Kasold Drive Improvement Project

6TH STREET TO BOB BILLINGS PARKWAY

CFS cfse.com ENGINEERS

City of Lawrence

Project Scope/Concept Study

KASOLD DR.
Improvement Project

- Failing pavement and base (PCI 43.8)
- Full Reconstruction needed – base failures, missing curb
- Add sidewalk and bicycle lanes
- CIP 2017 Budget - Infrastructure sales tax
- Concept Study - Feb. 2015 - 2016

Public/Stakeholder Outreach

PUBLIC MEETINGS

- May 27, 2015 neighborhood meeting at Christ Community Church
- June 16, 2015 Livewell Healthy Built Environment
- July 7, 2015 Area Business Owners Meeting at University Bank
- July 21, 2015 Presbyterian Manor Meeting
- July 21, 2015 Bicycle Advisory Committee
- September 30, 2015 Lawrence Pedestrian Coalition

STAKEHOLDER OUTREACH

- Sunset Hills Neighborhood Association
- USD 497 – School Crossing At Harvard and Kasold
- City Utilities Department – Waterline and Sewer
- Westar, Black Hills, AT&T & WOW, Lawrence Fire Medical Department

WEBSITE

- Facilitates Public Involvement
- Provides Real-Time Updates

Historic Traffic Data

- Traffic relatively **stable** since 1992
  - Actual growth rate = approx. 0.4%
- Growth factor used for projections = 0.5%
  - Fully developed corridor
  - Considers K-10/SLT and BBP extension

Comparison of Record KDOT's 24-Hour Traffic Volumes (vehicles per day, VPD)

Segment	1992	1995	1998	2001	2004	2007	2010	2013
Kasold, 6th-8th	11,105	12,955	13,370	14,840	15,155	13,645	13,935	13,925
Kasold, 14th-BBP	13,220	15,265	17,960	15,780	16,640	14,195	14,280	14,735
Harvard, East App.	N/A	2525	3290	3750	4055	3270	2990	3035
Harvard, West App.	N/A	N/A	4500	3660	4105	3855	3745	N/A

Traffic Data

Current	
Traffic Counts (vehicles per day, VPD)	
Kasold Drive	14,735
Harvard Road	3,035
Kasold & Harvard	17,902
8th St at Kasold	2,225
Bus/Truck Traffic	< 3%

2040 Projected	
Traffic Counts (vehicles per day, VPD)	
Kasold Drive	16,576
Harvard Road	3,414
Kasold & Harvard	20,139
8th St at Kasold	2,515
Bus/Truck Traffic	< 3%

Peak Traffic Volumes

KASOLD DR.
Improvement Project

Current

Peak Hour Traffic Volumes along Kasold, (vehicles per hour, VPH), AM/(PM)

Segment	NB	SB	Total
6th – 8th	518/(707)	531/(589)	1049/(1296)
8th – Harvard	499/(526)	436/(531)	935/(1057)
Harvard – 13th	353/(651)	511/(523)	864/(1174)
13th – 14th	361/(654)	508/(526)	869/(1180)
14th – BBP (15th)	359/(790)	489/(548)	848/(1338)

2040 Projected

Peak Hour Traffic Volumes along Kasold, (vehicles per hour, VPH), AM/(PM)

Segment	NB	SB	Total
6th – 8th	582/(795)	597/(662)	1180/(1458)
8th – Harvard	561/(591)	490/(597)	1051/(1189)
Harvard – 13th	397/(732)	574/(588)	972/(1320)
13th – 14th	406/(735)	571/(591)	977/(1327)
14th – BBP (15th)	403/(888)	550/(616)	954/(1505)

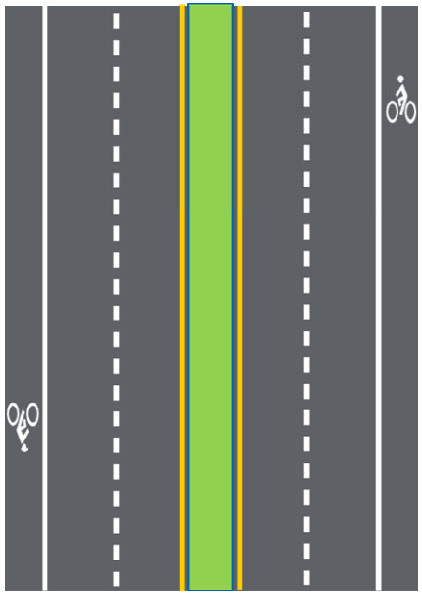
What Did We Consider?

- 5 Lanes (2 Through Lanes in each direction and TWLTL)
- 3 Lanes (1 Through Lane in each direction and TWLTL)
- 4 Lane with Median & Left Turn Lanes
- 2 Lane with Median & Left Turn Lanes
- Mountable Median
- Bicycle Lanes
- Buffered Bicycle Lanes
- Sidewalk
- Shared Use Path
- Traffic Signal
- Single & Double Lane Roundabouts
- Stop-controlled Intersections
- Restricted Turns
- Pedestrian Beacon
- Non-controlled Intersection
- No Improvements

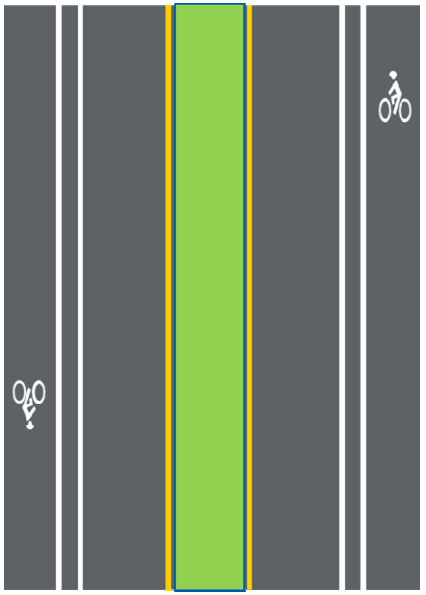
Options Modeled & Evaluated

KASOLD DR. Improvement Project

- **Typical Street Reconstruction Option**



- **Complete Streets Option**

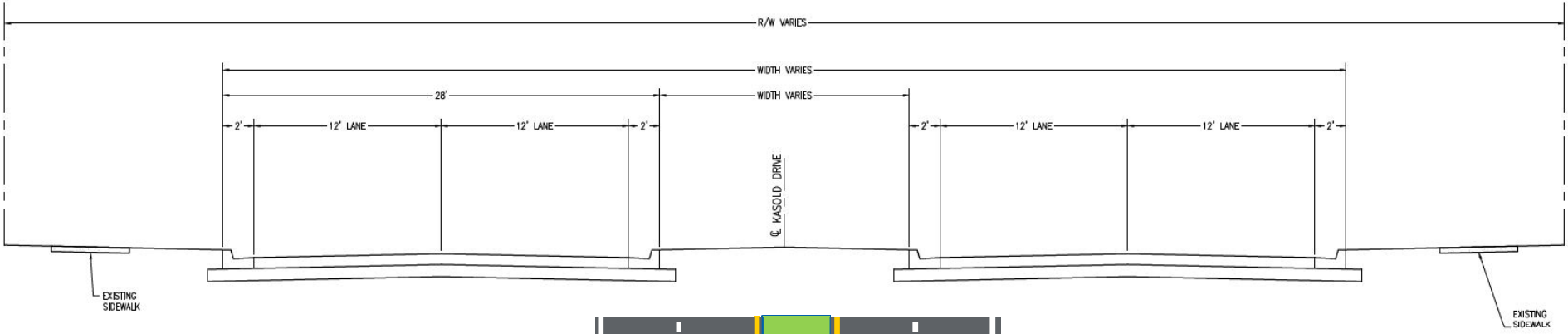


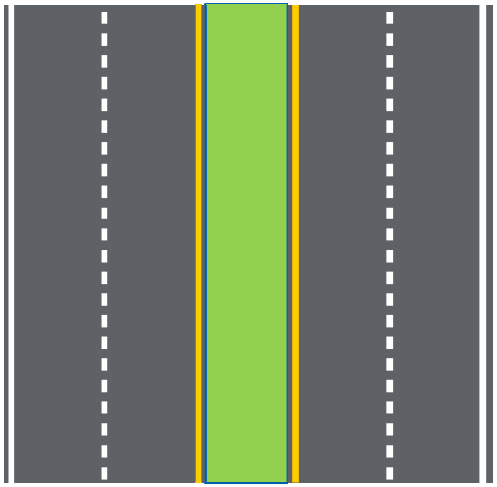
- **8th Street Intersection**

Stop Sign, Traffic Signal, Roundabout, Pedestrian Beacon, Restricted Turns

- **Replacement of Water Distribution System**
- **Extension of Shared Use Path north to Peterson**

Existing Kasold Drive

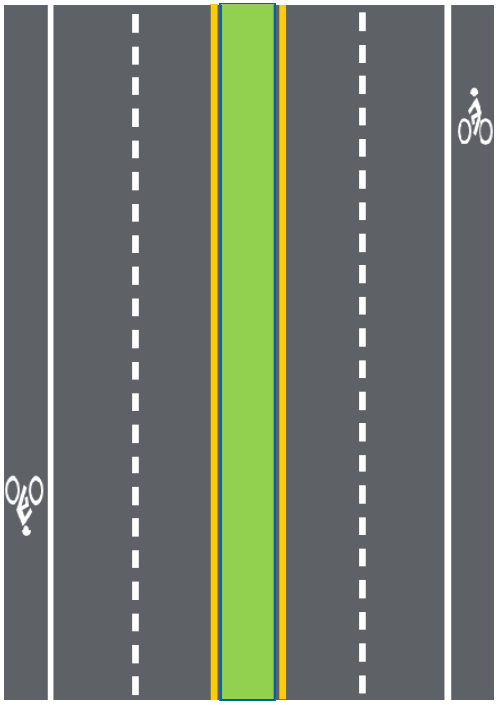




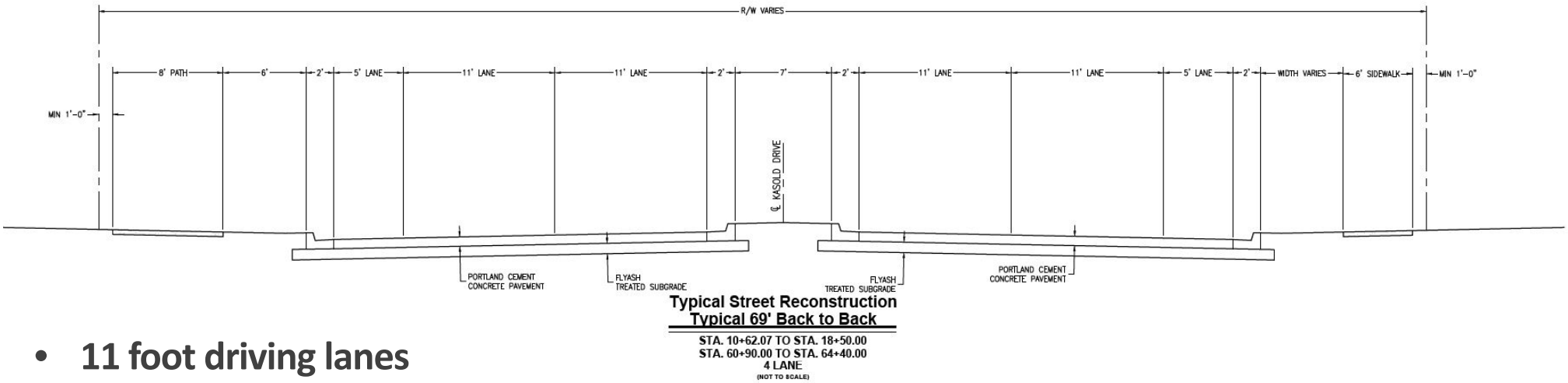
Option -
Typical Street Reconstruction

KASOLD DR.
Improvement Project

- 2 lanes in each direction
- Median with turn lanes
- Bicycle lanes & Sidewalk
- Traffic signal @ Kasold



Typical Street Reconstruction Option



Typical Street Reconstruction
Typical 69' Back to Back

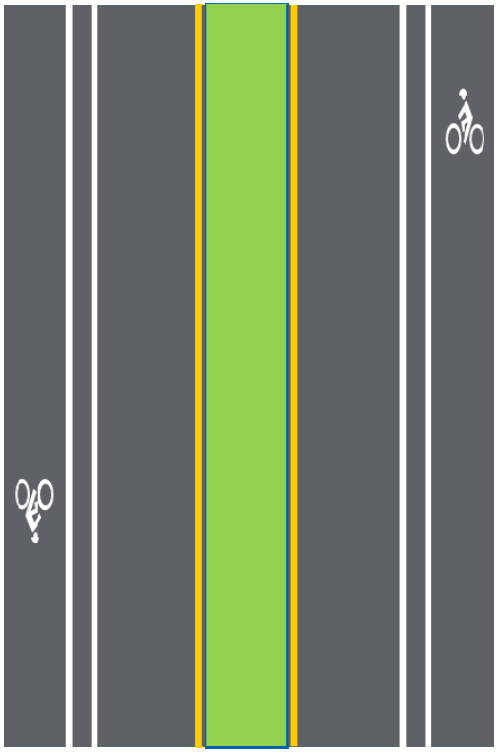
STA. 10+62.07 TO STA. 18+50.00
STA. 60+90.00 TO STA. 64+40.00
4 LANE
(NOT TO SCALE)

- **11 foot driving lanes**
- **5 foot bicycle lanes**
- **8’ Shared-use path and 6’ Sidewalk**
- **Narrower median**

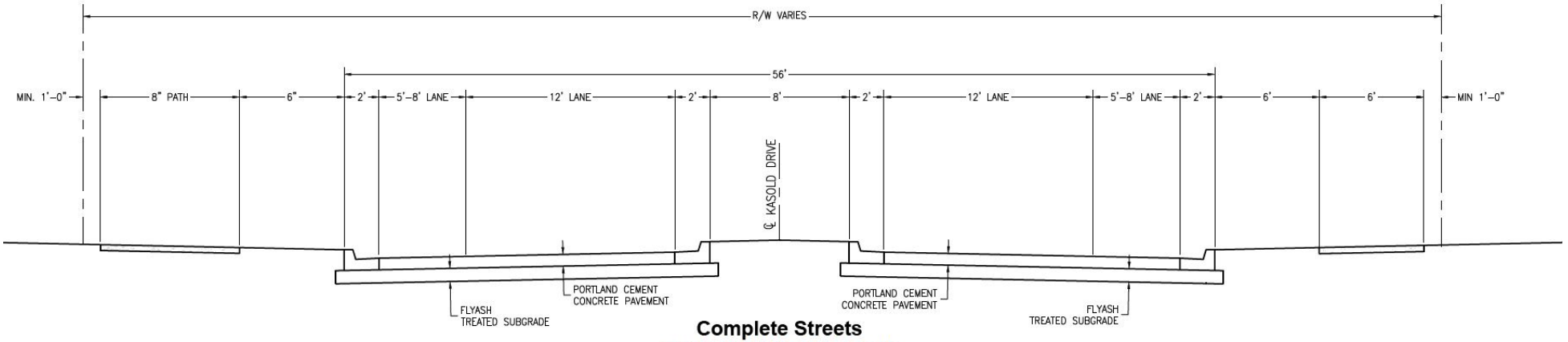
Option -
Complete Street Reconstruction

KASOLD DR.
Improvement Project

- 1 lane in each direction (8th to 14th Street)
- 2 lanes each direction at signal approaches (6th to 8th & 14th to 15th)
- Median With Turn Lanes
- Buffered Bike Lanes
- Extended Sidewalk Network
- Roundabout at Kasold



Complete Streets Option



Complete Streets
Typical 56' Back to Back
STA. 20+75.00 TO STA. 35+53.34
STA. 38+00.00 TO STA. 56+50.00
2 LANE
(NOT TO SCALE)

- **12 foot driving lane**
- **5-8 feet for bicycle lane**
- **Median width stays same**
- **8' Shared-use path & 6' Sidewalk**

Evaluation of Options

Number of Traffic Lanes	
Capacity of Single Lane	1,900 VPH
Capacity of Double Lane	3,800 VPH
Peak Hour Kasold, Current	651 VPH
Peak Hour Kasold, 2040	736 VPH

Roundabout or Signal?	
Capacity Single Lane Roundabout	1,250 – 1,600 VPH
Capacity Double Lane Roundabout	2,400 – 3,000 VPH
Peak Hour at Kasold & Harvard, Current	651 VPH
Peak Hour at Kasold & Harvard, 2040	736 VPH

Lane Reconfiguration *	
Lane Reconfiguration Parameters	10,000 – 25,000 VPD
Kasold ADT, Current	14,735 VPD
Kasold ADT, 2040	16,576 VPD

* Lane reconfiguration parameters have been compiled by numerous studies and similar projects performed and constructed over the past two decades.

Level of Service Results

Harvard & Kasold, AM/PM

Approach	Existing Cond. ~~LOS~~ Delay (sec.)	Roundabout Option ~~LOS~~ Delay (sec.)	Signal Option ~~LOS~~ Delay (sec.)
EB	B/(B)	B/(A)	B/(B)
	13.2/(12.7)	10.1/(8.1)	11.4/(12.4)
WB	B/(B)	A/(A)	A/(B)
	11.2/(13.8)	6.3/(9.6)	9.4/(15.6)
NB	B/(C)	A/(B)	A/(A)
	12.4/(17.2)	8.6/(9.4)	8.4/(6.9)
SB	B/(B)	A/(B)	A/(B)
	13.3/(14.8)	9.2/(11.7)	8.8/(11.0)

Level of Service Results

8th & Kasold, AM/(PM)

Approach	Existing Cond. LOS Delay (sec.)	Roundabout Option LOS Delay (sec.)	3-Way Stop Option LOS Delay (sec.)	E-Leg Stop Option LOS Delay (sec.)	Signal Option LOS Delay (sec.)
WB	B/C	A/(B)	B/(C)	C/(D)	A/(A)
	11.9/(15.1)	8.8/(12.3)	11.9/(15.1)	21.9/(26.7)	6.4/(6.8)
NB	B/(C)	B/(B)	B/(C)	A/(A)	A/(A)
	14.3/(16.6)	13.6/(10.6)	14.3/(16.6)	0/(0)	3.9/(5.5)
SB	C/(C)	B/(B)	C/(C)	A/(A)	A/(A)
	15.7/(17.2)	11.6/(11.7)	15.7/(17.2)	2.8/(1.7)	5.5/(6.5)

Estimated Travel Times

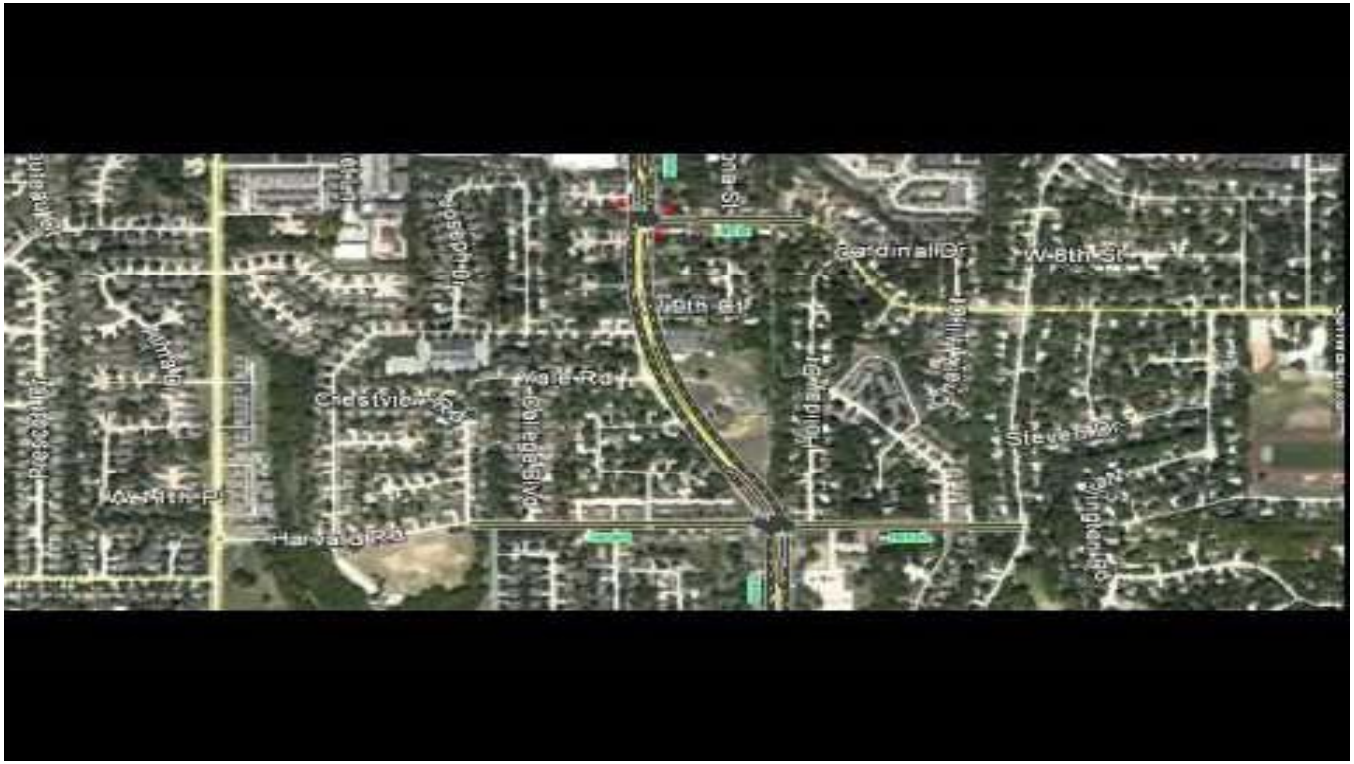
Kasold Drive, 6th Street to Bob Billings Parkway, NB + SB Totals, (minutes)

	Existing Conditions	Typical Street Stop Signs @ 8th Signal @ Harvard	Typical Street Signal @ 8th Signal @ Harvard	Complete Streets Signal @ 8th Roundabout @ Harvard
AM Peak Current	7.1	6.6	6.3	6.3
PM Peak Current	6.8	6.5	6.2	6.3
AM Peak 2040	7.2	7.0	6.5	6.5
PM Peak 2040	7.5	7.1	6.5	6.6

All options studied exhibit decreased travel times when compared to existing conditions.

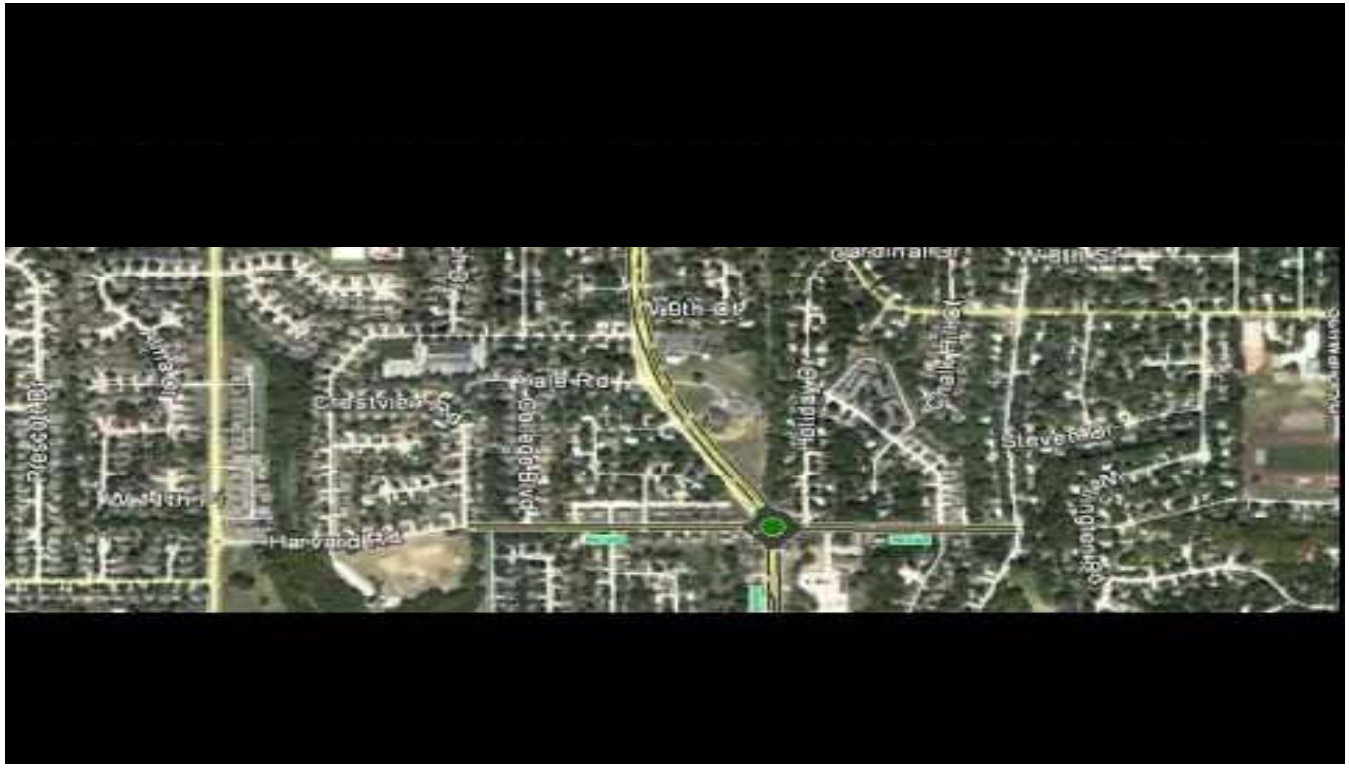
Synchro Model
Typical Street Reconstruction

KASOLD DR.
Improvement Project



Synchro Model
Complete Streets Option

KASOLD DR.
Improvement Project



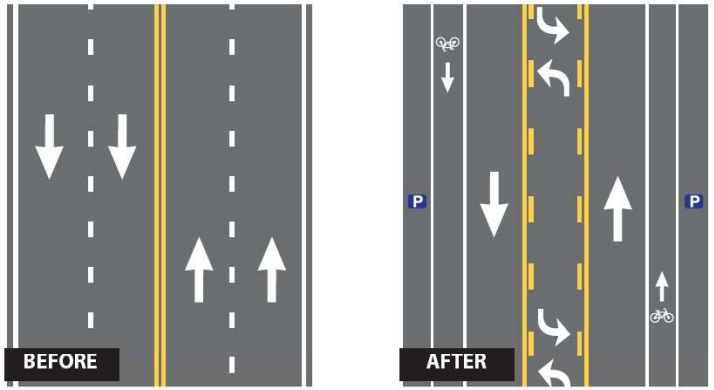
Case Studies –
Lane Reconfiguration

KASOLD DR.
Improvement Project

9th Street, East Of Emery, Lawrence, KS

- ADT = 16,755 VPD
- Better traffic flow
- Safer turning movements and bicycle lanes

Arterials in Kansas City, MO



- Currently evaluating all arterials with ADT < 20,000 VPD
- Plan to implement lane reconfiguration at time of repaving

Case Studies –
Lane Reconfiguration

KASOLD DR.
Improvement Project

Mission Road in Kansas City, KS and Prairie Village, KS

- **ADT's: 15,000 – 25,000 VPD**
- **Kansas City, KS:**
  from 43rd Street to Belrose Manor
- **Prairie Village:**
  from 71st Street to 75th Street
  VERY similar to Kasold corridor
- **Various cities are planning additional lane reconfiguration improvements along the Mission Road corridor**

Case Studies –
Lane Reconfiguration

KASOLD DR.
Improvement Project

Burton Street, Grand Rapids, MI

- Arterial (ADT = 15,000 VPD)
- School & Park Nearby
- Opponents With Concerns Over Congestion, Turning Gaps
- Slower Speeds
- Less Congestion
- Increased Bicycle Traffic
- No Apparent Diversion

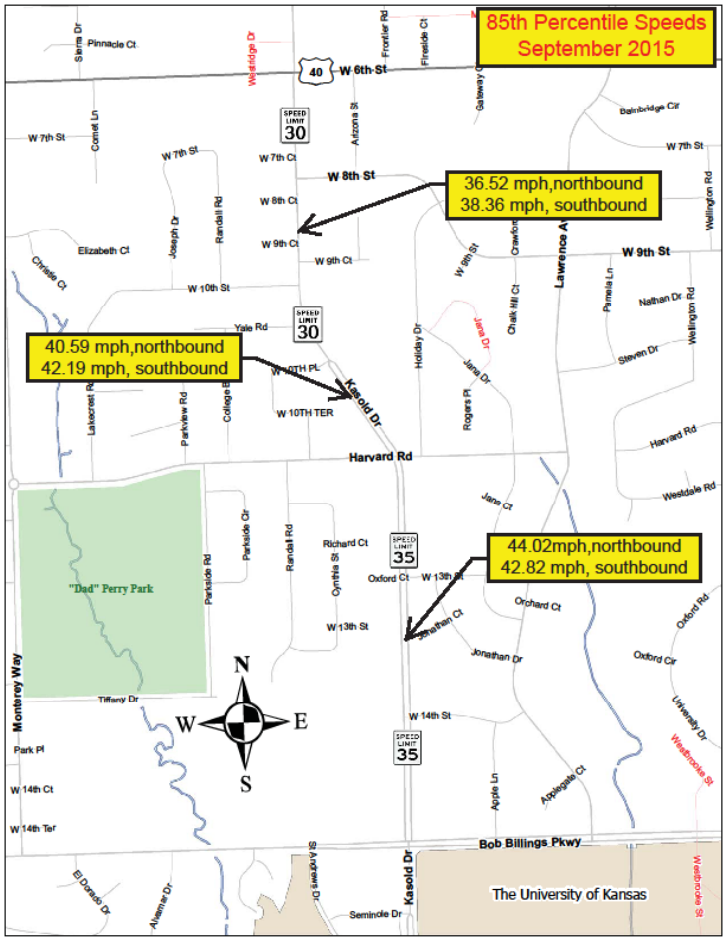
Lawyer's Road, Reston, VA

- Arterial (ADT = 17,000 VPD)
- Speed Limit 40/45
- Suburban Area
- 70% Reduction In Crashes
- Travel Time Remained Consistent
- Increase In Bicycle Use
- 74% Agreed It Was An Improvement

Speeds on Kasold Drive

- **Drivers are not driving the current speed limit**
  - Re-evaluate Speed Limits and/or
  - Install/Implement Speed Management Countermeasures
- **Road Diet is an FHWA Proven Safety Countermeasure and reduces top-end speeders**

Location	Speed Limit	85th Percentile Speed
Kasold between 13th & 14th	35 mph	**43 mph**
Kasold at 10th Street	30 mph	**41 mph**
Kasold between 8th & 10th	30 mph	**37 mph**
27th St & Kasold Dr crosswalk	40 mph	**52 mph**



Case Studies –
Lane Reconfiguration for Speed Reduction

- **Luten Avenue in Staten Island, New York**
  - Road Diet Near School
  - RESULTS: The **percentage of vehicles exceeding the speed limit** **decreased by 34 percent** along southbound Luten Avenue and **decreased by 21 percent** in the northbound direction.
- **US 75 in Sioux County, Iowa – Road Diet**

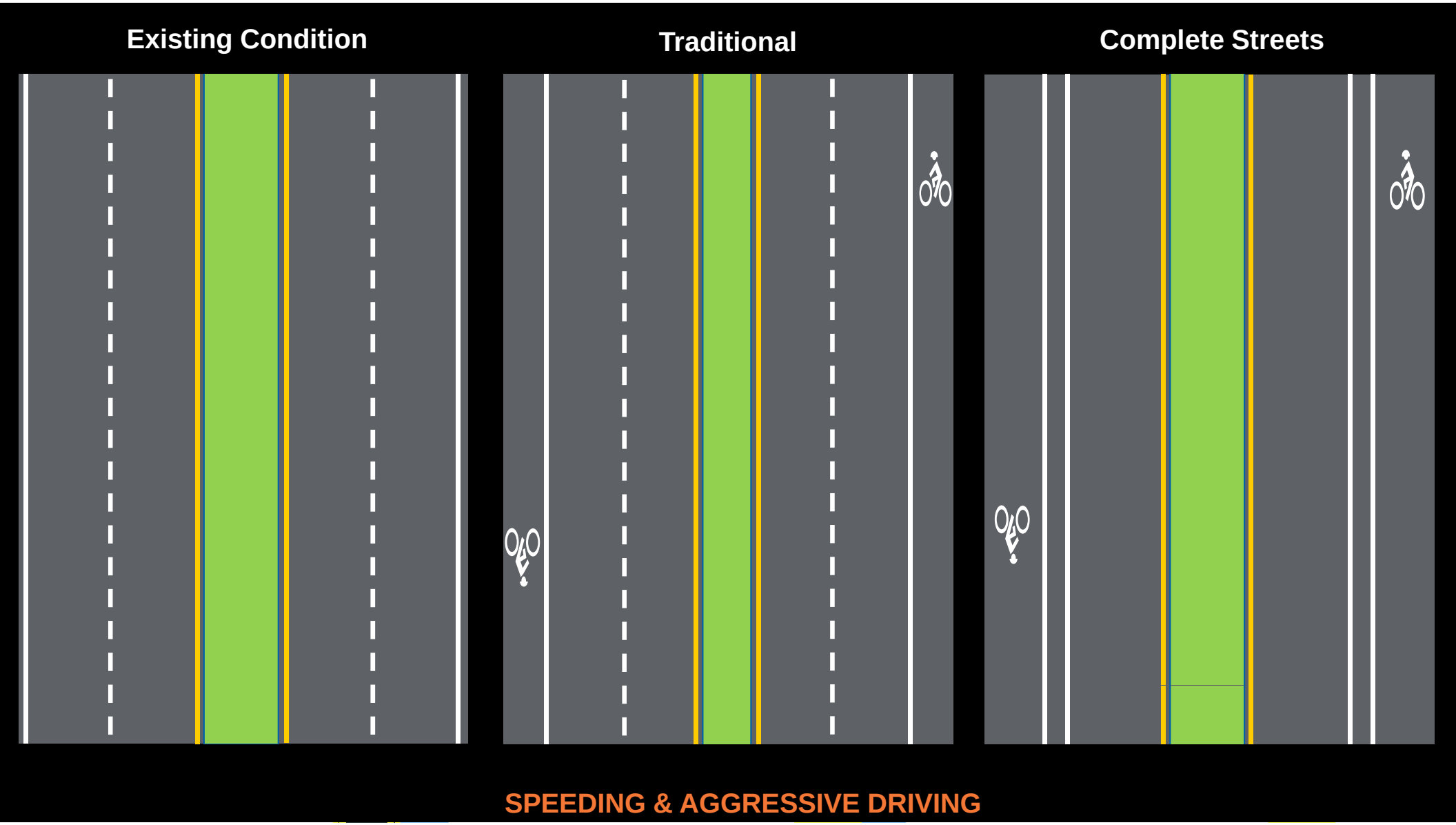
	BEFORE	AFTER
Percent of vehicles traveling more than 5 mph over the speed limit	**43 percent**	**13 percent**

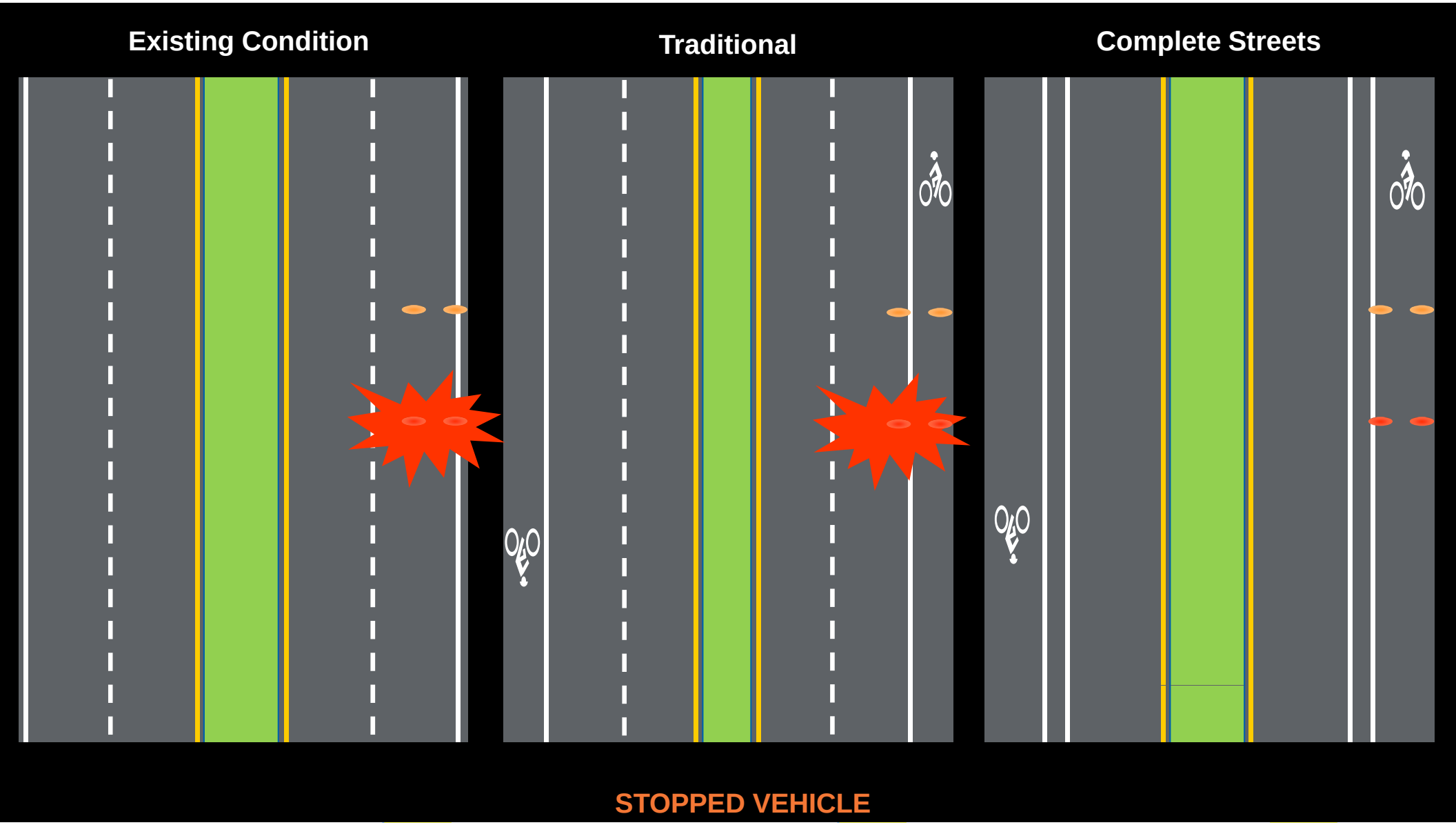
Lane Reconfiguration Resources

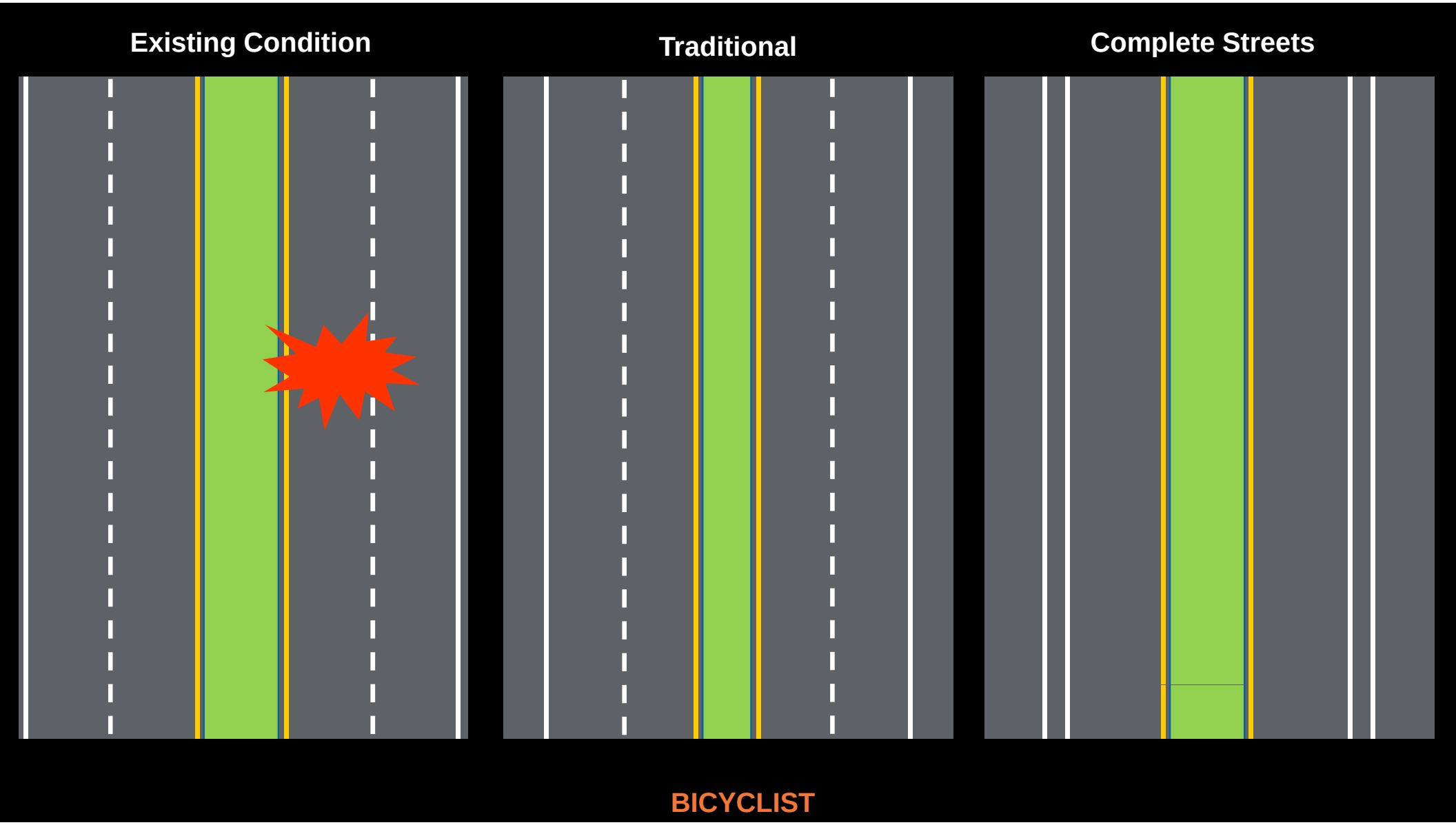
- Knapp, K.K., Welch, T.M. and Witmer, J.A., **Converting Four Lane Undivided Roadways to a Three-Lane Cross Section: Factors to Consider**, ITE Annual Meeting, 1999
- Knapp, Chandler, et al. for the Federal Highway Administration, **Road Diet Informational Guide**, 2014
- Kansas City Missouri Public Works Department, **Road Diet Analysis**, 2015
- Russell & Mandavilli for Kansas State University, **Analysis of a Road Diet Conversion and Alternative Traffic Controls**, 2003
- AARP and the Walkable and Livable Communities Institute, **Road Diets - A Livability Fact Sheet**, 2014
- Burden, D. and Lagerwey, P., **Road Diets: Fixing the Big Roads**, Walkable Communities, Inc., March 1999
- Walkable Streets (August 2003), **Economic Merits of Road Diets and Traffic Calming**
- Safe Routes to School National Center (November 2013), **Safe Routes to School Online Guide** http://guide.saferoutesinfo.org/engineering/tools_to_reduce_ crossing_distances_for_pedestrians.cfm#diet
- FHWA, **Road Diet Case Studies**, FHWA-SA-15-052, available at: http://safety.fhwa.dot.gov/road_diets/case_studies/

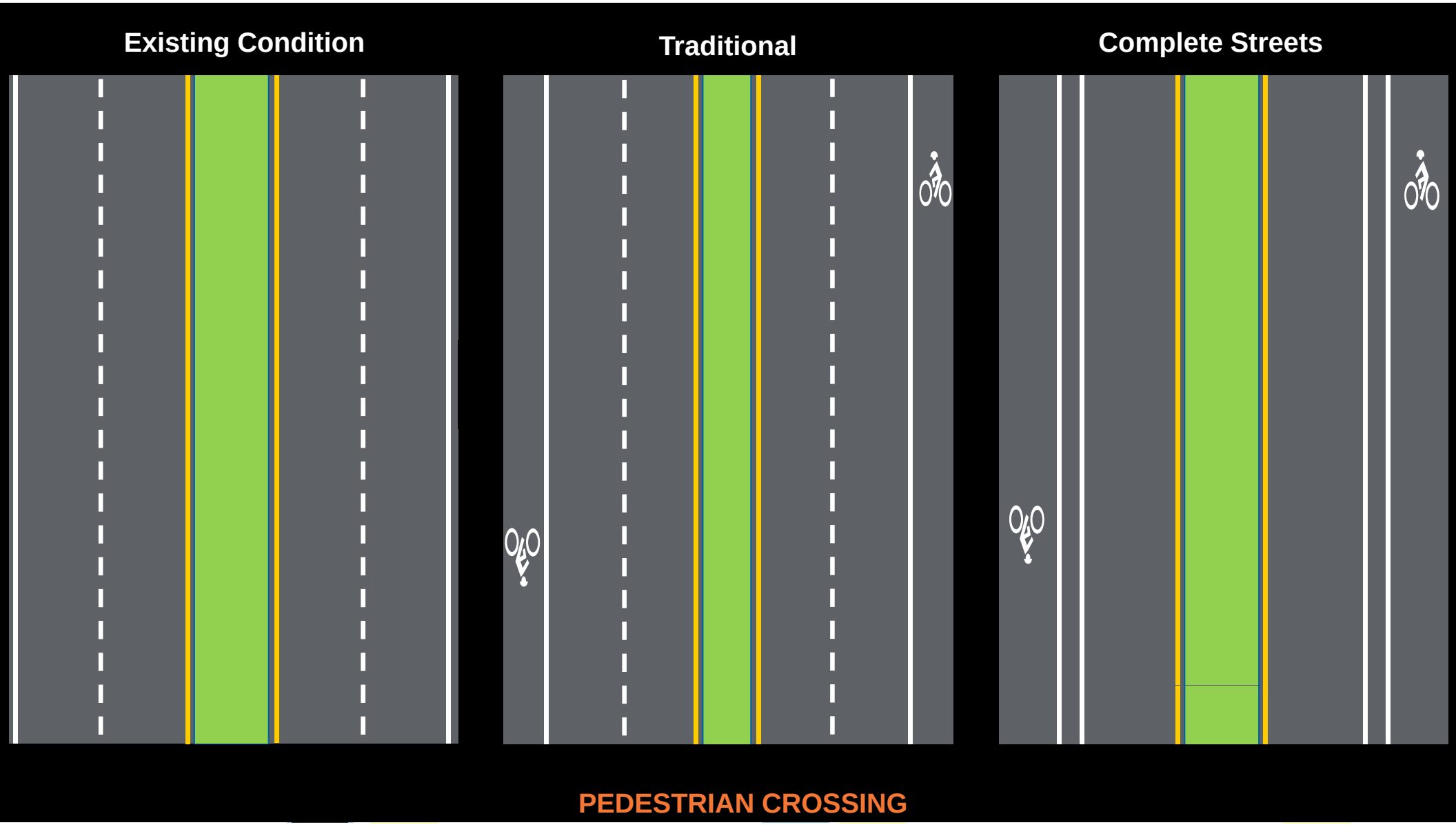
FHWA – Road Reconfiguration Review

- FHWA has ongoing initiative to review road reconfiguration projects
- Worked with FHWA Staff and consultant to review Kasold Concept Plans and Traffic Study
- FHWA concurred with the feasibility for the ‘Complete Streets’ alternative
- FHWA provided the following animated drawings to illustrate scenarios for different lane configurations


Existing Condition
Traditional
Complete Streets
SPEEDING & AGGRESSIVE DRIVING


Existing Condition
Traditional
Complete Streets
STOPPED VEHICLE


Existing Condition
Traditional
Complete Streets
BICYCLIST


Existing Condition
Traditional
Complete Streets
PEDESTRIAN CROSSING

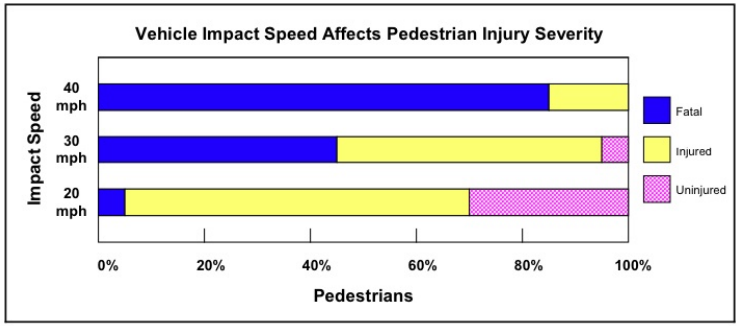
Benefits of Lane Reconfiguration

- **Reduced Conflict Points**
- **Improved Sight Lines**
- **Less Difficult Crossing Maneuvers**
- **Lower and More Uniform Speeds**
- **Traffic Demands Still Met**
- **Improved Conditions for Others**
- **Supports Local Business**
- **Minimum Costs and Impacts**

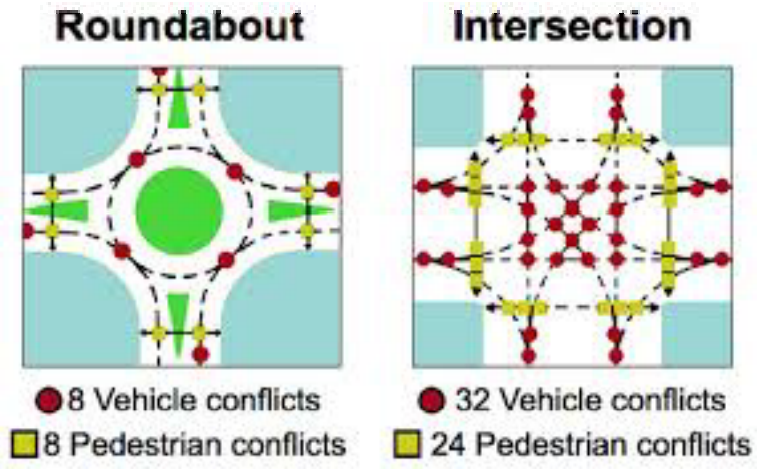
Safety Benefits of Roundabouts

KASOLD DR.
Improvement Project

- Slower traffic speeds: Roundabout design speed is 20 -25mph



- Less conflict points for vehicles and pedestrians
- Pedestrians only cross one lane at a time with a protected median

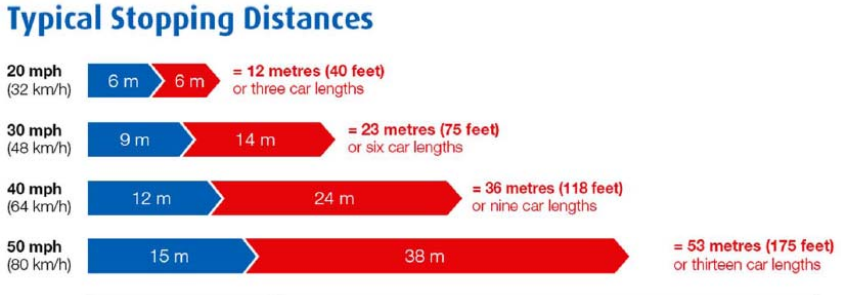


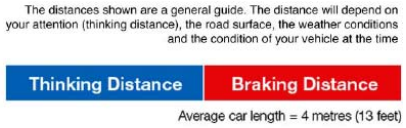
Safety Benefits of Roundabouts

KASOLD DR.
Improvement Project

- High-severity conflicts of right angle and left-turn head-on crashes greatly reduced
- Low speeds allow drivers more time to react to potential conflicts
- Low speeds reduce crash severity
- Road users travel at similar speeds

The Insurance Institute for Highway Safety (IIHS) Study
- 39% overall decrease in crashes
- 76% decrease in injury crashes
- 90% decrease in fatal or incapacitating injuries





Safety Benefits of Roundabouts

Historic Intersection Crash Data for City of Lawrence, KS, as of July 2016

Year	Number of Pedestrian Crashes at Signals	Number of Pedestrian Crashes at Roundabouts	Number of Bike Crashes at Signals	Number of Bike Crashes at Roundabouts
2013	11	0	10	0
2014	8	0	7	0
2015	13	0	9	0
2016 (through June)	7	1	7	0

City of Lawrence currently has 20 roundabout controlled intersections and 92 signal controlled intersections

Roundabout with Bike Lanes

- Option 1: Can merge and ride bike as a vehicle in roundabout
- Option 2: Can take ramp onto sidewalk and use crosswalks as a pedestrian
- Cyclist has less conflicts making left turns
- Example: O'Connell Road & E 25th Terrace

Comparison of Options

	Typical Street Reconstruction	Complete Streets
Effect on speeding	Minimal reduction in overall speeds expected; aggressive/speeding drivers may not be reduced	May reduce speeds overall; Road Diets significantly reduce the aggressive/top-end speeders
Effect on collisions	No anticipated reduction	*Road Diets* • Create less conflict points. • Reduction in vehicle collisions by 40 percent. • Reduction in injury collisions by 76 percent. *Roundabouts* • Create less conflict points • 76 percent reduction in injury crashes • 90 percent reduction in fatal and incapacitating injuries
Left-turn Lane Design	No offset left-turn lane design	May allow for some positive offset left-turn lane design, which provides improved safety for aging drivers.
Bicycle Lanes	5 ft bicycle lanes	Buffered 5 ft bicycle lane (8 ft total); improves safety for bicyclists by creating more space between vehicle lane and bicycle lane
Pedestrian/School Crossings	No change in distance to cross roadway	Shorter distance to cross roadway; improves safety for pedestrians/students

Comparison of Options

	Typical Street Reconstruction	Complete Streets
Estimated Travel Times (using software model)	6.2 to 7.1 seconds	6.5 to 6.9 seconds
Lane capacity **Projected estimate –** ***736 vehicles per hour*** **on Kasold in 2040**	Capacity of double lane - *3,600 vehicles per hour*	Capacity of single lane - *1,900 vehicles per hour*
Driving lane width	11 ft	12 ft
Intersection control capacity at Harvard & Kasold	Traffic Signal Level of service A-B	Roundabout Level of Service A-B
Additional R/W & Easements?	Most likely	Not likely
Includes extension of bicycle and pedestrian facilities	No	Yes ($250,000)
Construction Cost	$5.13 million	$3.97 million

Comparison of Costs

KASOLD DR.
Improvement Project

TYPICAL STREET RECONSTRUCTION OPTION *

ESTIMATED ROAD CONSTRUCTION	$5.40M
ESTIMATED WATERLINE CONSTRUCTION	$0.57M
CONCEPT DESIGN COSTS	$0.13M
ESTIMATED FINAL DESIGN & CA	$0.45M
TOTAL COST TO CITY OF LAWRENCE	**$6.55M**

COMPLETE STREETS OPTION *

ESTIMATED ROAD CONSTRUCTION	$4.64M
ESTIMATED WATERLINE CONSTRUCTION	$0.57M
CONCEPT DESIGN COSTS	$0.13M
ESTIMATED FINAL DESIGN & CA	$0.45M
FEDERAL/STATE SAFETY FUNDING	($0.40M)
TOTAL COST TO CITY OF LAWRENCE	**$5.39M**

DIFFERENCE IN COST = $1.16M

SHARED-USE PATH ON KASOLD – 6TH STREET TO PETERSON ROAD ~ $250,000

* Does not include property acquisition costs, assumes traffic signal at 8th Street

Recommended Options

Complete Streets Option

✓ **Increase in Safety**
- Reduction in Vehicle Speeds
- Reduction In Vehicle Collisions And Injury Collisions at Kasold & Harvard
- Shorter Pedestrian/School Crossings
- Buffered Bike Lanes Provide Improved Safety for Bicyclists
- Extension of Bicycle/Pedestrian Facilities North To Peterson

✓ **Context Sensitive Design For Residential Area**
- Improved livability and "feel" of the neighborhood

✓ **Lower Costs**
- Additional R/W & Easement Requirements are UNLIKELY
- Estimated Construction Cost Savings Of $1,000,000
- Roundabout Requires Less Maintenance and Operational Costs Compared to a Traffic Signal

Traffic Signal at 8th & Kasold

✓ Increased Safety
✓ Better Traffic Flow