

BrDR/BrM USER GROUP MEETINGS



Brad Noll, PE
Office of Structural Engineering



Department of
Transportation

State of Ohio

(Fun Facts)



17th State – Statehood in 1803



34th Largest U.S. state by area

(Ranked between Pennsylvania and Virginia)

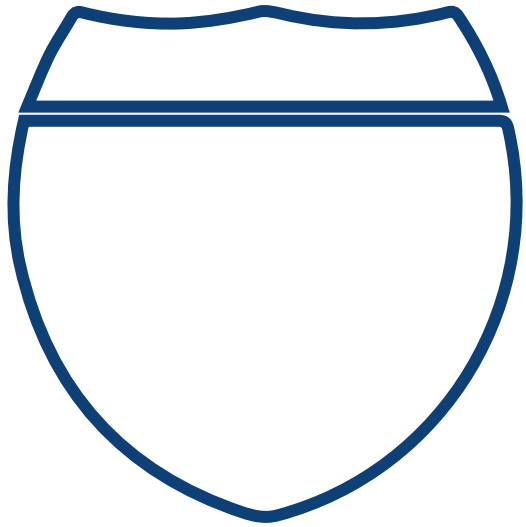


7th Most Populous U.S. state

(Ranked between Illinois and Georgia)



5TH



3RD

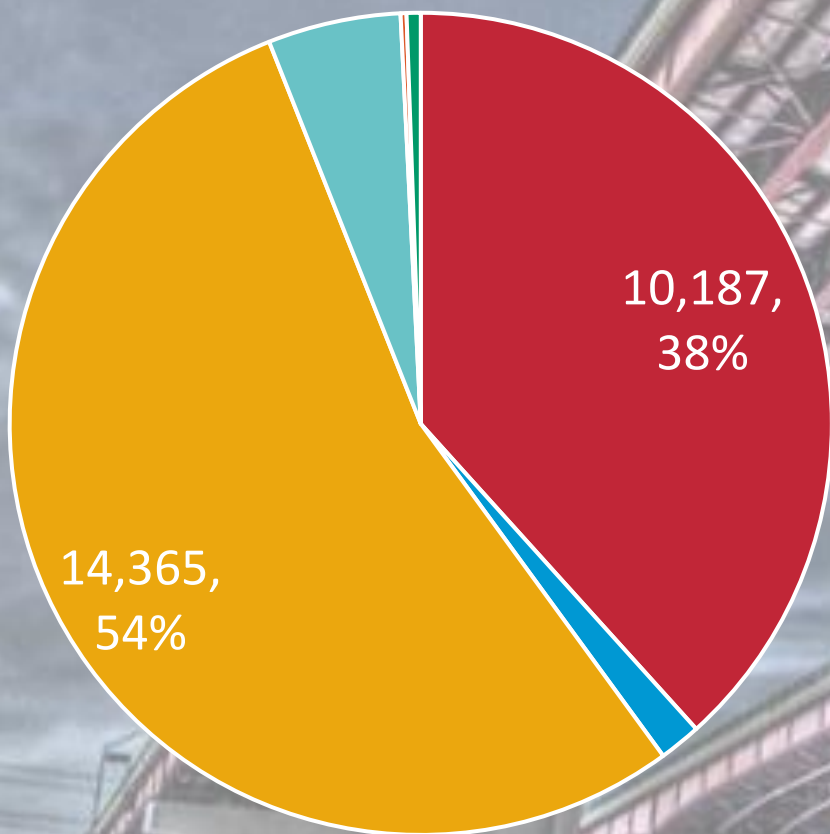
6TH



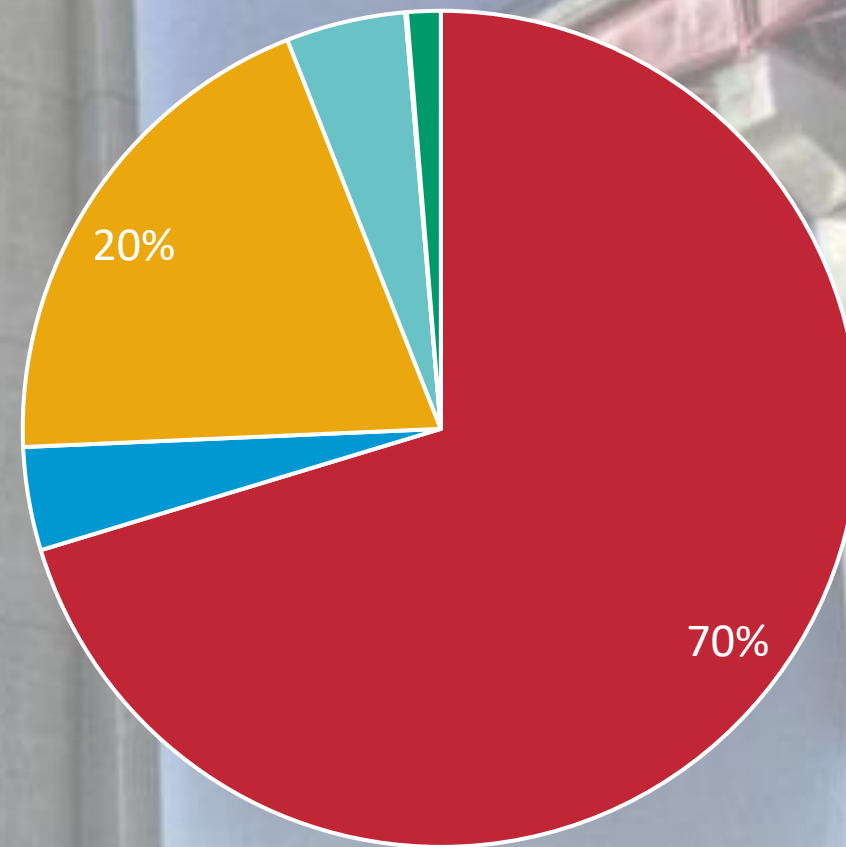
7TH

Ohio Bridges

NBI Bridge Count = 26,629



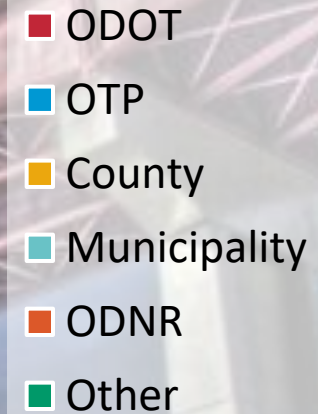
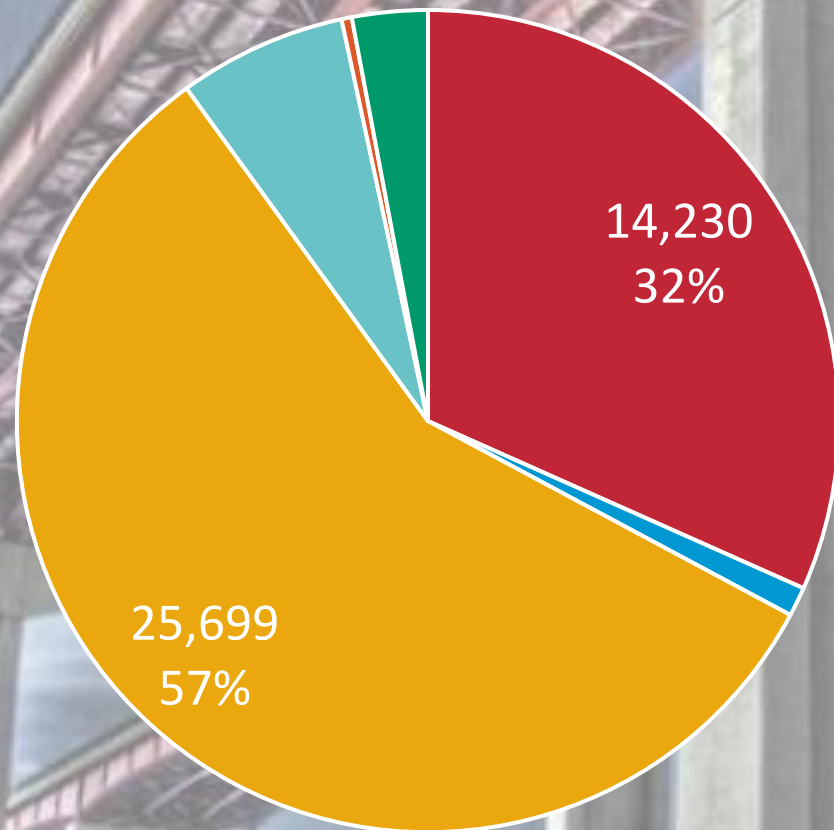
NBI Deck Area



Ohio Bridges

Ohio Bridge Count = 44,936

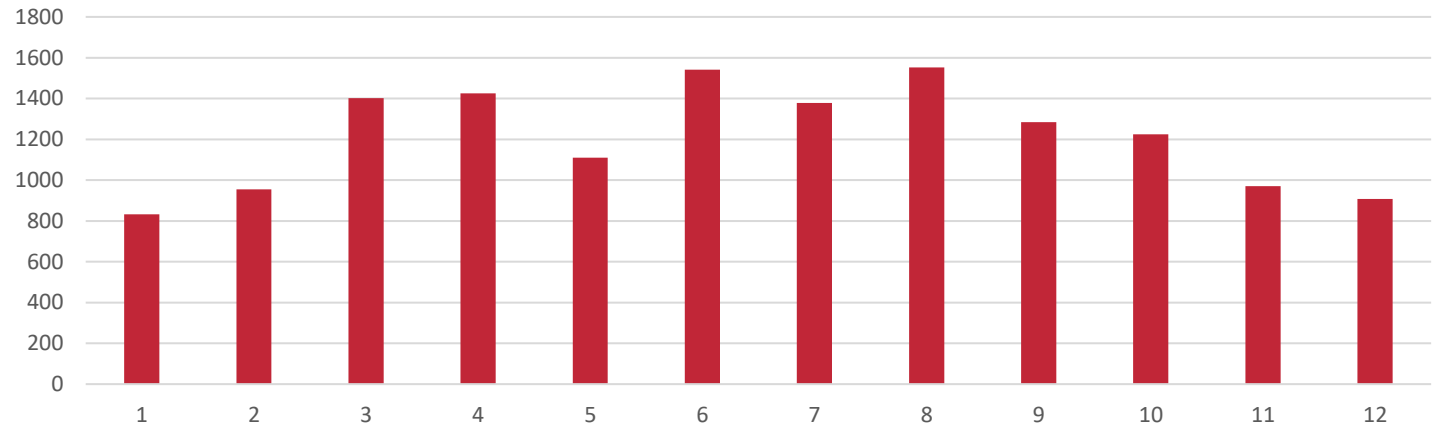
Includes Bridge Lengths: 10' – 20'



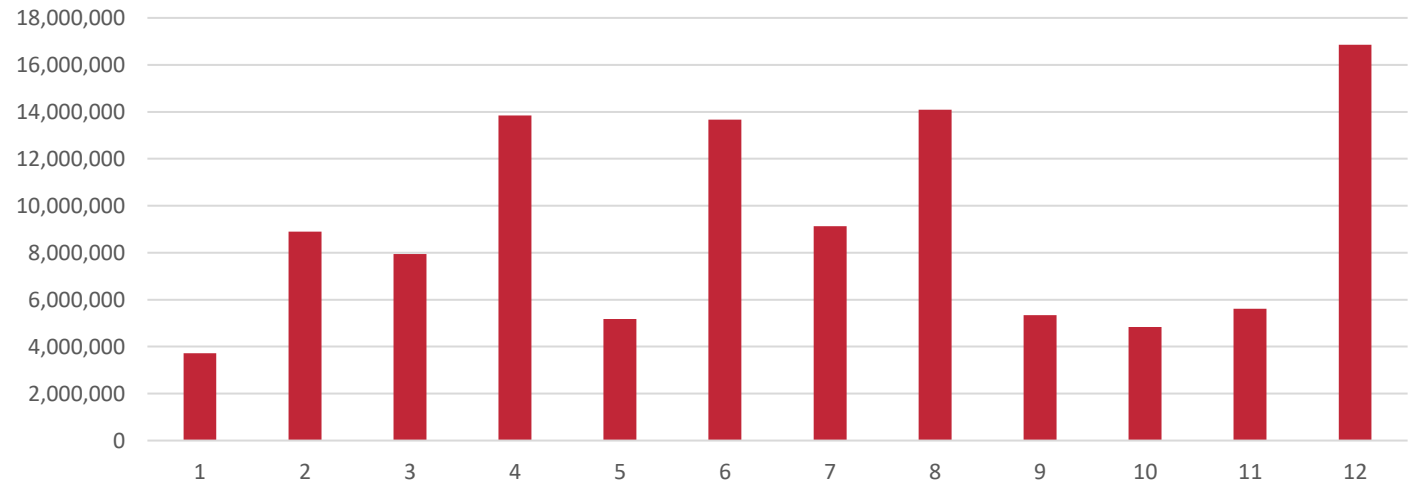
ODOT DISTRICTS



Total Bridges



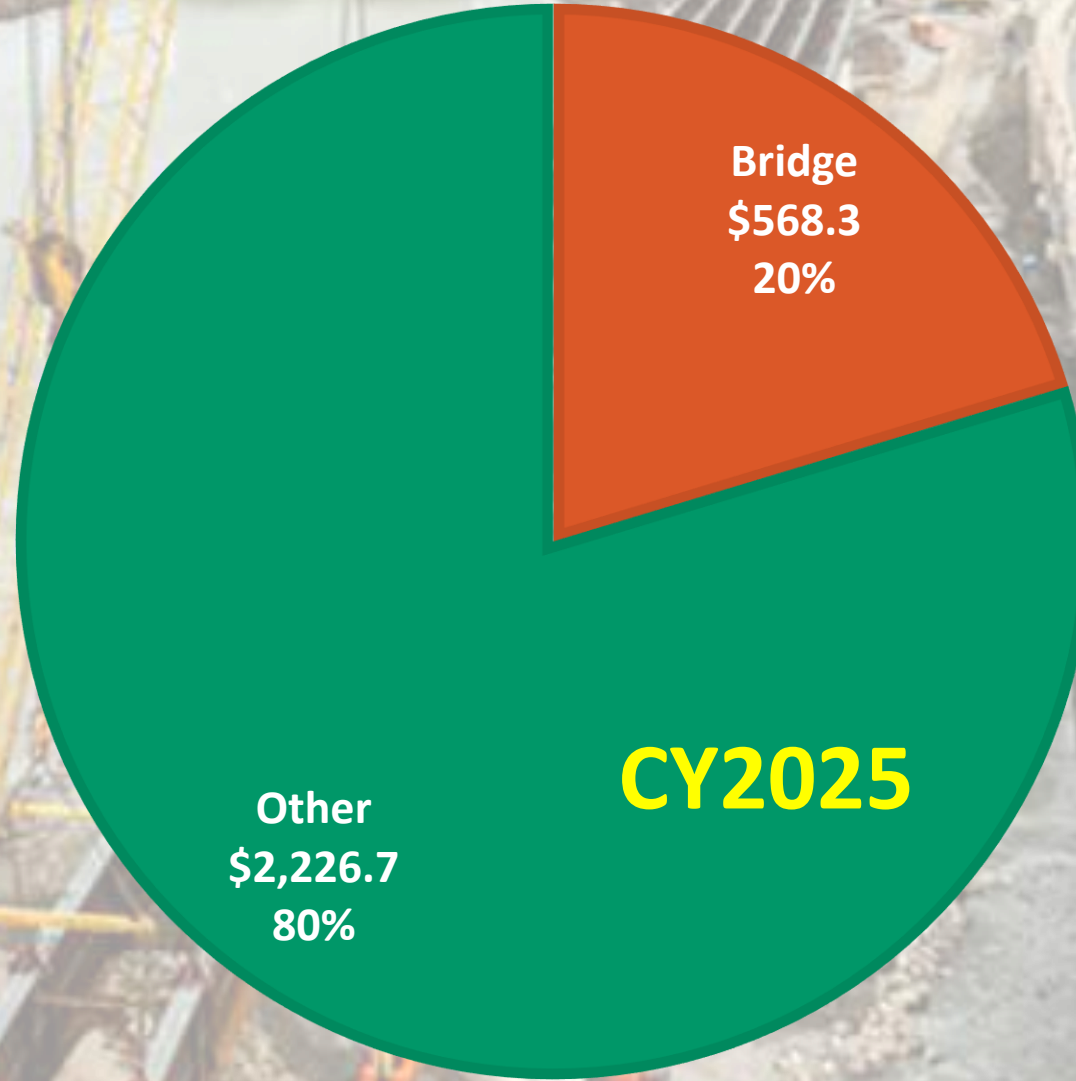
Total Deck Area



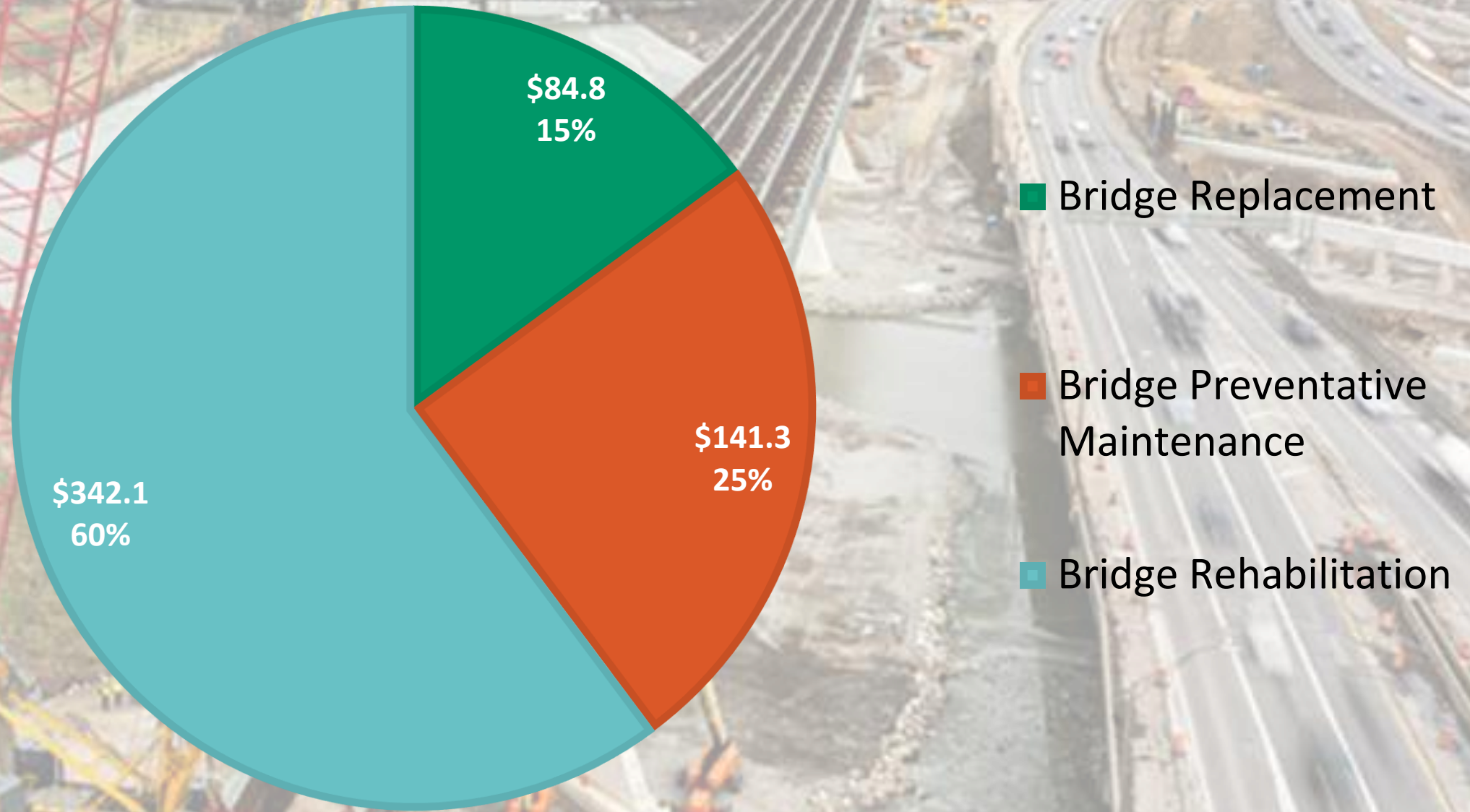
“Home Rule”

- Amendment to Ohio Constitution allowing cities and villages to govern themselves.
- Applies to Asset Management – **371** individual agencies
- Municipal Bridge Inspection Program (**2884** Bridges)
 - Cities (< 50k pop.) & Villages may opt in
 - Consultant Inspection/Inventory performed in accordance with SNBI and Ohio law
 - Q/A of Program performed by ODOT OSE
 - ≈ \$2.8M Available Annually

ODOT CONSTRUCTION BUDGET = \$2795M



BRIDGE CONSTRUCTION BUDGET = \$568.3M



Brent Spence Project

- New Double Deck Cable Stay across Ohio River in Cincinnati
- 5-mi of Roadway Improvements in Kentucky
- 3-mi of Roadway Improvements in Ohio
- Progressive Design-Build Contract – Walsh-Kokosing
- \$3.6B Estimated Cost (\$1.635B from BIL in 2022)



OHIO INSPECTION AND INVENTORY DATA



OHIO LAWS & ADMINISTRATIVE RULES
LEGISLATIVE SERVICE COMMISSION

Ohio Revised Code:

- Defining a Bridge in Ohio
- Bridge Inspection Frequency



OHIO DEFINITION OF A BRIDGE

"Bridge" means any structure of ten feet or more clear span or ten feet or more in diameter on, above, or below a highway, including structures upon which railroad locomotives or cars may travel.

(Section 5501.47 of Ohio Revised Code)



OHIO STATE LAW CHANGE – BRIDGE INSPECTION INTERVALS

- **Effective July 1, 2021:** Ohio Revised Code (ORC) now allows routine bridge inspections at intervals up to **24 months**, established by the Director of Transportation (previously annual).
- **RBI Interval:** The new “Reliability Based Inspection” (RBI) interval is defined in Ohio’s Manual of Bridge Inspection, Chapter 4.
- **Routine Inspection Types Only:** Fracture Critical and Underwater Dive Inspections remain governed by federal regulations.
- **Criteria for 12-Month Interval:** Bridges must be inspected every 12 months if they meet any of these:
 - Fracture Critical
 - Scour Critical
 - Load Posted/Restricted
 - General Appraisal or Deck Summary < “7-Good”
 - Newly constructed/rehabilitated (<3 years)
 - Other bridges as determined by control authority



RBI IMPLEMENTATION & DATA MANAGEMENT

- **AssetWise System:** Inspection intervals managed in ODOT's AssetWise application.
- **Interval Assignment:** Bridges meeting any previously mentioned criteria are set to 12 months; others up to 24 months.
- **Updates:** Interval field is read-only, updated twice yearly (Dec 15 & Feb 15) by ODOT Central Office.
- **Planning:** Program Managers can utilize AssetWise/TIMS map viewer to plan inspections and verify intervals.
- **Impact:** About half of Ohio's bridges qualified for the extended 24-month interval, saving resources without reducing safety



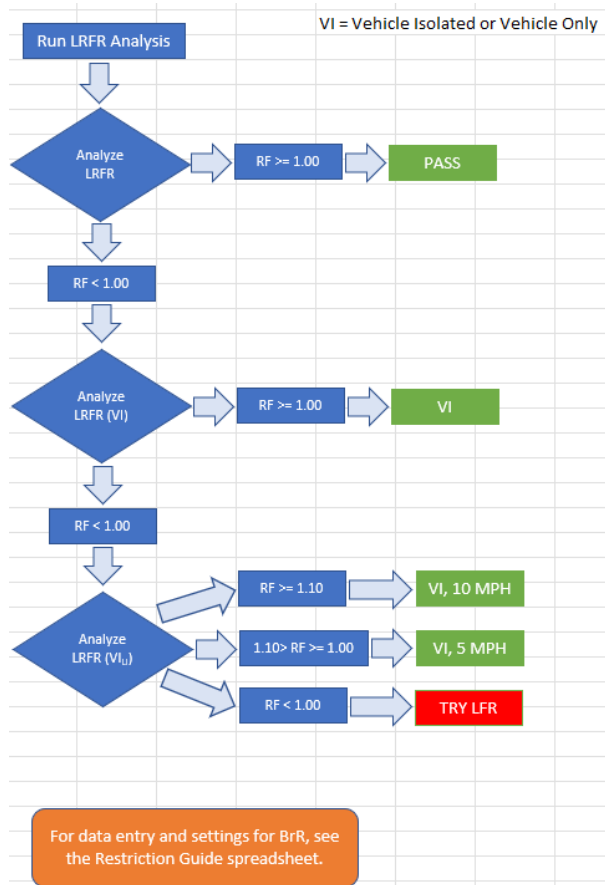
AASHTOWARE BRDR IN OHIO

- AASHTOWare BrDR is ODOT's preferred load rating method.
 - Over 10,000 ODOT bridges are modeled in BrR.
 - Thousands more by locals.
- Various uses of BrDR models
 - Ease of additional vehicles or specification changes over time.
 - Capture and evaluate load and condition changes
 - Proposed treatments
 - Incorporate deterioration
 - Report of effects of other damage (Bridge Hits, etc.)
 - Permit Analysis



PERMIT ANALYSIS

The Ohio Hauling Permit System (OHPS) is an automated system used to evaluate more than 380,000 permit loads each year.



Established In-House Procedure

Our team developed and followed a systematic in-house procedure to ensure all analyses are as consistent as possible.

LRFR and LFR Flow Charts Utilized

Flow charts are effectively utilized for permit analysis process for each bridge.

Restriction Guides

Restriction guides compliment the analysis flow charts and designate how the analysis settings are set.

Limitations and Restrictions

Common restrictions include isolating the permit vehicle, speed restrictions and limiting the travel way.

Truck Type	Vehicle Properties Columns				Rating	Recommended Restriction
	Impact	Single Lane Loads	Frequency	Loading Condition		
Single Lane Truck			Multiple Trips	Mixed With Traffic	>1.00	No Restriction
			Single Trip	Escorted	>1.00	Isolation
	0.3333	X	Single Trip	Escorted	>=1.10	Isolation, 10mph
	0.3333	X	Single Trip	Escorted	1.00 - 1.09	Isolation, 5mph
	0.3333	X	Single Trip	Escorted	<1.00	Cannot Cross
Dual Lane Truck as Single Lane Truck (16' minimum width)			Multiple Trips	Mixed With Traffic	>1.00	No Restriction
			Single Trip	Escorted	>1.00	Isolation
	0.3333		Single Trip	Escorted	>=1.10	Isolation, 10mph
	0.3333		Single Trip	Escorted	1.00 - 1.09	Isolation, 5mph
	0.3333		Single Trip	Escorted	<1.00	Cannot Cross
Dual Lane NSG			Multiple Trips	Mixed With Traffic	>1.00	No Restriction
			Single Trip	Escorted	>1.00	Isolation
	0.3333		Single Trip	Escorted	>=1.10	Isolation, 10mph
	0.3333		Single Trip	Escorted	1.00 - 1.09	Isolation, 5mph
	0.3333		Single Trip	Escorted	<1.00	Cannot Cross

RESEARCH: DEVELOPMENT OF SIMPLIFIED FACTORS FOR LATERAL DISTRIBUTION OF LOADS FOR NON-STANDARD GAUGE (NSG) AXLES

Development of Simplified Factors for Lateral Distribution of Loads of Non-Standard Gauge (NSG) Axles



Prepared by:
Burgess & Niple, Inc.

Prepared for:
The Ohio Department of Transportation,
Office of Statewide Planning & Research

Project ID Number: 114241

June 2022

Final Report

Importance of Lateral Load Distribution

Understanding lateral load distribution on bridges is crucial for ensuring structural integrity and safety, especially with non-standard axles.

Simplified Correction Factors

The development of simplified factors aids engineers in accurately assessing load ratings without complex calculations.

Provides Tables and Information for Analysis

Governing values given and the research results and tables can be utilized to fit more specific structure types and span lengths.

BURGESS & NIPLE



RESEARCH: DEVELOPMENT OF SIMPLIFIED FACTORS FOR LATERAL DISTRIBUTION OF LOADS FOR NON-STANDARD GAUGE (NSG) AXLES

Distribution Factor Correction Matrix for Non-Standard Gauge Axles:

Total Width (Note 4)	Gauge Width (Note 4)	Number of Wheel Lines (Note 3)			
		2	4	6	8 or More
5.5 ft	3.5 ft	1.25	-	-	-
8 ft	6 ft	1.00	-	-	-
10 ft	8 ft	1.00	0.96	-	-
12 ft	10 ft	1.00	0.91	-	-
14 ft	12 ft	1.00	0.87	0.82	-
16 ft	14 ft	-	0.85	0.82	-
18 ft	16 ft	-	0.82	0.80	0.80
22 ft	20 ft	-	-	0.76	0.77
26 ft	24 ft	-	-	0.73	0.73

Notes:

1. This table is applicable to the following bridge types:

	Span Range	Beam Spacing
Composite and Non-Composite Side by Side Concrete Box Beam Bridges	33 ft - 115 ft	3 ft - 4 ft
Concrete Slab Bridges	11.0 ft - 57.5 ft	-
Concrete I-Beam Bridges	50 ft - 140 ft	7 ft - 12 ft
Steel Multi-Beam Bridges	50 ft - 180 ft	7 ft - 12 ft

2. This table is not applicable to steel bridges with interior and exterior beams that have significantly different moment or shear capacity.
3. A wheel line is defined as a load point on an axle line. It can consist of a single tire or a pair of tires.
4. Total width is defined as the width of the axle from outside face to outside face of the outer wheel lines. In the determination of correction factors, total width is conservatively assumed to be equal to the gauge width + 2 feet. The correction factors provided in the table are applicable to total axle widths equal to or greater than the values shown.

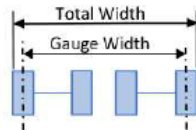


Figure 5.1.1: Correction Factor Matrix

**Distribution Factor Correction Matrix for Non-Standard Gauge Axles:
(Box Beam Bridges Excluded)**

Total Width (Note 4)	Gauge Width (Note 4)	Number of Wheel Lines (Note 3)			
		2	4	6	8 or More
5.5 ft	3.5 ft	1.25	-	-	-
8 ft	6 ft	1.00	-	-	-
10 ft	8 ft	0.96	0.96	-	-
12 ft	10 ft	0.93	0.91	-	-
14 ft	12 ft	0.90	0.87	0.73	-
16 ft	14 ft	-	0.70	0.73	-
18 ft	16 ft	-	0.60	0.73	0.74
22 ft	20 ft	-	-	0.60	0.64
26 ft	24 ft	-	-	0.55	0.53

Notes:

1. This table is applicable to the following bridge types:

	Span Range	Beam Spacing
Concrete Slab Bridges	11.0 ft - 57.5 ft	-
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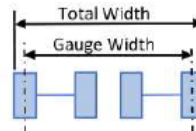


Figure 5.1.2: Correction Factor Matrix, Box Beam Bridges Excluded

Two Sets of Factors Provided

One set excludes Box Beam Bridges to obtain lower correction factors.

Factors can be Selected Based on Width and Wheel Lines

Selection of correction factors will depend on the vehicle configuration.

PERMIT ANALYSIS

Have moved loads totaling over 1.5 million lbs. and all sorts of sizes.



MOVING THE INTEL LOADS



- **General Route & Escort Info**
 - 150+ miles long
 - 12+ parking locations
 - Up to 10 State Highway Patrol
 - 20+ Bucket Trucks
- **General Travel Info**
 - Smaller loads – 2 to 6 days
 - Larger loads – 7 to 10 days



WHAT NEEDS MOVED

- 4 – Cold boxes
 - Manchester OH to New Albany OH



- **Dimensions**
 - 23' Tall
 - 20' Wide
 - Approximately 300' Long
 - Over 900,000 lbs.

WHAT NEEDS MOVED

- 32 – Various Loads
 - Manchester OH to New Albany OH



- **Dimensions Range From**
 - 18' - 20 Tall
 - 12' - 18' Wide
 - 150' – 300' Long
 - 150,000 – 900,000 lbs.

HOW DID WE DO IT?

- Perform Permit Load Rating Analysis
 - AASHTOWare BrR - Standard gauge vehicles with correction factors
 - Research “Development of Simplified Factors for Lateral Distribution of Loads for Non-Standard Gauge (NSG) Axles
 - AASHTOWare BrR – Built and ran NSG vehicle analysis
 - MIDAS – Built and ran NSG vehicle analysis
 - Use custom spreadsheets and other load rating tools

ROUTES SELECTED! LET'S GET MOVING!



LIKE A VERY EXPENSIVE PARADE



All Permit Loads were successfully moved safely and with no issues.

OHIO AND AASHTOWARE BRM

Utilize Bentley's AssetWise for bridge inventory and inspection.

- ODOT manages the software and submits data to FHWA on behalf of the whole state.
- Various Bridge owners are responsible for their own:
 - Inventory
 - Inspection
 - Management
- Plan to utilize BrM for ODOT Bridge Management Functions



ODOT BRIDGE MANAGEMENT PRACTICES

Primary methods for bridge work selection:

- Examine roadway resurfacing and other State projects and include any minor bridge work for bridges within the limits of the projects.
 - Resurfacing cycles can range from 8 to 12 years for pavements.
 - Typically, only include minor bridge work. (Due to cost and environmental/stakeholder coordination)
 - Asphalt overlays
 - Deck Sealing
 - Guardrail/parapet work
- Run data queries for “Bridge Condition Targets”, (GA, DS, WS & PCS) & utilize in-house developed spreadsheets and tools
 - Identify bridges that are already programmed for work and verify dates.
 - View deck area and general estimated work prices to produce estimated costs and then work through annual budget to find space based on cost and condition severity.
- Additional checks:
 - Look over posted bridges.
 - Look over bridges that have been identified or flagged by inspectors.
 - Rapid decrease in condition
 - Maintenance recommendations
 - Safety concerns



OHIO AND AASHTOWARE BRM

Happening Now:

- Currently use combinations of data queries, spreadsheets and misc. tools. (Each District is different.)
- Setting up various inputs
 - Live Inspection/Inventory Data
 - Developing API from AssetWise
 - Unit Cost Estimates
 - Deterioration information
- Incorporation of Bridge Project Data

Future Goals:

- Be prepared/ready to run optimizations and LCCA when SNBI is fully implemented and full set of data is available.
- Continue to tweak settings and variables to get more comfortable with analysis results.
- Proposed roll out to locals in the future.

Challenges:

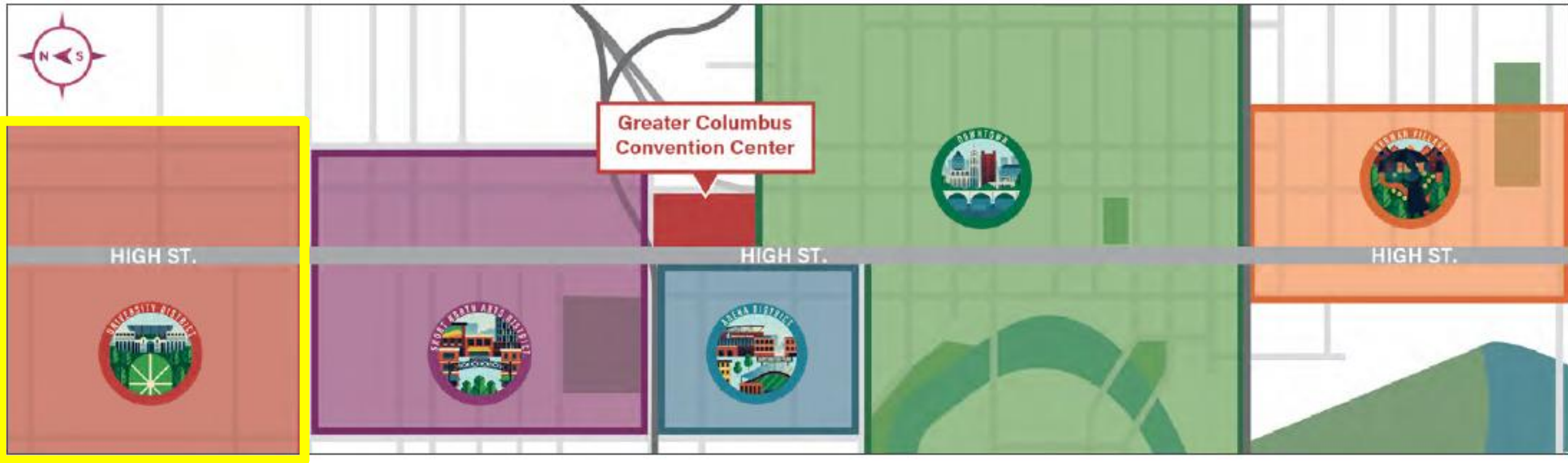
- Further Development and application of degradation models.
- Program and project optimization.
 - Both short- and long-term planning.
 - Balancing financial and conditional tradeoffs.
- Tracking work actions.
- Budget and funding allocation.
- Transition to Specifications for the National Bridge Inventory (SNBI)

ENJOY YOUR STAY IN COLUMBUS

Columbus Ohio Facts:

- Founded in 1812 and named after Christopher Columbus
- Ohio's capital city since 1816 (replaced Chillicothe)
- Largest city population in Ohio (905,748 – 2020 Census)
- 14th-most populous city in the U.S. (between Fort Worth & Indianapolis)

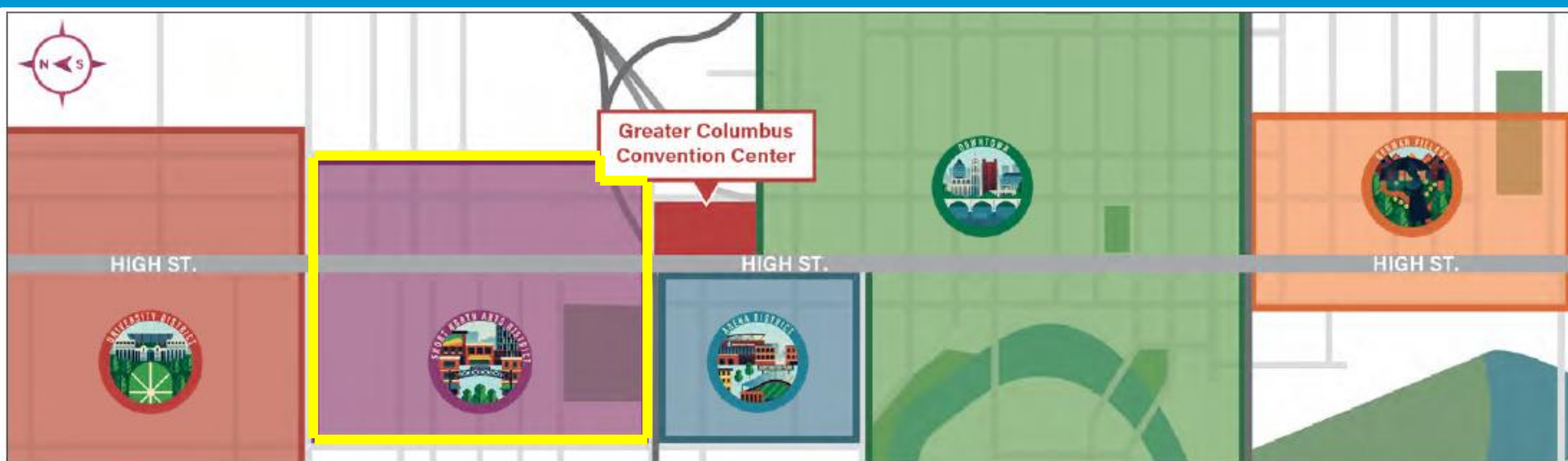
ENJOY YOUR STAY IN COLUMBUS



University District:

Home to The Ohio State University, this neighborhood is packed with cutting-edge science and tech, as well as sports, shopping, music and nightlife.

ENJOY YOUR STAY IN COLUMBUS



Short North District:

The “art and soul” of Columbus is lined with charming buildings that house the city’s best boutique shopping, art galleries, dining and buzzing nightlife.

ENJOY YOUR STAY IN COLUMBUS



Downtown District:

Downtown holds hotels, historic theaters, world-class museums and acres of green space that create an iconic skyline in the heart of the city.

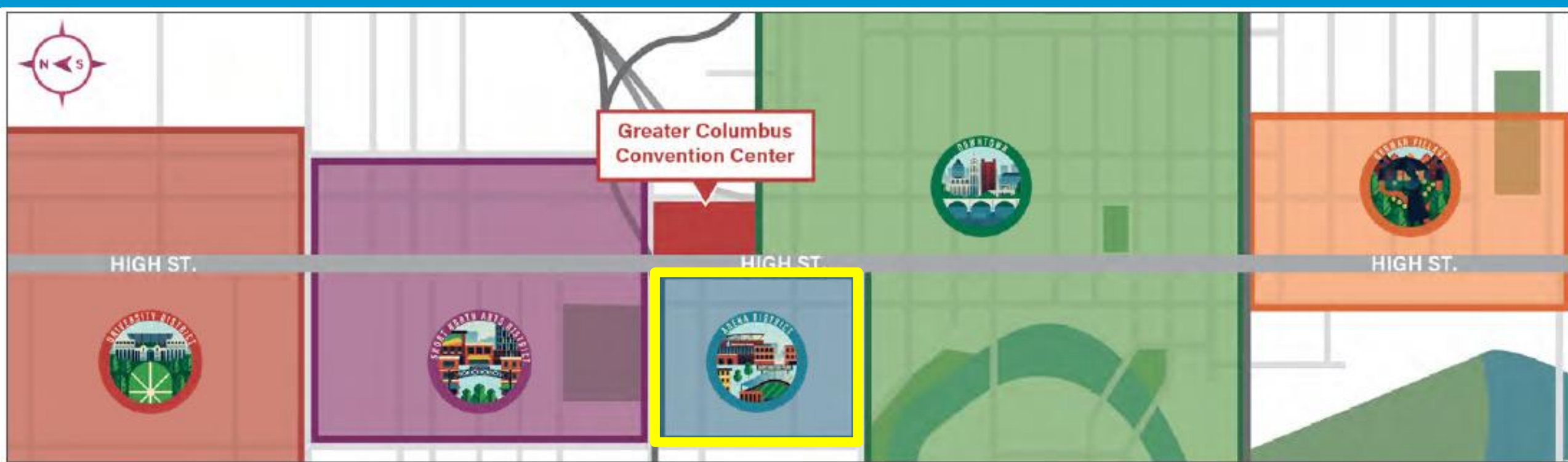
ENJOY YOUR STAY IN COLUMBUS



German Village District:

This quaint, historic neighborhood is one of the most atmospheric in the country. Here you'll find brick-lined streets, brick homes and shops and some of the best local dining.

ENJOY YOUR STAY IN COLUMBUS



Arena District:

This district is home to all of the city's professional sports teams and brings live music, nightlife and dining within steps of the convention center and adjoining hotels.

AUGUST 18 VS. ST. PAUL @ 7:05 “DIME-A-DOG NIGHT”

AUGUST 19 VS. ST. PAUL @ 7:05 “WWE NIGHT”

Standard Tickets = \$11.75

Columbus Clippers vs St. Paul

15-min Walk West on Nationwide Blvd.



AUGUST 19 VS. CF MONTREAL @ 7:30

Standard Tickets = \$25.00

Columbus Crew vs CF Montreal

17-min Walk West on Nationwide Blvd.



ENJOY THE MEETINGS!

