Eisenhower expressway

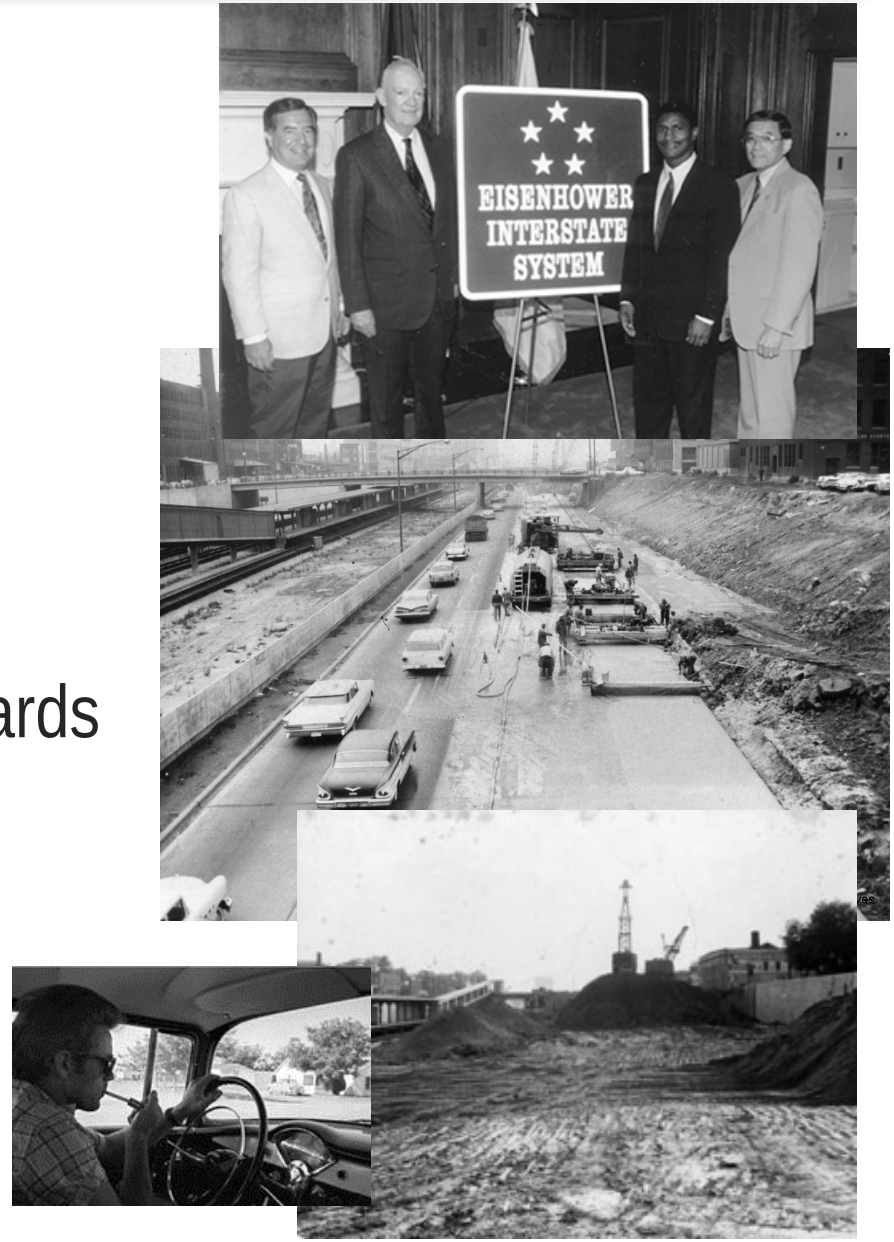
Illinois Department of Transportation

Harlem Avenue Interchange Design Discussion

August 24, 2015

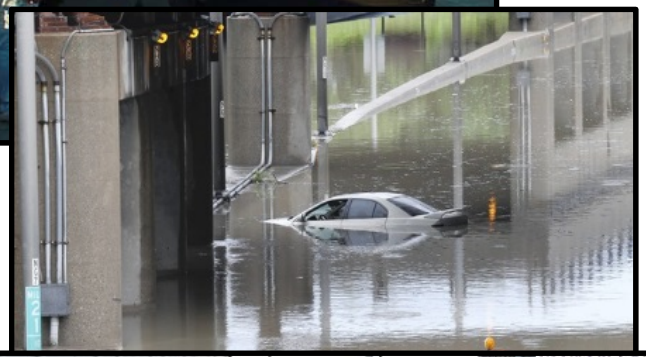
Expressway Construction Pre-dates Modern Design Standards

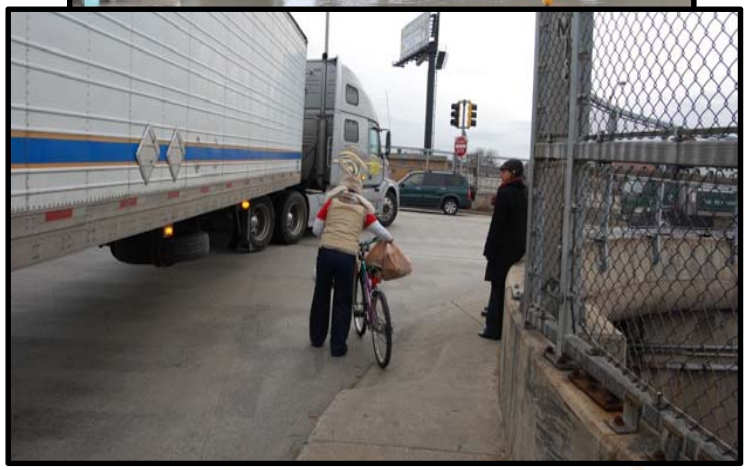
- Expressway designed and constructed in 1950's
- No past experience to base design standards on
- Little or no data – safety vs. design
- No noise or air quality standards at the time
- Existing ramps designed to minimize ROW footprint.



PROJECT NEEDS

- Safety
- Mobility
- Facility condition and design
- Create an asset for the communities





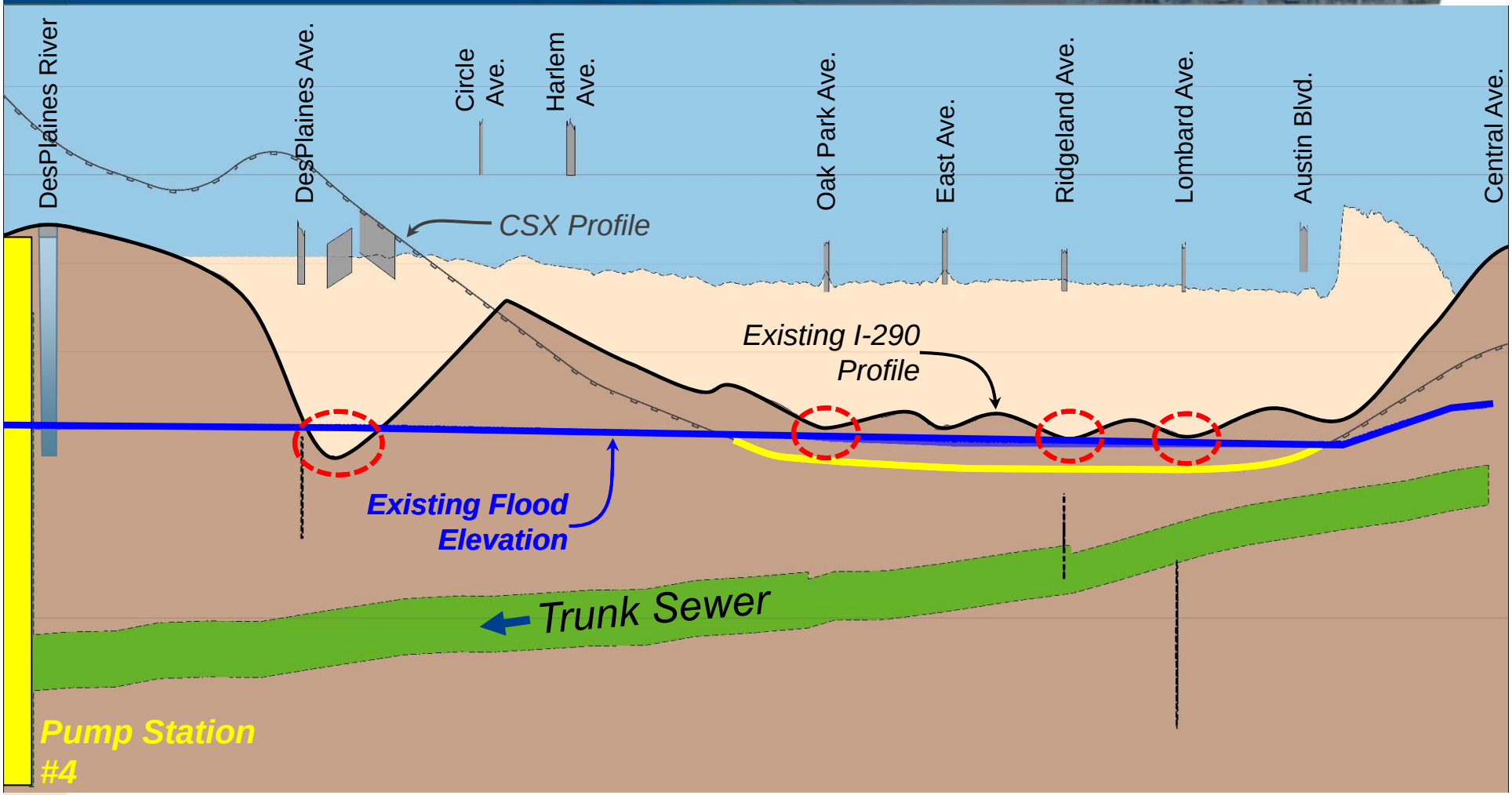
DENSE URBAN SETTING POSES MULTIPLE DESIGN CONSTRAINTS

- Constrained existing right-of-way
- CTA Blue Line
- CSX Railroad
- Vehicle & non-motorized crossings
- Drainage

EXISTING DRAINAGE SYSTEM IN OAK PARK

- I-290 trunk sewer begins at Central Avenue
- Drains west to Pump Station #4 @ DesPlaines River
- Drains I-290, CTA and CSX in this area

EXISTING DRAINAGE SYSTEM IS UNDERSIZED & RESULTS IN EXPRESSWAY AND RAIL FLOODING



- Existing system cannot adequately convey storm water during heavy storms
- Existing expressway system designed for 10-year storm
- I-290, CTA, and CSX are subject to frequent flooding

MULTIPLE FACTORS INFLUENCE HARLEM AVENUE DESIGN

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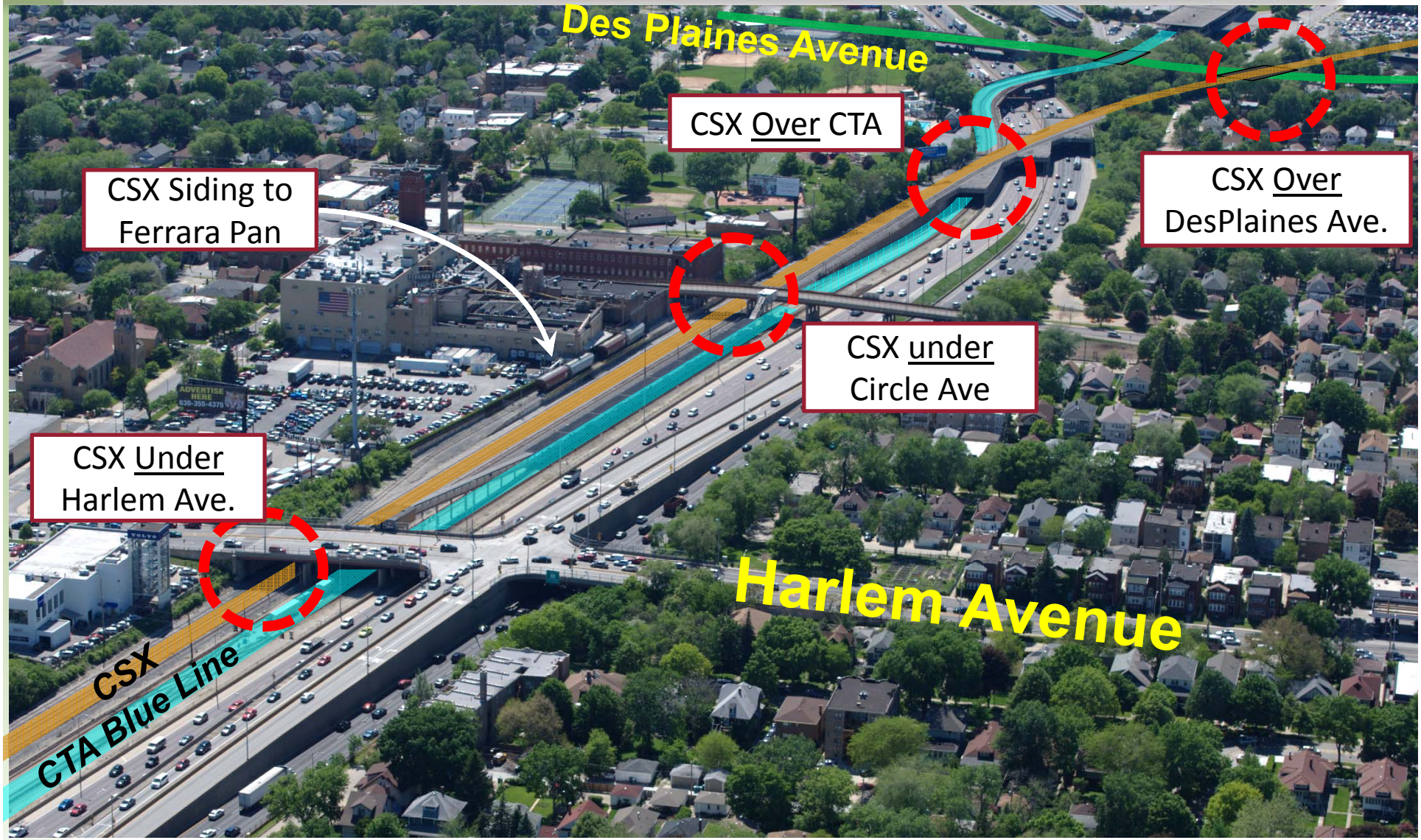

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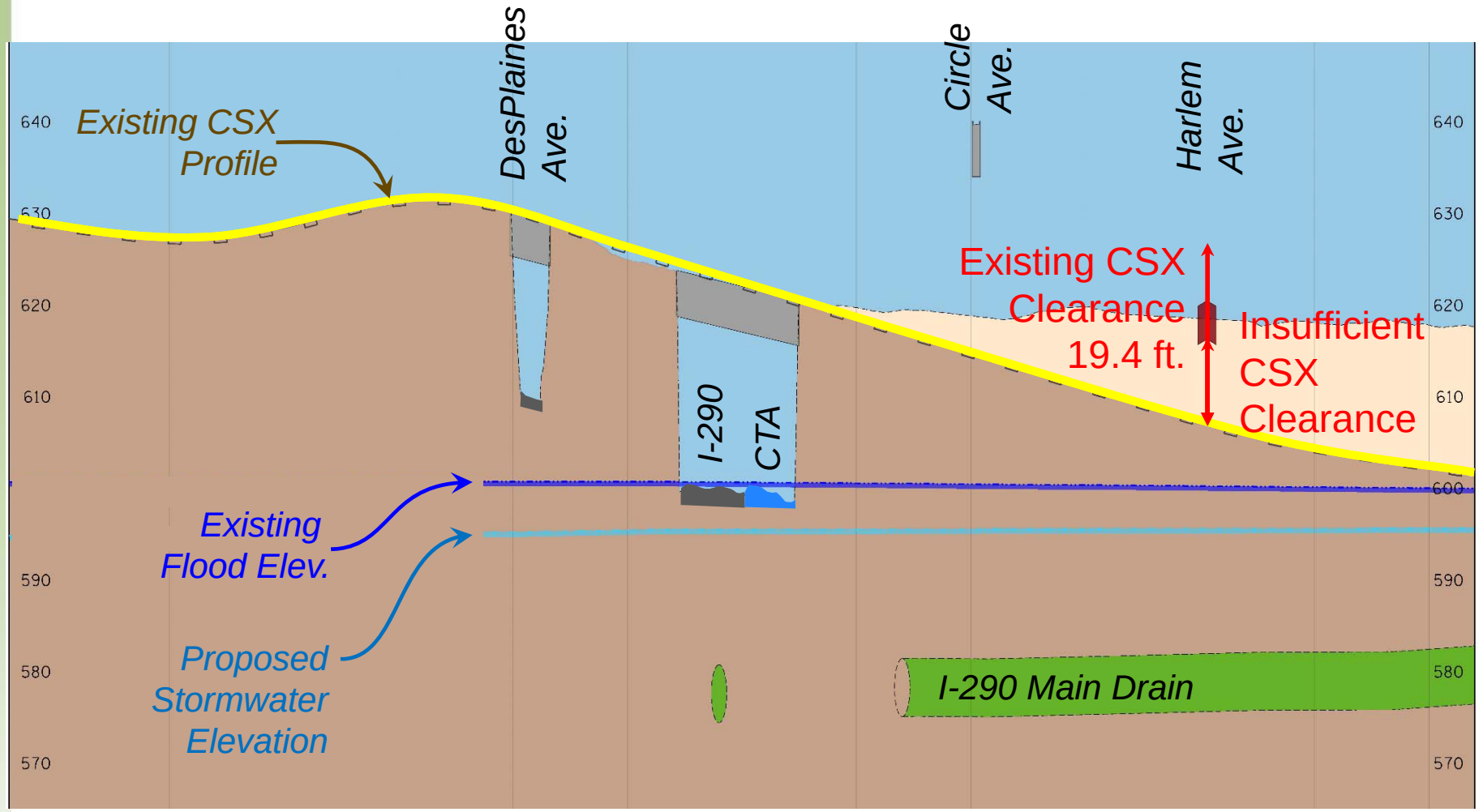
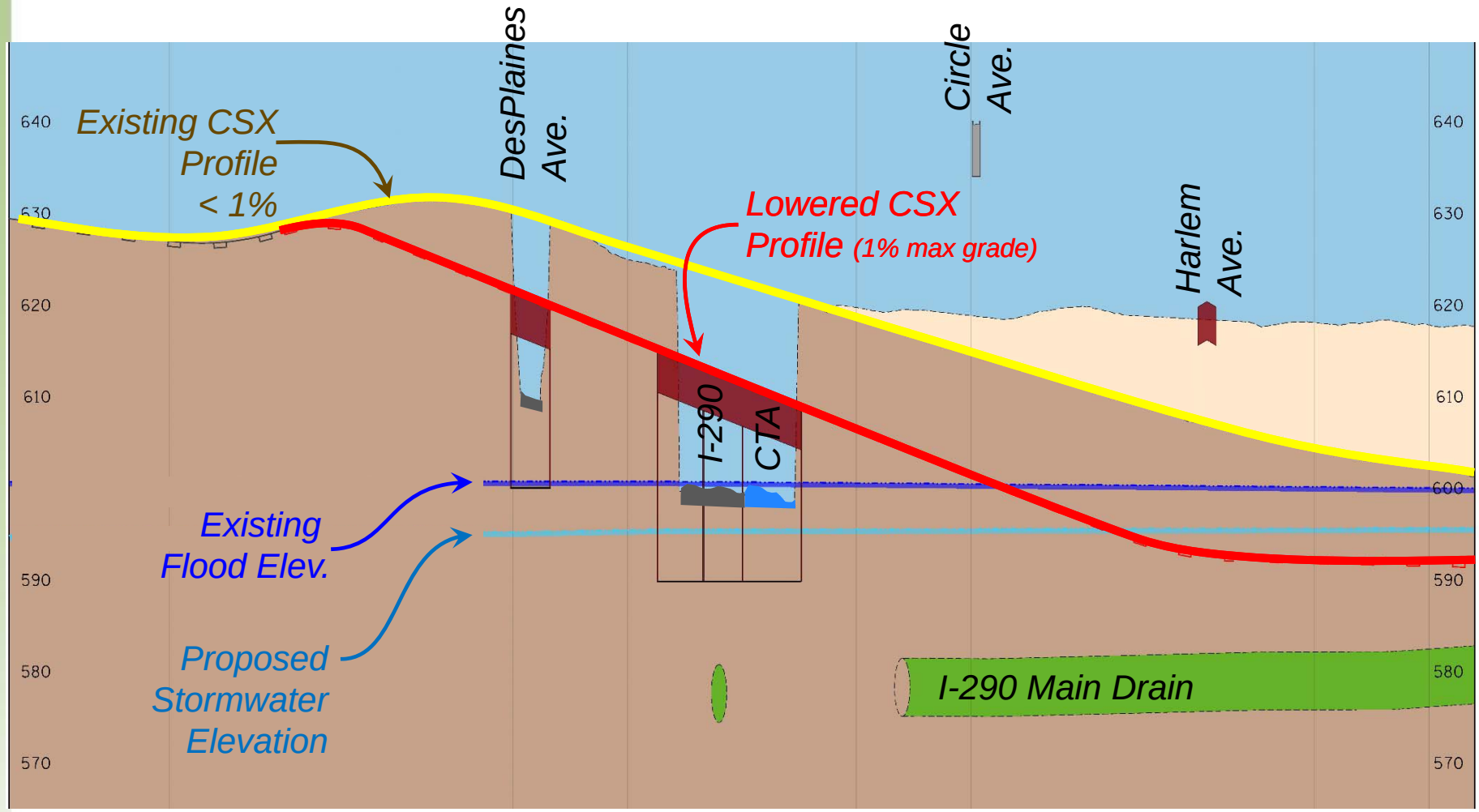
LOWERING OF CSX REQUIRES LOWERING OF CTA, I-290 & DESPLAINES AVE.



LOWERING OF CSX REQUIRES LOWERING OF CTA, I-290, & DESPLAINES AVENUE



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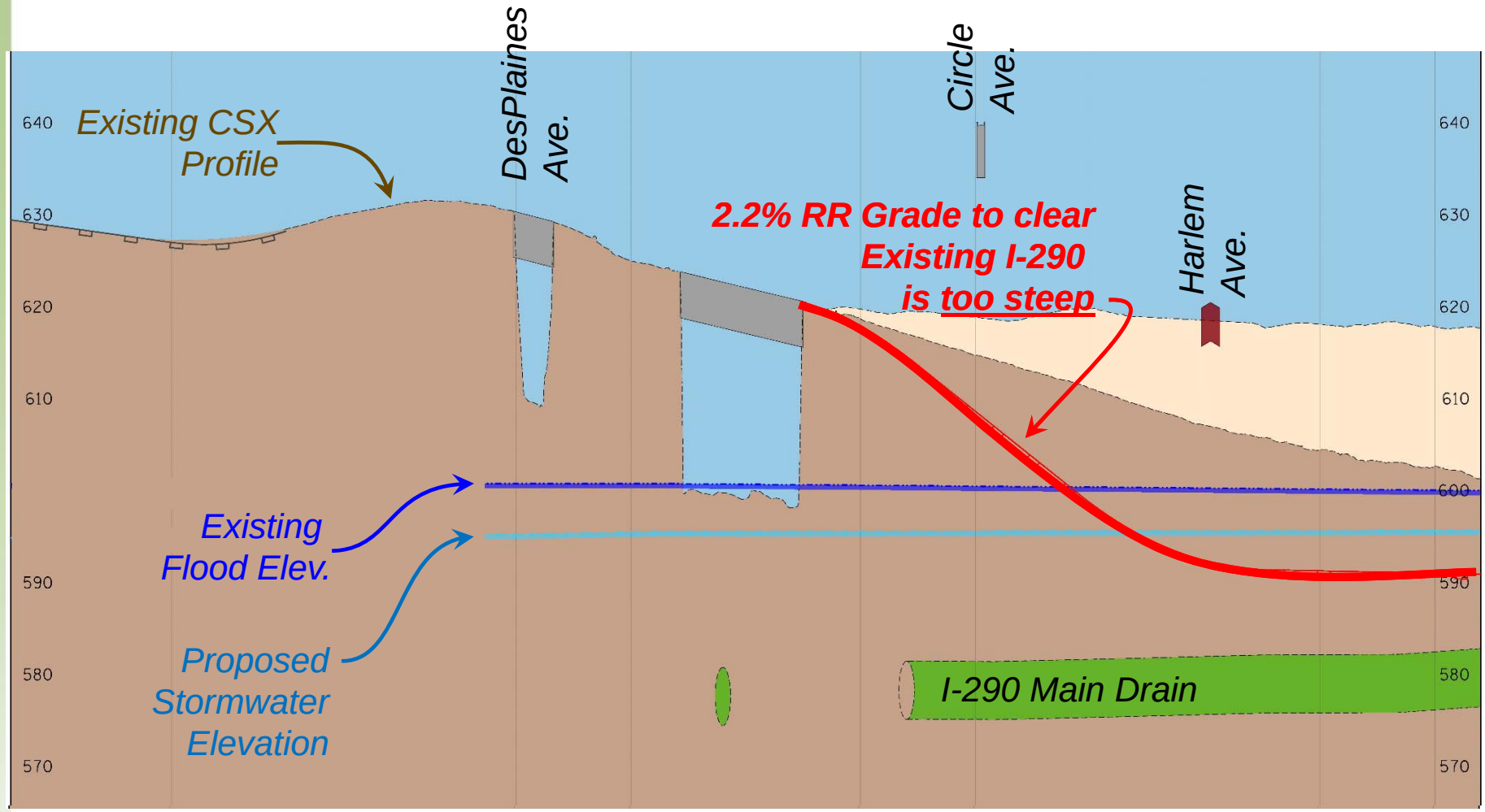
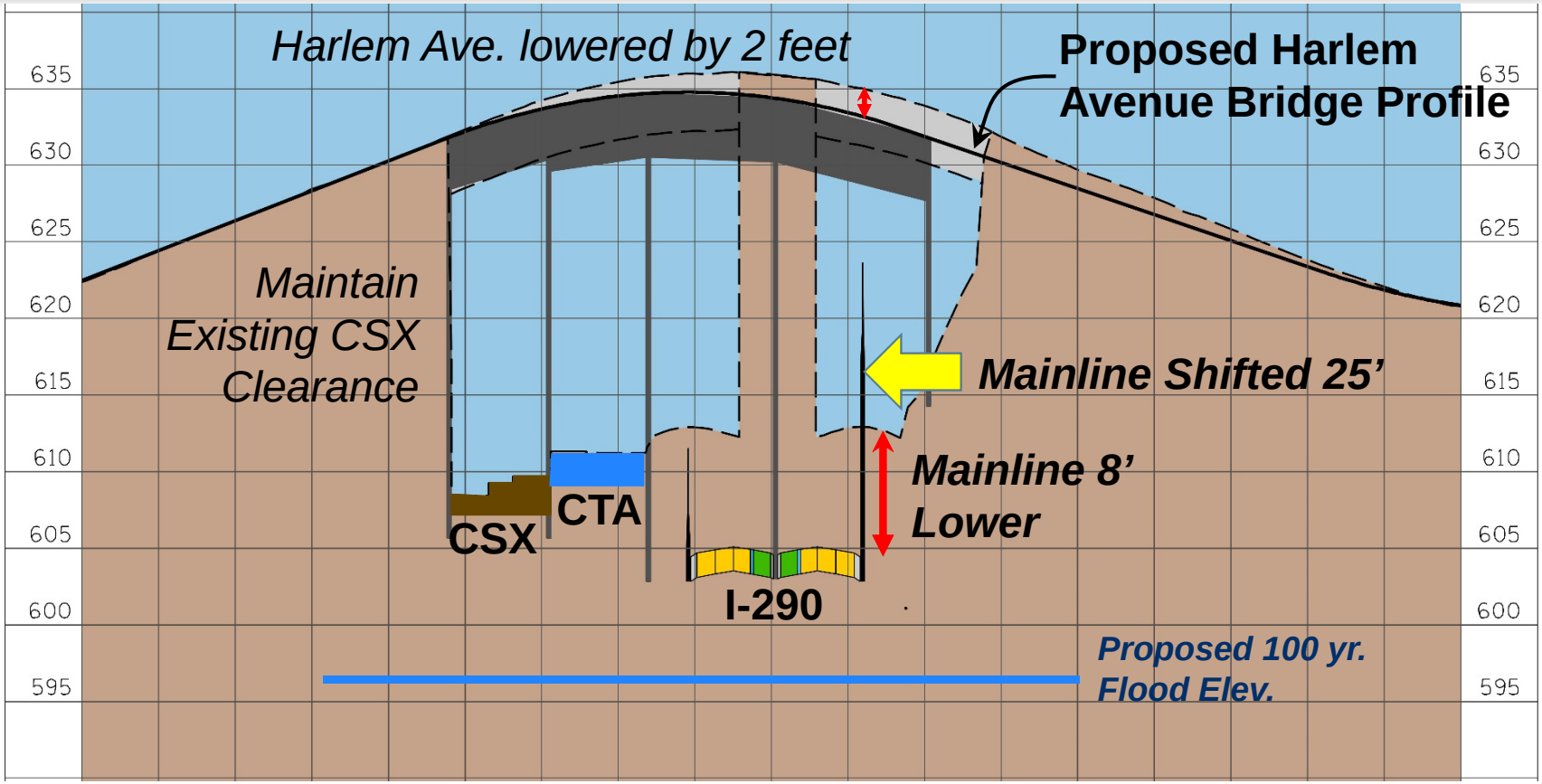


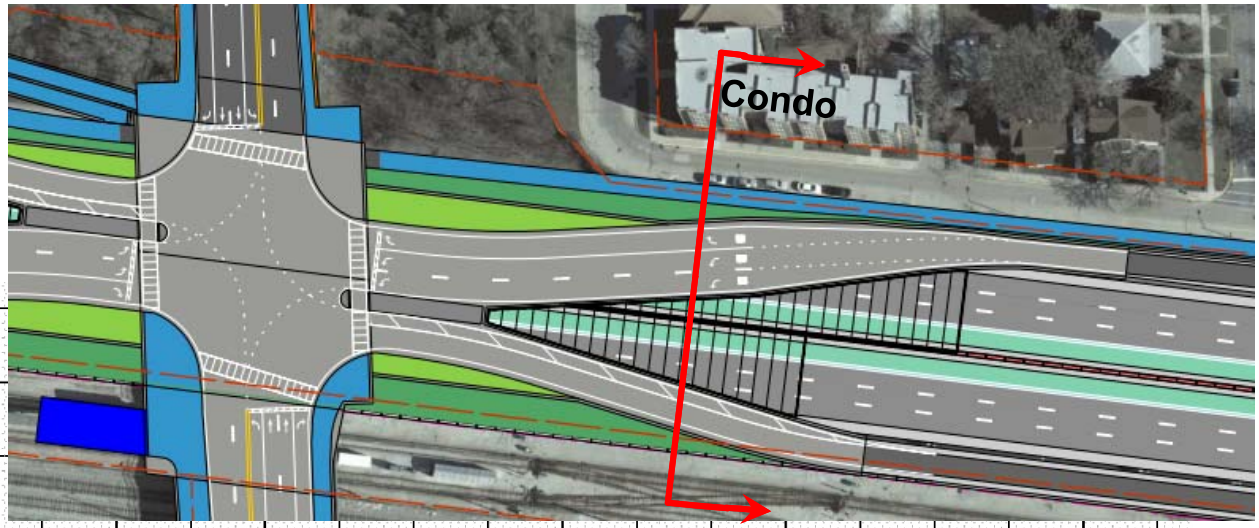
PROPOSED PROFILE LOWERS MAINLINE & MEETS DRAINAGE REQUIREMENTS

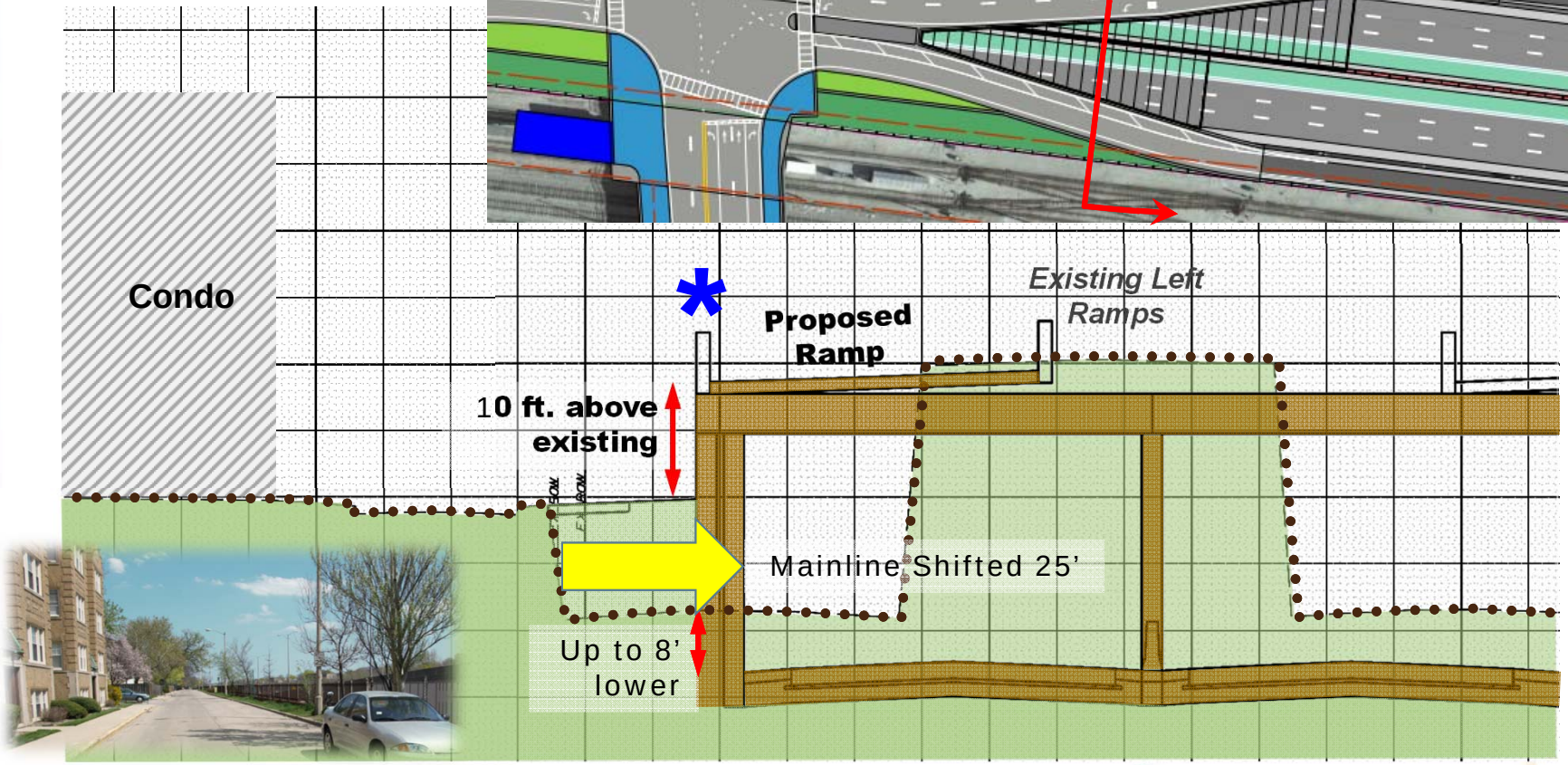


Profile Grid Scale
5' vertical
50' horizontal

- *Lowers mainline up to 9'*
- Lowers Harlem Avenue & ramp intersection by 2'
- No impacts to CSX or CTA profile/clearance
- Avoids cumulative construction impacts of lowering CSX
- Meets drainage requirements

PROPOSED RAMPS LOWER MAINLINE & SHIFT EXPRESSWAY AWAY FROM COMMUNITY





XS Grid Scale
5' vertical
10' horizontal

* *Noise walls to be determined*

Eisenhower expressway

Air Quality Effects

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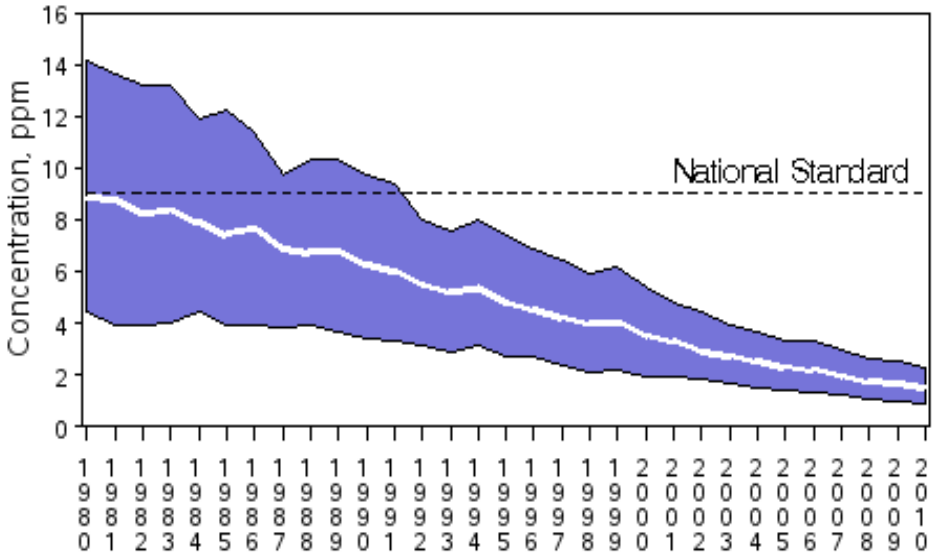
REGIONAL AIR QUALITY TRENDS

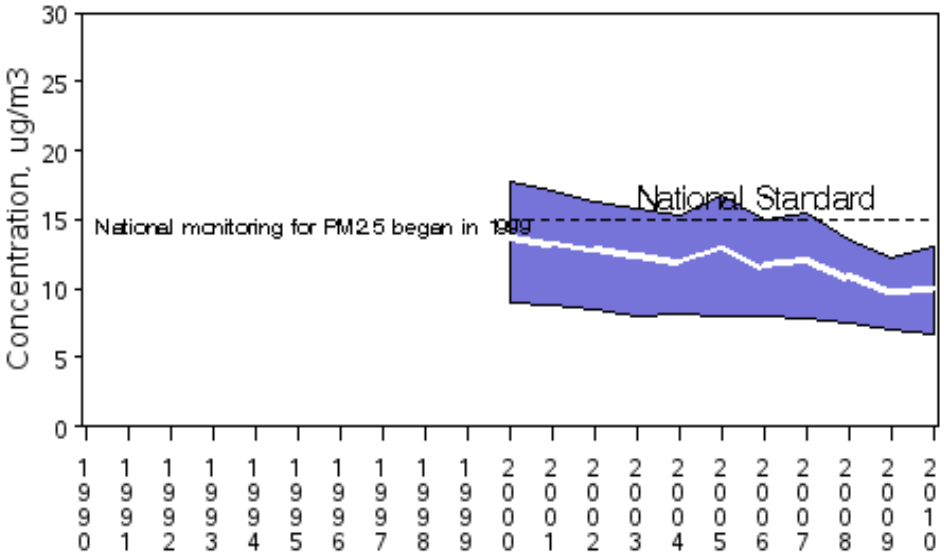
- USEPA National Ambient Air Quality Standards for 6 pollutants (carbon monoxide, nitrogen dioxide, ozone, particulate matter, sulfur dioxide & lead)
- Significant progress in reducing mobile source emissions (cleaner vehicles, cleaner fuels, inspection & maintenance)

CO Air Quality, 1980 - 2010
(Based on Annual 2nd Maximum 8-hour Average)
National Trend based on 104 Sites



1980 to 2010 : 82% decrease in National Average

PM2.5 Air Quality, 2000 - 2010
(Based on Seasonally-Weighted Annual Average)
National Trend based on 646 Sites



2000 to 2010 : 27% decrease in National Average

NE ILLINOIS TRANSPORTATION AIR QUALITY IN CONFORMANCE

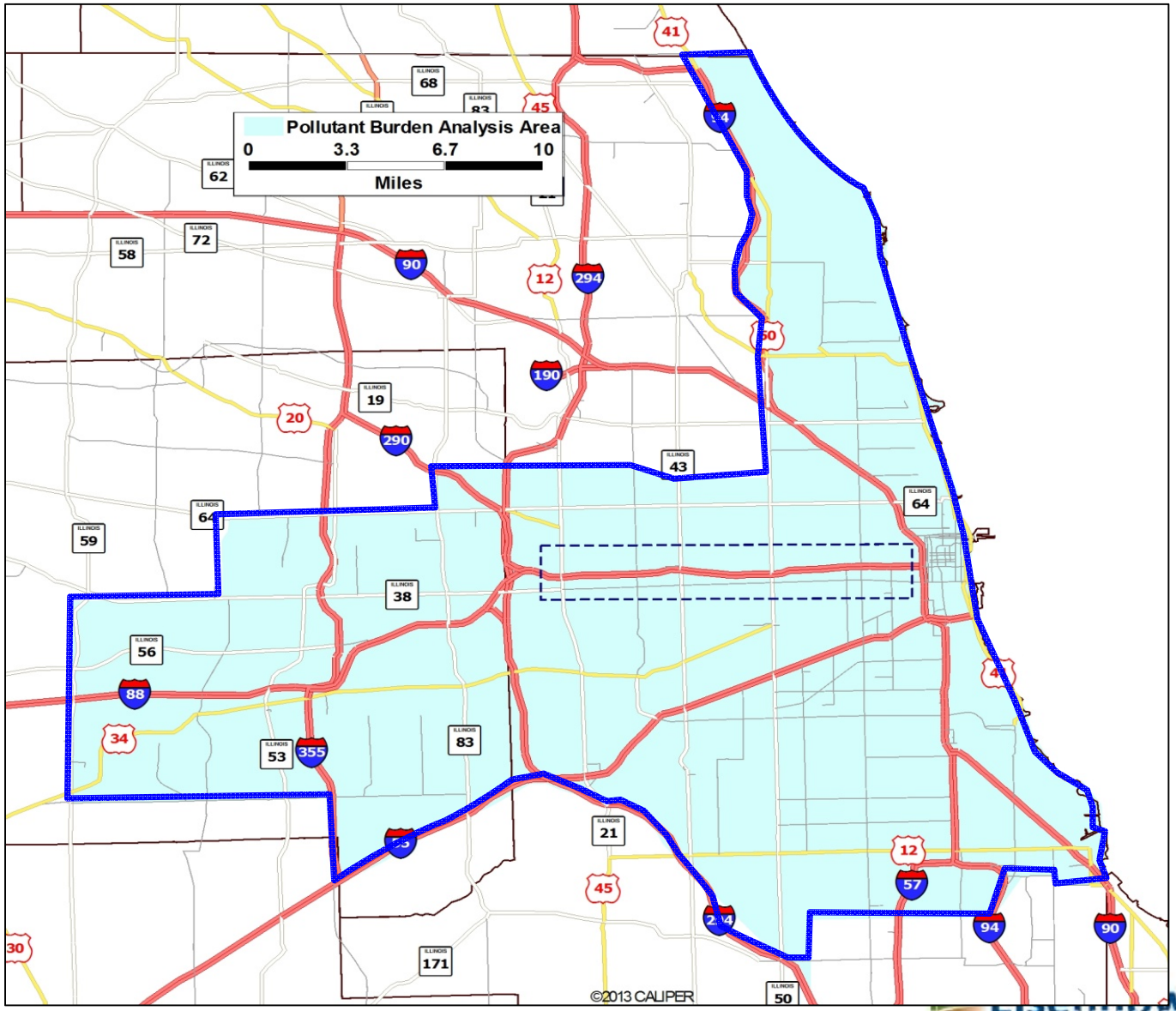
- Cook County is a:
  - Non-attainment area for ozone
  - Maintenance area for small particulate matter
- CMAP Long Range Plan & Program
  - Region-wide transportation air quality conformity analysis
  - Region in conformance
  - I-290 Expressway improvements included

PROJECT LEVEL AIR QUALITY SENSITIVITY TESTING

- NEPA/FHWA Requirement: PM2.5 for Preferred Alternative
- Threshold: 10,000 increase in truck ADT
  - I-290 alternatives mostly below threshold
  - Further coordination needed
- "Corridor" analysis, rather than location specific

Sensitivity analysis undertaken as initial step – stakeholder comments

AREA-WIDE AIR QUALITY SENSITIVITY ANALYSIS



AREA-WIDE AIR QUALITY SENSITIVITY ANALYSIS

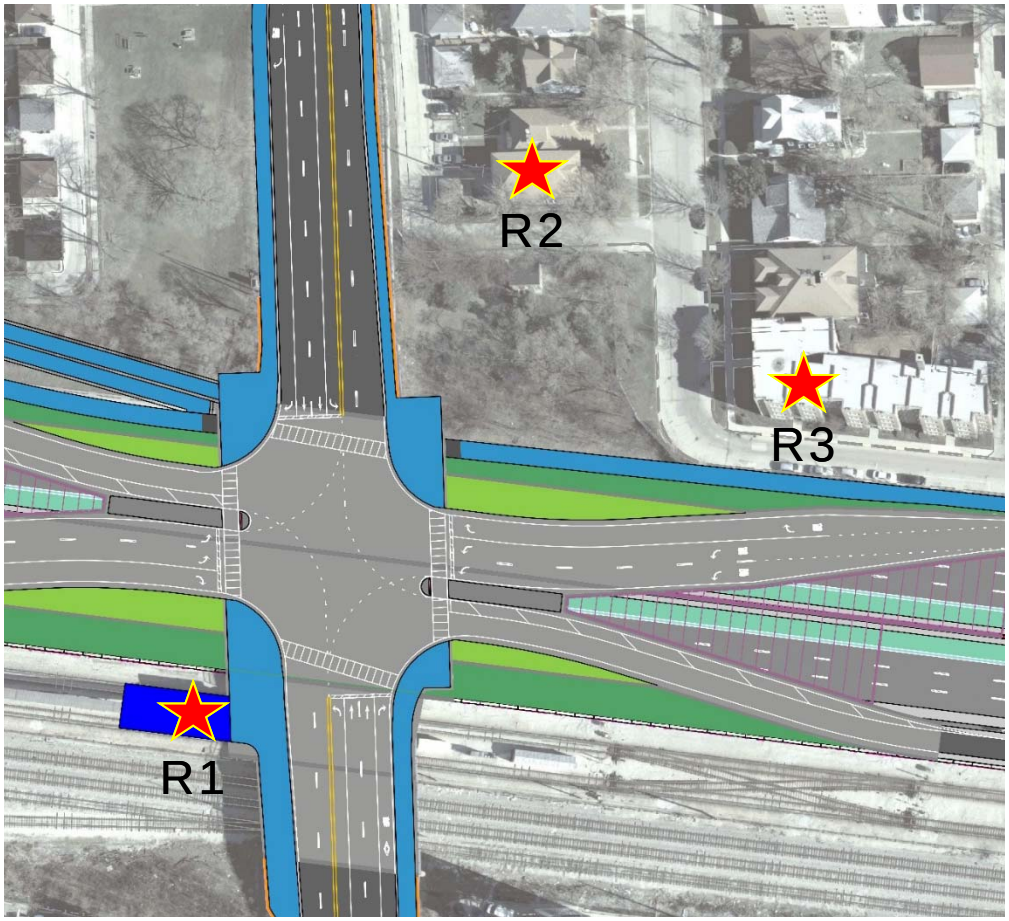
- Pollutant emissions based on traffic volumes, speed, vehicle miles traveled, vehicle mix, meteorological conditions, etc.
- Area-wide pollutant emissions for CO, NO_2, Hydrocarbons, PM_{10} & $PM_{2.5}$
- Change in emissions for all pollutants less than 1% for all alternatives
- *Conclusion:*
  - No significant change from No-Build
  - No significant change between alternatives

CARBON MONOXIDE INTERSECTION SENSITIVITY ANALYSIS

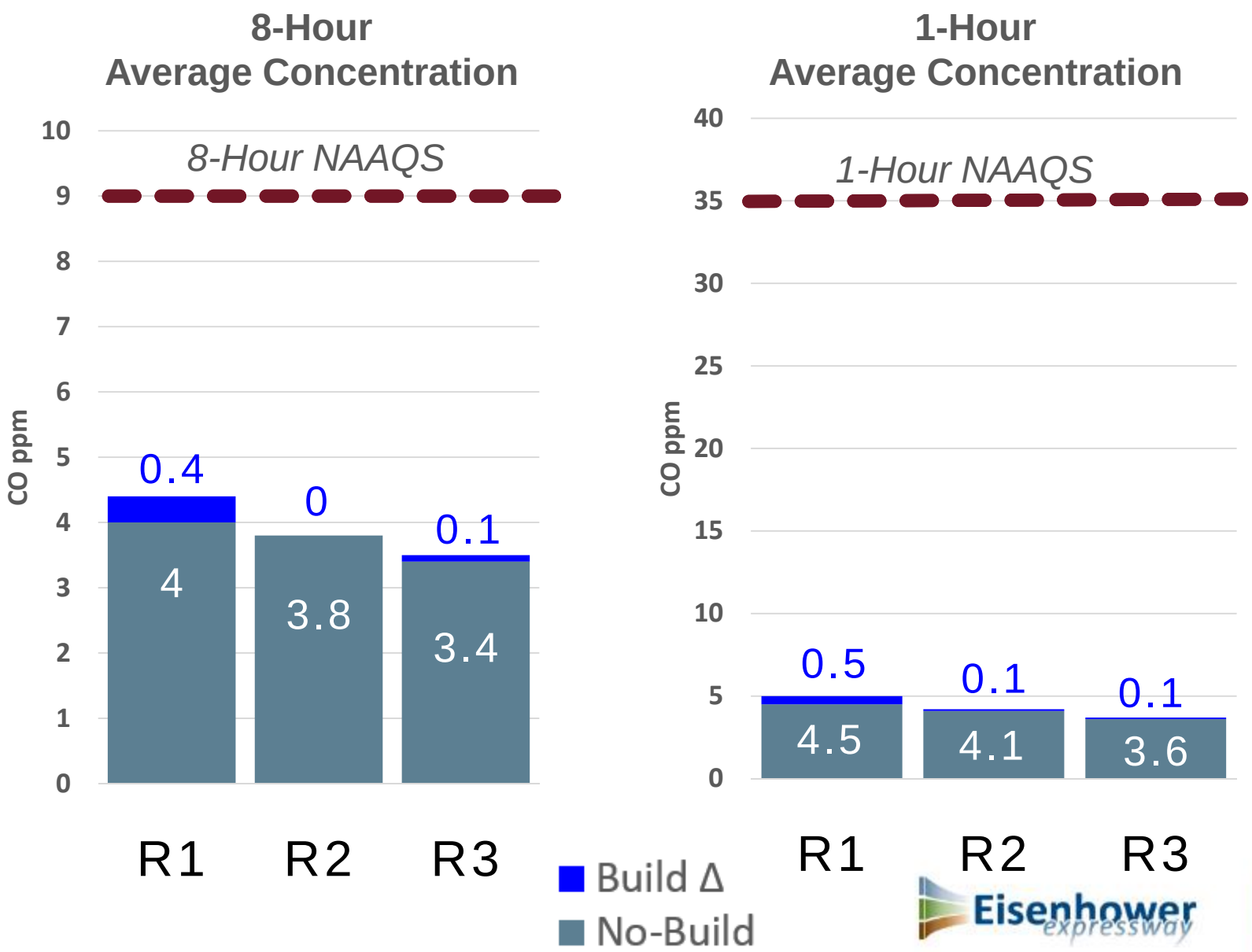
- Criteria:
  - 62,500 ADT highest design ***1-way*** volume
  - Harlem Ave ***2-way*** ADT 28,900 - 39,000
- Used as sensitivity analysis
- CO concentration measured in parts per million (ppm)
  - 70 ppm – some health concern
  - 150 - 200 ppm – serious heath concern
- Greatest exposure – ***inside a car***
- Pass/Fail standard for transportation projects:
  - Established to protect vulnerable populations (children, elderly, etc.)
  - 9 ppm - 8 hour average
  - 35 ppm - 1 hour average

HARLEM AVENUE INTERSECTION CO ANALYSIS

- CO Factors
  - Background CO
    - 3 ppm assumed
    - 2 ppm measured in field
  - Traffic volume
  - Proximity/location of receptors
  - Closest receptor locations:
    - R1 – CTA station entrance
    - R2 – Single family home
    - R3 – Condo building



HARLEM AVENUE INTERSECTION CO SENSITIVITY ANALYSIS



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Noise Effects

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TRAFFIC NOISE

- Traffic noise is predicted by FHWA Traffic Noise Model, validated with field measurements
- Receptors and Noise-Sensitive Land Uses

NOISE ABATEMENT CRITERIA (NAC)

- Category A: Serene lands - rarely applies. (Tomb of the Unknown Solider)
- Category B: Residential
- Category C: Hospitals, schools, places of worship, parks
- Category D*: Hospitals, libraries, places of worship, institutions, schools
- Category E: Hotels, offices, restaurants
- Category F: Agricultural, industrial, retail, utilities
- Category G: Undeveloped lands

*Interior noise, to be studied only after exterior is studied, or if noise abatement is not feasible and reasonable

INTERIOR vs EXTERIOR NOISE

- IDOT and FHWA stipulate that outdoor areas of frequent human use be given primary consideration
- Interior noise for private residences not studied, as that analysis focuses on noise levels interfering with outdoor conversations

"Only consider the interior levels at these land uses after fully completing an analysis of any outdoor activity areas or determining that exterior abatement measures are not feasible or reasonable."

-- FHWA's *Highway Traffic Noise: Analysis and Abatement Guidance*

Common Noise Levels

72 dB(A)
NAC
*Category **E***

67 dB(A)
NAC
*Category **B** & **C***

dB(A)	Examples
90	Food blender @ 3 feet, freight train at 100 feet
80	
70	
60	Dishwasher in next room, large business office
50	
40	Library. 45dB(A) – quiet urban nighttime
30	
20	
10	
3	Threshold of human hearing

Oak Park - Existing vs. No-Build Noise Levels

Studied I-290 Noise Receptors*	Receptors with Existing Levels Higher than NAC	Receptors with 2040 No Build Levels Higher than NAC
48	35	36

** Representative receptors representing nearly 2,000 individual receptors within Oak Park through the project area*

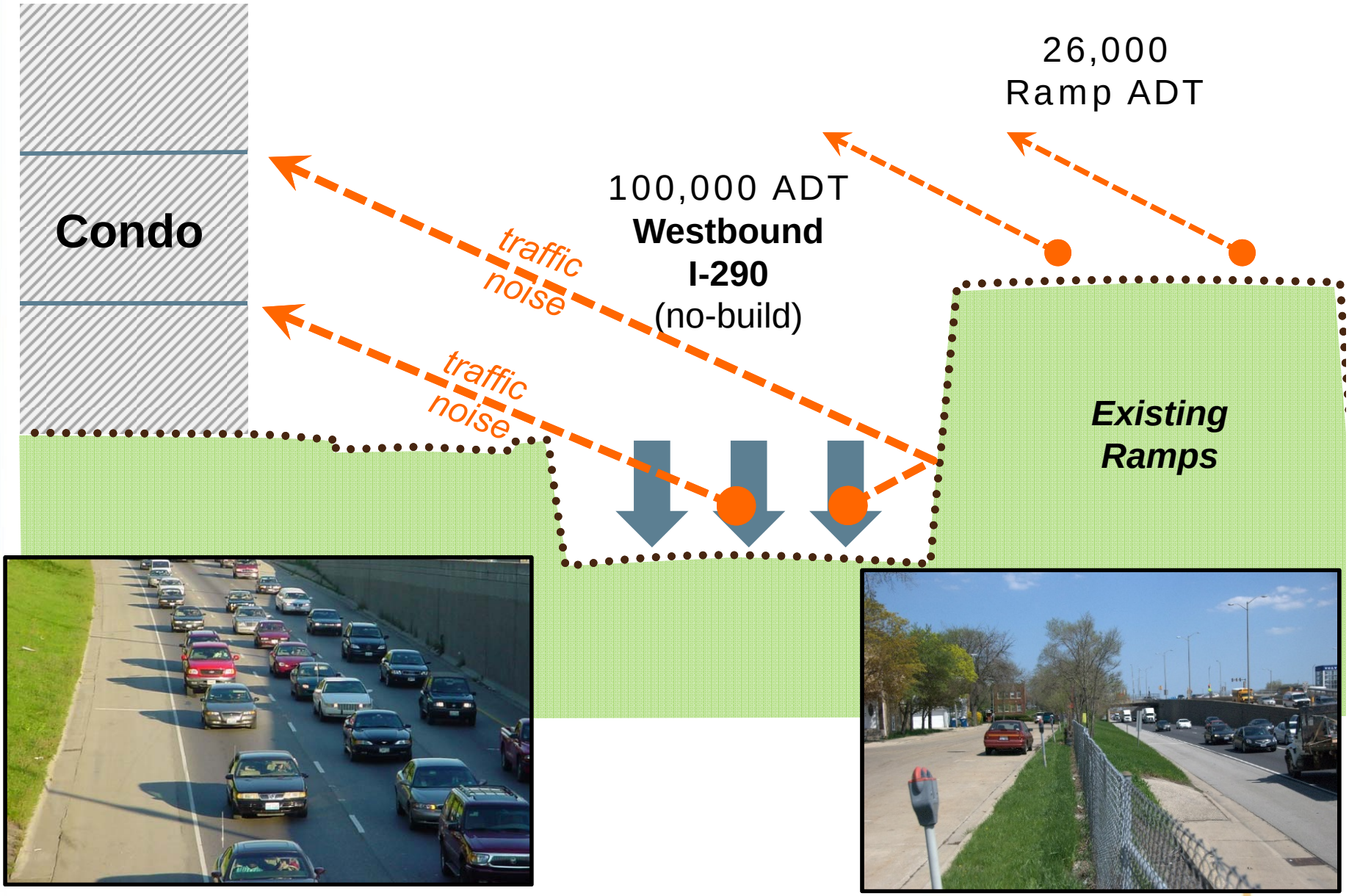
- 75% of receptors above NAC for Existing or Future No Build (without project)
- Noise abatement appears constructible through Oak Park
- *October: Recommended wall locations and heights*

What Can Affect Traffic Noise Levels?

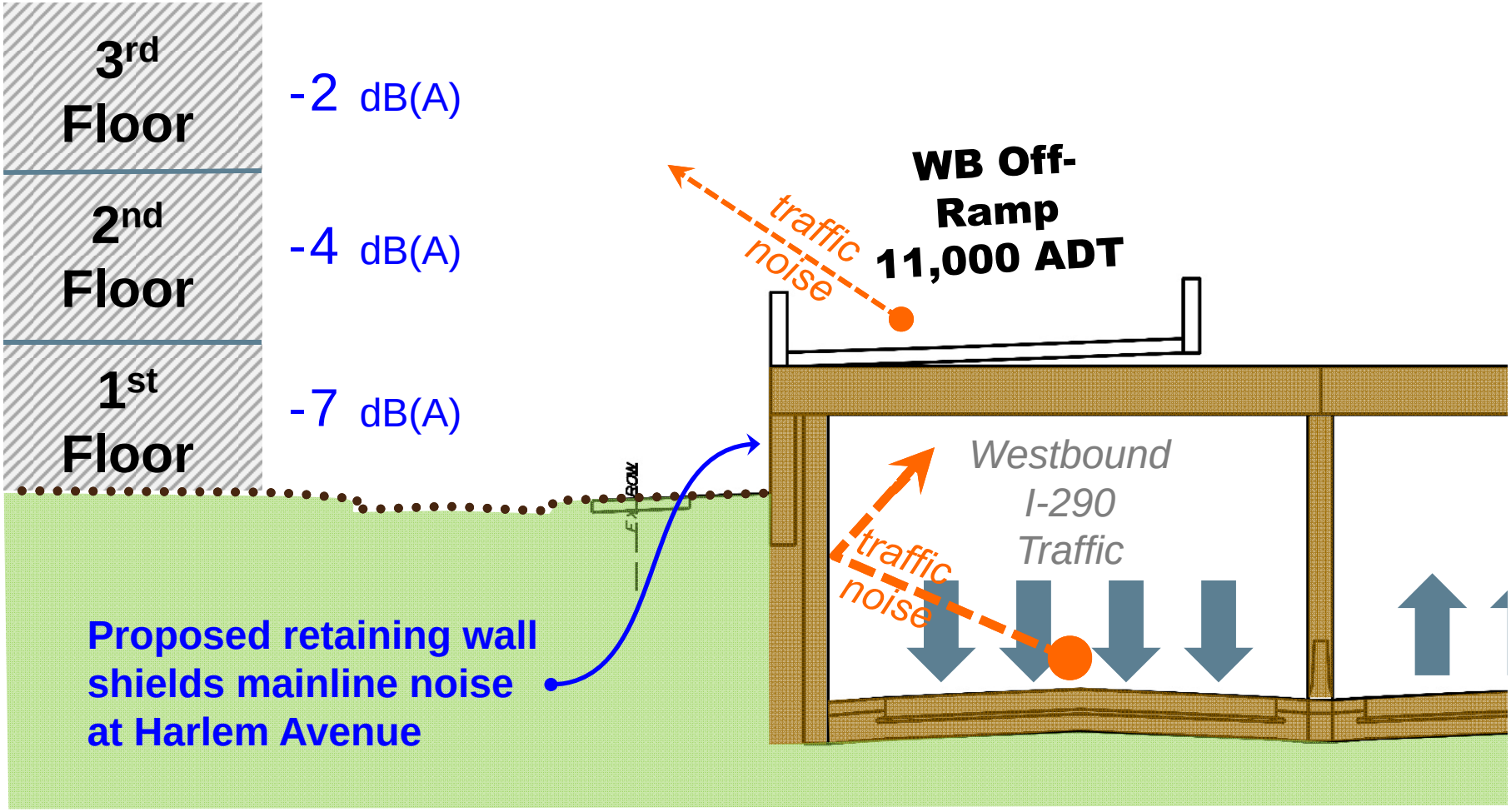
- Amount of traffic
  - Doubling of traffic is 3 dB(A) increase (barely perceptible)
- Traffic composition
- Distance from roadway to receptor
  - Doubling distance is 4.5 dB(A) reduction
- Land cover type between roadway & receptor

  (vegetation or pavement)
- Vehicle speed & traffic control
- Topography & elevation between roadway & receptor

Existing Ramps at Harlem Avenue



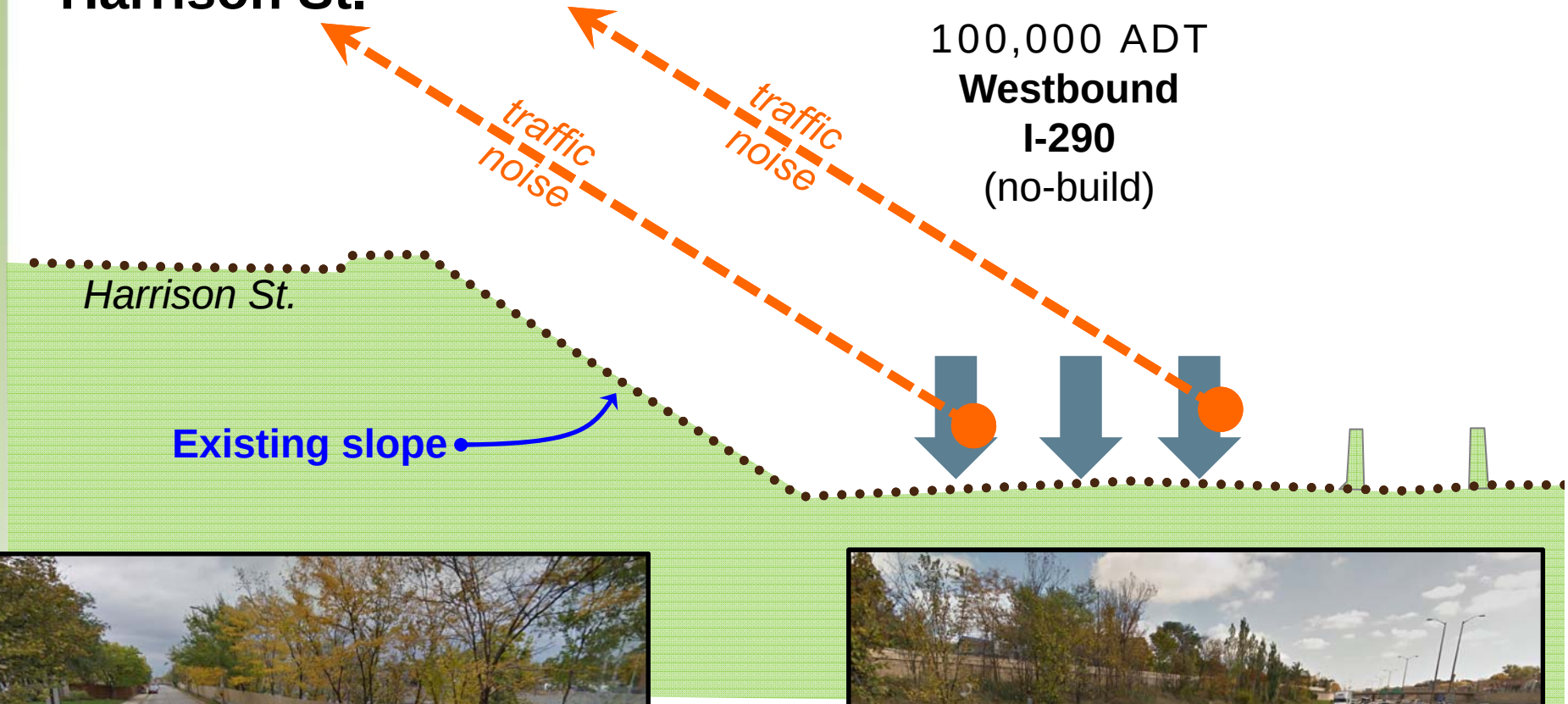
Proposed Ramps at Harlem Avenue



- 11,000 ramp ADT (Build) vs, 100,000 WB mainline ADT
- Analysis is *without* noise walls

Existing Mainline Near Proposed WB Ramp Terminal

Kenilworth Ave. & Harrison St.

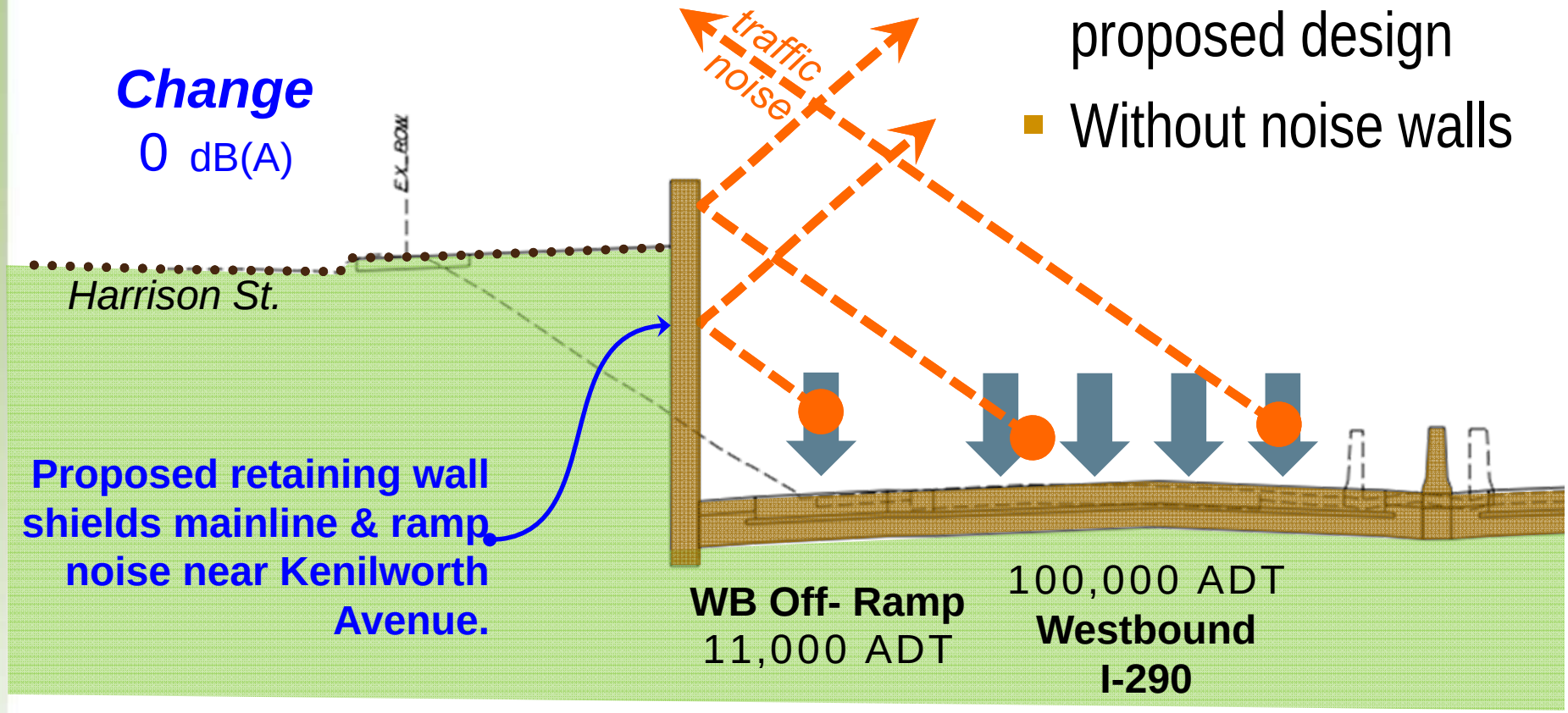


Proposed Harlem Avenue WB Ramp Terminal

Kenilworth Ave. & Harrison St.

Change
0 dB(A)

- No net change in noise level due to proposed design
- Without noise walls



Harlem Ave. Ramp Geometry Noise Sensitivity Analysis

Key findings:

- Mainline is the predominant noise source
- Ramp location does not significantly affect overall noise levels

VISUALIZATIONS

- 3D Model
- Before & After Photo Simulations

PROPOSED DESIGN FEATURES

- Expressway lowered by 8 ft. & shifted by 25 ft.
- Proposed design features
  - Ramps split – high volume ramp shifted further south
  - Traffic volume tradeoff
    - 11,000 ramp ADT *instead of* 100,000 WB I-290 ADT
- Design offers built-in noise reductions – up to 7dba
- Ramp design does not influence air quality
- Improved bike & pedestrian environment

NEXT STEPS

- Follow up presentations/discussions as requested
- Aesthetics development
- Austin Boulevard presentation - September