APPENDIX B

DETAILED ALTERNATIVES ANALYSIS

DETAILED ALTERNATIVES ANALYSIS

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No tables.

2.0 Alternatives

This section describes the alternatives considered for Deerfield Road from Milwaukee Avenue to Saunders/Riverwoods Road. As discussed below, reasonable alternatives were evaluated based on their ability to satisfy the purpose and need for the project. Alternatives that did not satisfy the purpose and need for the project, or that would have unacceptable impacts in comparison to other alternatives were dismissed from further consideration as part of an alternatives development and evaluation process based on engineering evaluation and stakeholder input. The alternatives development and evaluation process was coordinated through the National Environmental Policy Act (NEPA)/404 Merger process. Refer to Appendix E-2 for summaries of the NEPA/404 Merger meetings related to the alternatives development and evaluation process described below.

2.1 What Alternatives were considered?

2.1.1 What is the 2040 No-Build Alternative?

The 2040 No-Build includes committed projects in the CMAP Transportation Improvement Program (TIP) and lane additions required for a private development recently completed (2019) at the northwest corner of Milwaukee Avenue and Deerfield Road. The Milwaukee Avenue intersection improvements recently completed includes a second left turn lane on both northbound (NB) and southbound (SB) legs of Milwaukee Avenue, and a second eastbound (EB) through lane on Deerfield Road with a lane drop after the intersection.

What is the 2040 No-Build Alternative?

Beyond the private development intersection improvement plans, the No-Build Alternative consists of no additional geometric or capacity improvements to the project corridor and intersections within the 2040 planning horizon. Only routine maintenance to keep Deerfield Road serviceable would be provided.

Although the No-Build Alternative would not require acquisition of any right-of-way and would avoid impacts to the natural environment and to residential and commercial properties, the transportation performance and associated safety, mobility and operational deficiencies would not be addressed.

On this basis, the No-Build Alternative does not satisfy the purpose and need for the project.

2.1.2 Transportation System Management (TSM) Considerations

The provisions of 23 Code of Federal Regulations (CFR) 450.320(a) and (b) places restrictions on the use of federal funds for projects in Transportation Management Areas (TMAs) designated as non-attainment for carbon monoxide and/or ozone. In these areas, federal funds may not be programmed for any project that will increase capacity for single occupancy vehicles (SOV) unless the project is addressed through a

Congestion Management Process (CMP). The CMP is required to provide an appropriate analysis of alternatives to the proposal for adding SOV capacity, including all reasonable congestion management strategies. If the analysis demonstrates that other alternatives and/or congestion management strategies cannot fully satisfy the need for additional capacity and that, therefore, the additional SOV capacity is warranted, the CMP must identify all reasonable strategies that will maintain the functional integrity of the additional lanes.

Individual projects involving addition of SOV capacity were evaluated, selected, and prioritized in the course of developing the Federal Fiscal Year (FFY) 2019-2024 Transportation Improvement Plan (TIP) and the long range GO TO 2040 Comprehensive Regional Plan (CRP) for Northeastern Illinois. The development process for the TIP and CRP through the Chicago Metropolitan Agency for Planning (CMAP) constitutes the CMP for Northeastern Illinois. This process documents warranted projects for adding SOV capacity in Northeastern Illinois, and also documents that regional and/or project specific alternatives such as Transportation Demand Management (TDM) measures, High Occupancy Vehicle (HOV) measures, Transit Capital Improvements, Growth Management, Intelligent Transportation System (ITS) including traffic surveillance and incident management, would not obviate the need for adding SOV capacity. The Northeastern Illinois CMP is documented on the CMAP website at: *https://www.cmap.illinois.gov/mobility/roads/cmp* . For this project, it has been determined that stand-alone CMP alternatives will not satisfy the project purpose and need and, therefore, this undertaking is a warranted project for adding SOV capacity.

Reasonable project-specific CMP strategies, including Traffic Operational Improvements, Transit Operational Improvements, Non-motorized modes/measures (Pedestrian/Bicycle), ITS, and Access Management, have been incorporated into this project to the extent practical. Specific strategies incorporated include:

- An 8 feet wide multi-use path will be built along the south side of Deerfield Road from Milwaukee Avenue to Portwine Road and along the north side of Deerfield Road from Portwine Road to Saunders/ Riverwoods Road.
- Wider bike friendly shoulders will be incorporated per LCDOT roadway typical standards.

As documented in the above information, this project results from the CMP for Northeastern Illinois as a warranted project for adding SOV capacity and all reasonable congestion management strategies have been incorporated into the project to sustain its effectiveness.

2.1.3 What Build Alternatives Were Considered?

Public Information Meeting #1 was held on November 30, 2016. At this public meeting, as well as the initial agency scoping meetings and the initial Stakeholder Involvement Group (SIG) meetings, stakeholder input was gathered that led to the development of an initial range of alternatives. Several alternatives suggested by stakeholders were considered, but dismissed prior to the comparative evaluation and are described below.

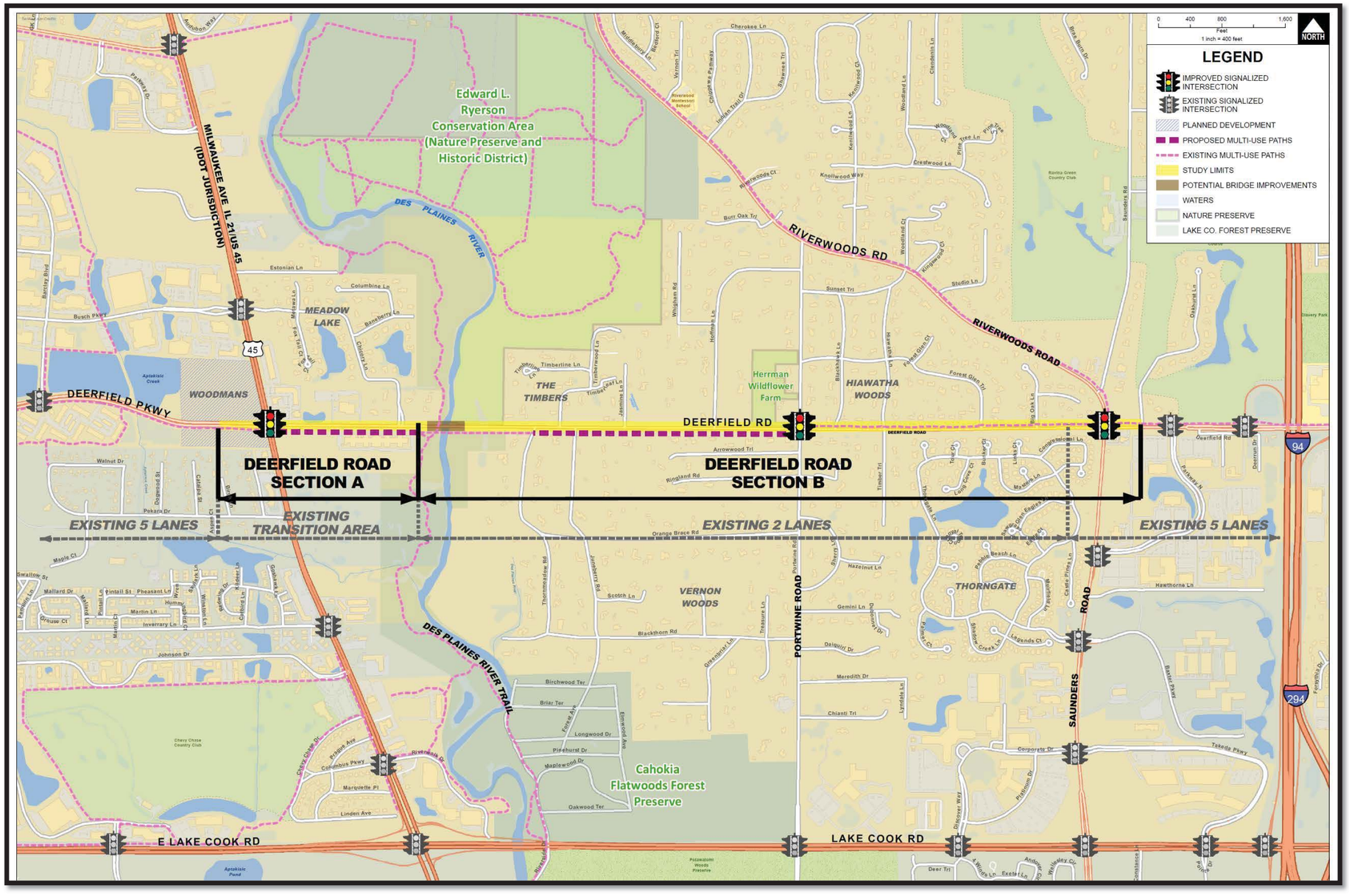
2.1.3.1 Deerfield Road Section A and Section B

Through the evaluation process, it became evident that Deerfield Road has two distinct "sections" within the corridor, shown in Figure 2-1. Section A is the west portion of the corridor inclusive of the Milwaukee Avenue intersection. Section A is mostly commercial with high volume access driveways. Section B is the east portion of the corridor; from the Des Plaines River to and inclusive of the Saunders/Riverwoods Road intersection. Section B consists of large lot residential with many low volume access driveways and streets. Due to the differing adjacent land use to Section A and Section B, each have unique transportation demands and needs, and therefore alternative concepts and a range of alternatives were developed for each.

Based on traffic volumes and delays at the Milwaukee Avenue intersection, a large improvement is anticipated. Specifically, the east leg of the Milwaukee Avenue intersection along Deerfield Road for up to 2,000 feet can be affected by the intersection improvement with lane shifts and lane drops. Therefore, Section A alternatives are focused around the alternatives considered at the Milwaukee Avenue intersection. Section 2.1.3.2 provides a discussion of the intersection concepts considered at the Milwaukee Avenue intersection, and Section 2.2.2 presents and discusses the range of alternatives that were developed and comparatively evaluated.

Initial concepts for Section B that were considered and dismissed are discussed in Section 2.1.3.3, and Section 2.2.2 presents and discusses the range of alternatives developed and comparatively evaluated.

Figure 2-1: Deerfield Road Section A and B Range of Alternatives Location Map



2.1.3.2 Section A Initial Concepts

This section provides a discussion of the Milwaukee Avenue intersection concepts considered.

Grade Separation

Some members of the Stakeholder Involvement Group (SIG) and resource agencies asked if a grade separation was under consideration. Due to the high traffic volume on both Milwaukee Avenue and Deerfield Road, a grade separation was considered at the intersection. However, like the Milwaukee Avenue and Lake Cook Road interchange located approximately one (1) mile south of the intersection, a large footprint needing up to 25 acres of additional ROW would be required and result in environmental and socio-economic impacts including impacts to floodplain, floodway, high quality wetland, nature preserve, property impacts, and building displacements. The cost of a grade separation at over $75M is prohibitively high, and there is little to no support from stakeholders for an improvement to this extent. Therefore, a grade separation was dismissed.

Milwaukee Avenue and Lake Cook Road Interchange

At-Grade Intersection Configurations

None of the at-grade intersection configurations were dismissed prior to the comparative evaluation in Section 2.2.

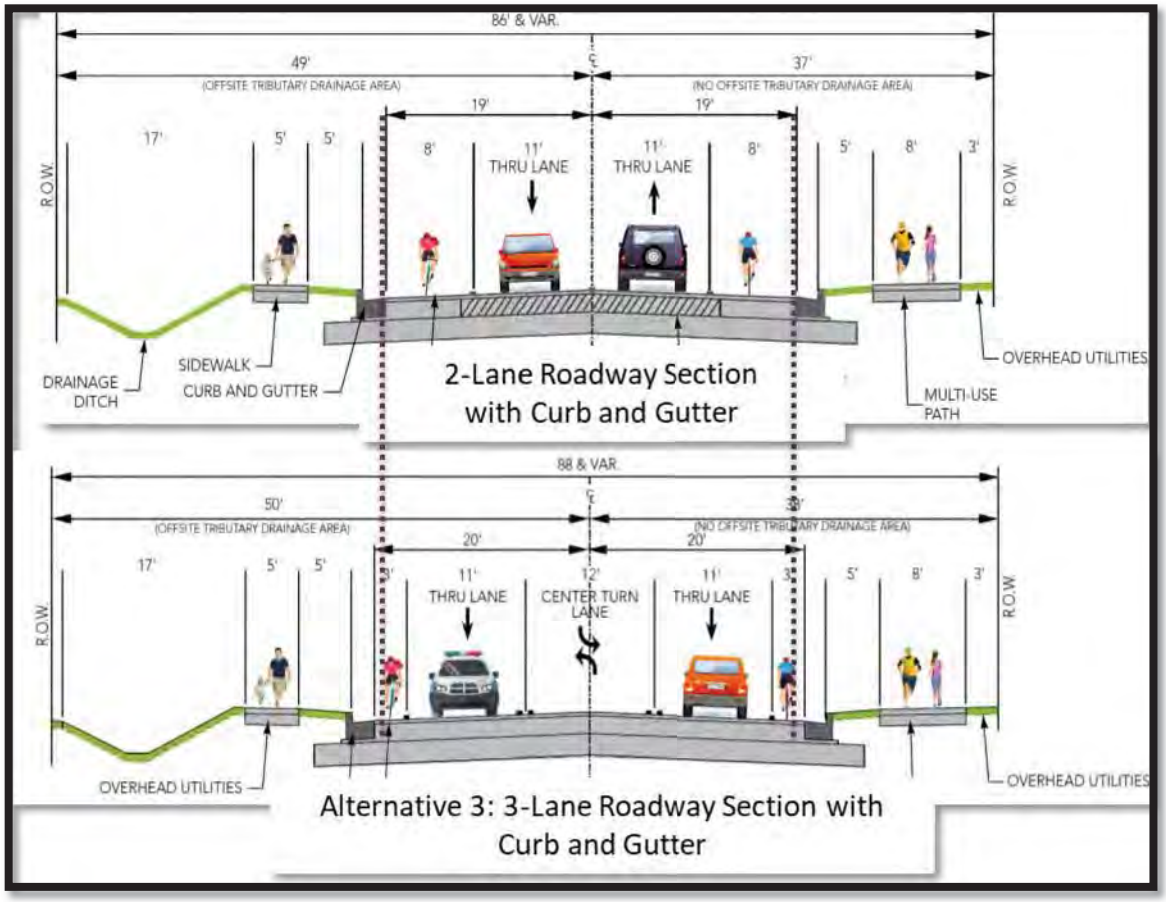
2.1.3.3 Section B Initial Concepts

Typical roadway sections were identified based on initial project stakeholder coordination and agency scoping. These roadway typical sections were screened with respect to geometric requirements, and the alternatives carried forward for comparative evaluation are discussed in Section 2.2.2. A 2-lane with curb and gutter was not carried forward and is described below.

2-Lane with Curb and Gutter

Representatives from the Riverwoods Preservation Council (RPC), an active local group promoting environmental awareness and education, requested consideration of a 2-Lane Roadway Section with Curb and Gutter to minimize the roadway footprint. For 2-lane arterials, eight (8) foot wide shoulders are required per IDOT Bureau of Local Roads and Streets (BLRS) Figure 32-2D to accommodate emergency vehicles. This is not required for 3-lane arterials because emergency vehicles can utilize the center turn lane. As shown in Figure 2-2, the 2-lane with curb and gutter has 1 foot less of pavement width in each direction than the 3-lane with curb and gutter, for a total pavement width savings of two (2) feet (38 feet versus 40 feet, respectively). While the 2-lane roadway section with curb and gutter was considered, it was dismissed prior to the comparative evaluation because providing a center turn lane is a more effective use of the pavement area as it improves safety, mobility, and operations. A 2-lane roadway section with shoulder and ditch was evaluated as Alternative 1.

Figure 2-2: 2-Lane Roadway Section with Curb and Gutter Compared to a 3-Lane Roadway Section with Curb and Gutter



2.2 What Alternatives were Eliminated and Why?

2.2.1 Section A Alternatives Comparative Evaluation

Based on traffic volumes and delays, a large intersection improvement is anticipated at the Deerfield Road and Milwaukee Avenue intersection. Specifically, on the east leg of Milwaukee Avenue intersection nearly 2,000 feet is needed for lane shifts, advanced warning distance, and lane drops related to added lanes at the intersection. Therefore, Section A alternatives are focused around the alternatives considered at the Milwaukee Avenue intersection.

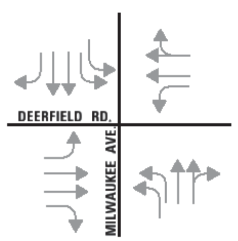
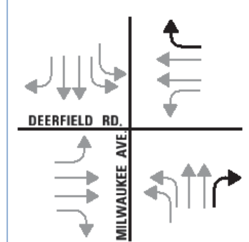
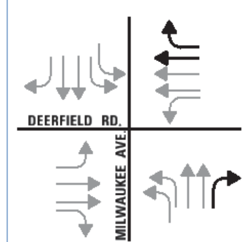
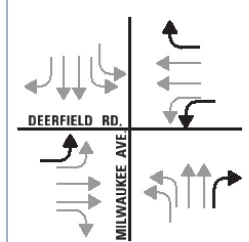
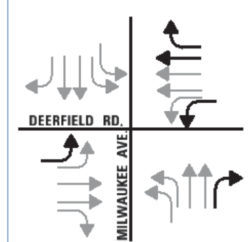
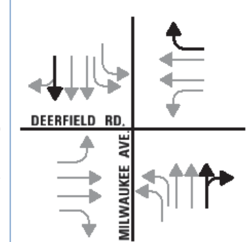
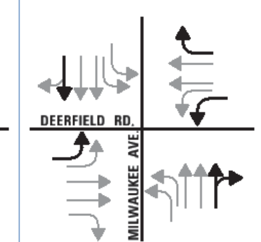
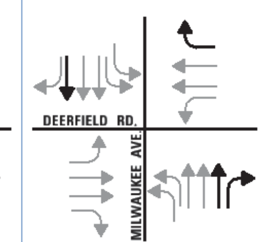
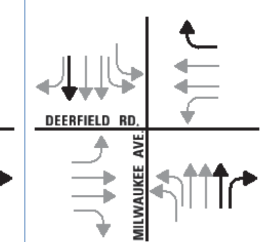
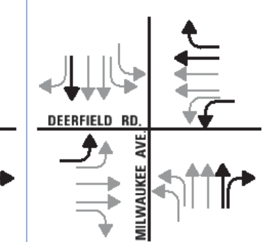
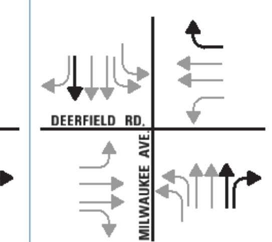
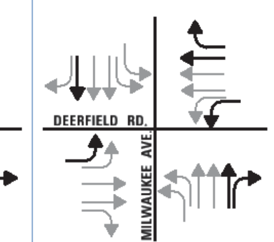
A range of 12 alternatives were developed and evaluated for Section A. Basic lane diagrams are shown in Figure 2-3, with the grey arrows being the 2040 No-Build and black arrows indicating the proposed lanes for the respective alternative. The following description of the alternatives include the specific improvements being made to the 2040 No-Build alternative, and include:

- 2040 No-Build
- Alternative A1A: Add a westbound (WB) right turn lane (RTL) and extend the northbound (NB) RTL
- Alternative A1B: Alt. A1A plus add a 3rd WB Thru Lane on Deerfield Road
- Alternative A1C: Alt. A1A plus add dual left turn lanes (LTLs) on Deerfield Road
- Alternative A1D: Alt. A1A plus add a 3rd WB Thru Lane and Dual LTLs on Deerfield Road
- Alternative A2A: Alt. A1A plus add NB and SB combined 3rd Thru/RTL on Milwaukee Avenue (Lane Drop Following Intersection)
- Alternative A2B: Alt. A1C plus add NB and SB combined 3rd Thru/RTL on Milwaukee Avenue (Lane Drop Following Intersection)
- Alternative A3A: Alt. A1A plus add a 3rd NB and SB Thru Lane on Milwaukee Avenue at Intersection (Lane Drop Following Intersection)
- Alternative A3B: Alt. A3A plus add Dual LTLs on Deerfield Road (Milwaukee Avenue Lane Drop Following Intersection)
- Alternative A3C: Alt. A3B plus add a 3rd WB Thru Lane on Deerfield Road (Milwaukee Avenue Lane Drop Following Intersection)
- Alternative A4A: Alt. A1A plus add a 3rd NB and SB Thru Lane on Milwaukee Avenue Extended to Logical Termini
- Alternative A4B: Maximum Deerfield Road and Extended Milwaukee Avenue Improvement (A1D plus A4A)

A summary of the key comparative results is provided in the sections below.

Based on the alternative evaluation, the preferred intersection configuration is Alternative A1D: add a westbound right turn lane, extend the northbound right turn lane, add a third westbound thru lane, and add dual left turn lanes on both Deerfield Road approaches. The resulting recommendations are discussed in 2.3.

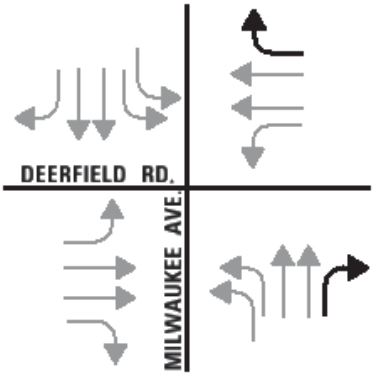
Figure 2-3: Section A Evaluation Table

Alternative and Description	2040 No-Build	Alternative A1a	Alternative A1b	Alternative A1c	Alternative A1d	Alternative A2a	Alternative A2b	Alternative A3a	Alternative A3b	Alternative A3c	Alternative A4a	Alternative A4b
	Development Improvements Currently under Construction and 2040 Traffic Volumes	Add WB RTL, Extend NB RTL	Alt. A1A plus 3rd WB Thru on Deerfield Road	Alt. A1A plus Dual LTLs on Deerfield Road	Alt. A1A plus 3rd WB Thru and Dual LTLs on Deerfield Road	Alt. A1A plus NB and SB Combined 3rd Thru/RTL on Milwaukee Avenue (Lane Drop Following Intersection)	Alt. A1C plus NB and SB Combined 3rd Thru/RTL on Milwaukee Avenue (Lane Drop Following Intersection)	Alt. A1A plus 3rd NB and SB Thru Lanes on Milwaukee Avenue at Intersection (Lane Drop Following Intersection)	Alt. A3A plus Dual LTLs on Deerfield Road (Lane Drop on Milwaukee Avenue Following Intersection)	Alt. A3A plus Maximum Deerfield Road (Lane Drop on Milwaukee Avenue Following Intersection)	Alt. A1A plus 3rd NB and SB Thru Lanes on Milwaukee Avenue Extended to Logical Termini	Maximum Deerfield Road and Extended Milwaukee Avenue Improvement
												
Deerfield Road at Milwaukee Avenue Intersection Delay (PM, seconds/ vehicle)	218.5	92.0	86.7	88.1	72.1	93.0	91.7	77.4	74.0	60.8	61.0	50.6
Deerfield Road Westbound Approach Delay (PM, seconds/ vehicle)	530.3	85.8	92.0	98.0	69.7	76.3	77.9	85.5	77.8	55.6	76.0	55.5
Total Travel Time from Saunders/ Riverwoods Road thru Milwaukee Avenue (PM, minutes)	31.7	11.7	7.9	11.8	6.7	10.8	9.9	13.2	9.7	6.7	12.1	6.7
Milwaukee Avenue Impacts	None	Minimal with No Added Thru Lane Capacity on Milwaukee Avenue				Adds approx. 1.8 AC of ROW and $11.3M to Project with Combined 3rd Thru/RTL on Milwaukee Avenue at Intersection Only		Adds approx. 2.2 AC of ROW and $18.9M to Project with Thru Lane Capacity Added on Milwaukee Avenue at Intersection Only			Adds approx. 8.3 AC of ROW and $47M to Project with Extended Milwaukee Avenue Improvements	
Results	Dismissed	Carried as part of Preferred Alternative	Carried as part of Preferred Alternative	Carried as part of Preferred Alternative	**Preferred Alternative**	Dismissed	Dismissed	Dismissed	Dismissed	Dismissed	Dismissed	Dismissed

2.2.1.1 Alternative A1A

Introducing exclusive RTLs separates right turning vehicles from the thru movement, decreasing delay, total travel time, and queues. The alternative demonstrates that adding auxiliary lanes is effective in decreasing delay and total travel time for Deerfield Road and is carried forward as part of the preferred alternative.

Alternative A1A

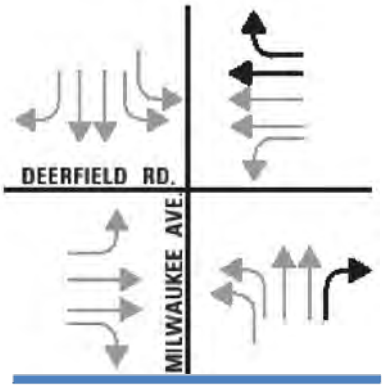


2.2.1.2 Alternative A1B

In addition to Alternative A1A, a third WB thru lane is proposed to be added on the east approach of Deerfield Road which lines up with the three thru lanes on the west side of Milwaukee Avenue.

Adding a 3rd WB Thru lane improves overall intersection delay and westbound total travel time, but increases eastbound total travel time. Therefore, this alternative was dismissed.

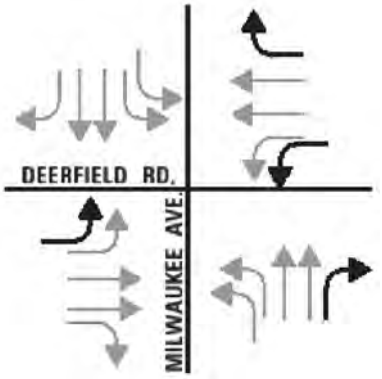
Alternative A1B



2.2.1.3 Alternative A1C

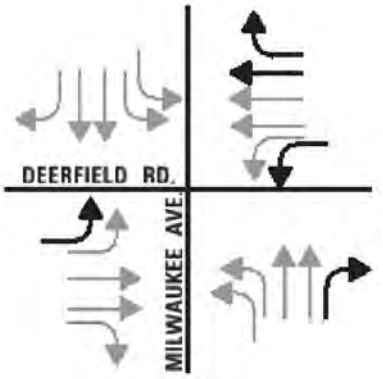
Adding dual LTLs on Deerfield Road approaches improves overall intersection delay and total travel time compared to Alternative A1A, however this widens the west approach of Deerfield Road just reconstructed with the private development improvements, and increases adjacent property impacts. This alternative is carried forward as part of the preferred alternative.

Alternative A1C



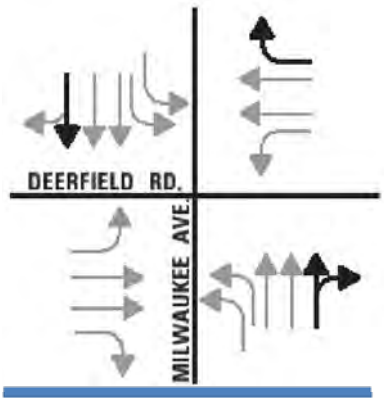
2.2.1.4 Alternative A1D

Alternative A1D

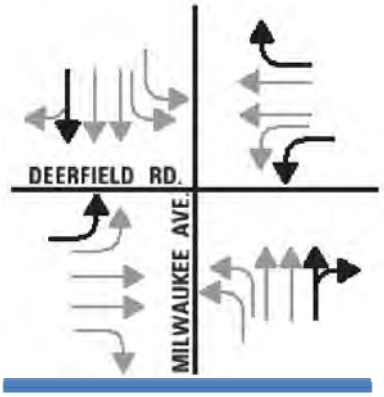


Adding the 3rd WB Thru lane and dual LTLs on Deerfield Road approaches improves intersection delay and total travel time compared to Alternative A1A. Alternative A1D maximizes improvements and transportation performance to the Deerfield Road legs of the intersection with this project, which sets up well for future improvements on the Milwaukee Avenue legs of the intersection (to be completed by IDOT) as no further improvements would be proposed on Deerfield Road. This is the preferred alternative.

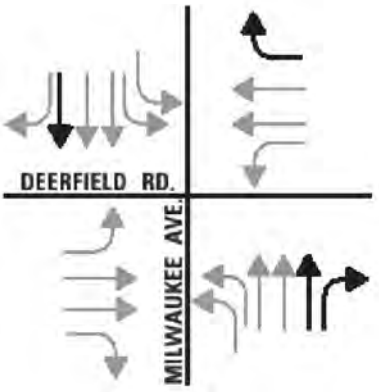
Alternative A2A



Alternative A2B



Alternative A3A



2.2.1.5 Alternative A2A

Alternative A2A adds a WB RTL on Deerfield Road and a combined 3rd Thru/RTLs on the NB and SB approaches of Milwaukee Avenue. This alternative was dismissed as it does not provide a notable benefit over Alternative A1A, and results in approximately 1.8 AC of additional ROW and $11.3M of additional cost to the project.

2.2.1.6 Alternative A2B

Adding dual LTLs on the Deerfield Road approaches slightly decreases some approach delays and total travel time compared to Alternative A2A, and specifically decreases EB approach delay substantially. However, the intersection and all other approach delays are similar to Alternative A2A and do not justify the additional ROW impacts on Deerfield Road. Therefore, this alternative was dismissed.

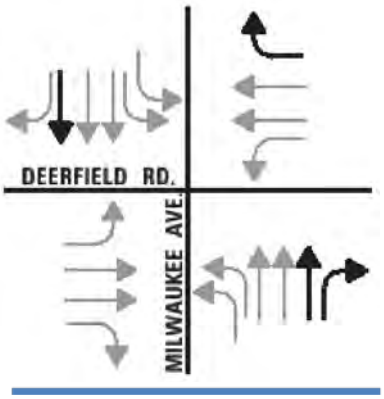
2.2.1.7 Alternative A3A

Adding the 3rd NB and SB thru lanes at the intersection only is not as effective at alleviating delay as if they were extended further south and north to Lake Cook Road and Aptakisic Road, respectively. As an extended Milwaukee Avenue improvement project is outside the scope for this Deerfield Road project, this alternative was dismissed.

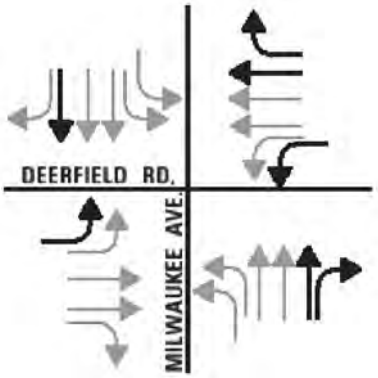
2.2.1.8 Alternative A3B

Adding dual LTLs on the Deerfield Road approaches improves overall intersection delay and total travel time compared to Alternative A3A, however the west approach of Deerfield Road is proposed to be widened, and this leg was just reconstructed with the private development improvements. While adding thru capacity on Milwaukee Avenue at the intersection slightly improves intersection delay and WB travel time compared to Alternative A1C and Alternative A2B, the benefit is not substantial enough to justify an intersection only add-lanes on Milwaukee Avenue. Therefore, this alternative was dismissed.

Alternative A3B



Alternative A3C

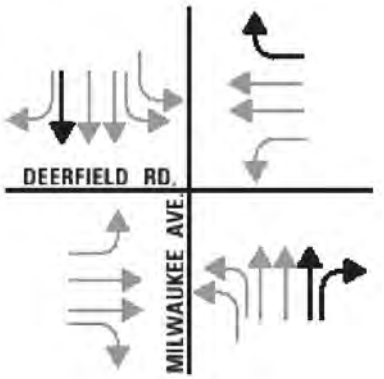


2.2.1.9 Alternative A3C

This alternative demonstrates the effect of adding the 3rd NB and SB thru lanes at the intersection only to the recommended Alternative A1D. The alternative was dismissed as it does not show an improvement to the EB and WB total travel time on Deerfield Road compared to Alternative A1D.

2.2.1.10 Alternative A4A

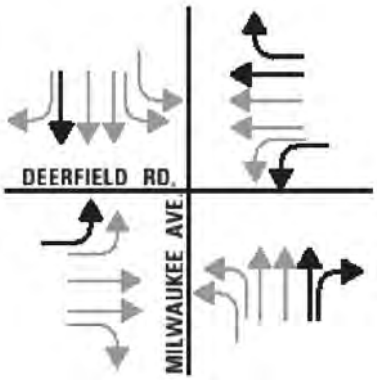
Alternative A4A



This alternative demonstrates the benefits to the intersection transportation performance by adding the 3rd NB and SB thru lanes on Milwaukee Avenue for an extended distance to logical termini such as south to Lake Cook Road and north to Aptakisic Road. Adding a 3rd thru lane in each direction on Milwaukee Avenue was recommended as part of the IDOT SRA study, however the Deerfield Road study is a county project and substantial improvements to state routes are not anticipated without IDOT cost participation. If the county were to add a 3rd NB and SB thru lane on Milwaukee Avenue as part of the Deerfield Road improvements without IDOT cost participation, the proposed geometry would have lane drops following the intersection which does not perform as well. Therefore, this alternative was dismissed.

2.2.1.11 Alternative A4B

Alternative A4B



This alternative demonstrates the benefits to the intersection transportation performance by adding the 3rd NB and SB thru lanes on Milwaukee Avenue for an extended distance to logical termini such as south to Lake Cook Road and north to Aptakisic Road. Alternative A4B also maximizes Deerfield Road improvements which result in the lowest delay and total travel time of the Alternatives studied, but also the most impacts to properties adjacent to Deerfield Road and Milwaukee Avenue. The westbound approach delay is not substantially less than for other alternatives considering the additional ROW impacts. Therefore, this alternative was dismissed.

2.2.1.12 Intersection Alternatives Evaluation Conclusion

Alternative A1A demonstrates that adding two auxiliary lanes is effective at decreasing delays and total travel times for Deerfield Road. Alternative A1A is the minimum intersection improvement proposed, and is part of the preferred alternative, A1D.

Alternatives A1B, A1C, and A1D are various levels of improvement to Deerfield Road with no added thru capacity on Milwaukee Avenue. All show improvement to the overall intersection

and Deerfield Road transportation performance. Alternative A1D is the preferred alternative as it sets up well for future Milwaukee Avenue improvements to be completed by IDOT by maximizing Deerfield Road improvements. Alternative A1C is carried forward as part of the preferred alternative. Alternative A1B was dismissed as a stand-alone project as it increases the eastbound left turn lane delay.

Alternative A2A and A2B were dismissed due to the increased delay for the southbound approach over Alternative A1A.

Alternative A3A, A3B, and A3C have a lane drop following the intersection. These alternatives do not decrease the total travel time as compared to Alternative A1A and A1D, and were dismissed for additional ROW impacts to Milwaukee Avenue without comparable additional benefits.

Alternative A4B combines maximum Deerfield Road improvements with extended Milwaukee Avenue improvements. While transportation performance is best of all Alternatives, impacts are also the highest with over 8.3 acres of ROW and $47M added for extended Milwaukee Avenue improvements. The preferred alternative (Alternative A1D) provides benefits as a stand-alone project, and sets up the intersection for the Alternative A4B future benefits as Deerfield Road improvements will already be maximized.

2.2.2 Section B Alternatives Comparative Evaluation

The Range of Alternatives was developed from the initial screening process and was conceptually developed and comparatively evaluated with respect to transportation performance, mobility, safety, environmental and socio-economic impacts, and cost. Based on the range of alternative evaluation results, a clear preferred alternative arose. The alternatives to be carried forward included Alternative 3: 3-Lane Roadway Section with Curb and Gutter (the preferred alternative) and 2040 No-Build for more detailed development and comparative evaluation. The following presents a summary of the range of alternatives and key considerations of the evaluation results to arrive at a preferred alternative for the project.

The range of alternatives consists of six alternatives and are shown as typical sections in Figure 2-4. Each alternative was conceptually developed based on the typical roadway cross sections, based on applicable LCDOT and IDOT roadway design criteria. Each of the alternatives was reviewed by LCDOT and IDOT to ensure an acceptable concept level design for comparative evaluation. The Section B range of alternatives consist of:

- 2040 No-Build
- Alternative 1 – 2-Lane with shoulder and ditch
- Alternative 2 – 3-Lane with shoulder and ditch
- Alternative 3 – 3-Lane with curb and gutter

- Alternative 4 – 4-Lane with curb and gutter
- Alternative 5 - 5-Lane with curb and gutter

The comparative evaluation was based on the following measurable criteria:

- Transportation Performance
- Mobility
- Safety
- Environmental Resource and Socio-Economic Impacts
- Construction Cost

Are Pedestrians and Bicycles Accommodated?

The Section B rang of alternatives were developed with a multi-use path on one side of the roadway and opposing sidewalk. Deerfield Road is included on the 2040 County Bike Plan, and the proposed multi-use path will be built with this project. A sidewalk was included in the comparative evaluation, and ultimately will require a local agency sponsor to be included in this project. After the comparative evaluation, the Village of Riverwoods declined a sidewalk. The sidewalk was removed for the alternative carried forward discussion. A bike friendly shoulder is included for all alternatives based on the LCDOT typical roadway section.

The results of this comparative evaluation are presented in the Section B Range of Alternative Evaluation Table, Figure 2-5. To minimize the influence of Section A on the Section B comparative results, all Section B alternatives assumed the same Section A Alternative A1A improvement and no improvement at the Saunders/ Riverwoods Road intersection to be implemented. Each alternative also assumes a bike path along the south side of Deerfield Road from Thornmeadow Road to Portwine Road, and along the north side of Deerfield Road between Portwine Road and Saunders/Riverwoods Road. The signalized intersection at Portwine Road is assumed to remain in all alternatives with an added northbound and southbound left turn lane. The preferred alternatives for Section A (Alternative A1D) and Section B (Alternative 3: 3-Lane with Curb and Gutter) are combined in Section 2.3.

Figure 2-4: Section B Range of Alternatives Typical Sections

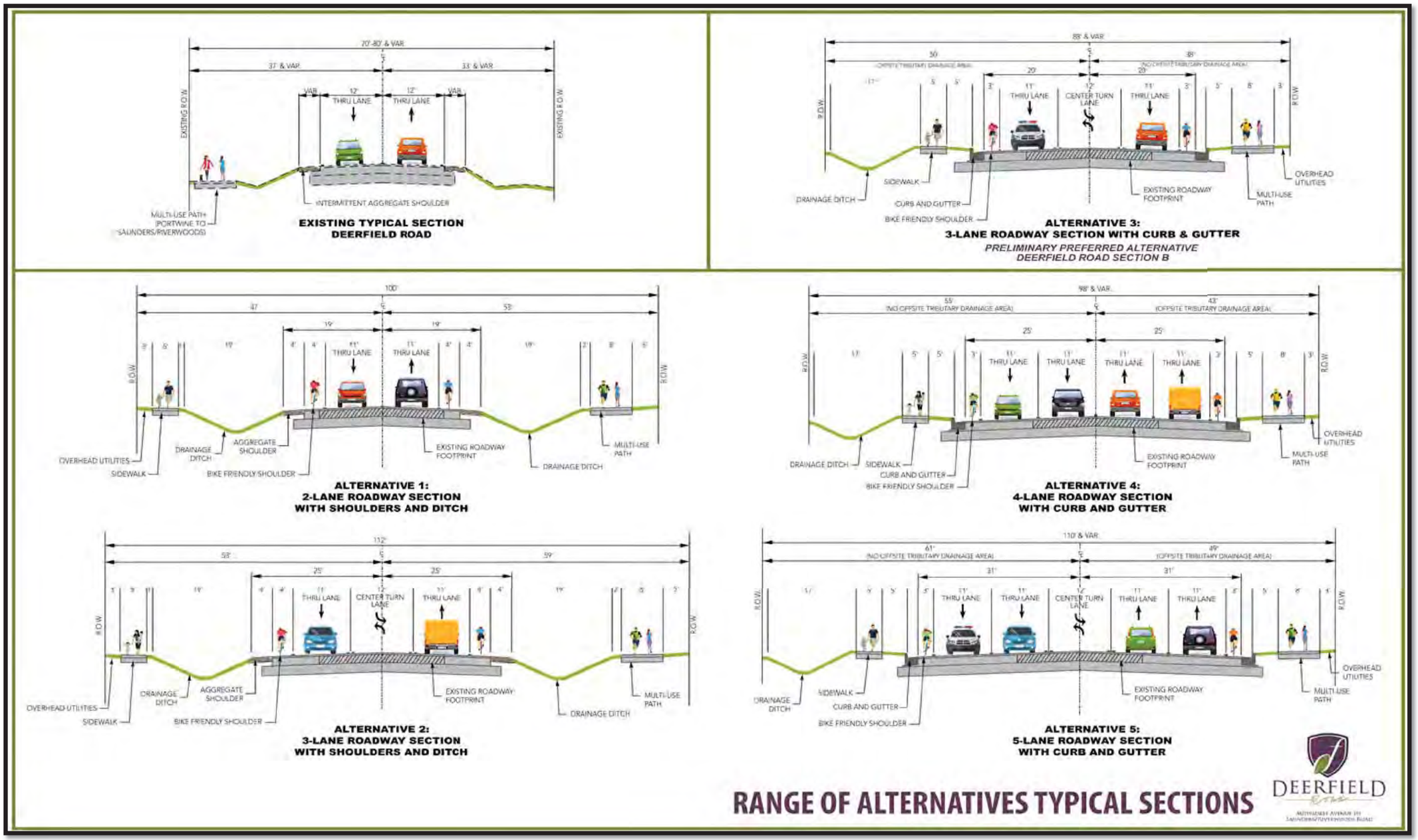
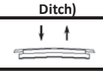
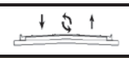
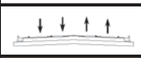
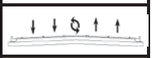


Figure 2-5: Section B Range of Alternatives Evaluation Table

Evaluation Criteria	Unit of Measure	No-Build 2040 Incorporating Private Development Lane Additions and Volumes	Range of Alternatives (Same Milwaukee Avenue and Saunders/Riverwoods Road Intersection Improvements Assumed)									
			Alternative 1 2 Lanes (Shldr & Ditch)		Alternative 2 3 Lanes (Shldr & Ditch)		Alternative 3 3 Lanes (Curb)		Alternative 4 4 Lanes (Curb)		Alternative 5 5 Lanes (Curb)	
												
Transportation Performance (Synchro Modeling)												
Deerfield Road Average Daily Traffic (ADT)		20,200	20,200		20,600		20,600		22,600		22,900	
Intersection Level of Service (LOS) and Average Delay [1]		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Deerfield Road at Portwine Road Intersection	LOS (sec/veh)	C (25.7)	D (37.1)	C (24.5)	D (38.8)	C (25.0)	D (45.0)	C (25.0)	D (45.0)	A (9.6)	B (13.9)	B (10.3)	B (15.9)
Deerfield Road at Saunders/ Riverwoods Road	LOS (sec/veh)	C (29.9)	D (37.5)	C (29.3)	C (33.1)	C (29.2)	C (33.9)	C (29.2)	C (33.9)	C (32.4)	D (36.4)	C (33.1)	D (36.1)
Total Travel Time		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Deerfield Road Eastbound (Milwaukee Avenue to Saunders/Riverwoods Road)	minutes	6.5	6.8	7.1	7.4	6.5	6.7	6.5	6.7	5.9	6.5	5.9	6.6
Deerfield Road Westbound (Saunders/ Riverwoods Road to Milwaukee Avenue)	minutes	6.6	35.6	5.2	10.7	4.8	11.7	4.8	11.7	4.5	14.9	4.5	15.8
Mobility (Synchro Modeling)													
Roadway Section Average Vehicular Gap Acceptance		AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Gaps Per Hour at Stop Controlled Intersections/Driveways (Reference location Timbewood Ln/Juneberry Rd)	#gaps (>8 seconds) per hour	52	0	60	33	53	31	53	31	73	31	74	38
Non-Motorized Accommodations													
Non-Motorized Accommodations	scale	-		+++++		+++++		+++++		+++++		+++++	
Safety (Illinois Highway Safety Design Manual)													
Average Predicted Crashes - Deerfield Road (Milwaukee Avenue to Saunders/Riverwoods Road)	% increase injury crashes/year	4.8%		4.8%		-51.4%		-51.4%		-38.2%		-48.6%	
Environmental Resources													
Added Net Pavement/Impervious Area	acres	-		5.88		7.23		6.92		9.24		10.51	
Floodplain Impact	acres	-		11.77		11.80		11.77		11.84		11.90	
Floodway Impact	acres	-		1.46		1.46		1.46		1.49		1.49	
Wetlands Impact	acres	-		0.57		0.60		0.52		0.54		0.56	
High Quality Wetlands Impact	acres	-		0.09		0.09		0.09		0.09		0.09	
Tree Impacts	acres	-		9.00		9.69		7.49		8.45		9.65	
Natural Area Impacts	acres	-		0.0		0.0		0.0		0.0		0.0	
Nature Preserve Impacts	acres	-		0.0		0.0		0.0		0.0		0.0	
Forest Preserve District Impacts	acres	-		0.0		0.0		0.0		0.0		0.0	
Socio-Economic Impacts													
Community Context & Character	scale	-		+++++		+++		++++		++		+	
Residential/Commercial Structure Impacts	each	-		0		0		0		0		0	
Residential Right-of-Way Acquisition	acres	-		3.87		4.86		2.60		3.62		4.87	
Commercial Right-of-Way Acquisition	acres	-		0.45		0.45		0.45		0.45		0.45	
Parcels Impacted	each	-		72		80		55		65		75	
Cost													
Preliminary Estimate of Construction Cost [2]	Dollars	-		$23-26M		$25-28M		$25-28M		$32-35M		$35-38M	

1) LOS is a letter grade from A (best) through F (worst) that represents the average amount of delay experienced at an intersection.

2) Includes the cost for property acquisition

Relative Comparison Scale

+	*Weakest in comparison to other alternatives*
++	
+++	
++++	*Strongest in comparison to other alternatives*
+++++	

2.2.2.1 Alternative 1: 2-Lane with Shoulder and Ditch

There is an improvement to the PM westbound total travel time for all build alternatives, and there is not a difference in the transportation performance between the build alternatives. From the 2040 No-Build to Alternative 1, the PM westbound total travel time improves from almost 36 minutes to about 11 minutes. This total travel time is within 1 minute of the preliminary preferred alternative. The intersection level of services (LOS) and delay are also similar between Alternative 1 and Alternative 3.

How is Access Being Addressed by the Project?

A key consideration for mobility within the study area is the ability to access Deerfield Road from side streets and access the side streets from Deerfield Road. Mobility was quantified based on how many acceptable gaps there are during the peak travel hour for side street users to access Deerfield Road. An acceptable gap is measured as an 8 second gap for side street vehicles turning onto Deerfield Road. All alternatives have improved mobility over the 2040 No-Build.

All alternatives have improved mobility over the 2040 No-Build. Based on the Synchro traffic model, side street access for the 2040 No-Build PM peak hour had no acceptable gaps. This improves to over 30 gaps per hour for all alternatives. AM peak hour gaps remains consistent.

Safety was analyzed using the Illinois Highway Safety Design Manual. The No-Build and Alternative 1 have a 5% increase in predicted injury crashes/year over existing conditions. Alternative 2, 3, 4, and 5 show a reduction in the predicted injury crashes/year with the 3-lane alternatives (Alternative 2 and 3) having the greatest reduction in injury crashes/year at over 50%. These alternatives meet Purpose and Need objectives to improve safety better than the 2040 No-Build or Alternative 1.

Alternative 1 has a large number of access points from the Des Plaines River to Saunders/Riverwoods Road. Based on IDOT guidance (per BDE Section 48-4.01), a center turn lane is warranted based on the number of access points per mile in order to reduce left turning vehicles conflicting with through traffic, causing delay. Finally, the Alternative 1 footprint is larger than the Alternative 3 footprint (preferred alternative), as shown in Figure 2-6 (about 100 feet vs 90 feet wide), which leads directly to an increase in environmental and socio-economic impacts. The 10 additional feet results in about 40% greater private property (ROW) impacts.

Alternative 1 does not provide an overall greater benefit than Alternative 3 for transportation performance, mobility, and safety measures of effectiveness. However, it has greater impacts, and was dismissed.

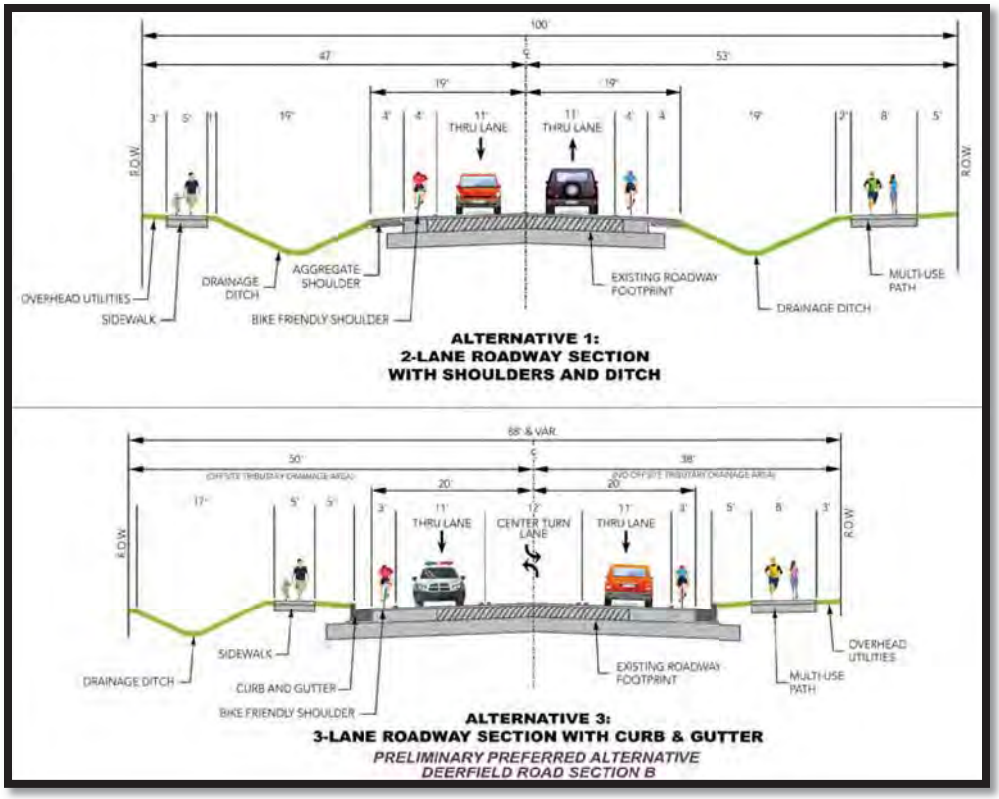


Figure 2-6: Alternative 1 Compared to Alternative 3 Footprint

2.2.2.2 Alternative 2: 3-Lane with Shoulder and Ditch

Alternative 2 and Alternative 3 are both 3-lane roadway sections, therefore the transportation performance, mobility, and safety are similar. The main differences are in the environmental resources and socio-economic impacts. The Alternative 3 footprint is approximately 90 feet wide versus the Alternative 2 footprint is approximately 110 feet wide, as shown in Figure 2-7, which directly correlates to higher environmental and private property impacts. The 20 additional feet results in about 75% greater private property impacts. While Alternative 2 may provide more community context and character based on stakeholder feedback desiring a more rural feel, this alternative was dismissed due to the additional impacts which include added impervious area, floodplain, wetland, and trees (see Figure 2-5).

Why is a Center Turn Lane Beneficial?

A center turn lane separates slowed or stopped left turning vehicles from through traffic, and improves delay, safety, and mobility. The 3-lane alternatives (Alternative 2 and 3) are predicted to have the greatest reduction in injury crashes/year at over 50% while the 2-lane alternative (Alternative 1) has a 5% increase in predicted injury crashes/year over existing conditions. Therefore, adding a center turn lane to a 2-lane roadway better meets Purpose and Need objectives to improve safety. In addition, a center turn lane is warranted for Deerfield Road based on the number of access points per mile to reduce left turning vehicles conflict with through traffic, causing delay.

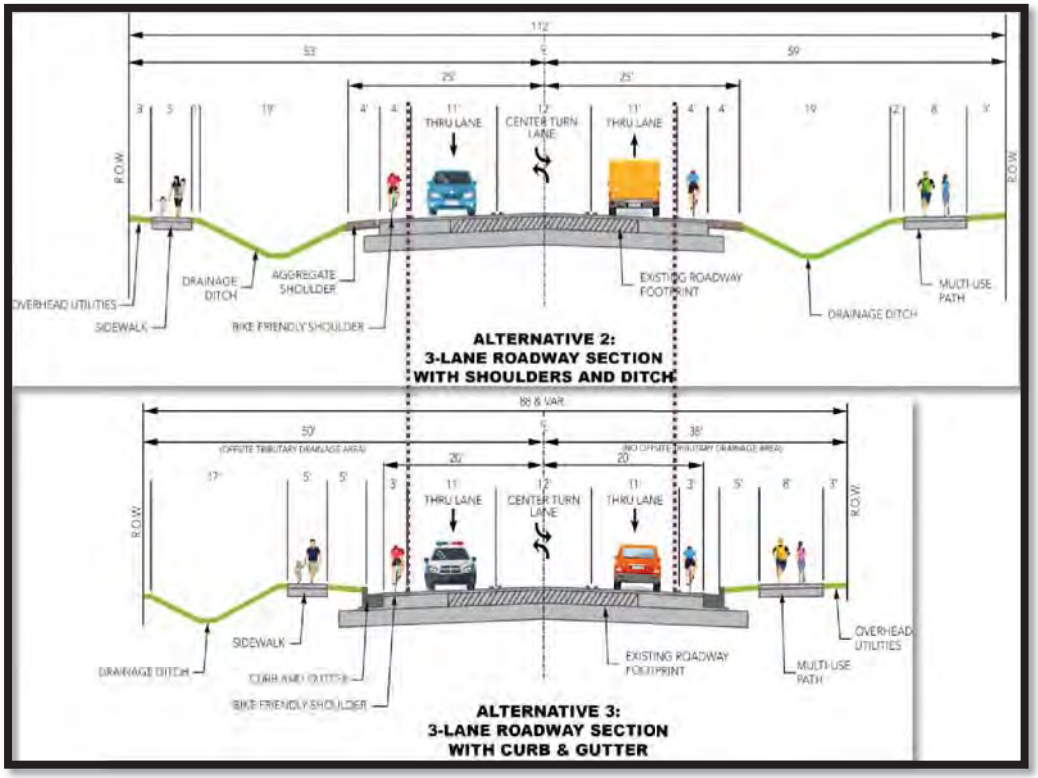


Figure 2-7: Alternative 2 compared to Alternative 3 Footprint

2.2.2.3 Alternative 3: 3-Lane with Curb and Gutter

There is an improvement to the PM westbound total travel time for all build alternatives. For Alternative 3, the PM westbound total travel time improves from almost 36 minutes to a little under 12 minutes.

How is the Long Queue Through the Corridor Being Addressed by the Project?

There is an improvement to the PM westbound total travel time for all build alternatives. Specific to Alternative 3, the PM westbound total travel time is reduced to a third of the 2040 No-Build (from about 36 minutes to 12 minutes), resulting in less delay through the corridor and shorter queues at intersections.

A key consideration for mobility is the ability to access Deerfield Road from side streets and access the side streets from Deerfield Road. Mobility was measured as 8 second gaps for side street vehicles turning onto Deerfield Road. All alternatives also have improved mobility over the 2040 No-Build. Based on the Synchro traffic model, side street access for the 2040 No-Build PM peak hour is zero acceptable gaps per hour. This improves to over 30 gaps per hour for all alternatives. AM peak hour gaps per hour remains consistent.

Alternative 3 has the smallest footprint at 90 feet which leads directly to smaller environmental and socio-economic impacts. Alternative 1 has a smaller amount of added impervious area. Otherwise, Alternative 3 has or ties for the lowest amount of

floodplain, floodway, wetlands, high quality wetlands, and tree impacts. All alternatives were designed to avoid natural area, nature preserve, forest preserve district, and building impacts, and Alternative 3 has the lowest amount of ROW acquisition.

2.2.2.4 Alternative 4: 4-Lane with Curb and Gutter

As shown in Figure 2-5, the WB and EB Total Travel Time is similar between Alternative 3 and Alternative 4 because the proposed termini intersection geometry is the same for all alternatives. The Portwine Avenue intersection LOS improves for Alternative 4 as compared to Alternative 3 due to the improved capacity of two thru lanes versus one thru lane. Mobility as measured by acceptable gaps per hour is similar between Alternative 3 and 4. Safety improves more for Alternative 3 than Alternative 4.

The Alternative 4 footprint is about 100 feet as compared to the Alternative 3 footprint of 90 feet, as shown in Figure 2-8. As previously described, the wider footprint directly correlates to higher environmental and property impacts. Alternative 4 results in 30% greater adjacent property (ROW) impacts than Alternative 3. Generally, Alternative 1 and Alternative 4 have similar footprints and impacts, with an exception that Alternative 4 has a greater amount of added pavement area which will result in higher detention requirements, which may be in ponds or pipes. Open space to provide any mitigation is very limited in this corridor. The cost estimate for Alternative 4 is approximately 30% higher than Alternative 3.

Alternative 4 does not provide an overall greater benefit to Alternative 3 for transportation performance, mobility, and safety measures of effectiveness. However, it has greater impacts, and was dismissed.

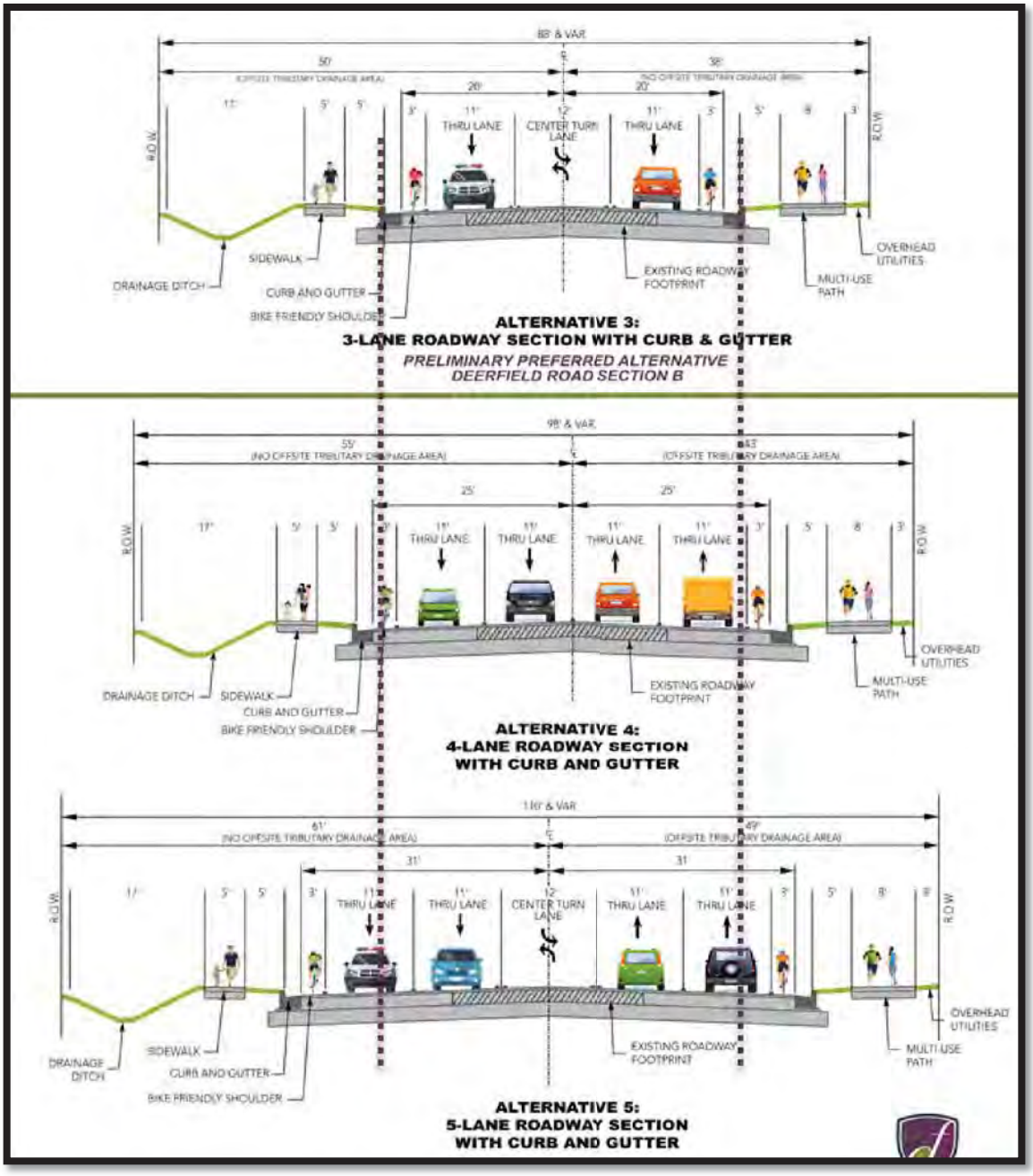


Figure 2-8: Alternative 3 Compared to Alternative 4 and 5 Footprints

2.2.2.5 Alternative 5: 5-Lane with Curb and Gutter

As shown in Figure 2-5, the WB and EB Total Travel Time is similar between Alternative 3 and Alternative 5 because the proposed termini intersection geometry is the same for all alternatives. The Portwine Avenue intersection LOS improves for Alternative 5 as compared to Alternative 3 due to the improved capacity of two thru lanes versus one

thru lane. Mobility as measured by acceptable gaps per hour is similar between Alternative 3 and 5. Safety improves more for Alternative 3 than Alternative 5.

The Alternative 5 footprint is about 110 feet as compared to the Alternative 3 footprint of 90 feet, as shown in Figure 2-8. As previously described, the wider footprint directly correlates to higher environmental and property impacts. Alternative 5 results in 75% greater adjacent property (ROW) impacts than Alternative 3. Generally, Alternative 2 and Alternative 5 have similar footprints and impacts, with an exception that Alternative 5 has a greater amount of added pavement area which will result in higher detention requirements, which may be in ponds or pipes. Open space to provide any mitigation is very limited in this corridor. The cost estimate for Alternative 5 is approximately 50% higher than Alternative 3.

Alternative 5 does not provide an overall greater benefit to Alternative 3 for transportation performance, mobility, and safety measures of effectiveness. However, it has greater impacts, and was dismissed.

2.2.2.6 Range of Alternative Evaluation Conclusions

In conclusion, Alternative 3, 3-Lane with Curb & Gutter was chosen as the preferred alternative because it provides:

- Best overall transportation performance improvement
- Good mobility improvement
- Greatest safety improvement
- Smallest roadway footprint
- Lowest environmental and socio-economic impacts
- Lower cost alternative

Alternative	Does the Alternative Meet the Purpose and Need?		Was the Alternative Carried Forward for Detailed Study?	
	Yes	If No, Why?	If No, Why?	Finalist
No-Build		Decreases transportation performance, mobility and safety	Yes	X
1		Decreases safety	No, decreases safety from existing conditions	
2	X		No, similar performance to Alt 3, but greater impacts	
3	X		Yes	X
4	X		No, similar performance to Alt 3, but greater impacts & cost	
5	X		No, similar performance to Alt 3, greater impacts & cost	

2.3 What are the Alternatives to Be Carried Forward?

The alternatives to be carried forward include the No-Build and the combination of Alternative A1D from Section A and Alternative 3 from Section B (Preferred Alternative). The No-Build alternative consists of no additional geometric or capacity improvements to the project corridor and intersections within the 2040 planning horizon, and does not address the transportation performance, safety, mobility and operational deficiencies. The No-Build is carried forward as a baseline for comparison of impacts and benefits.

The Preferred Alternative is shown in Figure 2-9. A comparative analysis of the No-Build and Preferred Alternative was performed with respect to transportation performance, mobility, safety, environmental resource impacts, socio-economic impacts, and design/cost considerations. The resulting Impact Evaluation is shown in Figure 2-10.

Figure 2-9: Preferred Build Alternative

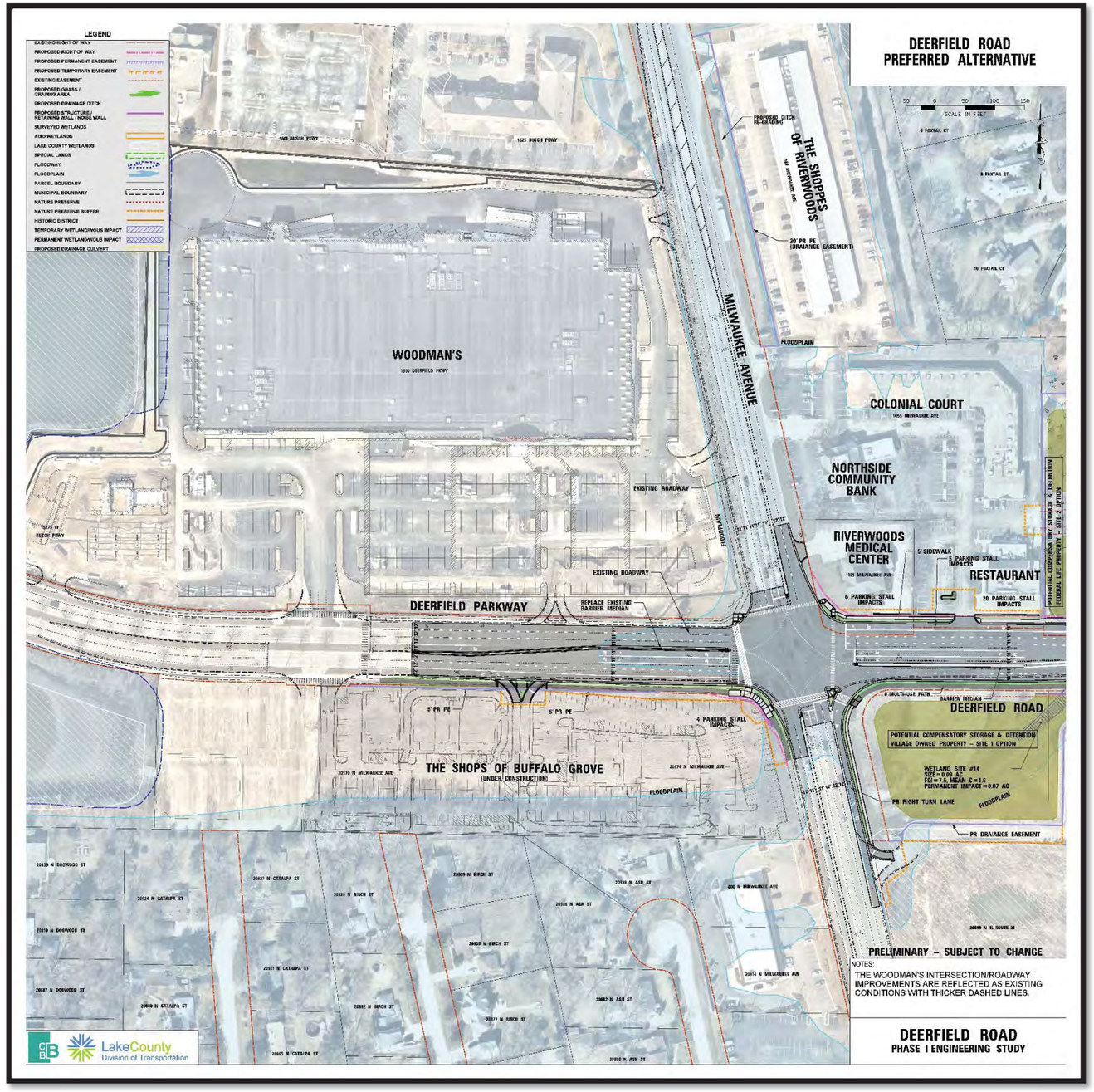


Figure 2-9: Preferred Build Alternative (con't)

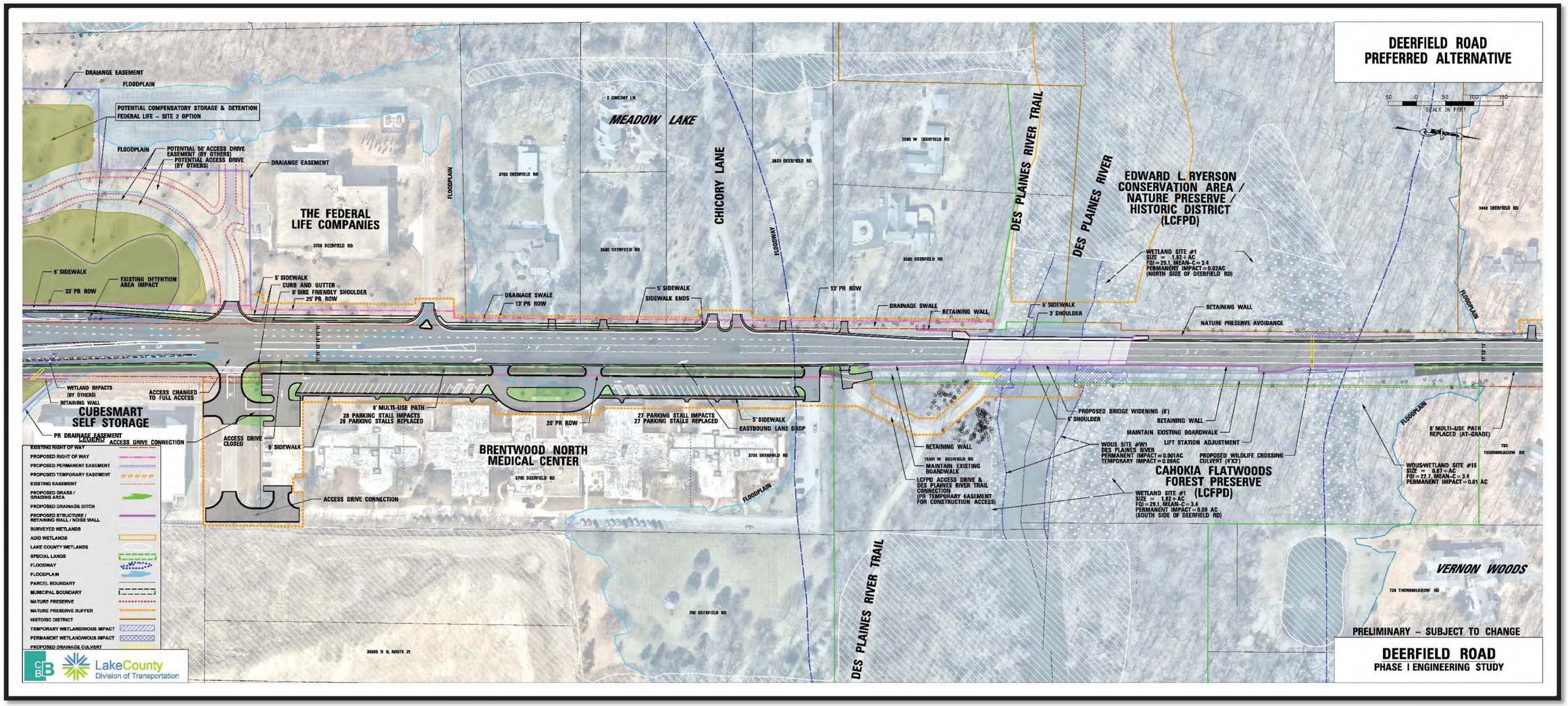


Figure 2-9: Preferred Build Alternative (con't)

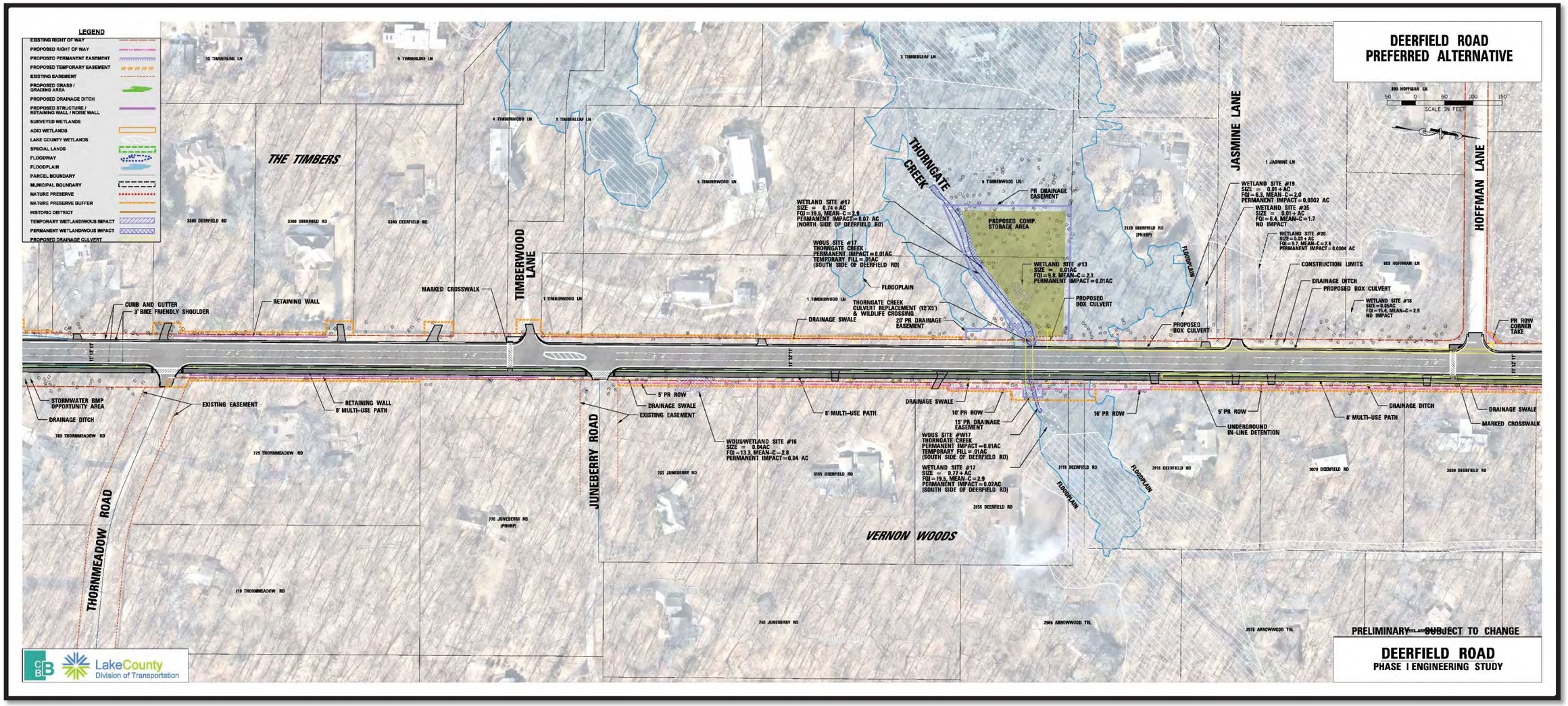


Figure 2-9: Preferred Build Alternative (con't)

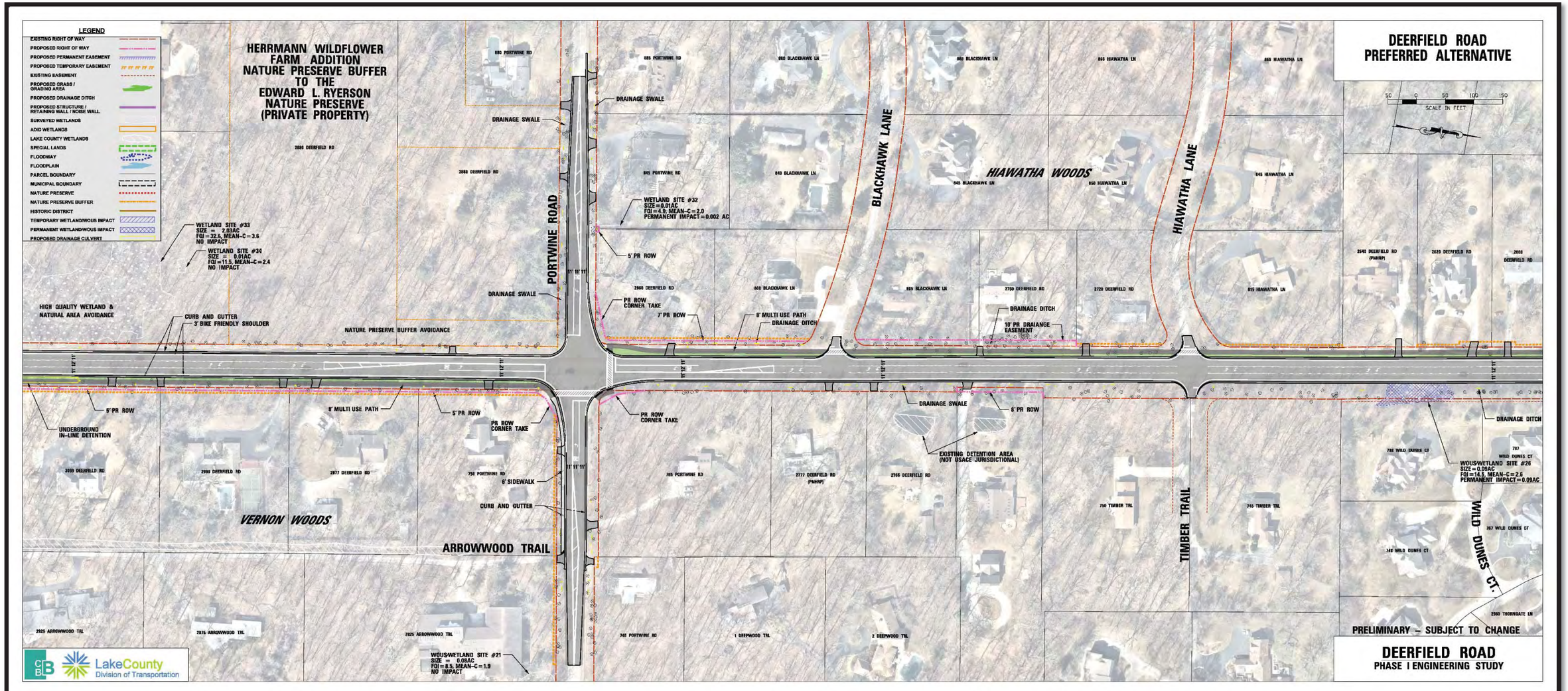


Figure 2-9: Preferred Build Alternative (con't)

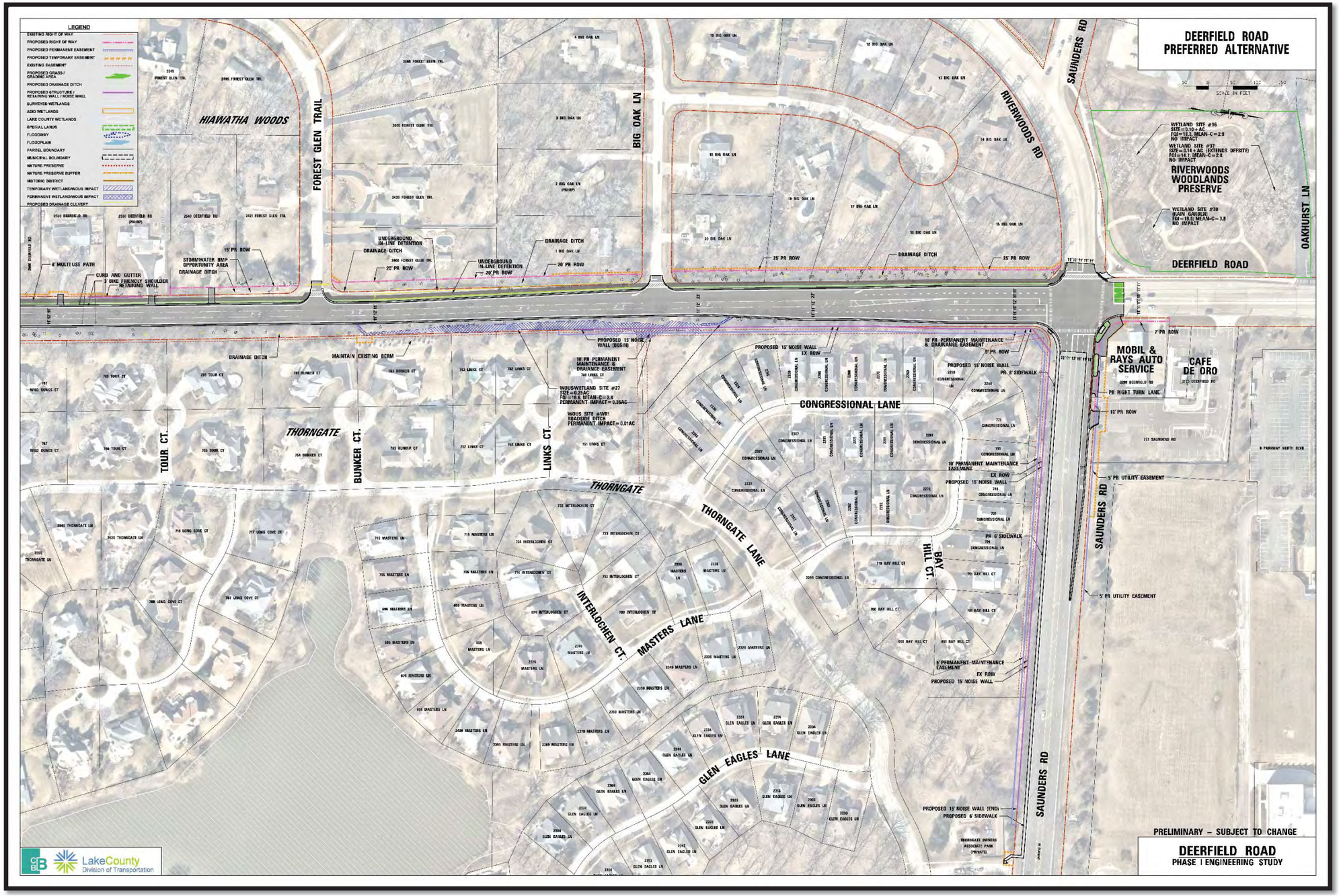
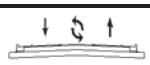


Figure 2-10: Finalist Alternatives Impact Evaluation

Evaluation Criteria	Unit of Measure	No-Build 2040 Incorporating Woodman's Development		Preferred Alternative	
					
Transportation Performance (Synchro Modeling)					
Deerfield Road Average Daily Traffic (ADT)		20,200		20,600	
Intersection Level of Service (LOS) and Average Delay [1]		AM	PM	AM	PM
Deerfield Road at Milwaukee Avenue Intersection	LOS (sec/veh)	E (66.7)	F (221.6)	D (44.0)	E (72.1)
Deerfield Road at Portwine Road Intersection	LOS (sec/veh)	C (25.7)	D (37.1)	C (24.8)	D (44.8)
Deerfield Road at Saunders/ Riverwoods Road	LOS (sec/veh)	C (29.9)	D (37.5)	C (27.2)	C (25.1)
Total Travel Time		AM	PM	AM	PM
Deerfield Road Eastbound (Milwaukee Avenue to Saunders/Riverwoods Road)	minutes	6.5	6.8	6.6	6.2
Deerfield Road Westbound (Saunders/ Riverwoods Road to Milwaukee Avenue)	minutes	6.6	35.6	4.7	7.4
Mobility (Synchro Modeling)					
Roadway Section Average Vehicular Gap Acceptance		AM	PM	AM	PM
Gaps Per Hour at Stop Controlled Intersections/Driveways (Reference location Timberwood Ln/Juneberry Rd)	# gaps (>8 seconds) per hour	52	0	53	31
Non-Motorized Accommodations					
Non-Motorized Accommodations	scale	-		+++++	
Safety (Illinois Highway Safety Design Manual)					
Average Predicted Crashes - Deerfield Road (Milwaukee Avenue to Saunders/Riverwoods Road)	% increase injury crashes/year	4.8%		-51.4%	
Environmental Resources					
Added Net Pavement/Impervious Area	acres	-		6.95	
Floodplain Impact	acres	-		7.12	
Floodway Impact	acres	-		1.46	
Wetlands Impact	acres	-		0.59	
High Quality Wetlands Impact	acres	-		0.09	
Tree Impacts	acres	-		7.33	
Natural Area Impacts	acres	-		0.0	
Nature Preserve Impacts	acres	-		0.0	
Forest Preserve District Impacts	acres	-		0.0	
Socio-Economic Impacts					
Community Context & Character	scale	-		++++	
Residential/Commercial Structure Impacts	each	-		0	
Residential Right-of-Way Acquisition	acres	-		2.61	
Commercial Right-of-Way Acquisition	acres	-		1.25	
Parcels Impacted	each	-		55	
Cost					
Preliminary Estimate of Construction Cost [2]	Dollars	-		$25-28M	

1) LOS is a letter grade from A (best) through F (worst) that represents the average amount of delay experienced at an intersection.

2) Includes the cost for property acquisition

2.4 What is the Preferred Alternative?

The preferred alternative is compared against the No-Build in Figure 2-10. Notable benefits of the preferred alternative over the No-Build include:

- Improving capacity and congestion by decreasing the Deerfield Road at Milwaukee Avenue intersection delay by almost 70% (222 seconds/vehicle to 72 seconds/ vehicle), and
- Decreasing Deerfield Road westbound total travel time through the corridor in the PM by 80% (36 minutes to 7 minutes).
- Improving mobility and accessibility as measured by side street access to Deerfield Road from zero to over 30 acceptable gaps for the PM peak hour.
- Improving safety by decreasing the injury crashes/year by over fifty percent.
- Improving non-motorized connections by implementing the off-road multi-use path along Deerfield Road with the project.
- Correcting operational deficiencies by reconstructing Deerfield Road to meet current standards.

On the above basis, the preferred alternative meets the Purpose and Need for the project as compared to the No-Build. The Preferred Alternative is shown in Appendix C Figure C-1 and includes:

- An intersection improvement at Milwaukee Avenue, including two thru lanes, dual left turn lanes, and an exclusive right turn lane on the northbound, southbound, and eastbound approaches and three thru lanes, dual left turn lanes, and an exclusive right turn lane on the westbound approach.
- An intersection improvement at Portwine Road, including an exclusive left turn lane on the northbound and southbound approaches.
- An intersection improvement at Saunders/Riverwoods Road, including a right turn lane on the northbound approach.
- The typical roadway section from Milwaukee Avenue to Saunders/ Riverwoods Road includes two 11 feet wide travel lanes in each direction separated by a 12 feet wide two-way left turn lane and 3 feet wide bike friendly shoulders bounded by barrier curb and gutter.
- A separate 8-foot wide multi-use path along the south side of the roadway from Milwaukee to Portwine and along the north side of the roadway from Portwine to Saunders/ Riverwoods Road. The multi-use path will be a part of the regional Lake County Trail network.

- A 5-foot wide sidewalk along the north side of Deerfield Road from Milwaukee Avenue to Chicory Lane, west side of Portwine Road from Deerfield Road south to Arrowwhead Trail, and west side of Saunders Road from Deerfield Road to Thorngate HOA Park.
- A new closed drainage system.
- A new pavement structure.
- Widening and re-decking of the Deerfield Road bridge structure over the Des Plaines River.

The environmental resources, impacts, and mitigation associated with the Preferred Alternative are discussed in detail within Chapter 3.