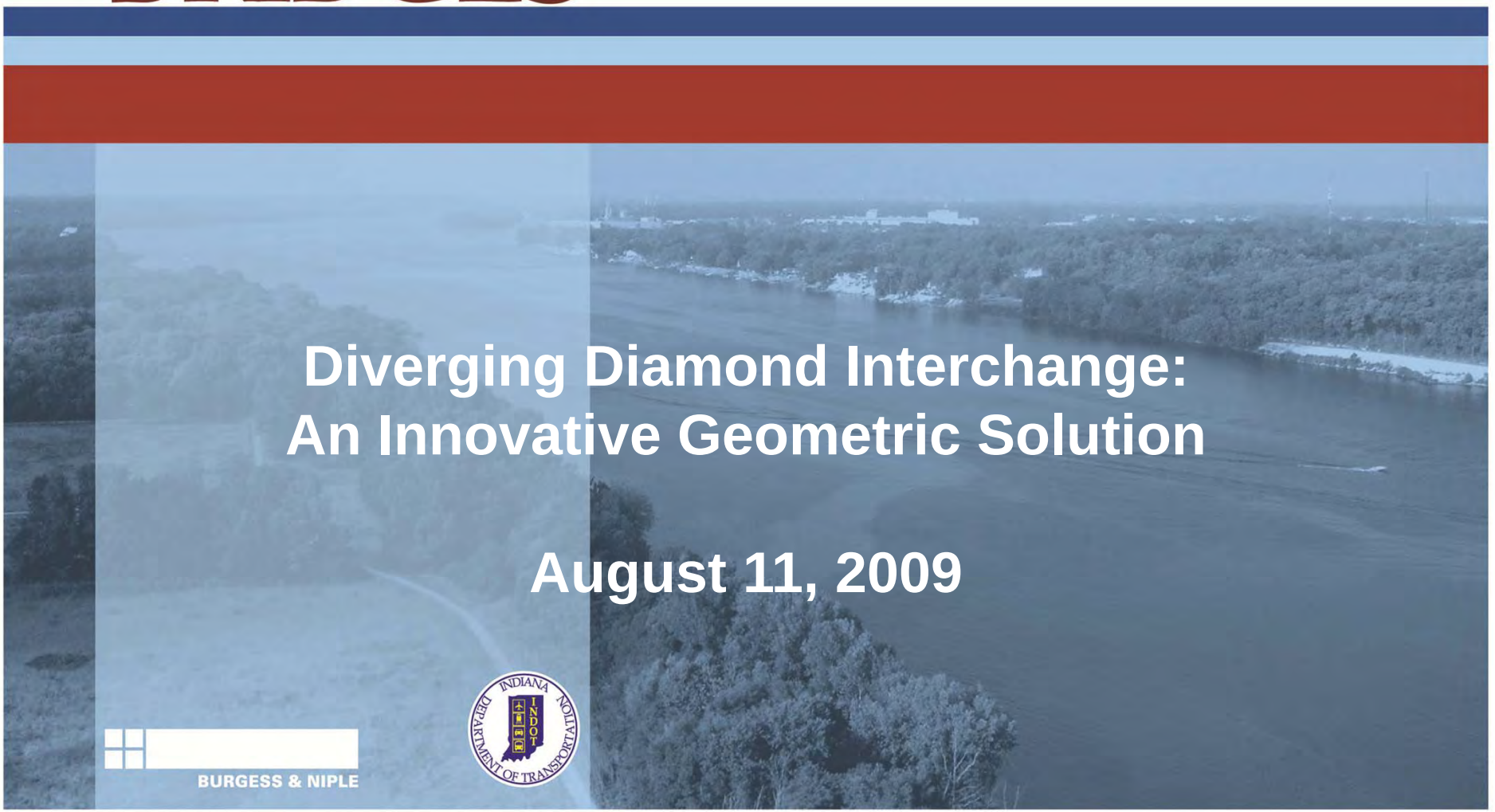
2009 ACEC-KY/FHWA/KYTC Partnering Conference



LSIORB – Case Study

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Existing Interchange

THE OHIO RIVER BRIDGES

Existing Conditions

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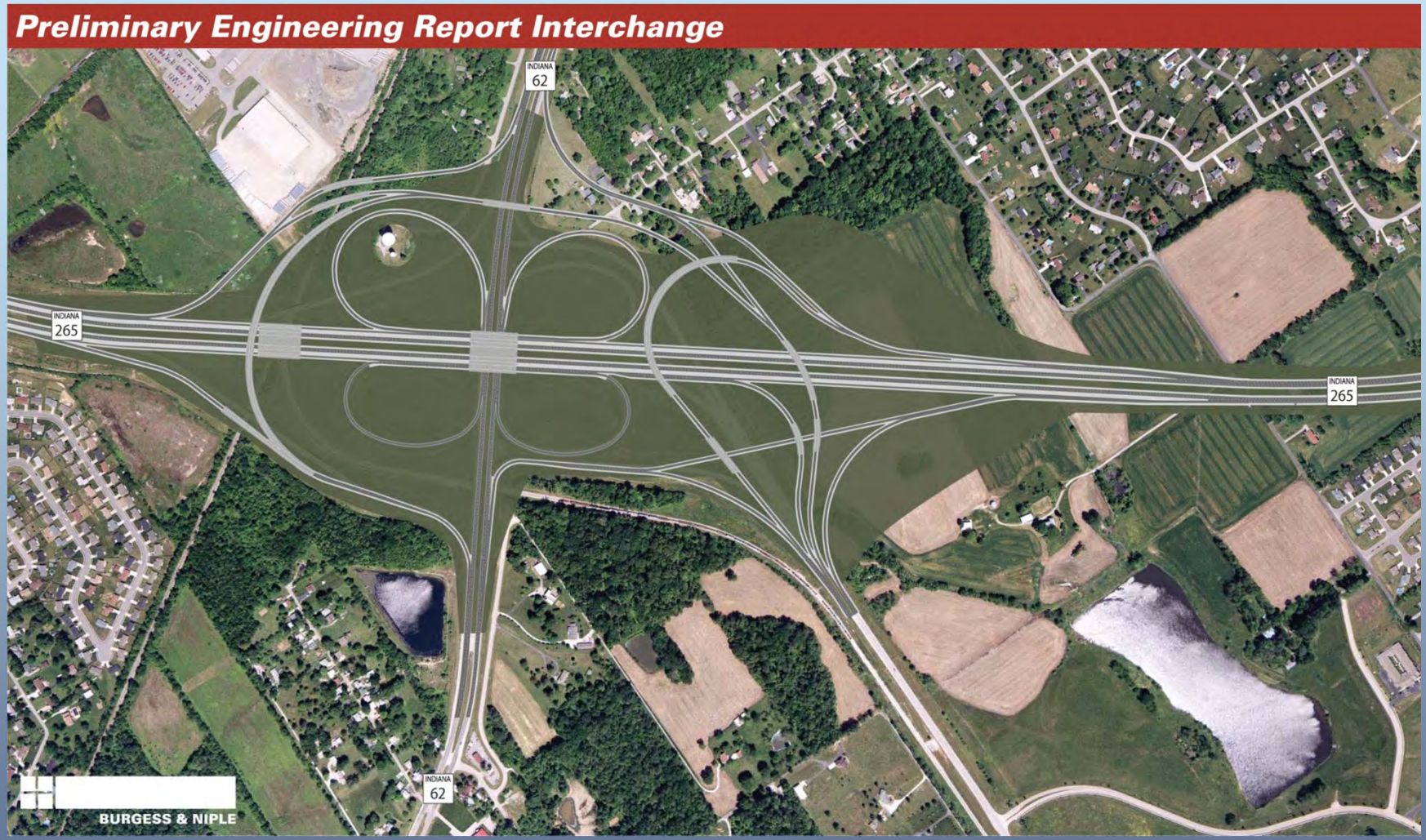
Preliminary Engineering Report Alternative



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Value Engineering

20 Alternatives Considered

Evaluation Criteria

- Safety
- Traffic Operations
- Right of Way
- Constructability/Maintenance of Traffic
- Cost

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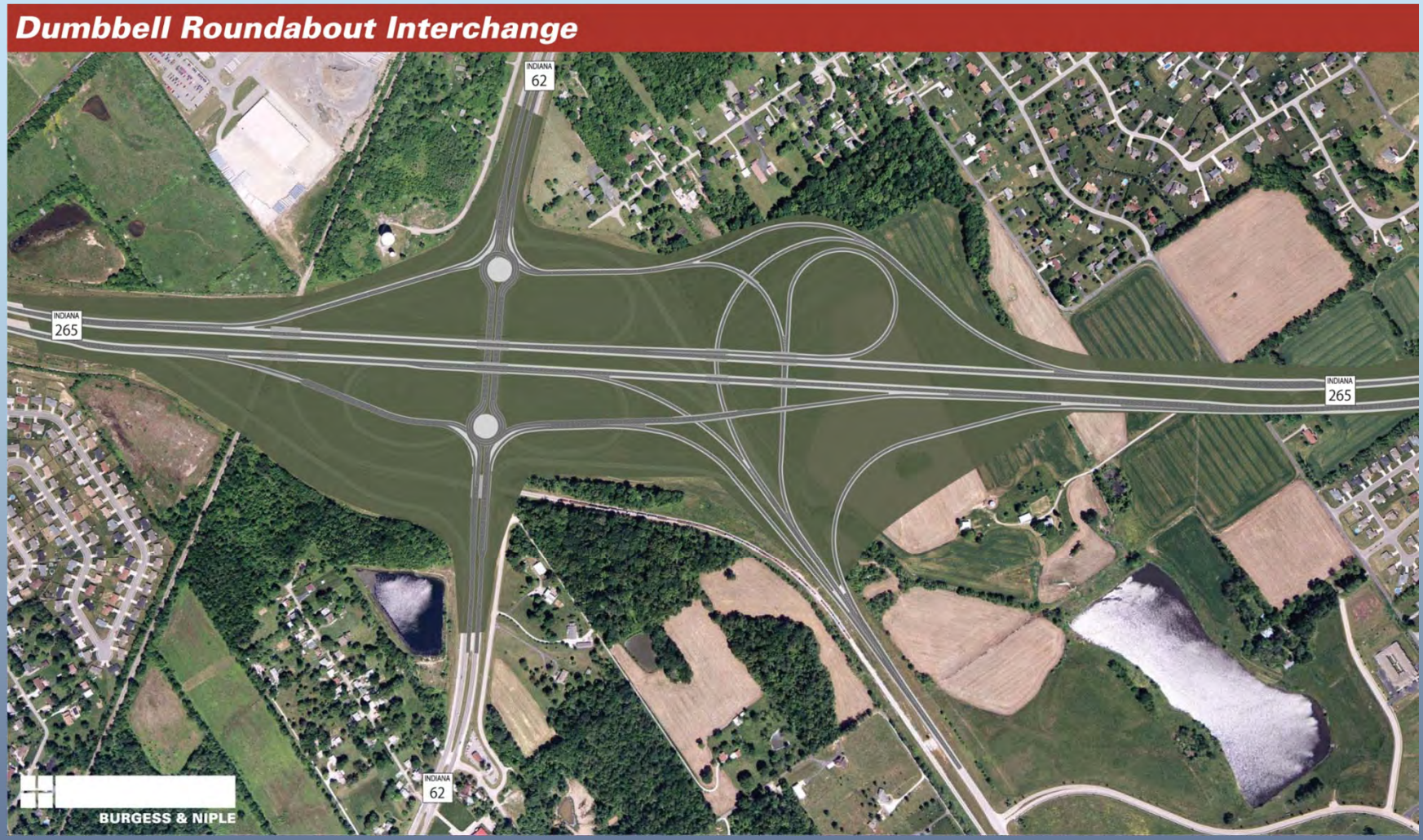
Dumbbell Roundabout



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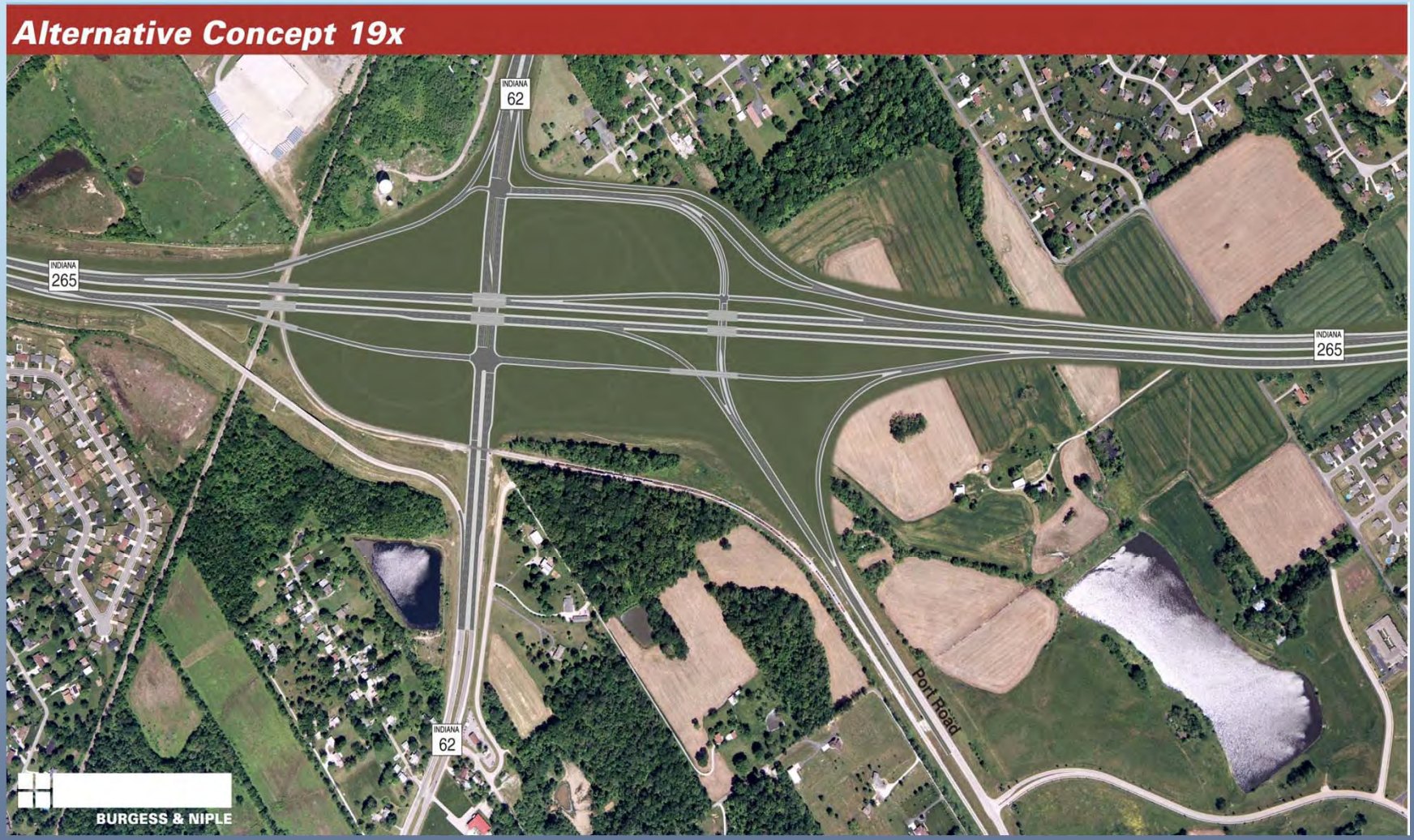
Conventional Diamond



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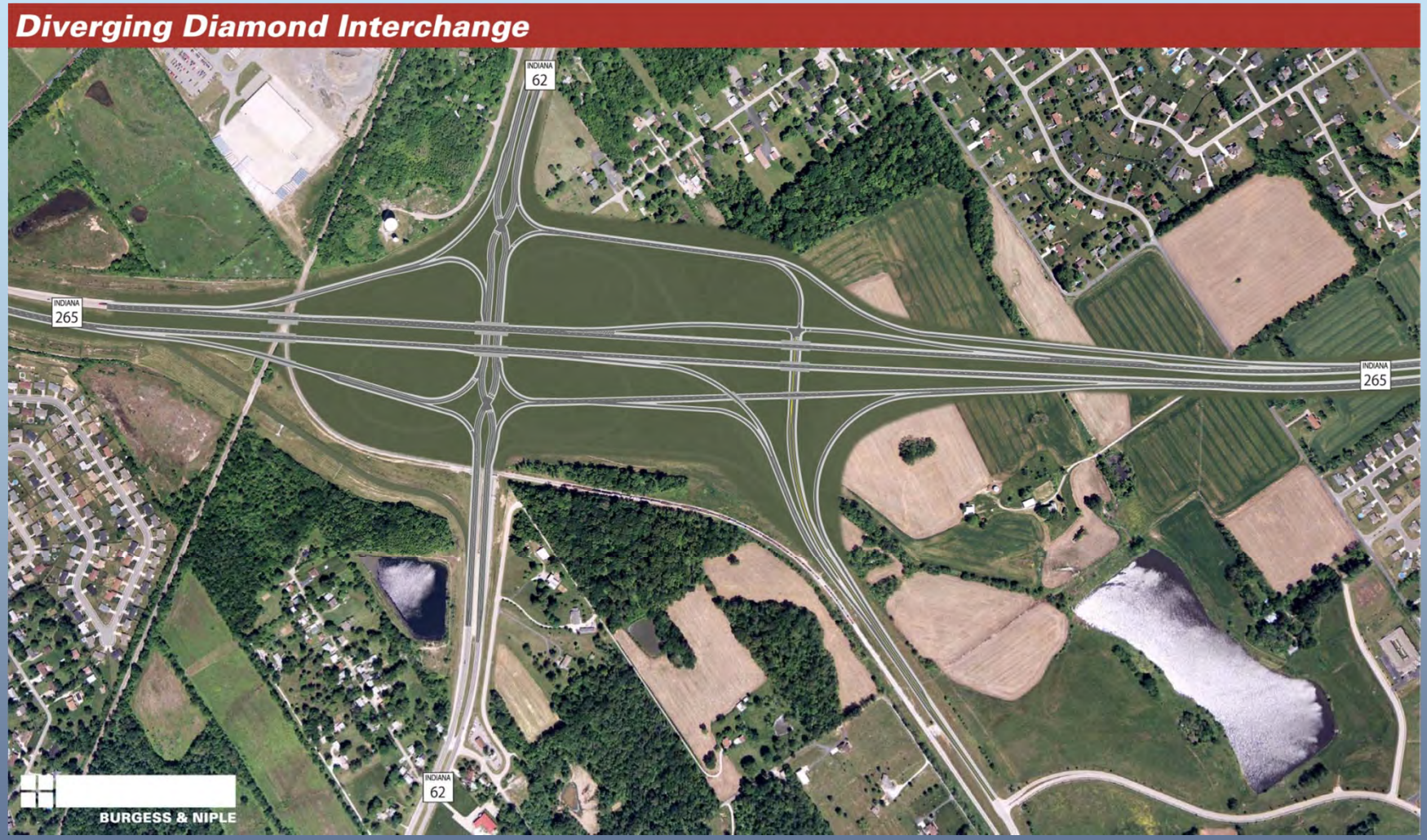
Diverging Diamond



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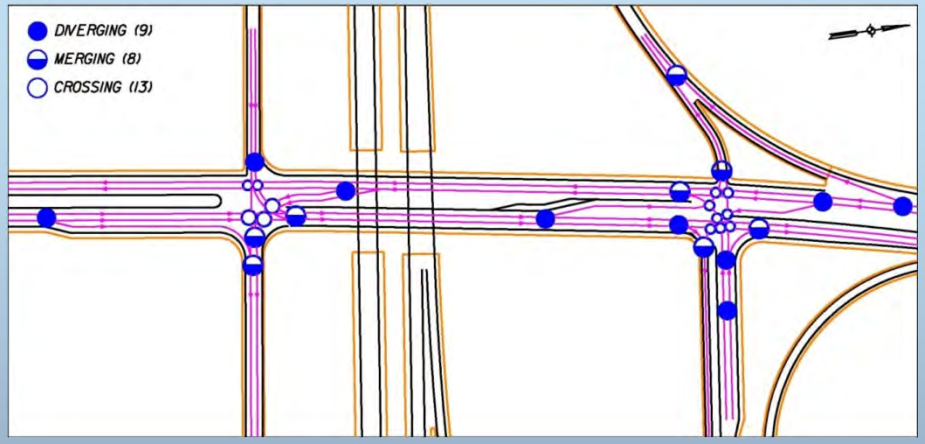
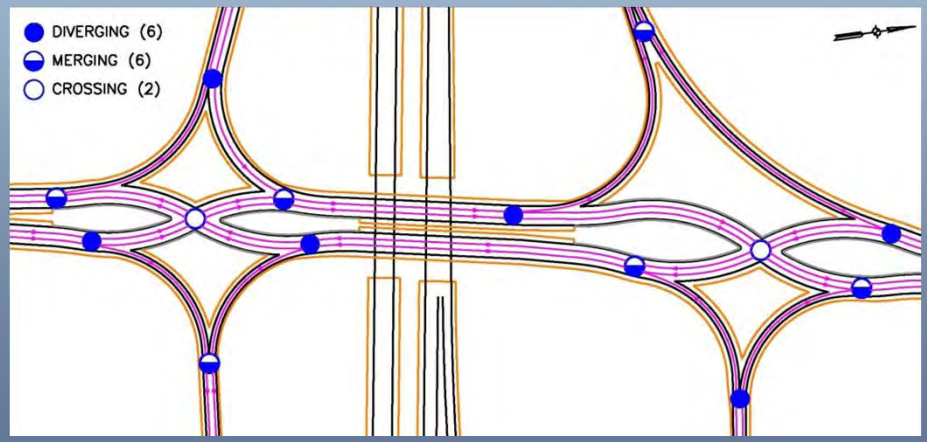
Safety

- Fewer Conflict Points



- Normal Diamond has 30 Conflicts; 13 are crossings

- DDI has 14 conflicts; only 2 are crossings



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Safety

- The use of raised islands and glare screens discourages wrong-way movements.
- Speed reduction due to reverse curvature decreases the severity of crashes that do occur.
- Driver simulation study yielded no attempt to travel the wrong way.

Traffic Operations

- VISSIM was primary tool used for capacity analysis
  - HCS, Synchro and aaSIDRA used as needed to supplement VISSIM analysis

- Sensitivity analysis conducted to determine the results of 110%, 120% and 130% of Design Traffic

Traffic Operations Sensitivity Analysis- Conventional Diamond vs. DDI

100% Traffic Demand	Int	Int	EB			WB			NB			SB		
Alternative 19-X	Delay	LOS	LT	T	RT	LT	T	RT	LT	T	RT	LT	T	RT
SR 62 and WB Ramp Terminal	20.1	C	-	-	-	D	D	A	C	B	B	D	C	-
SR 62 and EB Ramp Terminal	21.2	C	D	-	-	-	-	-	-	C	A	D	A	-
Port Road and WB Ramp Terminal	7.8	A	-	-	-	-	D	-	A	A	-	-	A	-

100% Traffic Demand	Int	Int	EB			WB			NB			SB		
Alternative 20-X	Delay	LOS	LT	T	RT	LT	T	RT	LT	T	RT	LT	T	RT
SR 62 and WB Ramp Terminal	19.7	B	-	-	-	C	-	C	A	B	-	-	C	-
SR 62 and EB Ramp Terminal	17.7	B	B	-	-	-	-	-	-	C	A	A	B	-
Port Road and WB Ramp Terminal	10.3	B	-	-	-	C	-	-	A	A	-	-	-	-

110% Traffic Demand	Int	Int	EB			WB			NB			SB		
Alternative 19-X	Delay	LOS	LT	T	RT	LT	T	RT	LT	T	RT	LT	T	RT
SR 62 and WB Ramp Terminal	20.6	C	-	-	-	D	D	A	D	A	A	D	C	-
SR 62 and EB Ramp Terminal	25.1	C	D	-	-	-	-	-	-	C	A	D	A	-
Port Road and WB Ramp Terminal	9.4	A	-	-	-	-	D	-	A	A	-	-	A	-

110% Traffic Demand	Int	Int	EB			WB			NB			SB		
Alternative 20-X	Delay	LOS	LT	T	RT	LT	T	RT	LT	T	RT	LT	T	RT
SR 62 and WB Ramp Terminal	21.7	C	-	-	-	C	-	C	A	C	-	-	C	-
SR 62 and EB Ramp Terminal	19.2	B	B	-	-	-	-	-	-	C	B	A	B	-
Port Road and WB Ramp Terminal	10.6	B	-	-	-	C	-	-	A	A	-	-	-	-

120% Traffic Demand	Int	Int	EB			WB			NB			SB		
Alternative 19-X	Delay	LOS	LT	T	RT	LT	T	RT	LT	T	RT	LT	T	RT
SR 62 and WB Ramp Terminal	22.8	C	-	-	-	E	E	A	C	A	A	D	C	-
SR 62 and EB Ramp Terminal	28.8	C	E	-	-	-	-	-	-	D	A	D	A	-
Port Road and WB Ramp Terminal	11.6	B	-	-	-	-	D	-	B	A	-	-	A	-

120% Traffic Demand	Int	Int	EB			WB			NB			SB		
Alternative 20-X	Delay	LOS	LT	T	RT	LT	T	RT	LT	T	RT	LT	T	RT
SR 62 and WB Ramp Terminal	23	C	-	-	-	C	-	C	A	C	-	-	C	-
SR 62 and EB Ramp Terminal	20.5	C	B	-	-	-	-	-	-	C	B	A	C	-
Port Road and WB Ramp Terminal	12	B	-	-	-	C	-	-	B	A	-	-	-	-

130% Traffic Demand	Int	Int	EB			WB			NB			SB		
Alternative 19-X	Delay	LOS	LT	T	RT	LT	T	RT	LT	T	RT	LT	T	RT
SR 62 and WB Ramp Terminal	29.5	C	-	-	-	E	E	A	D	A	A	F	C	-
SR 62 and EB Ramp Terminal	38.4	D	E	-	-	-	-	-	-	E	A	E	A	-
Port Road and WB Ramp Terminal	14.9	B	-	-	-	-	E	-	C	A	-	-	A	-

130% Traffic Demand	Int	Int	EB			WB			NB			SB		
Alternative 20-X	Delay	LOS	LT	T	RT	LT	T	RT	LT	T	RT	LT	T	RT
SR 62 and WB Ramp Terminal	26.8	C	-	-	-	C	-	C	A	C	-	-	C	-
SR 62 and EB Ramp Terminal	22.3	C	B	-	-	-	-	-	-	D	B	A	C	-
Port Road and WB Ramp Terminal	11.7	B	-	-	-	C	-	-	B	A	-	-	-	-

Operational Advantages

- Two-Phase signals with short cycle lengths significantly reduces delay
- Increases the capacity of turning movements from the ramps.
- Reduce the number of lanes on the crossroad, minimizing impacts to existing right-of-way.

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Level of Service (130%)
Conventional Diamond

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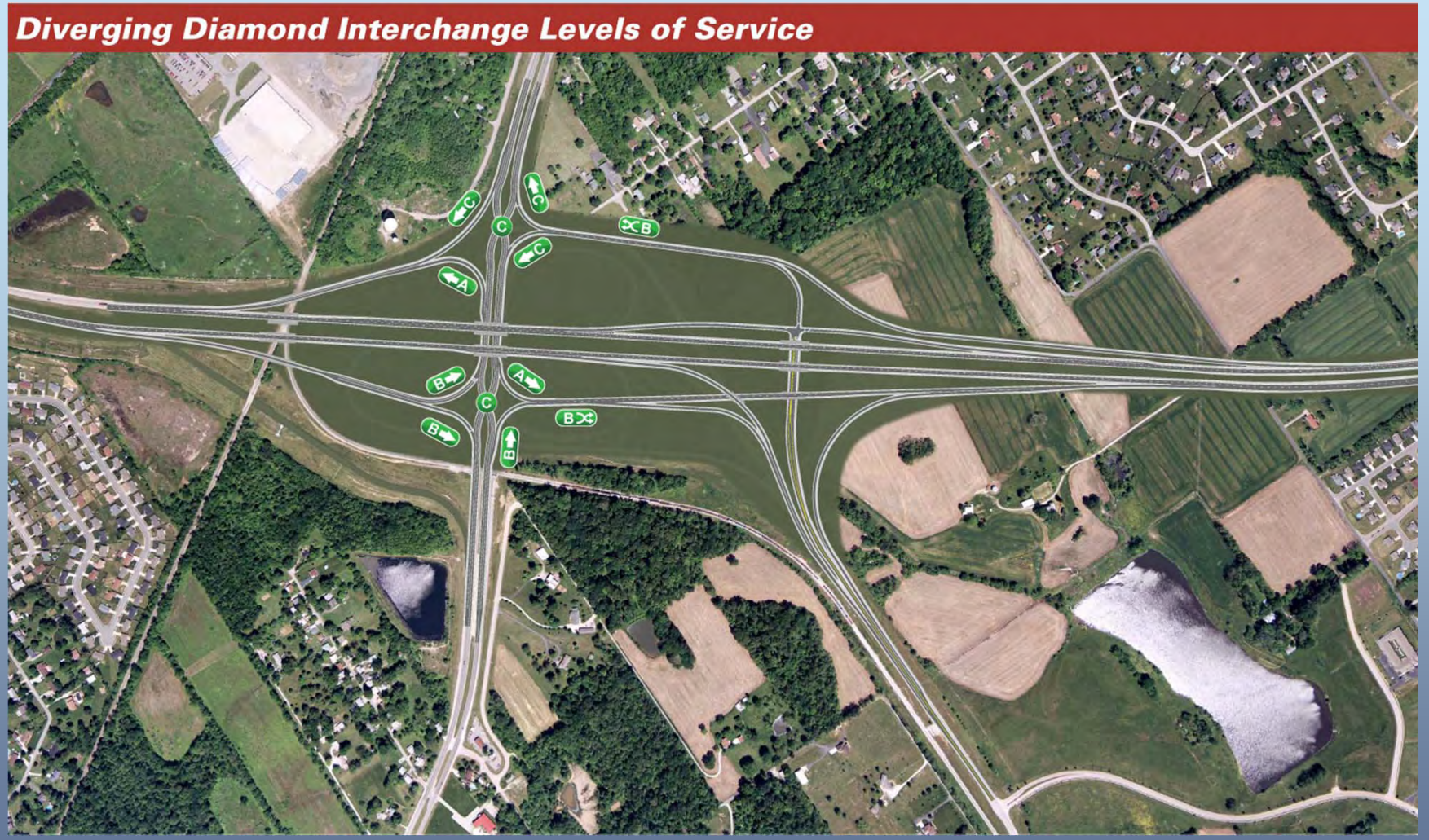
Level of Service (130% Traffic)
Diverging Diamond



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VISSIM Model

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Why the DDI?

- Benefits
  - Improved Safety
    - Reduced Conflicts
  - Enhanced Traffic Operations
    - Improved Capacity
    - All movements >LOS D
  - Reduced Cost
    - Fewer Bridges
    - Smaller Footprint

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Interchange Cost

- PE Report = $118,070,000
- Dumbbell = $80,630,000
- Conventional Diamond = $60,140,000
- Diverging Diamond = $51,990,000

- Total Cost Savings = $66,080,000

Thank You!

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Proposed Diverging Diamond

- North Intersection

- South Intersection

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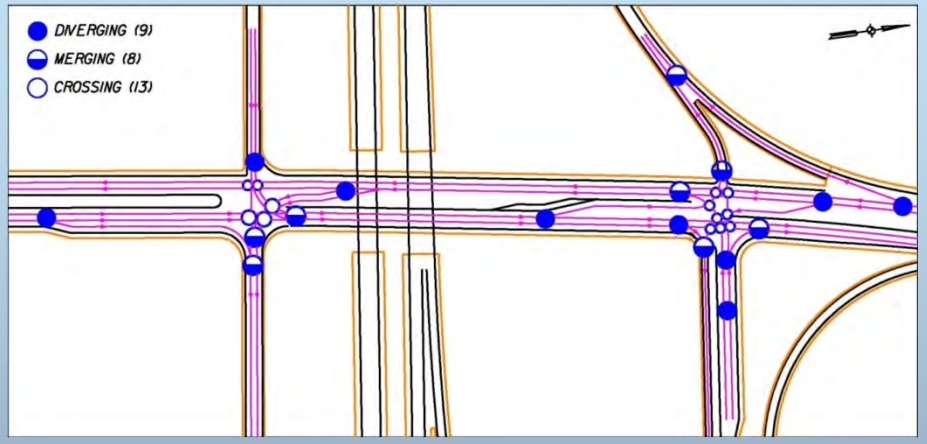
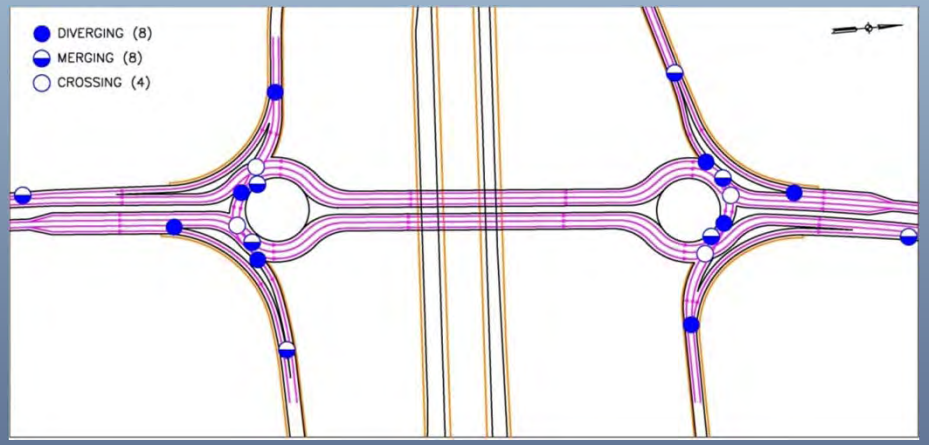
Safety

- Fewer conflict points



- Normal Diamond has 30 Conflicts; 13 are crossings

- Roundabout has 20 conflicts; 4 are crossings



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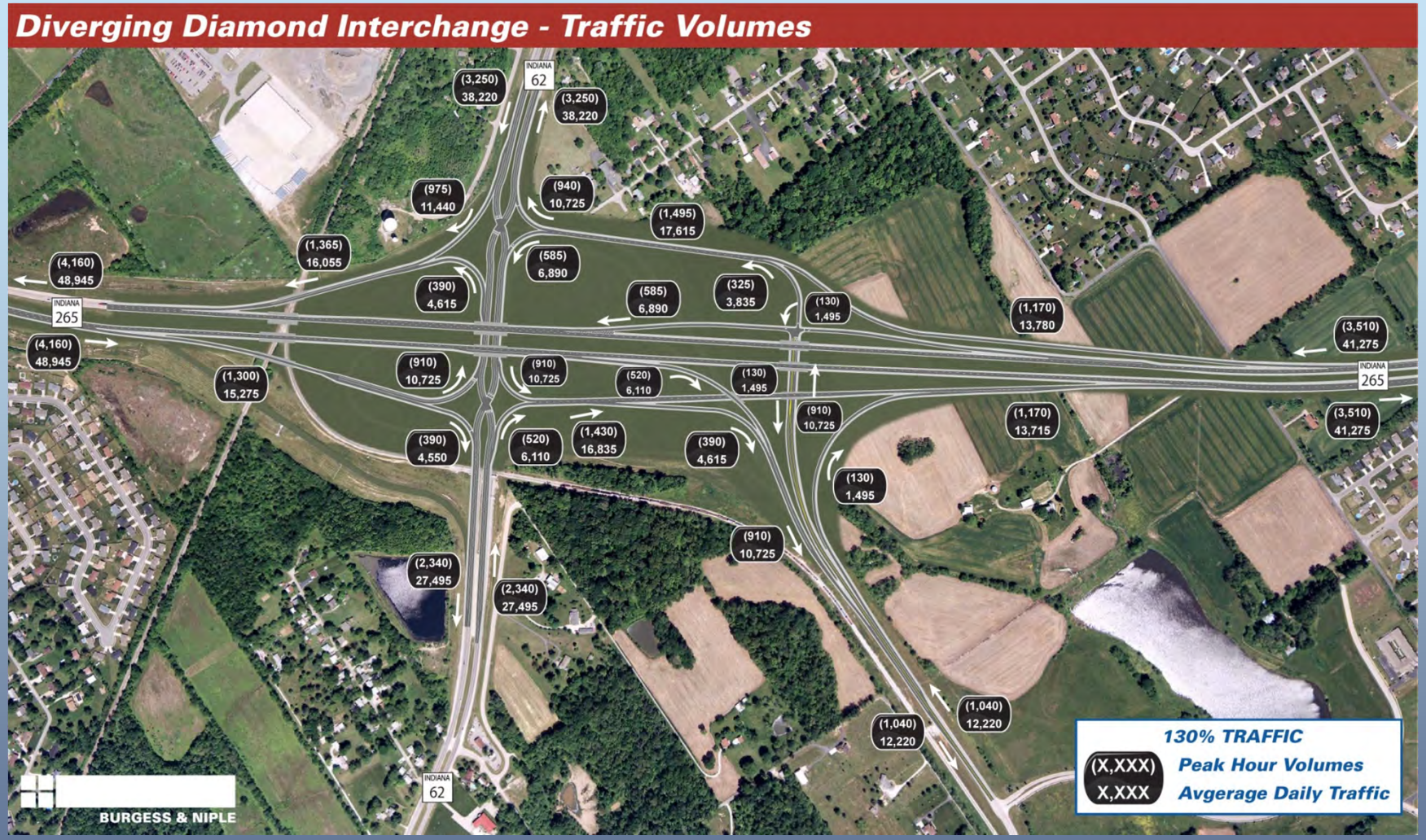
Traffic Volumes (130% Traffic)
Diverging Diamond – 2035 Projection



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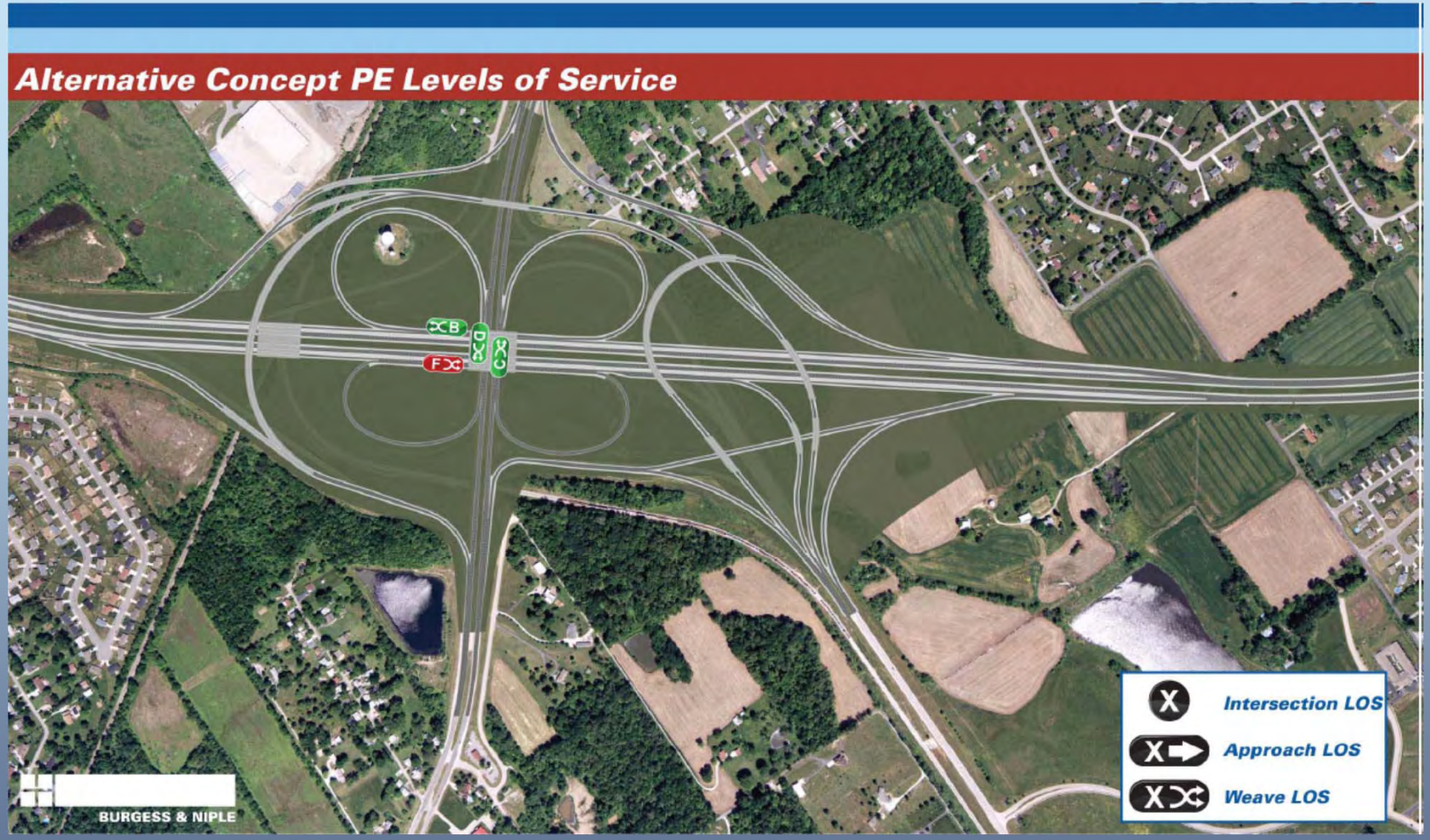
Level of Service (100% Traffic)
Preliminary Engineering Report Alternative



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Level of Service (100% Traffic)
Dumbbell Roundabout

Other DDI Projects

- First Diverging Diamond in Indiana
  - Missouri DOT has opened DDI in Springfield, MO
    - I-44/Route 13
  - Utah DOT is currently constructing by Design/Build I-15 and American Fork Main Street Diverging Diamond Interchange and will be completed in late fall of 2010
  - Missouri DOT has another DDI planned (I-435/Front Street)
    - FHWA Case Study
  - Others being considered in Michigan, New York, Kentucky, Louisana, Ohio and Oregon