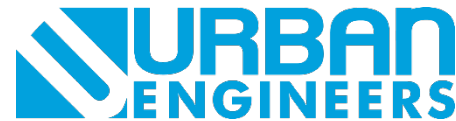




SPC Regional Roundabout Screening Study



SPC - Transportation Operations and Safety Forum

June 23, 2022

Introductions

Joshua Spano

Manager, Transportation
Operation and Safety
Southwestern Pennsylvania
Commission (SPC)

Andrew Thompson, EIT

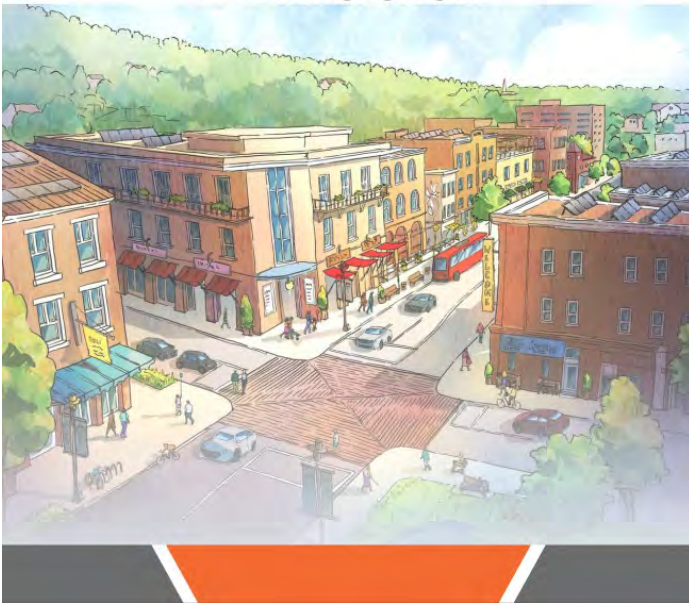
Engineering Associate
Kittelson and Associates



Southwestern Pennsylvania Commission

SmartMoves

SmartMoves
for a Changing Region



CONNECTED MOBILITY

A world-class, safe and well maintained, integrated transportation system that provides mobility for all.

SAFETY

To achieve a significant reduction in traffic fatalities and serious injuries on all public roads.

Safety

Connectivity

Major
Projects

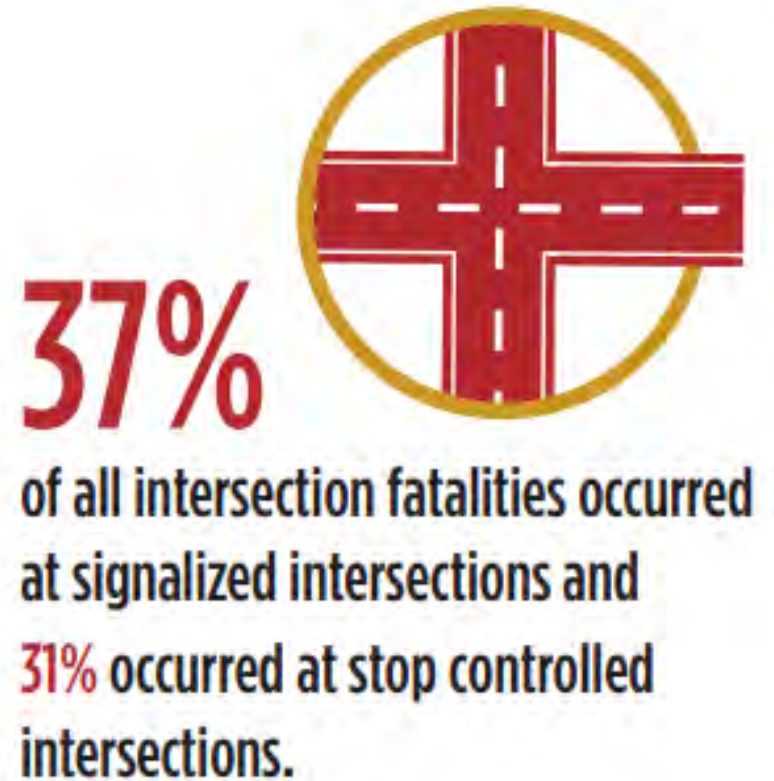
Mobility

Accessibility

Why roundabouts?

Roundabouts are a proven safety countermeasure because they can substantially reduce crashes that result in serious injury or death. Roundabouts can:

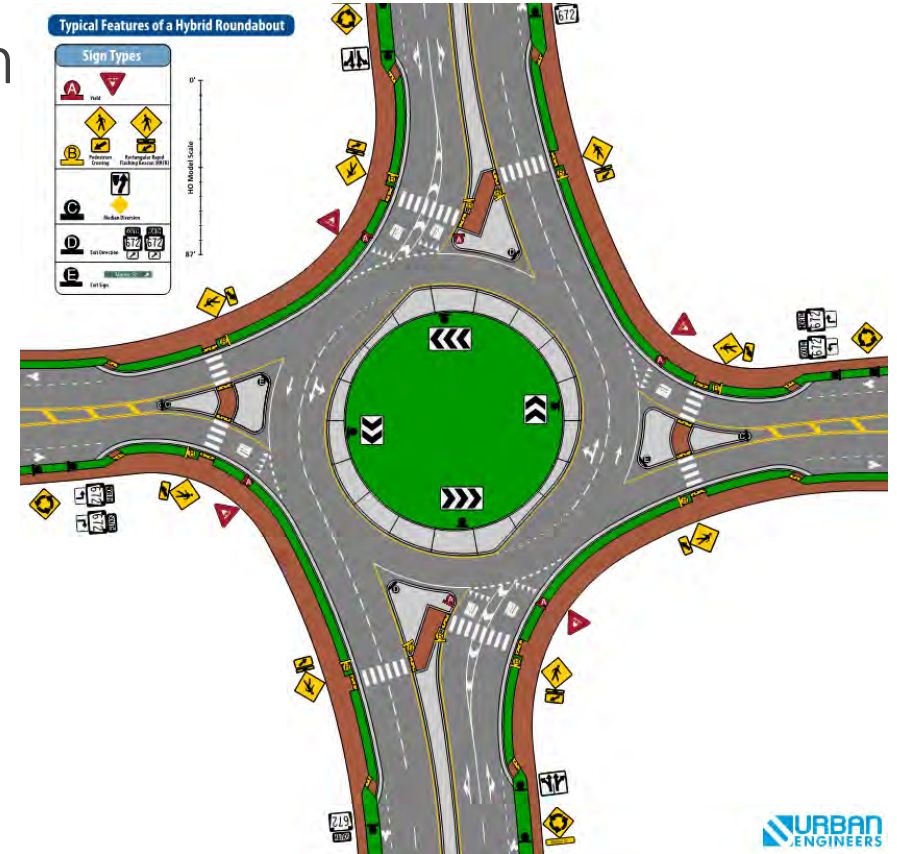
- Improve safety
 - 90% fatal crashes
 - 76% injury crashes
 - 39% all crashes
- Promote lower speeds and traffic calming
- Reduce conflict points
- Lead to improved operational performance
- Roundabouts identified by PennDOT's Strategic Highway Safety Plan (SHSP) to address intersection safety



Source: Pennsylvania Strategic Highway Safety Plan

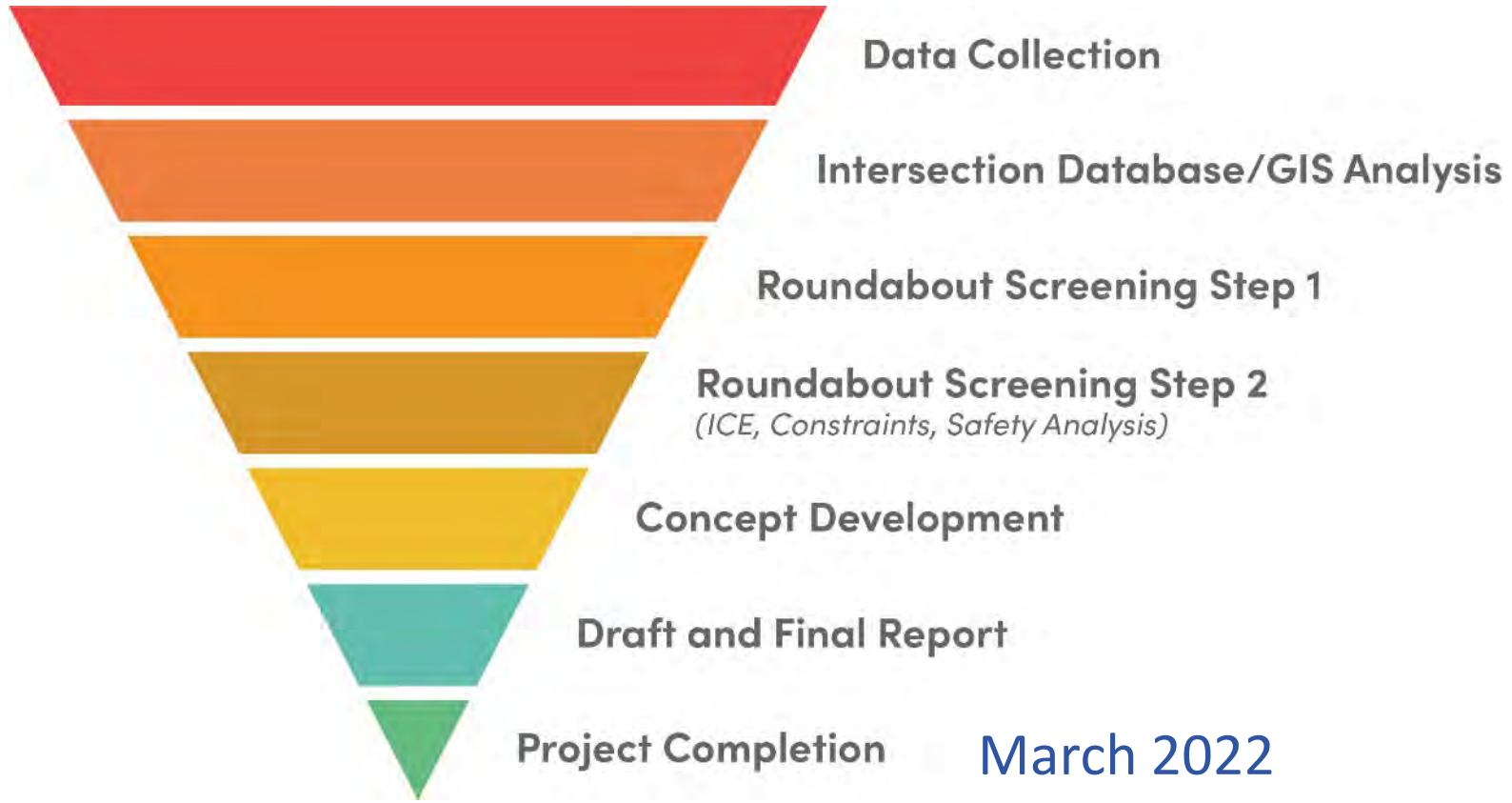
Purpose of SPC Regional Roundabout Screening Study

- Identify high potential locations for modern roundabouts
- Focus on enhancing:
 - ✓ Safety
 - ✓ Accessibility
 - ✓ Mobility
 - ✓ Connectivity
- Develop minimum of 6 concepts
- Position our self to:
 - Be informed when we receive funding applications
 - Be prepared for discretionary/statewide/federal funding opportunities



Screening Process

NTP – July 2021



March 2022

Collaborative Process with Steering Committee

Study Team:

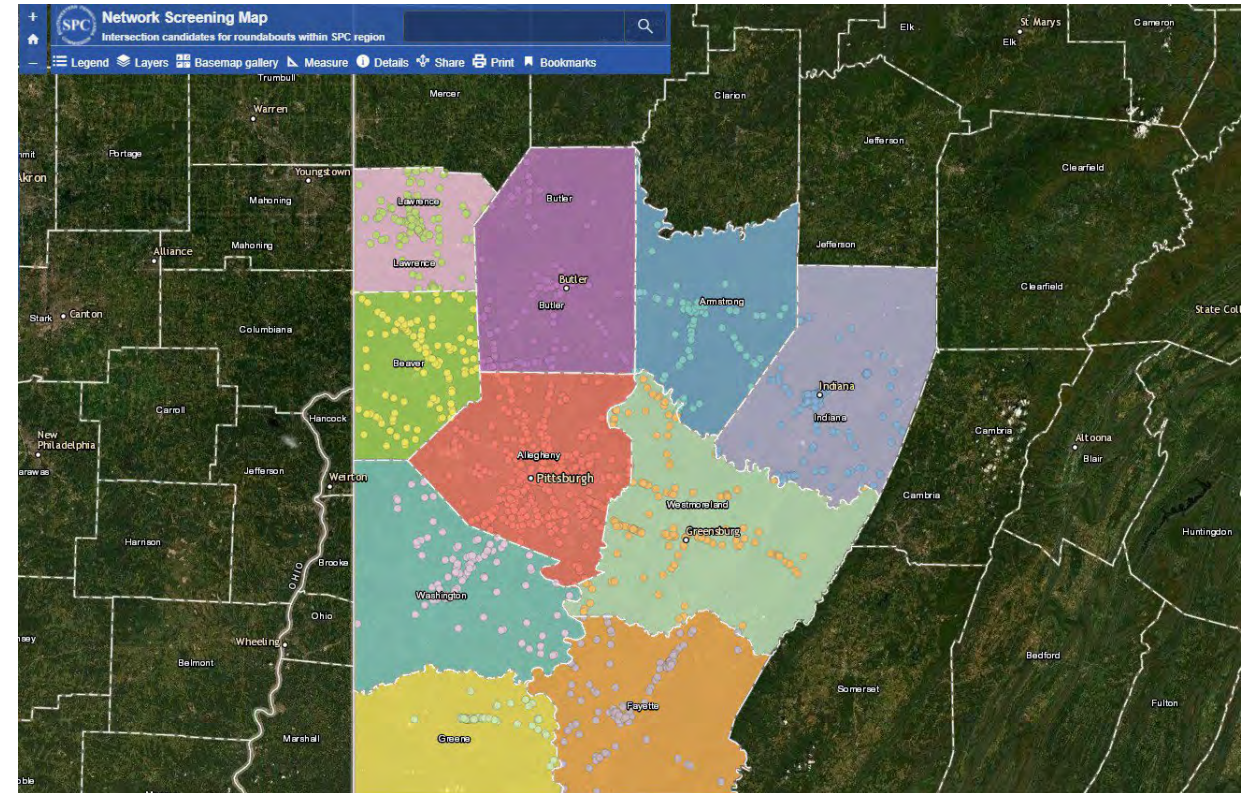


Steering Committee:

- 3 PennDOT Engineering Districts
- County Planning Partners
- City of Pittsburgh

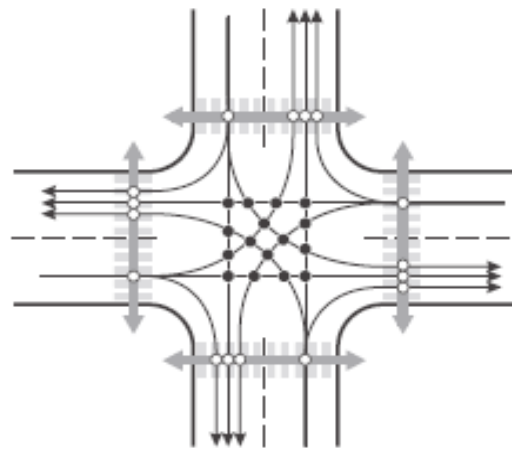
Study Website

- Present intersection locations
- Provide comments
- Locate relative to other PennDOT projects
- *Suggest a Location* feature

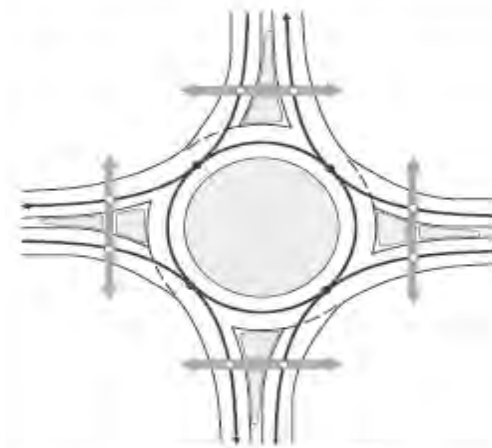


Intersection Database

- Use roundabouts where they make sense
- PennDOT's Highway Safety Network Screening (HSNS)
- Initial 1,379 HSNS intersections
 - Combined Urban and Rural intersections
 - Separated by County
 - Initially ranked by # of angle/head-on crashes



○ Vehicle/Pedestrian Conflicts
● Vehicle/Vehicle Conflicts



○ Vehicle/Pedestrian Conflicts
● Vehicle/Vehicle Conflicts

Roundabout Screening Step 1 – Starting Point

Greene County HSNS Intersection List - 2021

Rank	Rank	Type	District	County	Municipality	Intersection Type	Major Road Name	Major Designation	Major AADT	Minor Road Name	Minor Designation	Minor AADT	Traffic_Split	Intersection ADT	PDO	Total	Right_Angle	Excess_Cost	Excess_Cost	
1	6	Urban	12	Greene	Franklin Twp	4-Leg Signalized	Roy E Furman Hwy	SR 0021	18199	Elm Dr	T-684	4396	84%	22505	13	4	17	12	0.42	\$264,400
2	1	Urban	12	Greene	Franklin Twp	4-Leg Signalized	Roy E Furman Hwy	SR 0021	18199	Miller Ln	T-683	6162	75%	12361	6	4	10	9	-1.65	-\$252,800
3		Rural	12	Greene	Monongahela Twp	-Leg Minor-Street Stop-Controlle	Dilliner Pt Marion Rd	SR 0088	2747	Diamond St / Mapletown Rd	SR 2014 / SR 2016	798	77%	3545	5	5	10	8	1.05	\$213,200
4	2	Rural	12	Greene	land Twp / Monongah	4-Leg Signalized	Roy E Furman Hwy	SR 0021	7305	Dilliner Pt Marion Rd	SR 0088	4765	61%	12070	8	4	12	7	-2.00	-\$509,500
5	3	Urban	12	Greene	Franklin Twp	4-Leg Signalized	Mt Morris Rd / E High St	SR 0019	17342	Roy E Furman Hwy / Private D	SR 0021 / Private Dwy	16846	51%	34188	5	5	10	7	-0.93	-\$608,400
6		Urban	12	Greene	Waynesburg Boro	4-Leg Signalized	High St	SR 0019	6943	Washington St	Local Rd	1690	80%	8633	5	2	7	7	0.15	\$73,900
7	7	Rural	12	Greene	Carmichaels Boro	4-Leg Signalized	Vine St	SR 0088	5195	George St	SR 1021	2985	63%	8184	2	2	4	7	-1.58	-\$383,900
8		Rural	12	Greene	Cumberland Twp	-Leg Minor-Street Stop-Controlle	Roy E Furman Hwy	SR 0021	6382	Glade Run Rd	T-683	335	95%	6547	0	0	0	1	-0.81	-\$190,200
9		Urban	12	Greene	Franklin Twp	4-Leg Signalized	Roy E Furman Hwy	SR 0021	18199	School Dr / Jefferson Rd	T-734	1133	98%	19762	2	2	4	6	-1.05	-\$233,200
10		Urban	12	Greene	Waynesburg Boro	4-Leg Signalized	Greene St	SR 0019	8865	Morgan St	SR 0218	526	88%	11391	3	6	9	5	0.16	-\$78,000
11	4	Rural	12	Greene	Morgan Twp	Leg Minor-Street Stop-Controlle	Jefferson Rd	SR 0188	6008	Lippencott Rd	SR 0221	2150	74%	7083	6	0	6	5	-0.58	\$68,800
12		Urban	12	Greene	Waynesburg Boro	4-Leg Signalized	High St	SR 0019	7709	High St	SR 0019 / SR 0021	2379	76%	10095	2	4	6	5	-0.2	-\$114,500
13	5	Urban	12	Greene	Franklin Twp	Leg Minor-Street Stop-Controlle	High St / Roy Furman Hw	SR 0021	6577	High St	SR 0021	5702	54%	9228	4	3	6	4	0.17	\$54,200
14	8	Rural	12	Greene	Carmichaels Boro	4-Leg Signalized	Vine St	SR 0088	6248	High St	SR 0019	1214	84%	7462	1	4	5	4	-1.31	-\$440,600
15		Urban	12	Greene	Waynesburg Boro	4-Leg Signalized	High St	SR 0019	9415	High St	SR 0019	1452	87%	10867	1	3	4	4	-0.4	-\$145,100
16		Urban	12	Greene	Waynesburg Boro	-Leg Minor-Street Stop-Controlle	High St	SR 0019	10356	High St	SR 0019	1200	99%	10480	2	3	4	4	0.05	-\$7,400
17		Urban	12	Greene	Waynesburg Boro	4-Leg Signalized	High St	SR 0019 / SR 0021	5393	Morris St	SR 0019 / SR 3015	1130	78%	6873	1	2	3	4	-0.27	-\$95,400
18		Urban	12	Greene	Waynesburg Boro	-Leg Minor-Street Stop-Controlle	Morris St	SR 0019	7709	Morris St	SR 0019	625	80%	3063	0	2	2	4	0.01	-\$15,900
19		Urban	12	Greene	Franklin Twp	3-Leg Signalized	Roy E Furman Hw	SR 0021	3284	High St	SR 0019	414	75%	11440	6	0	6	3	-0.67	\$11,600
20		Urban	12	Greene	Franklin Twp	-Leg Minor-Street Stop-Controlle	Roy E Furman Hw	SR 0021	512	Roy E Furman Hw	SR 0021	512	95%	10316	3	1	4	3	-0.06	\$31,300
21		Urban	12	Greene	Franklin Twp	4-Leg Signalized	Roy E Furman Hwy	SR 0021	5103	High St	SR 0019	5103	66%	14907	1	2	3	3	-1.83	-\$411,100
22		Urban	12	Greene	Waynesburg Boro	-Leg Minor-Street Stop-Controlle	High St	SR 0019	10356	High St	SR 0019	445	96%	10797	0	1	1	3	-0.31	-\$59,900
23		Rural	12	Greene	Carmichaels Boro	-Leg Minor-Street Stop-Controlle	Vine St	SR 0088	4142	Greene St	Local Rd	117	84%	4959	4	2	6	2	0.27	\$111,400
24		Rural	12	Greene	Cumberland Twp	-Leg Minor-Street Stop-Controlle	Roy E Furman Hw	SR 0021	8907	High St	SR 0019	211	98%	9013	3	3	6	2	0.2	\$26,500
25		Urban	12	Greene	Franklin Twp	-Leg Minor-Street Stop-Controlle	Roy E Furman Hwy	SR 0021	9803	High St	SR 0019	495	85%	10298	2	4	6	2	0.1	-\$26,800
26		Rural	12	Greene	Monongahela Twp	-Leg Minor-Street Stop-Controlle	Point Marion Rd	SR 0088	2962	High St	SR 0019	178	94%	3140	4	1	5	2	0.34	\$140,300
27		Urban	12	Greene	Waynesburg Boro	-Leg Minor-Street Stop-Controlle	High St	SR 0021	8474	High St	SR 0021	981	90%	9455	1	3	4	2	-0.01	-\$36,100
28		Urban	12	Greene	Waynesburg Boro	-Leg Minor-Street Stop-Controlle	High St	SR 0021	8348	Spring St	Local Road	95	99%	8443	1	2	3	2	0.08	\$1,000
29		Rural	12	Greene	Morgan Twp	-Leg Minor-Street Stop-Controlle	Jefferson Rd	SR 0188	4581	Trailer Ct	Local Road	145	93%	4754	1	2	3	2	-0.19	-\$90,400
30		Rural	12	Greene	Washington Twp	-Leg Minor-Street Stop-Controlle	Washington Rd	SR 0019	3129	Washington Rd	SR 0019 / Local Road	2499	56%	5628	1	2	3	2	-0.64	-\$176,100
31		Urban	12	Greene	Waynesburg Boro	4-Leg Signalized	High St	SR 0021	16846	High St	SR 0021	5365	76%	22211	2	1	3	2	-1.98	-\$457,000
32		Urban	12	Greene	Franklin Twp	4-Leg Signalized	High St	SR 0019	10356	High St	SR 0019	2556	80%	12912	0	2	2	2	-0.97	-\$276,300
33		Rural	12	Greene	Center Twp	-Leg Minor-Street Stop-Controlle	Roy E Furman Hw	SR 0021	2885	Washington St	Local Rd	669	77%	3314	3	0	3	1	-0.28	\$20,500
34		Rural	12	Greene	Jefferson Boro	-Leg Minor-Street Stop-Controlle	Greene St	SR 0188	5009	Washington St	Local Rd	669	88%	5678	2	1	3	1	-0.28	-\$43,500
35		Urban	12	Greene	Waynesburg Boro	-Leg Minor-Street Stop-Controlle	Greene St	SR 0019 / Local Road	6706	Richhill St	SR 0019 / Local Road	6706	50%	13412	1	2	3	1	-0.45	-\$97,700
36		Rural	12	Greene	Cumberland Twp	-Leg Minor-Street Stop-Controlle	Dry Tavern Rd	SR 0088	3613	Willis Rd / Crucible Rd	SR 1017	307	92%	3920	0	3	3	1	-0.18	-\$178,300
37		Rural	12	Greene	Jefferson Twp	4-Leg Signalized	Jefferson Rd / Ferndale Rd	SR 0188 / SR 1008	3551	Dry Tavern Rd	SR 0088	3270	52%	6821	2	1	3	1	-2.34	-\$661,500
38		Urban	12	Greene	Franklin Twp	-Leg Minor-Street Stop-Controlle	High St	SR 0021	8348	Locust Ave / Private Dwy	T-681 / Private Dwy	276	97%	8624	1	1	2	1	-0.09	-\$13,100
39		Urban	12	Greene	Franklin Twp	-Leg Minor-Street Stop-Controlle	E High St	SR 0019	23289	Flowers St	Local Road	320	99%	23449	1	1	2	1	-0.67	-\$104,400
40		Urban	12	Greene	Franklin Twp	-Leg Minor-Street Stop-Controlle	E High St	SR 0019	18619	Bill George Dr	SR 0188	7434	71%	22336	2	0	2	1	-1.14	-\$158,400
41		Rural	12	Greene	Jefferson Twp	4-Leg Signalized	High St / Dry Tavern Fredto	SR 0088	3592	Jefferson Rd / Ferndale Rd	SR 0188 / SR 1008	3551	50%	7143	0	2	2	1	-2.12	-\$614,800
42		Urban	12	Greene	Franklin Twp	-Leg Minor-Street Stop-Controlle	E High St	SR 0019	23289	Second St	Local Road	73	100%	23326	0	1	1	1	-0.56	-\$99,100
43		Urban	12	Greene	Waynesburg Boro	-Leg Minor-Street Stop-Controlle	Greene St	SR 0019	4642	Blackberry St	Local Rd	62	99%	4704	0	0	0	1	-0.1	-\$9,300
44		Rural	12	Greene	Jefferson Twp	-Leg Minor-Street Stop-Controlle	Roy E Furman Hwy	SR 0021	9355	Rolling Meadows Rd	SR 2026	1213	89%	9962	2	5	7	0	-0.41	-\$217,200
45		Rural	12	Greene	Morgan Twp	-Leg Minor-Street Stop-Controlle	Jefferson Rd	SR 0188	4581	Homeville Rd	T-624	212	96%	4687	2	1	3	0	-0.08	-\$1,000
46		Rural	12	Greene	Cumberland Twp	-Leg Minor-Street Stop-Controlle	Crucible Rd	SR 1017	496	Woodrings Rd	Local Road	244	67%	740	0	3	3	0	0.22	-\$41,300

Traffic_Split

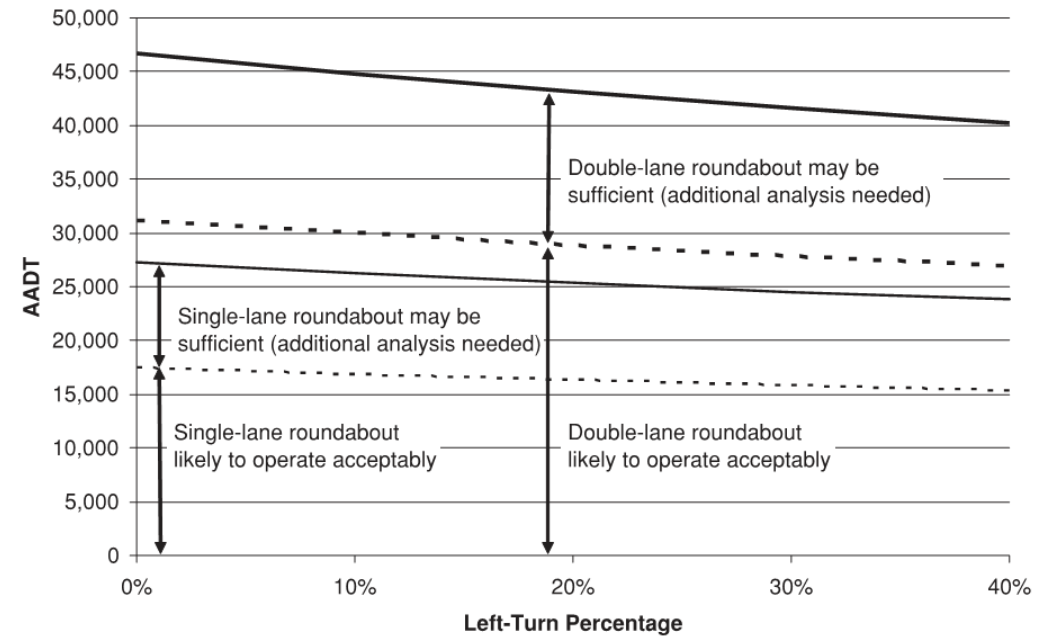
Intersection_ADT

Right_Angle

Excess_Cost

Roundabout Screening Step 1 – Intersection ADT

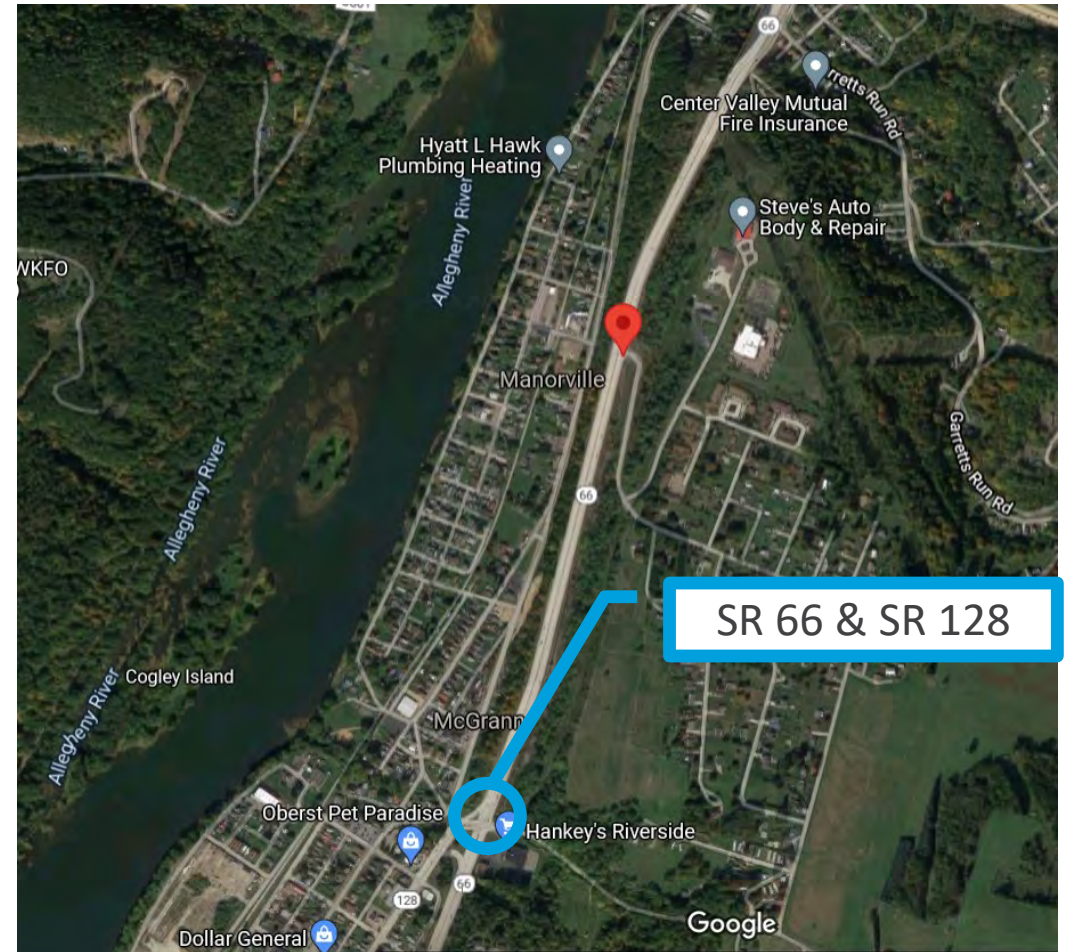
- Total entering volume
- Approximate roundabout size
- Roundabouts with less than two entrance lanes – no upper limit
- Sufficient traffic to justify improvement – Intersection with minor ADT >1,000 vpd



NCHRP Report 672 – Exhibit 3-12 – Planning Level Daily Intersection Volumes

Roundabout Screening Step 1 – 90-10 split

- Major roadway AADT exceeds 90% of total intersection AADT
- Found 90-10 intersections tend to have poor roadway typology for roundabout
- Often close to higher potential intersections



SR 66 & Fairground Rd – Manor Twp, Armstrong County

Roundabout Screening Step 1 – Excess Cost

- Predicted vs Observed vs Expected
- High crash locations are in the higher percentile of crash distribution
- Excess Cost did not correlate with good roundabout candidates



PennDOT HSM Tool A Example

Roundabout Screening Step 1 – Filter Summary

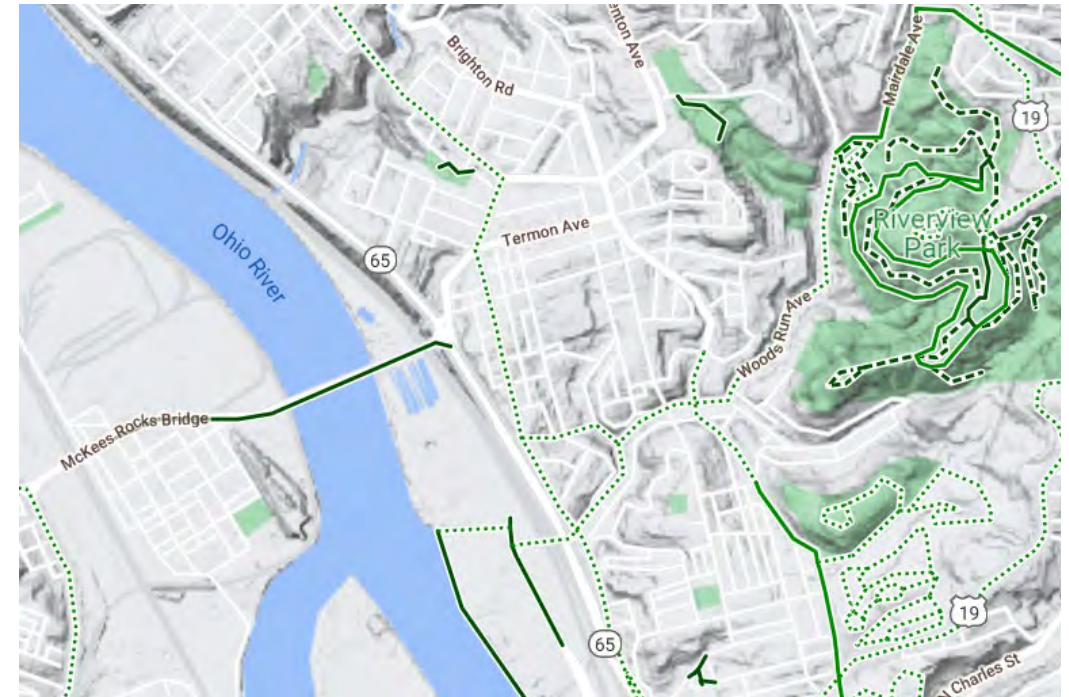
- Eliminated intersections with:
 - <4 angle/head-on crashes
 - Minor AADTs $\leq 1,000$ veh/day
 - Potential roundabout exceeded 2 entry lanes
 - Incompatible roadway network (e.g. complex interchanges, one-way intersections)



Saw Mill Run Road and SR 51 Interchange

Roundabout Screening Step 1 – Individual Review

- Reviewed 578 filtered sites
 - 160 High Potential
 - 257 Potential*
 - 161 Low Potential
- Noted
 - Topography
 - Transit opportunities
 - Adjacent intersections
 - Trails and railroads
 - Environmental constraints (e.g. gas stations, streams, parks, etc)



Roundabout Screening Step 1 - Summary

1,379 HSNS intersections > 578 filtered > 160 high potential > 84 recommended

- D10-0
 - Armstrong – 86 to 13
 - Butler – 128 to 60
 - Indiana – 142 to 26
- D11-0
 - Allegheny – 305 to 227
 - Beaver – 120 to 49
 - Lawrence – 134 to 33
- D12-0
 - Fayette – 111 to 40
 - Greene – 51 to 13
 - Washington – 109 to 42
 - Westmoreland – 121 - 75

Roundabout Screening Step 1 – HSM Analysis

Used PennDOT HSM Tools

- Tool A (AASHTO Part C)
- Tool B (AASHTO Part D)

Performed to:

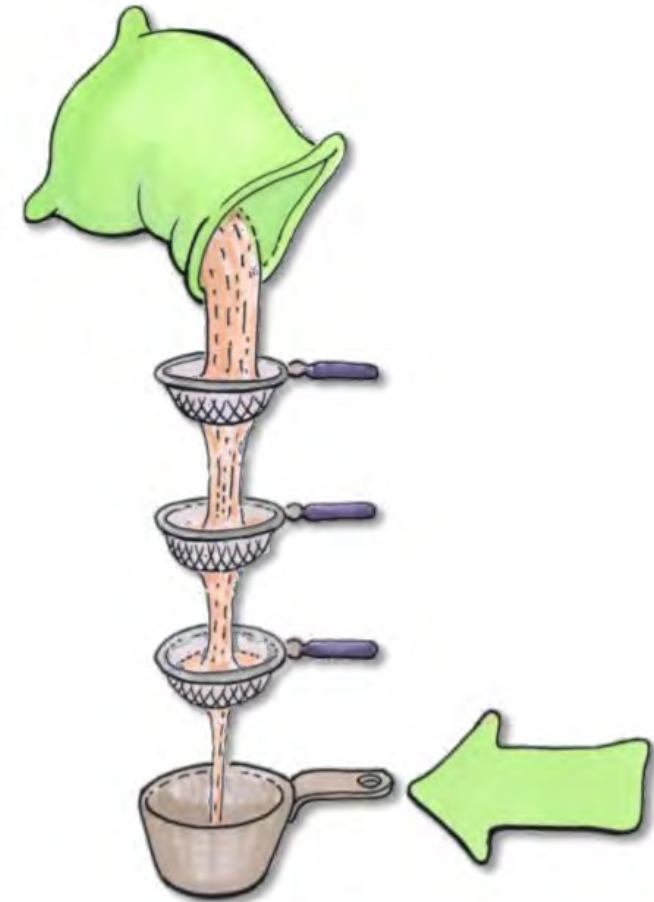
- Confirm continued crash performance
- Provide “benefit budget” for benefit/cost ratio

Progressed 40 intersection to Roundabout Screening Step 2

Roundabout Screening Step 2

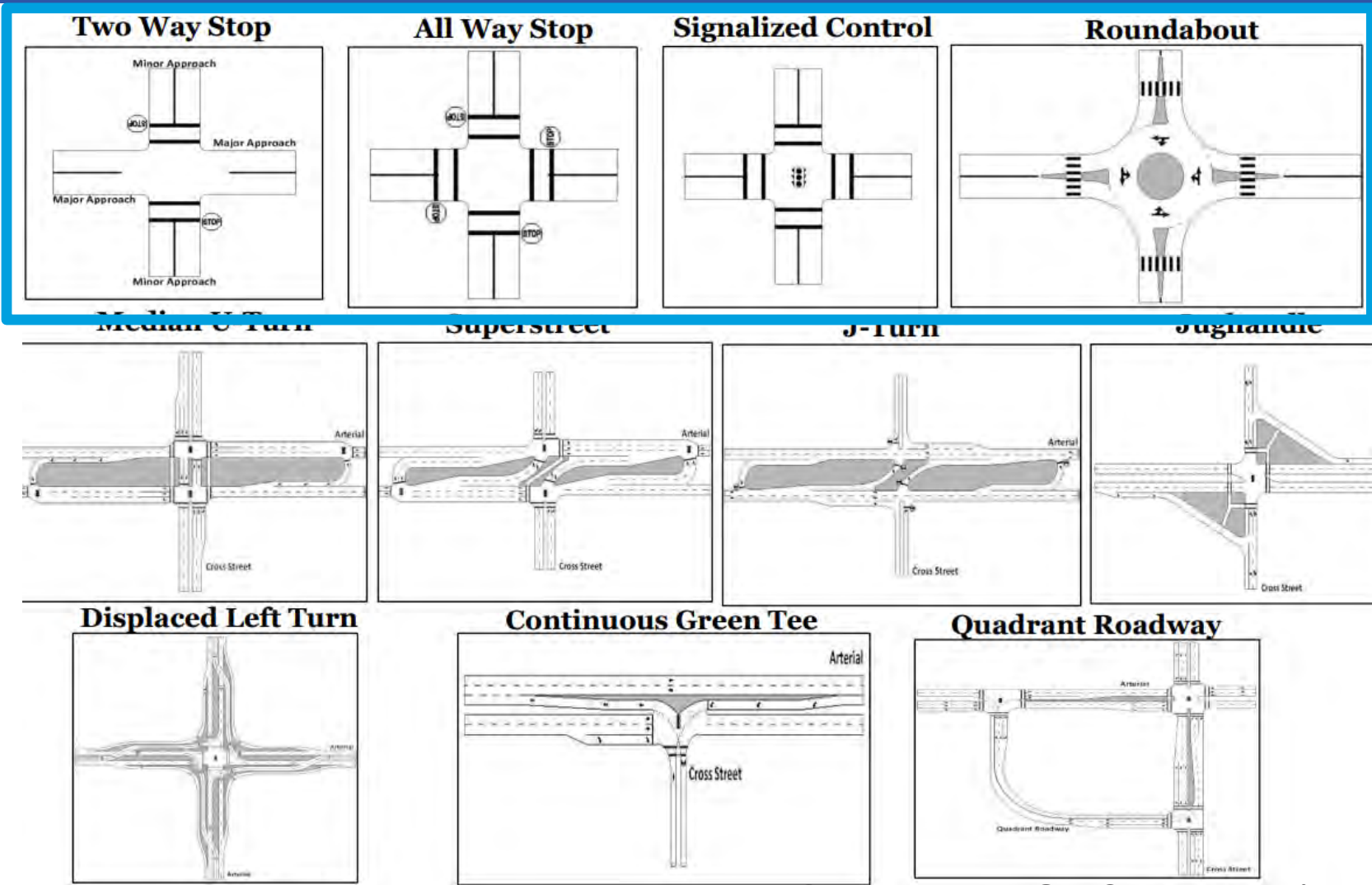
Intersection Control Evaluation (ICE)

- PennDOT's Intersection Control Evaluation (ICE)
- The purpose of ICE is to objectively and consistently consider multiple forms of intersection control when a new project is first contemplated.
- 3 stage forms
- One alternative is clearly preferred – ICE ends



Source: PennDOT ICE Presentation

Roundabout Screening Step 2 – ICE Stage 1 Control Strategies



Source: PennDOT ICE Presentation

Roundabout Screening Step 2 – ICE Stage 1 example

ID# 8159
District 12-0
Westmoreland County
Allegheny Township

Total Crashes – 33
Angle/Head-on – 9
Hit Fixed Object - 20



Roundabout Screening Step 2 – ICE Stage 2 Forms

- Safety
 - Compare crash reduction factors (CRF)
 - Review crash resumes
 - Update HSM Tool
- Operations
 - Requested historical turning movement counts
 - Streetlight Data
 - FHWA CAP-X tool
 - Sidra Intersection

Roundabout Screening Step 2 – ICE Summary

40 intersections

- 32 roundabouts
- 4 traffic signal improvements
- 1 Median U-Turn (MUT)
- 1 All-way stop
- 1 Realignment
- 1 Eliminated

7 intersections progressed to
concept development

Concept Development

Concept Report

- Concept Development
- Desktop Environmental Screening
- Traffic Analysis
- Cost Estimate
- HSM Analysis
- Benefit Cost



Conclusion

- Collaborative process with Steering Committee and Study Team
- Identified 160 high potential intersections
- Developed 7 intersection concept reports

Met requirements of PennDOT Highway Safety Improvement Program (HSIP)

1. Address Strategic Highway Safety (SHSP) priority
2. Be identified through a data-driven process
3. Contribute to reduction in fatalities and serious injuries

Thank you



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