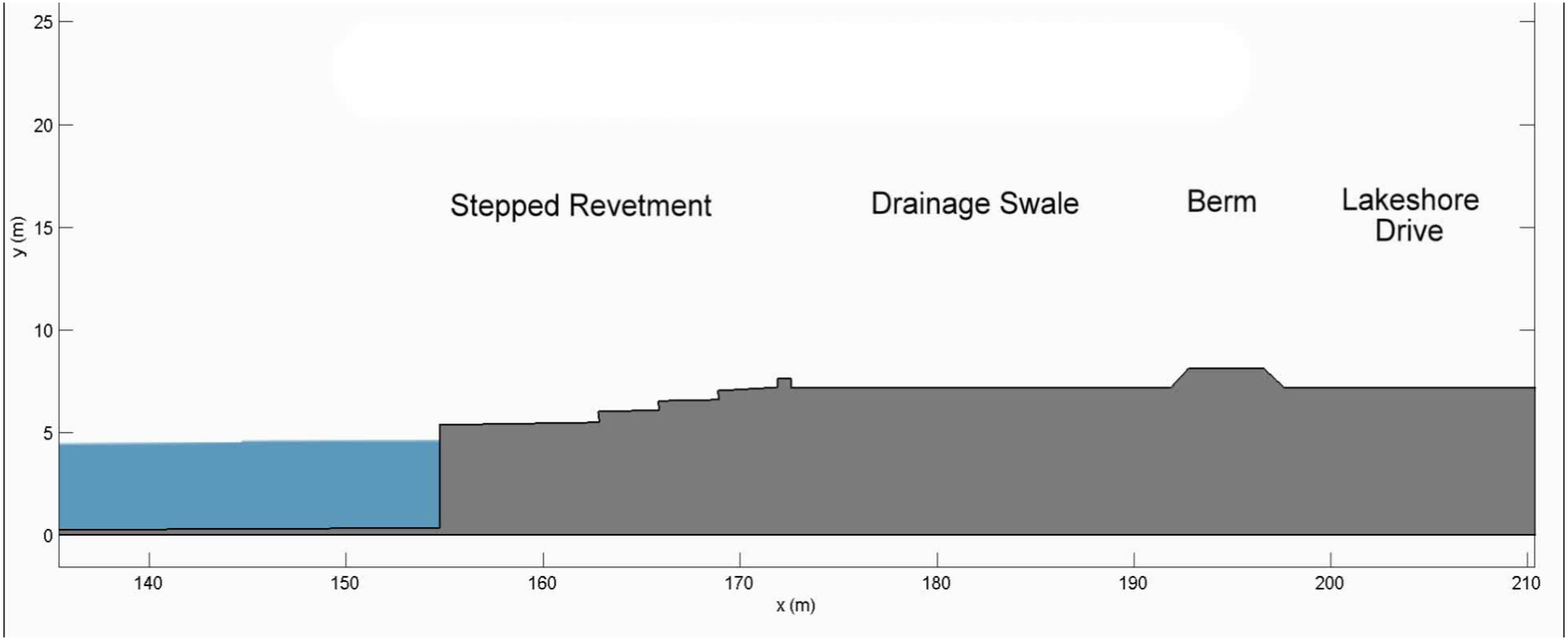
70% above SWL – 30% below



Simulation

Existing Conditions – Diversey to Fullerton

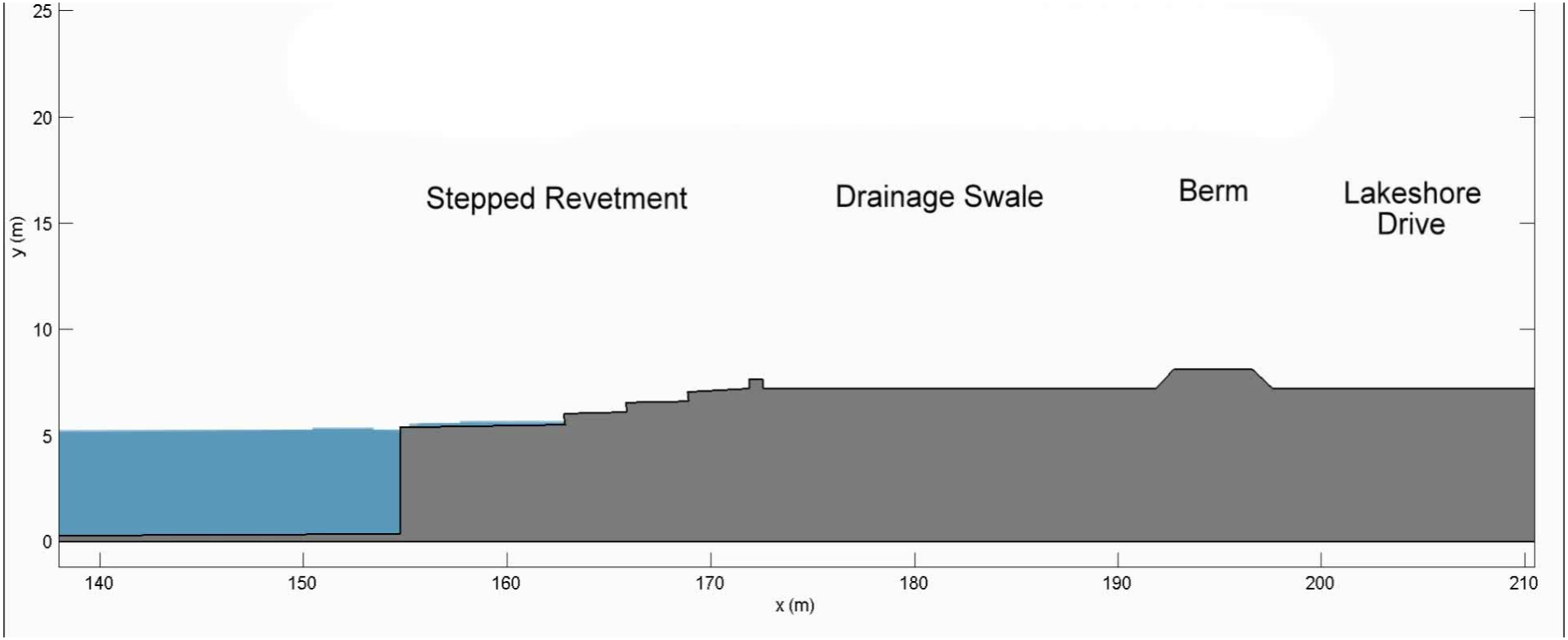
Low Water +1.0 (Halloween 2012)



Simulation

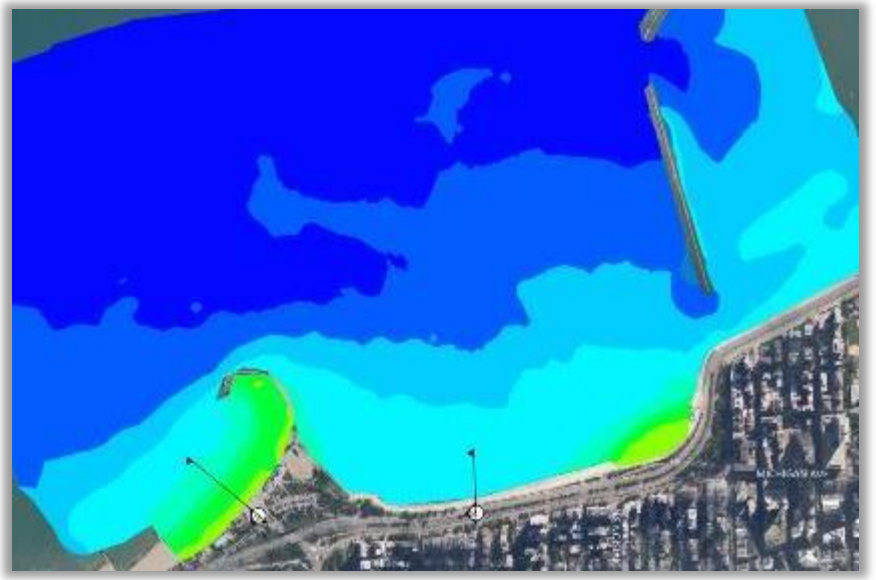
Existing Conditions – Diversey to Fullerton

High Water +7.0 (100 - Year Event)

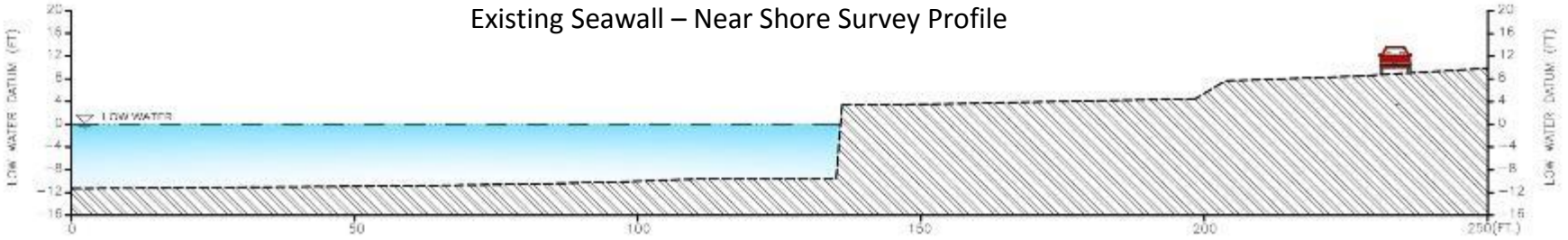


Site Investigations

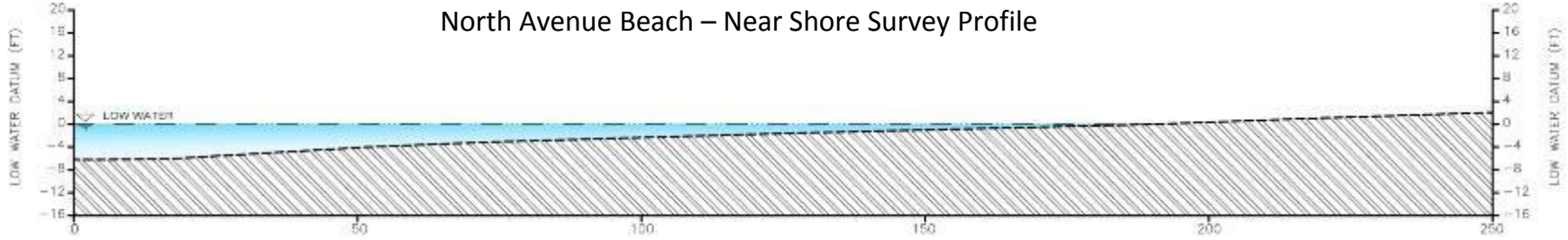
Bathymetry (Lake Bottom Topography)



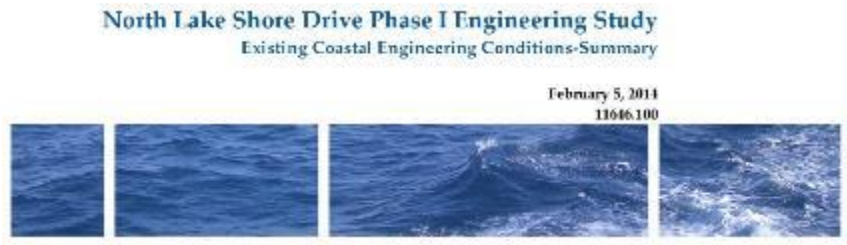
Existing Seawall – Near Shore Survey Profile

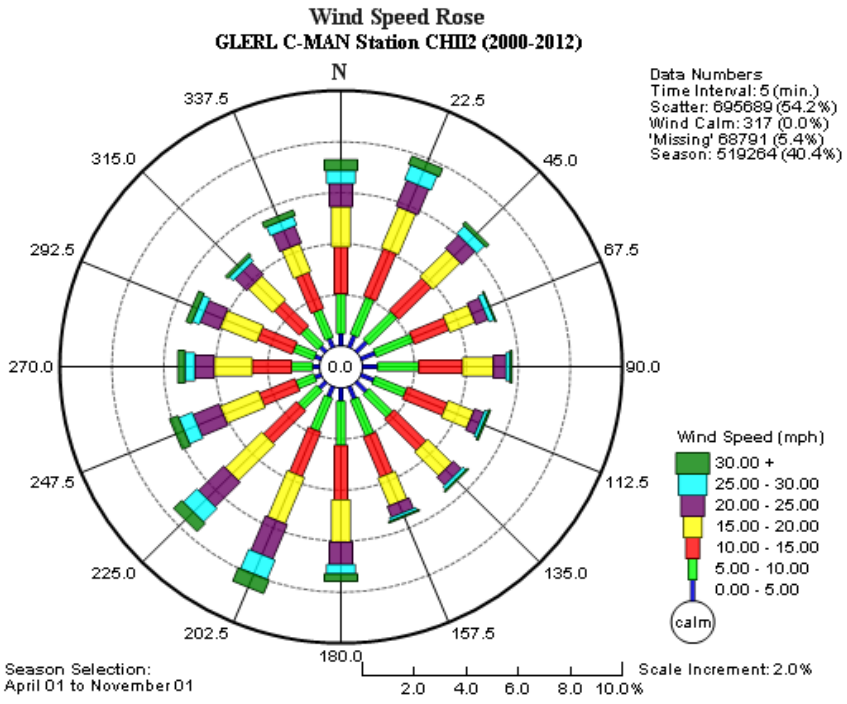


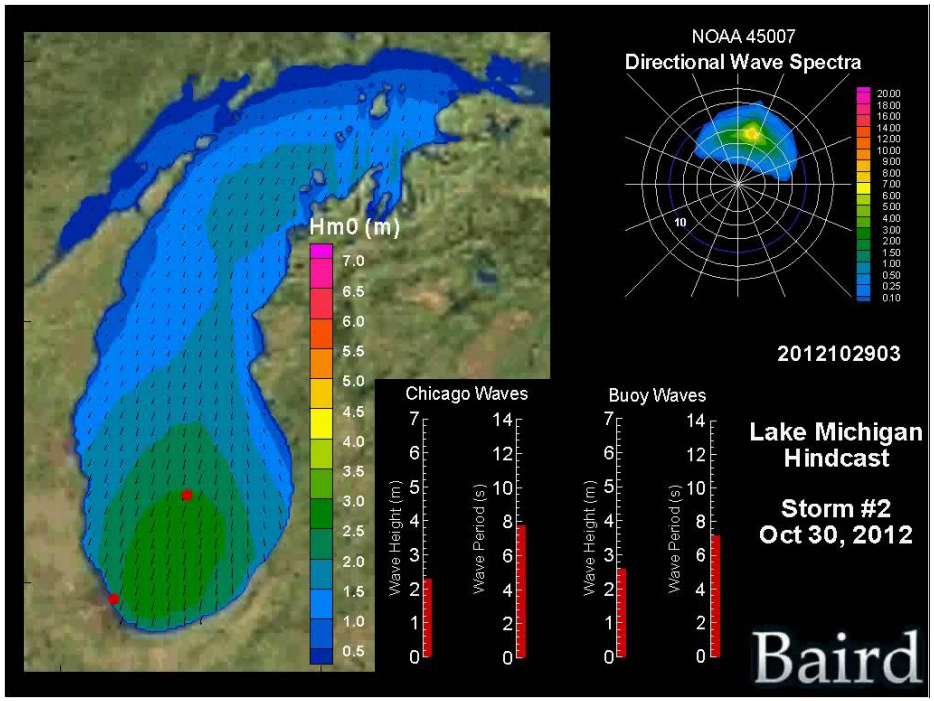
North Avenue Beach – Near Shore Survey Profile



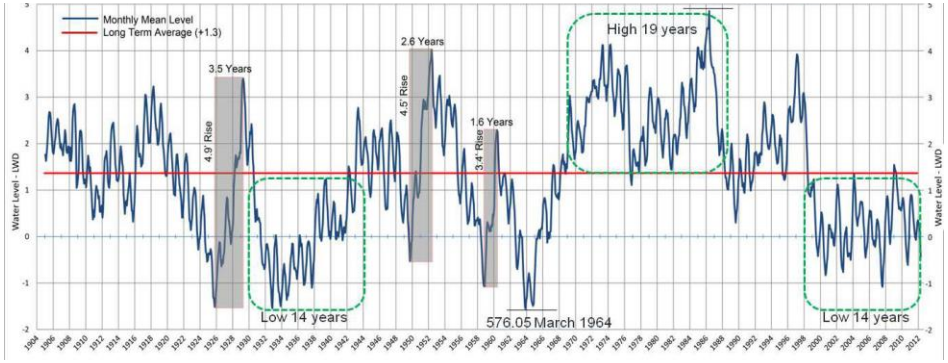
Wind, Wave and Water Levels



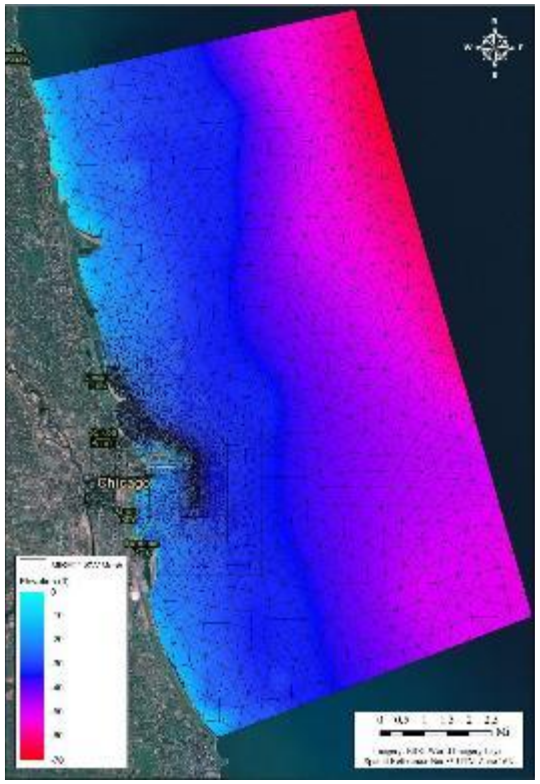


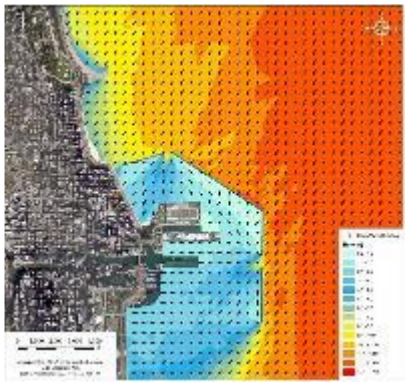


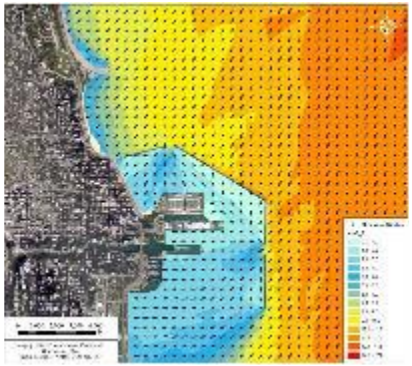
Calumet Harbor 1904 -2012

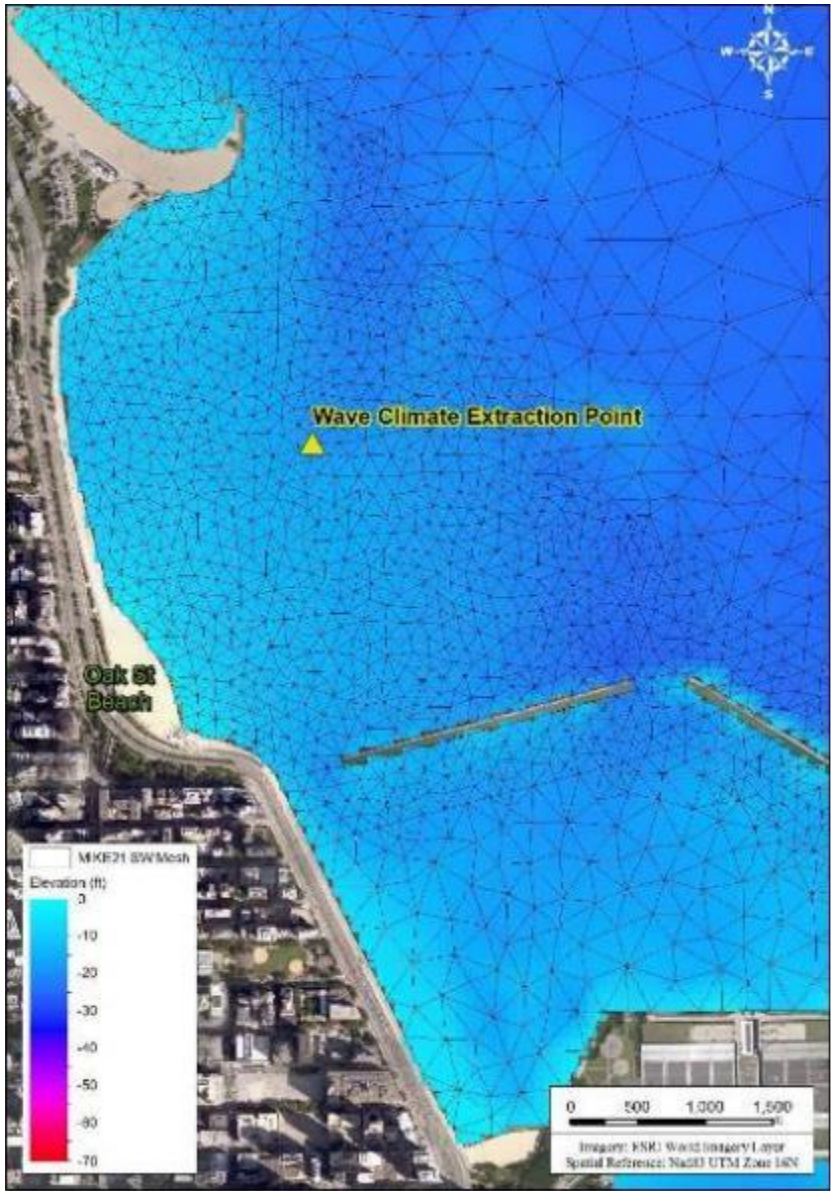


Numerical Modeling

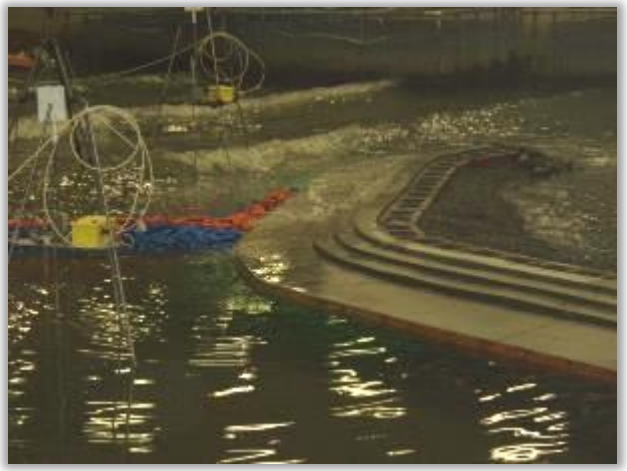






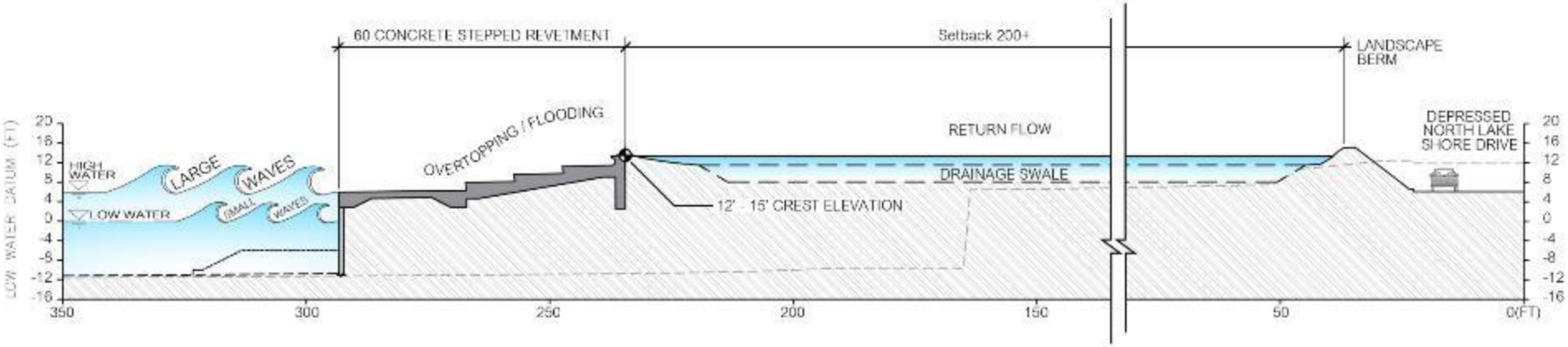


Physical Modeling

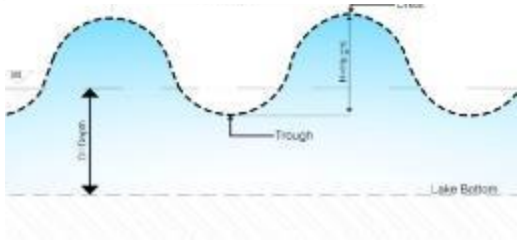


Shore Protection Summary

- 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

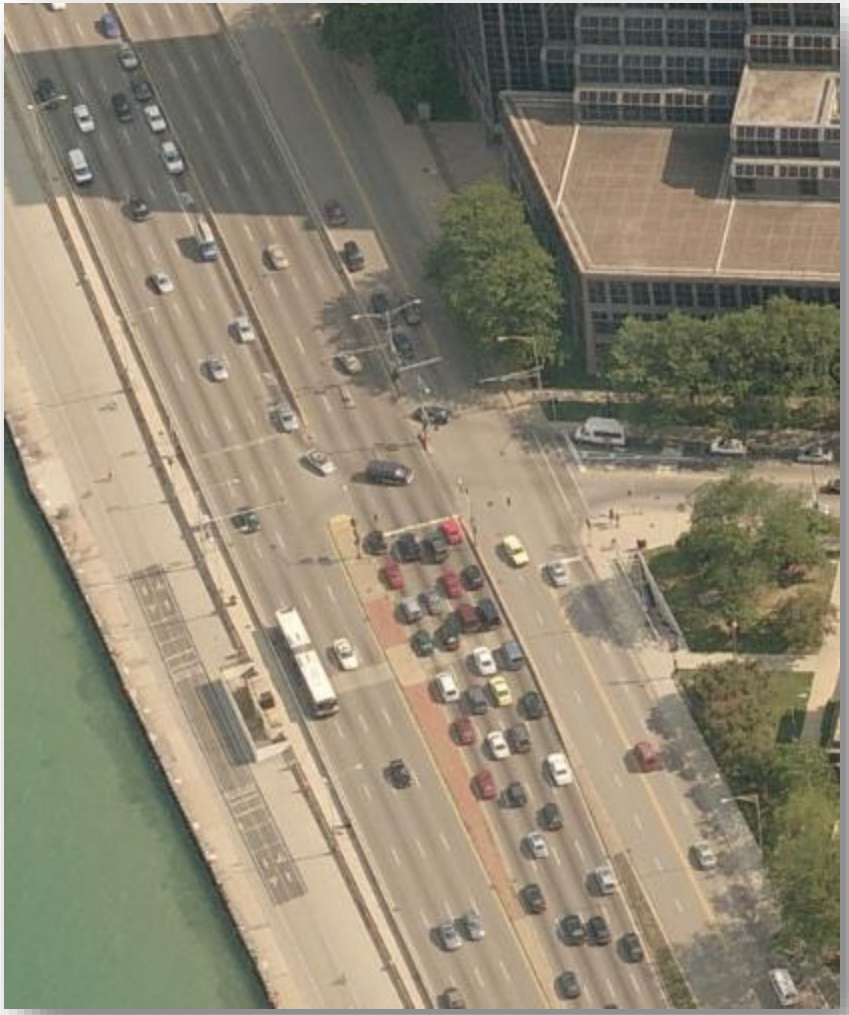
Junction Toolbox Example:

Chicago Avenue Junction Area

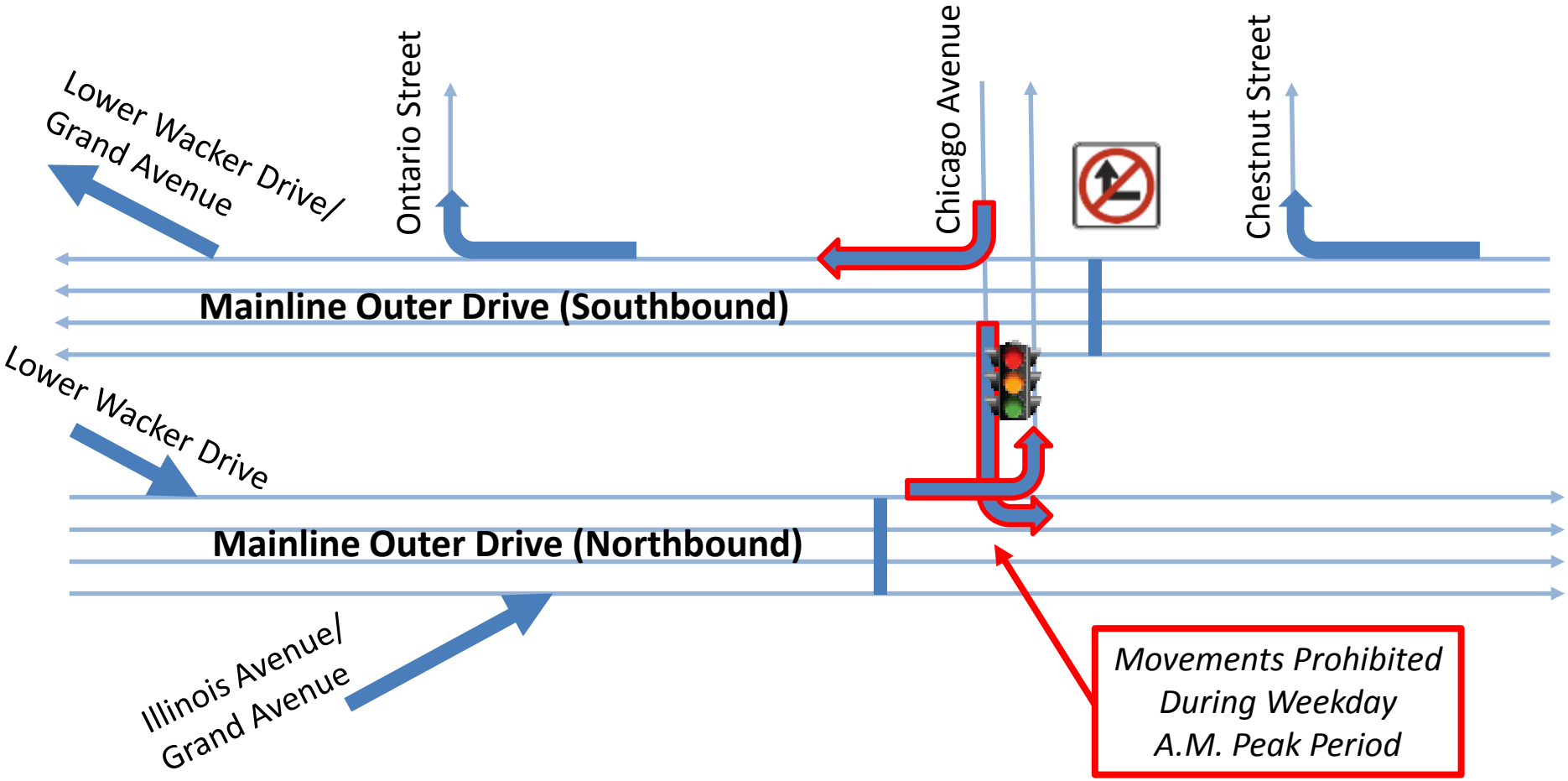
(Grand Avenue to Oak Street Curve)

Deficiencies & Needs

- Only signalized Outer Drive intersection
- Severe daily congestion along Outer 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

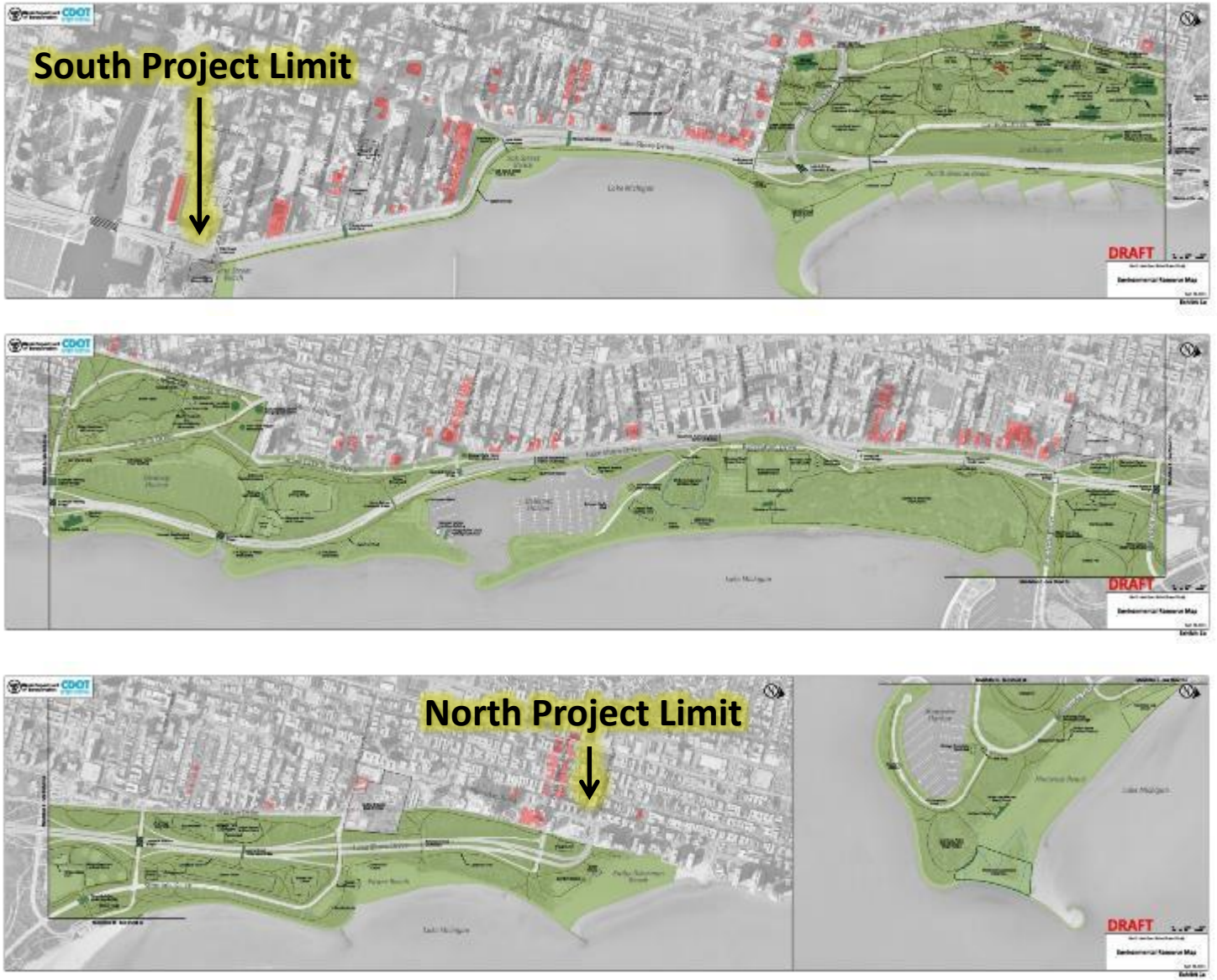


Traffic Movements to/from NLSD



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

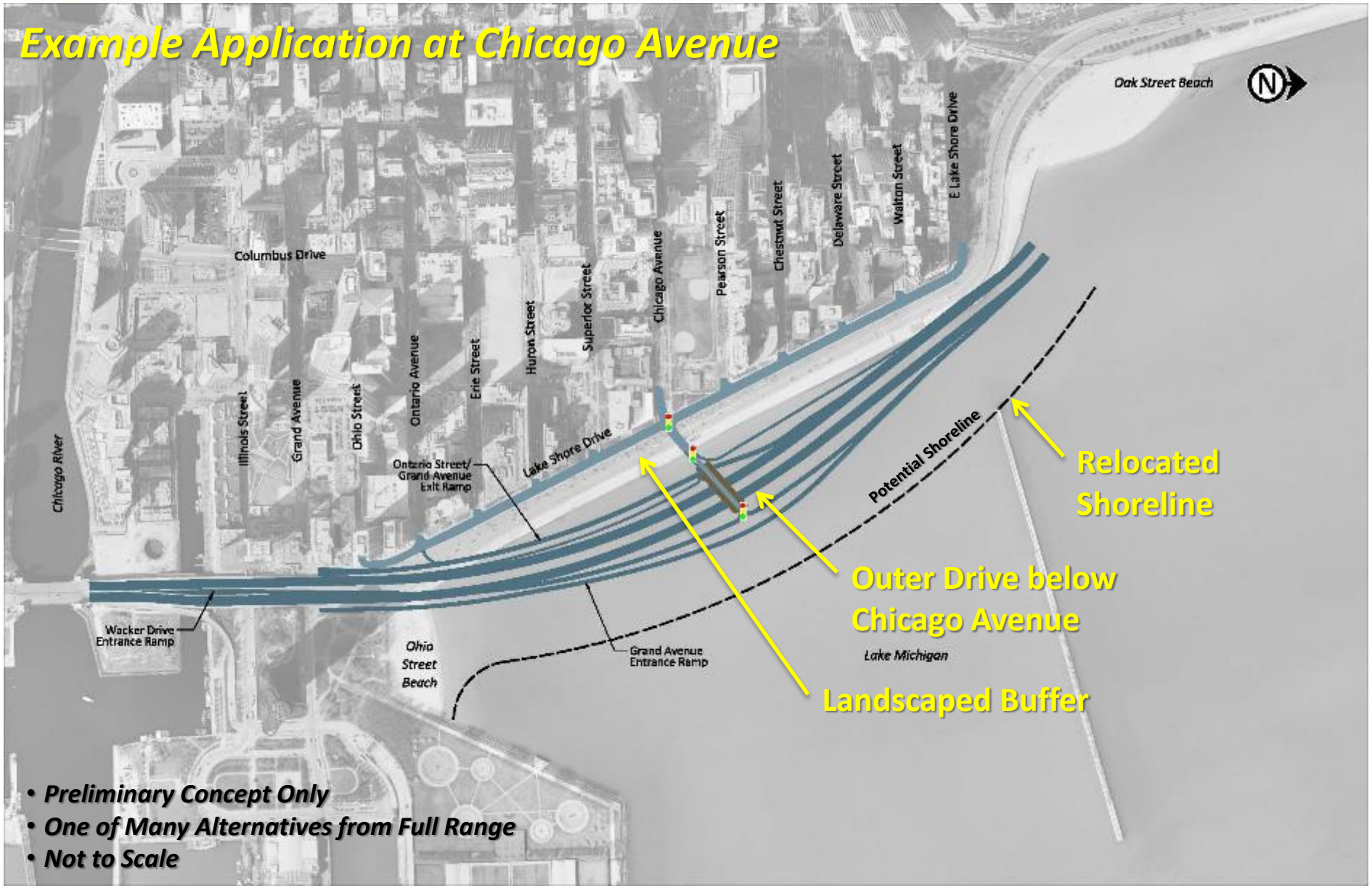
Historic Resources

Park Resources

Chicago Avenue Junction Treatments

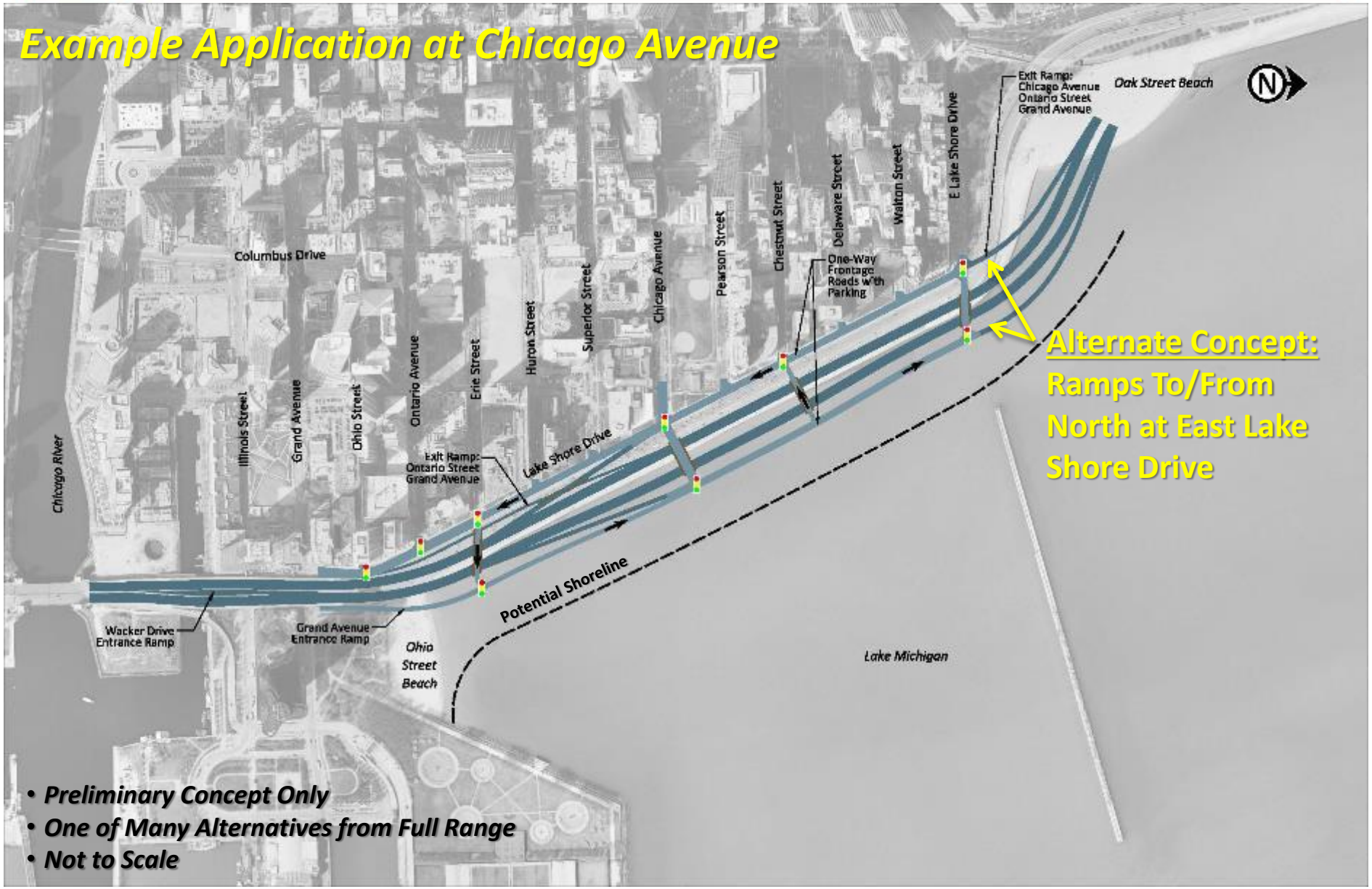
- Of the alternative treatments shown in the "Junction Toolbox", the following may be considered at the Chicago Avenue Junction Area:
  - Compressed Diamond Junction
  - Split Junction with Frontage Roads
  - Half Diverging Diamond Junction
  - Bow-Tie Roundabout Junction
  - At-Grade Intersection

Compressed Diamond Junction

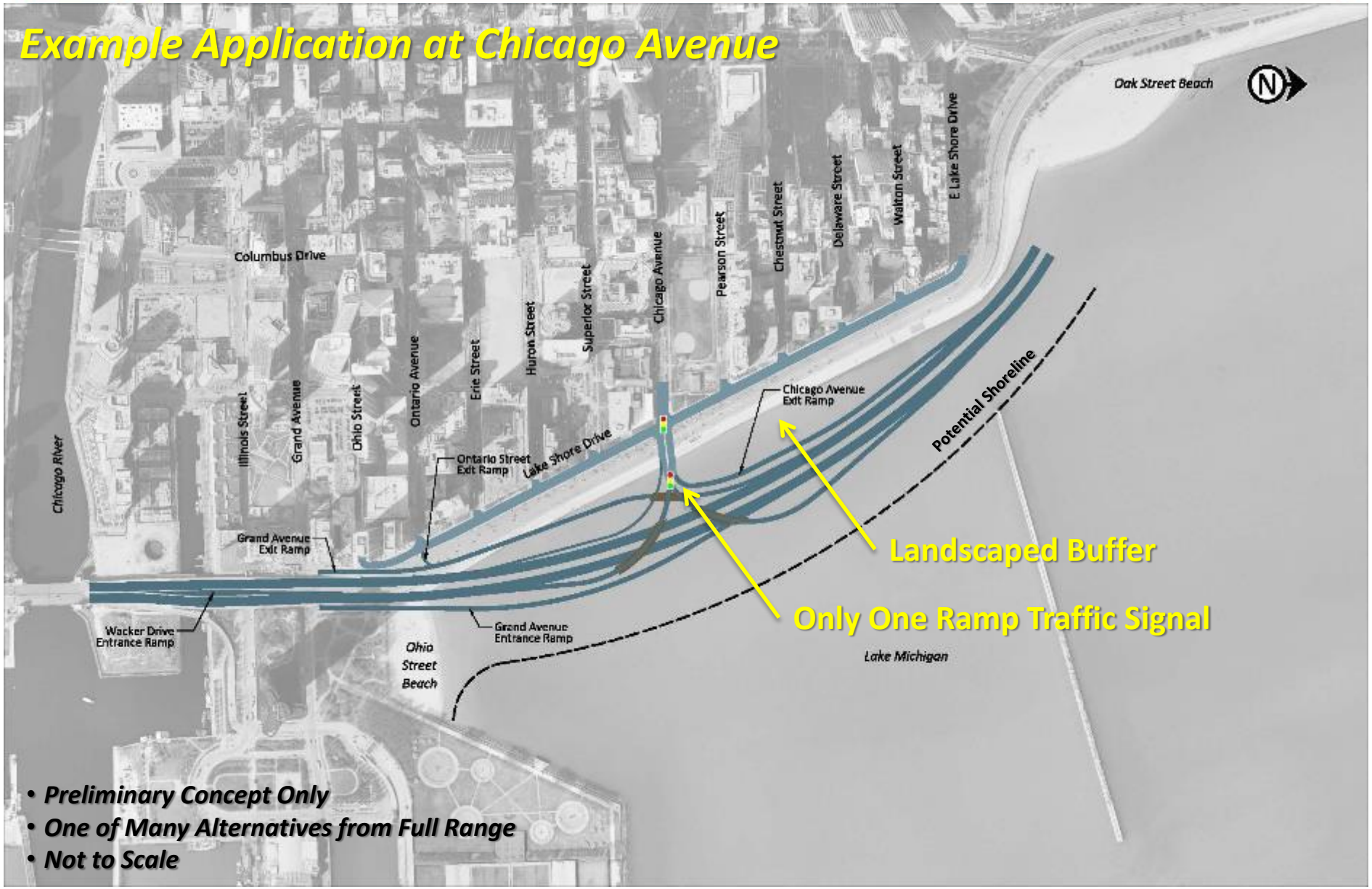


Split Junction with Frontage Roads

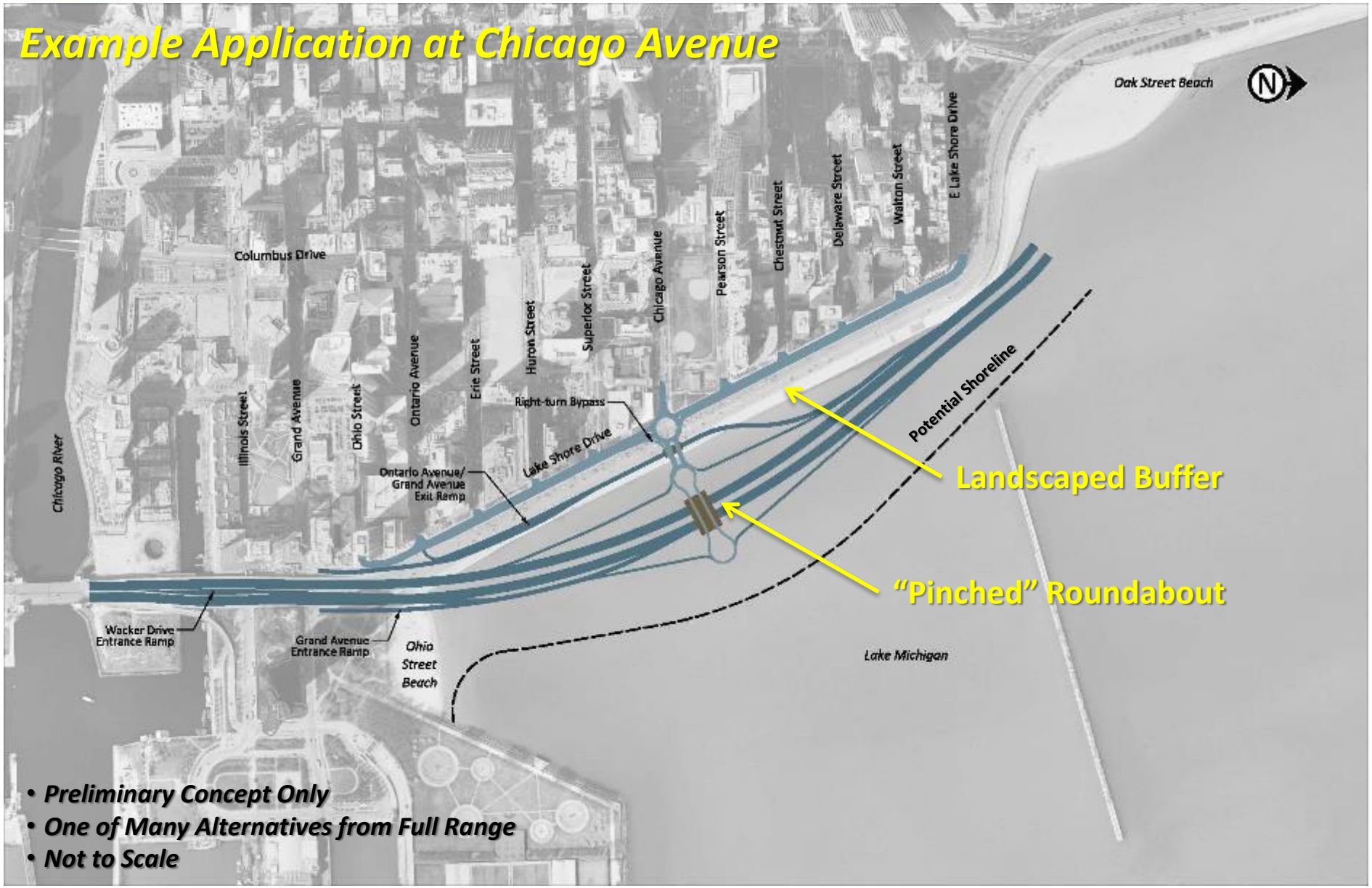
Split Junction with Frontage Roads



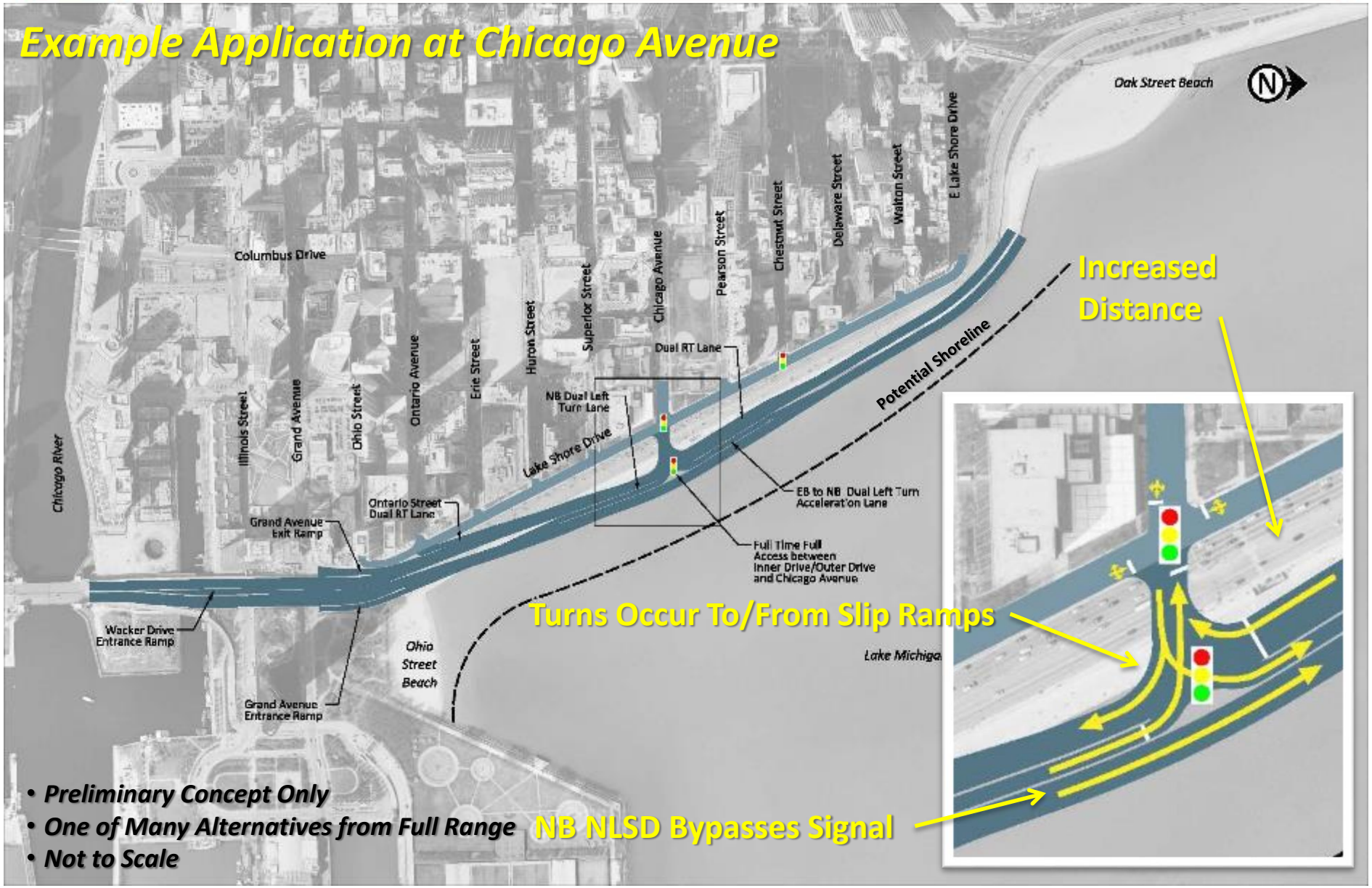
Half Diverging Diamond Junction



Bow-Tie Roundabout Junction



At-Grade Intersection

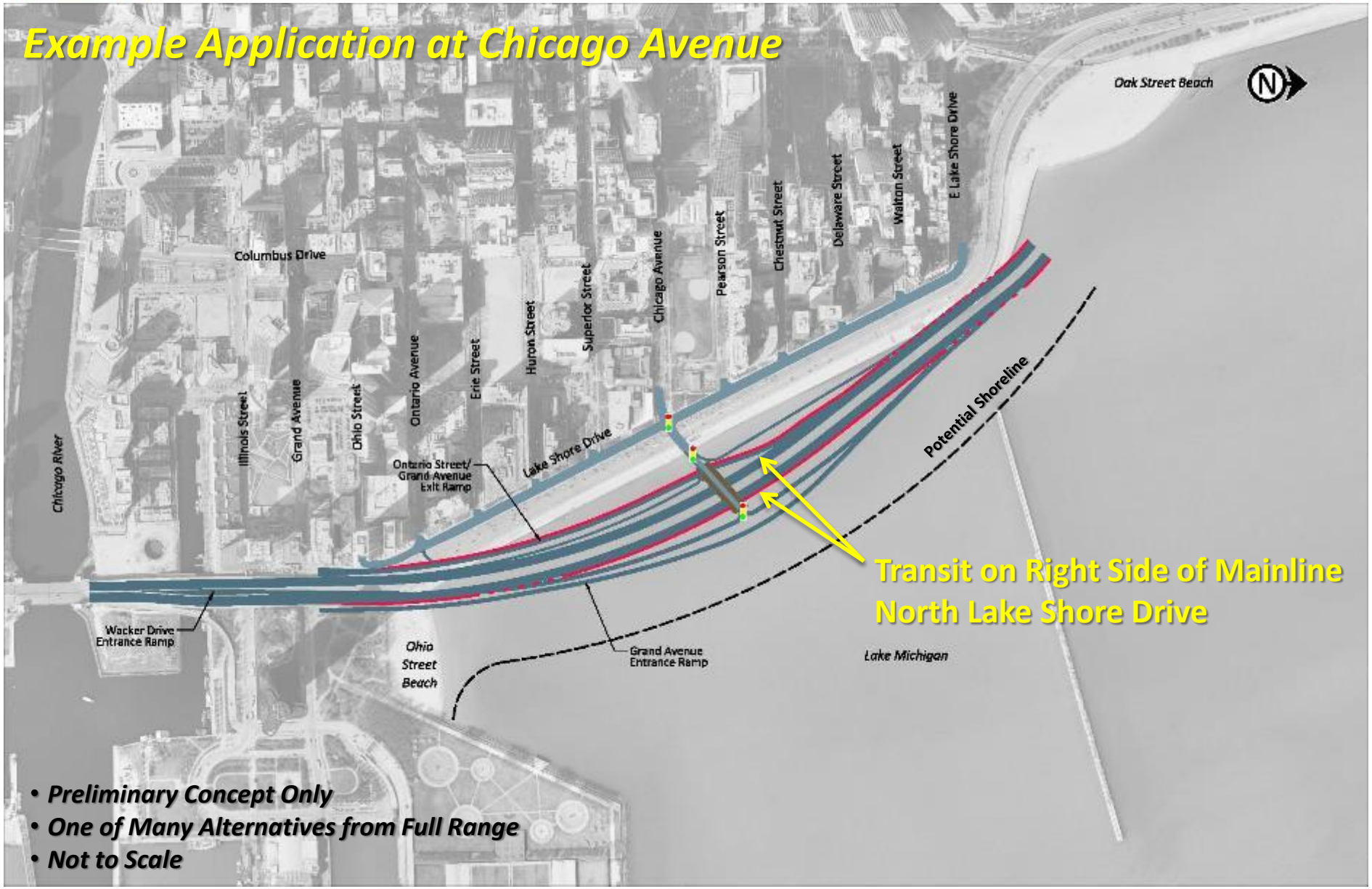


Transit and Non-Motorized Travel Building Block Examples:

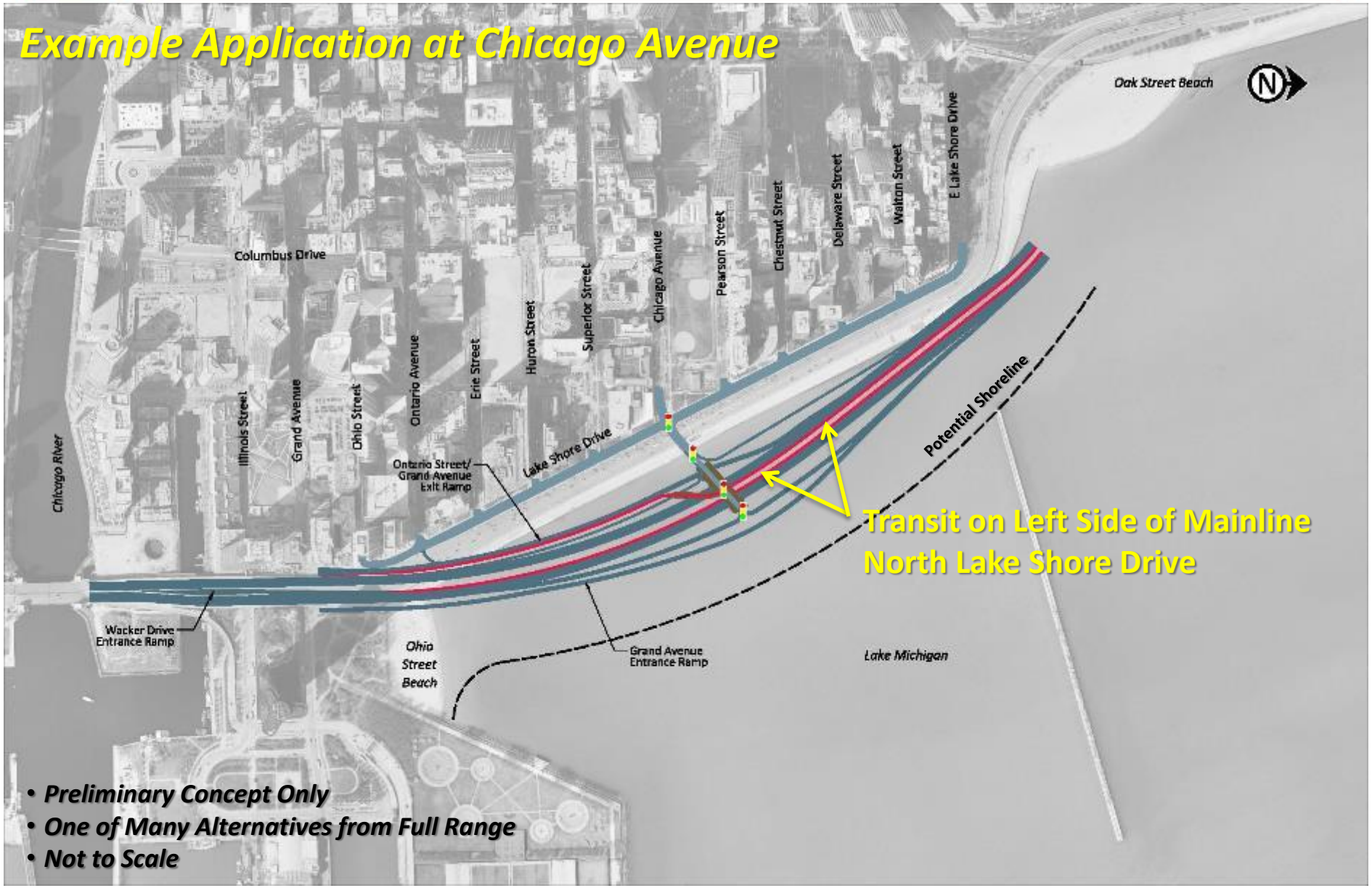
Chicago Avenue Junction Area

(Grand Avenue to Oak Street Curve)

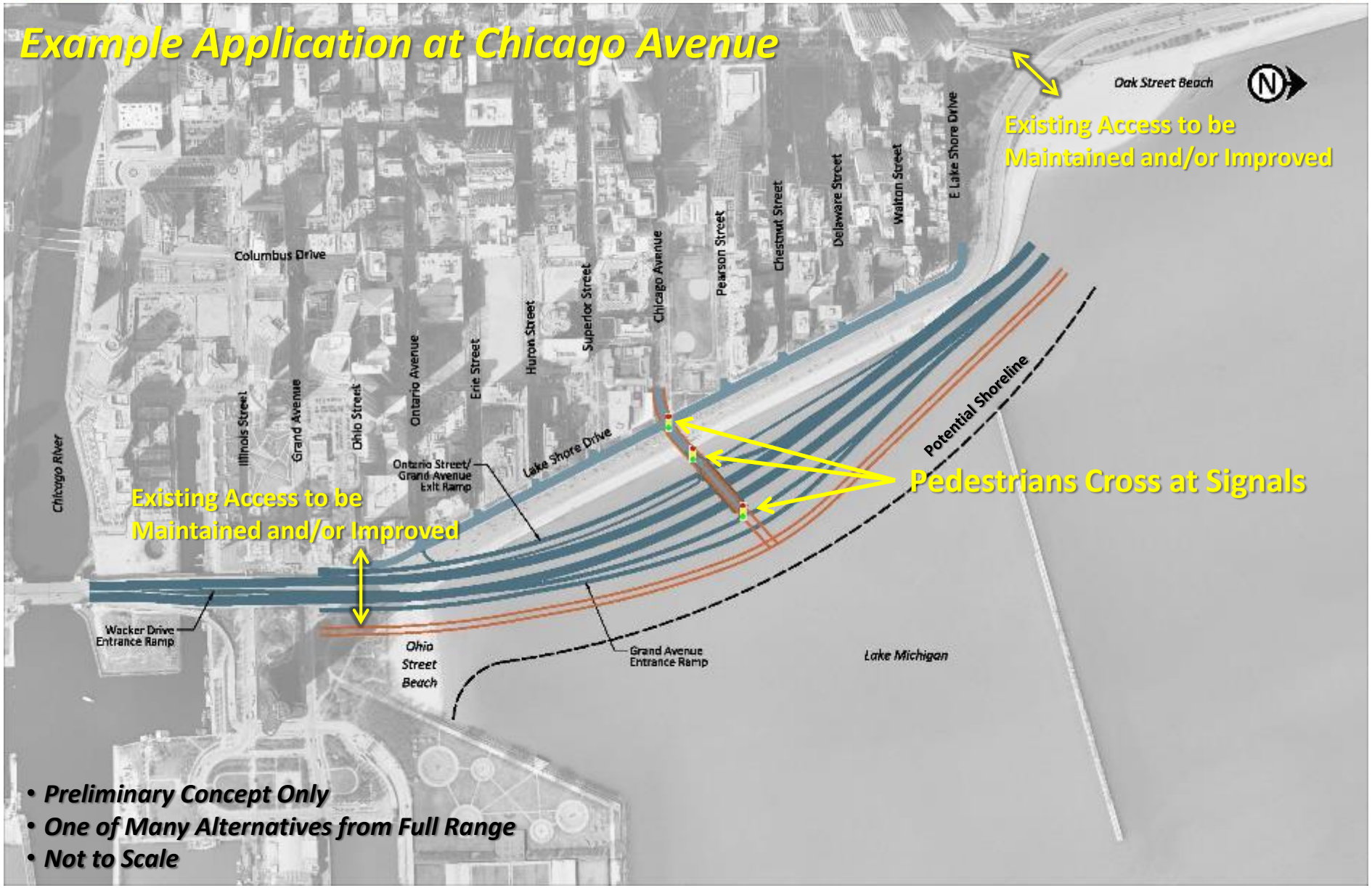
Transit – Right Side



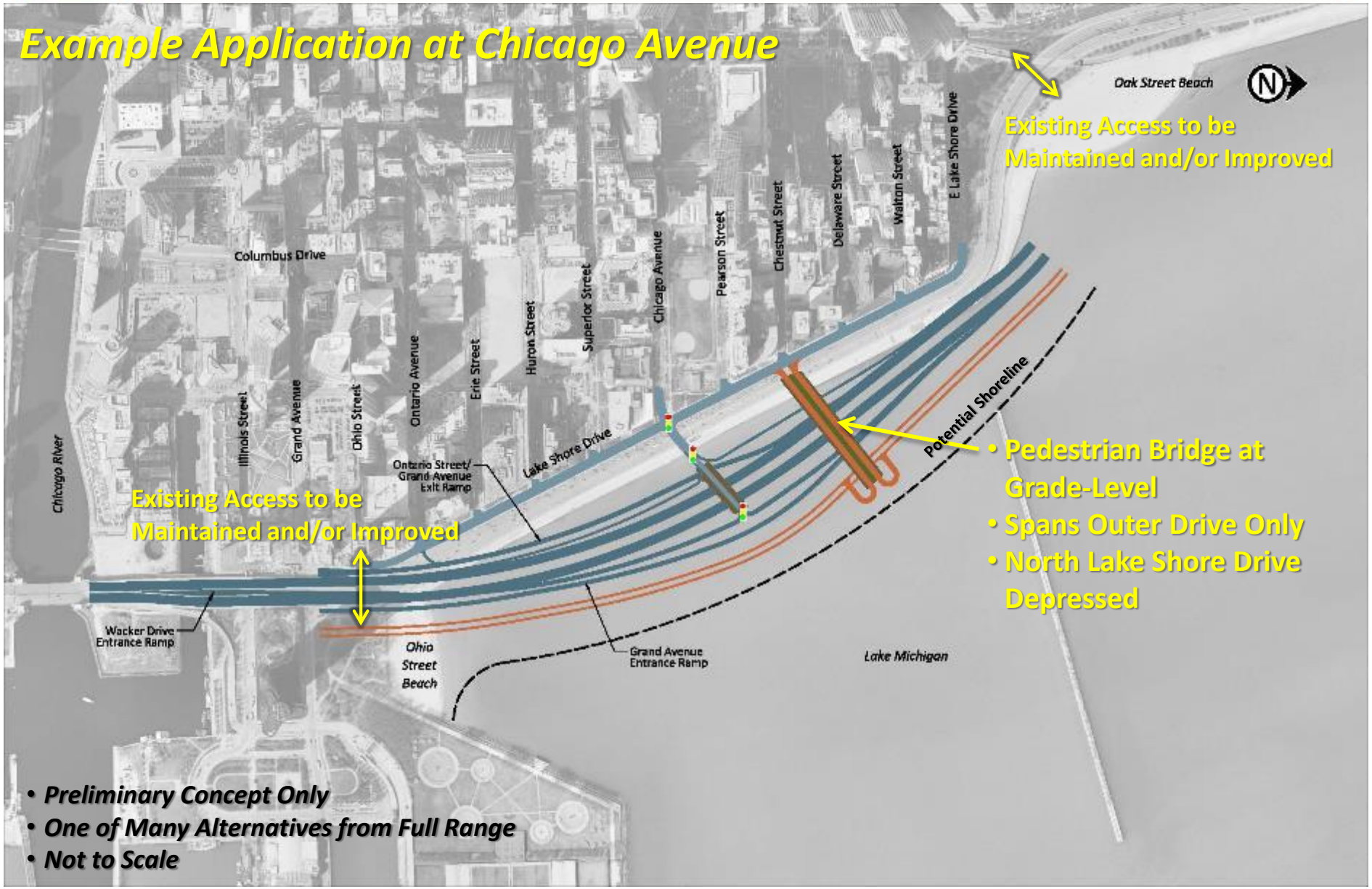
Transit – Left Side



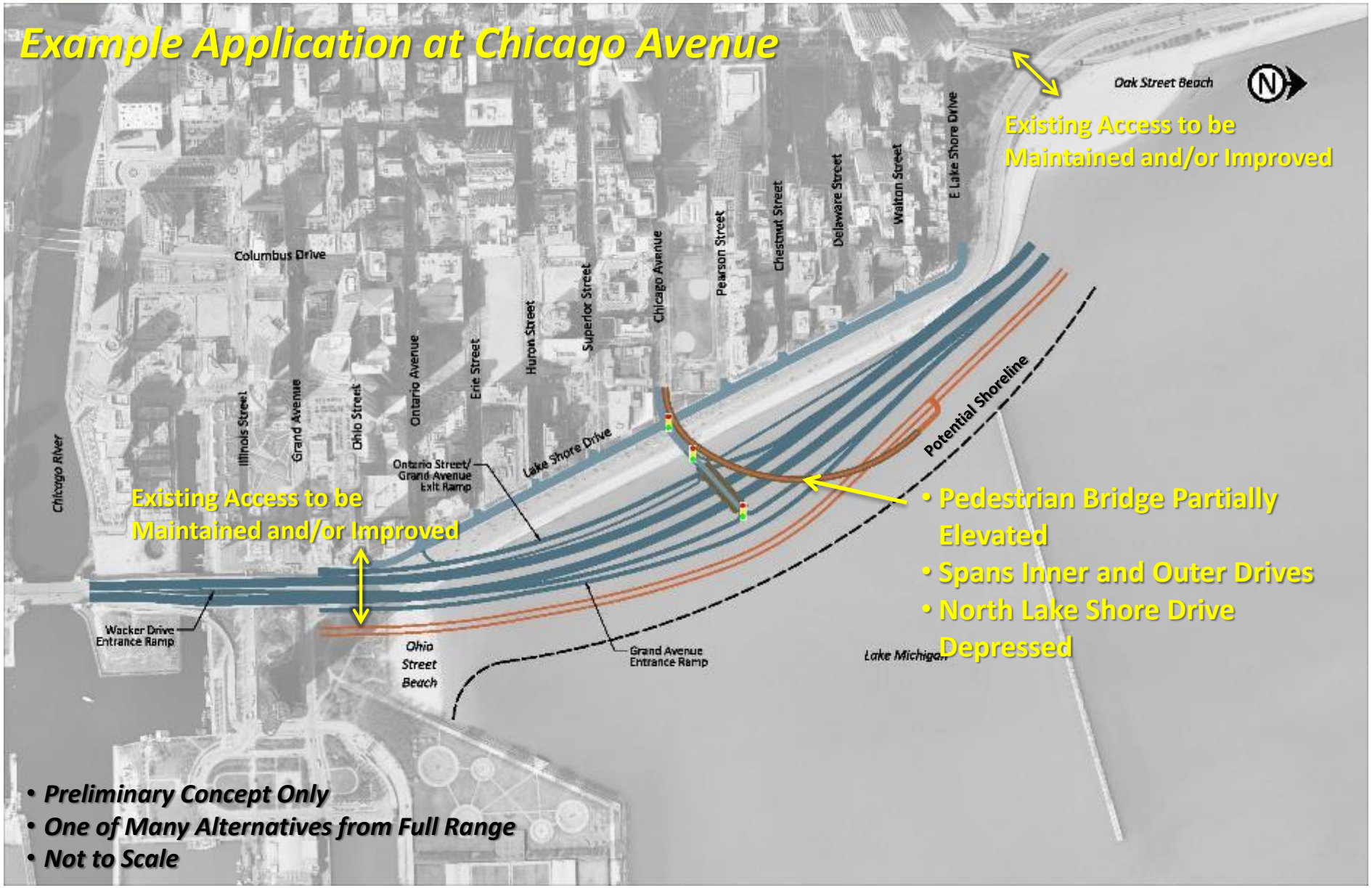
Non-Motorized Access – Conventional



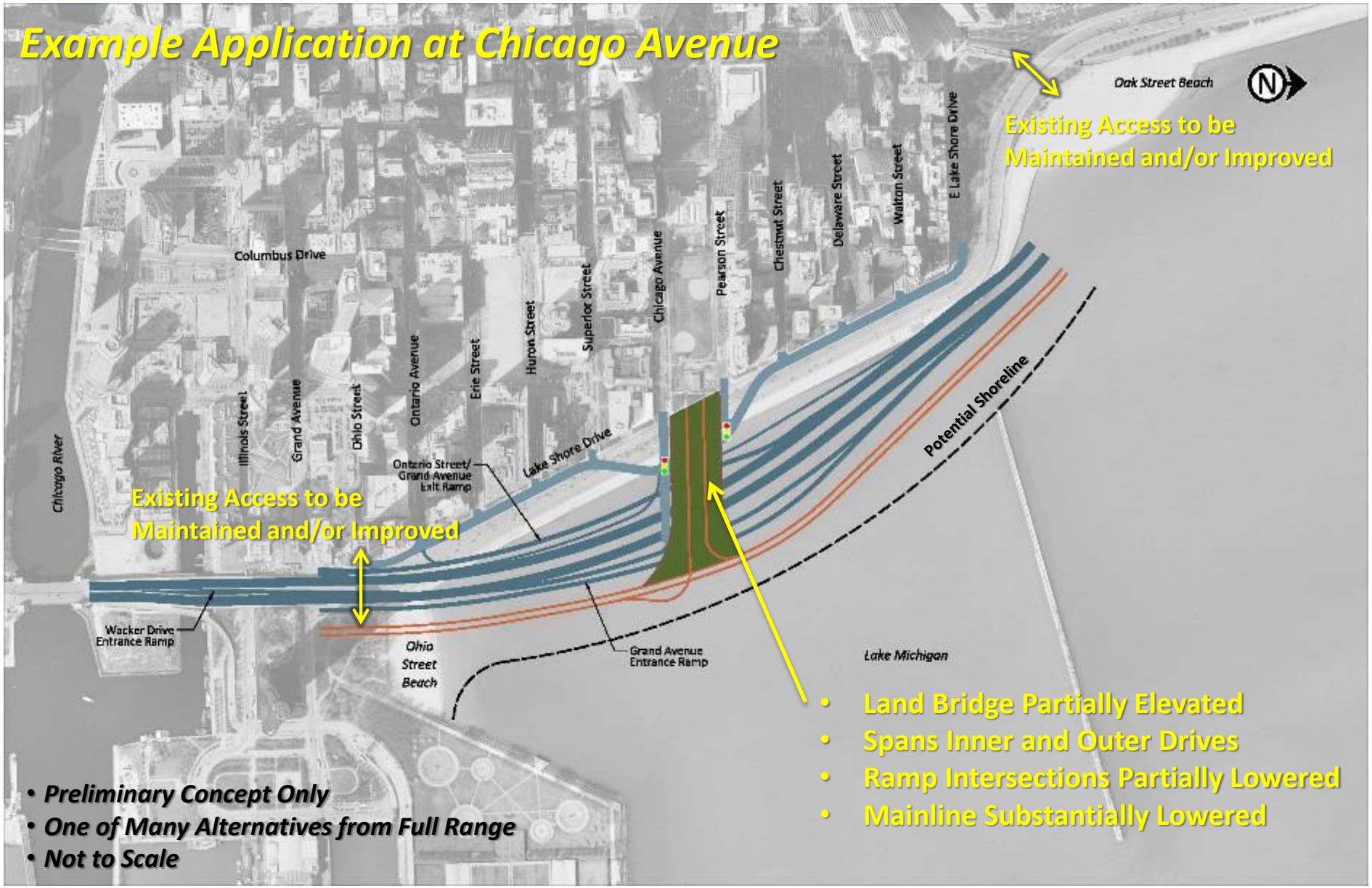
Non-Motorized Access: Pedestrian Bridge



Non-Motorized Access: Signature Pedestrian Bridge



Non-Motorized Access: Pedestrian Land Bridge



Environmental Resources at Chicago Avenue

Relatively Few Environmental Resources/Constraints

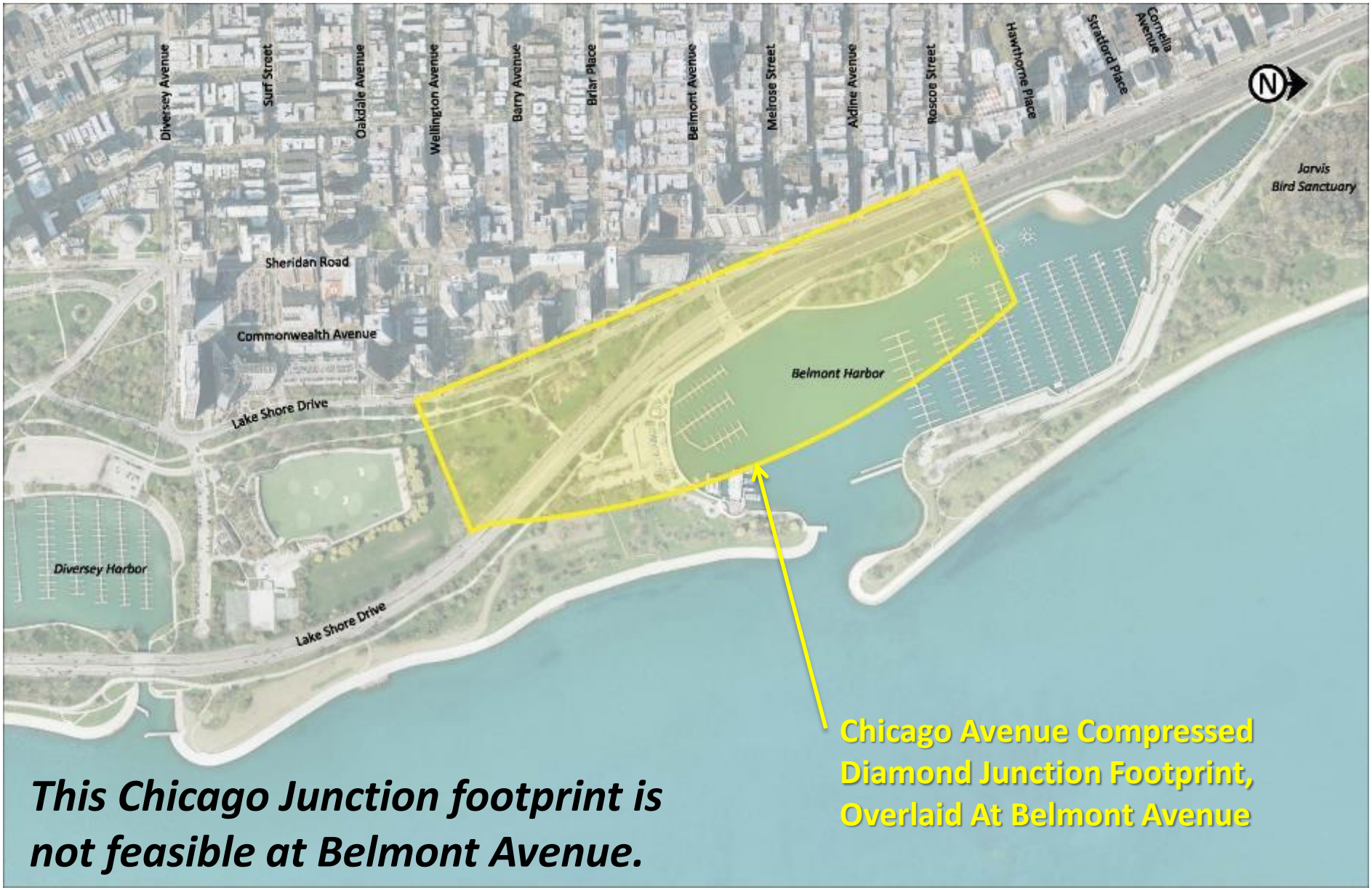
Historic Resources

Park Resources

Environmental Resources at Belmont Avenue

<u>Many</u> Environmental Resources/Constraints

Chicago Junction Footprint at Belmont Avenue



This Chicago Junction footprint is not feasible at Belmont Avenue.

Information Tables

- 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