



SRF
ENGINEERS
PLANNERS
DESIGNERS

CH 21 Downtown Prior Lake Reconstruction Local Transportation Assessment | 10.16.17



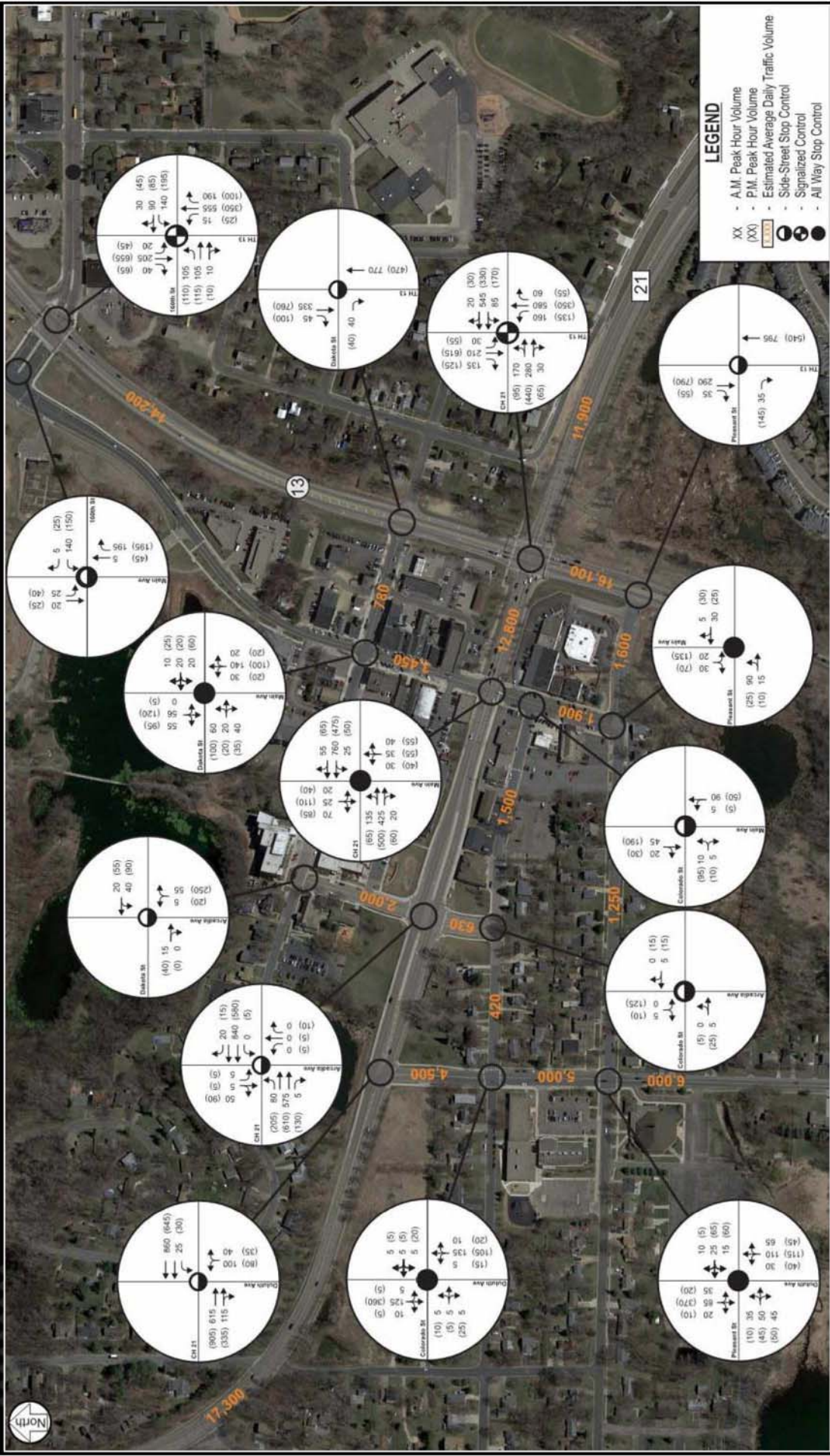
- Involved Throughout the Study Process
 - March 2017 to Present
- PMT Meetings (7)
- Open Houses (2)
- Visioning Workshops (3)
- City Council/Joint Work Session Meetings (3)
- Budget Progress ~ 60%

- A. Character:** Preserve and enrich the character of Downtown Prior Lake
- B. Non-Motorized:** Provide a comprehensive network for nonmotorized transportation that is compatible with the major transportation corridors
- C. Safety:** Safely accommodate all users along the major transportation corridors
- D. Mobility:** Enhance vehicle mobility on major transportation corridors
- E. Local:** Maintain and enhance local roadway system
- F. Infrastructure:** Provide infrastructure improvements compatible with the natural and human environment
- G. Cost:** Develop a financially responsible infrastructure implementation plan

Existing CH 21 Conditions

- Crash and severity rates at the study intersections/corridor generally fall below average rates for locations with similar characteristics, except the CH 21/Duluth Avenue intersection, which has a high percent of right-angle crashes.
- The CH 21/MN Highway 13 intersection operates at an overall LOS F during the p.m. peak hour as a result of the current traffic signal operation.
- Eastbound queues from the CH 21/MN Highway 13 intersection frequently extend beyond Main Avenue during peak periods; occasionally, westbound queues from the CH 21/Main Avenue intersection extend to MN Highway 13.
- Due to congestion along CH 21 between MN Highway 13 and Main Avenue, motorists were observed using alternative routes to avoid congestion.

SRF Existing Local Transportation System Conditions



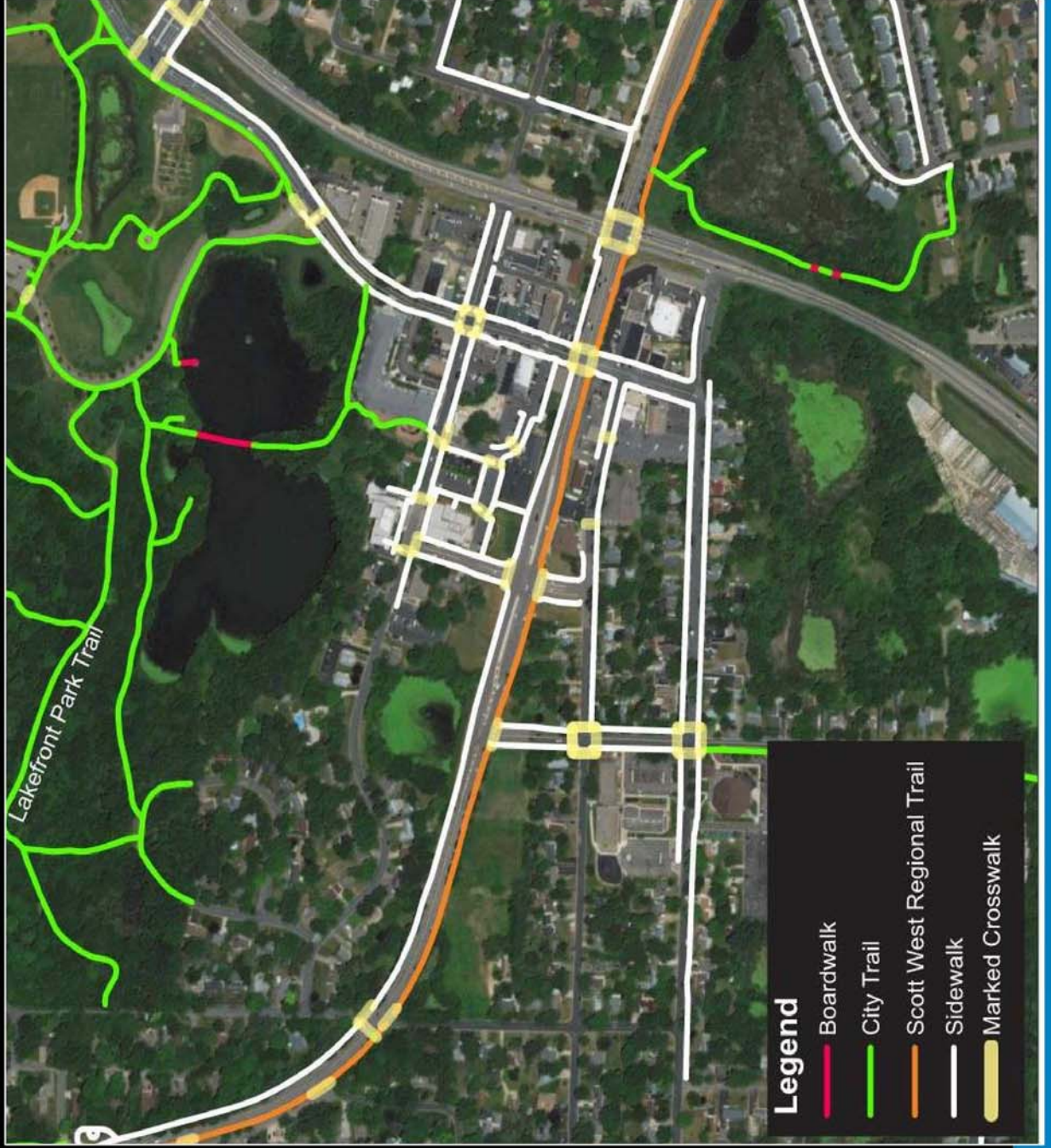
SRF Existing Travel Patterns





- The amount of reported crashes does not suggest any safety issues on local roadways within the study area from a frequency perspective.
- Near the Duluth Avenue/Pleasant Street intersection (2)
- Near the Arcadia Avenue/Dakota Street intersection (1)
- Dakota Street between Arcadia Avenue/MN Highway 13 (2)
- At the Main Street/Kop Parkway intersection (2)

Pedestrian Network



SRF Parking Utilization

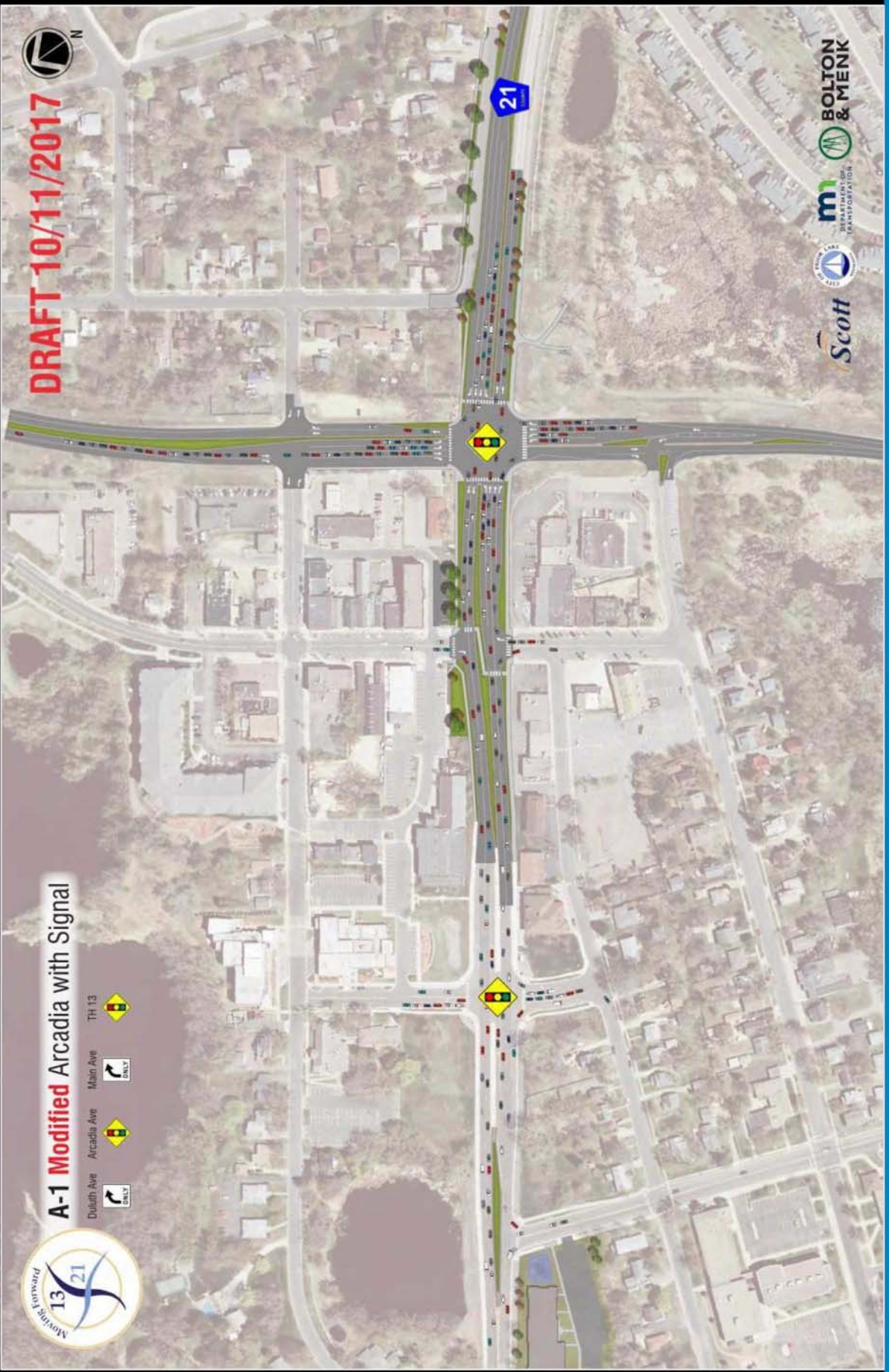


SRF Alternative A-1



A-1 Modified Arcadia with Signal

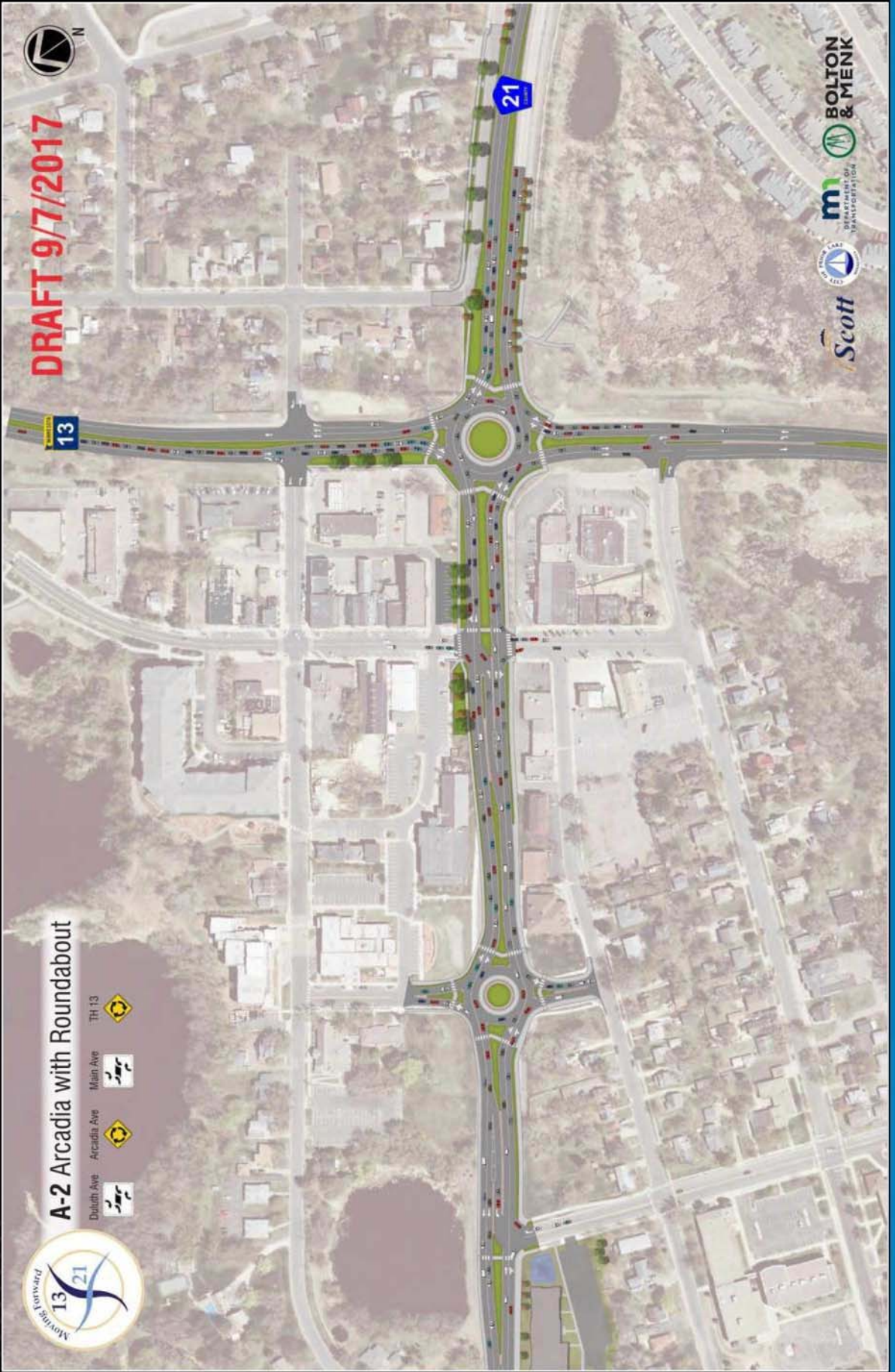
- Duluth Ave - Arcadia Ave  ONLY
- Main Ave  ONLY
- TH 13 



DRAFT 10/11/2017



SRF Alternative A-2



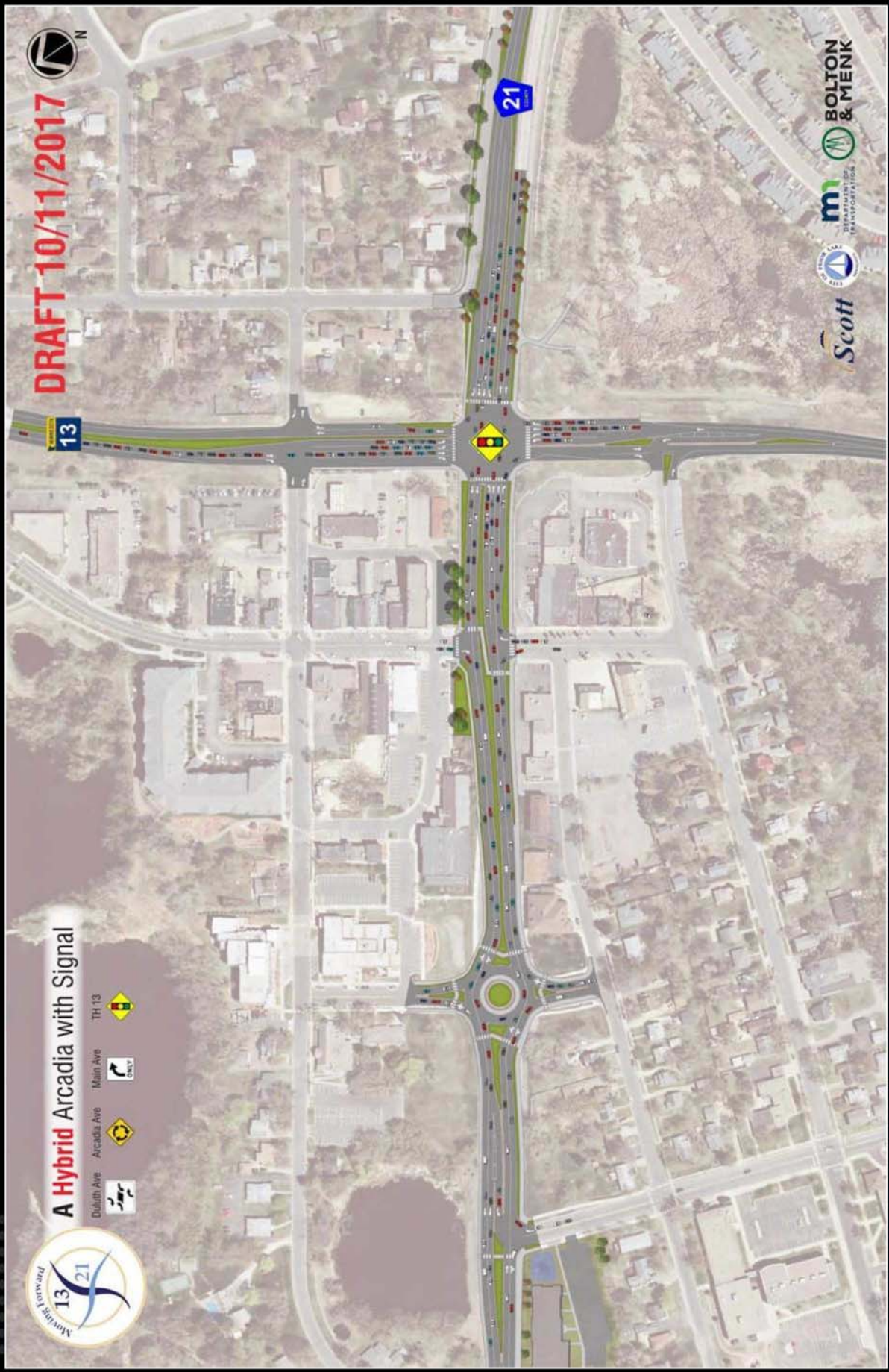
A-2 Arcadia with Roundabout

- Duluth Ave - Arcadia Ave
- Arcadia Ave - Main Ave
- TH 13

DRAFT 9/7/2017



SRF Alternative A Hybrid



A Hybrid Arcadia with Signal

- Duluth Ave Arcadia Ave
- Main Ave TH 13



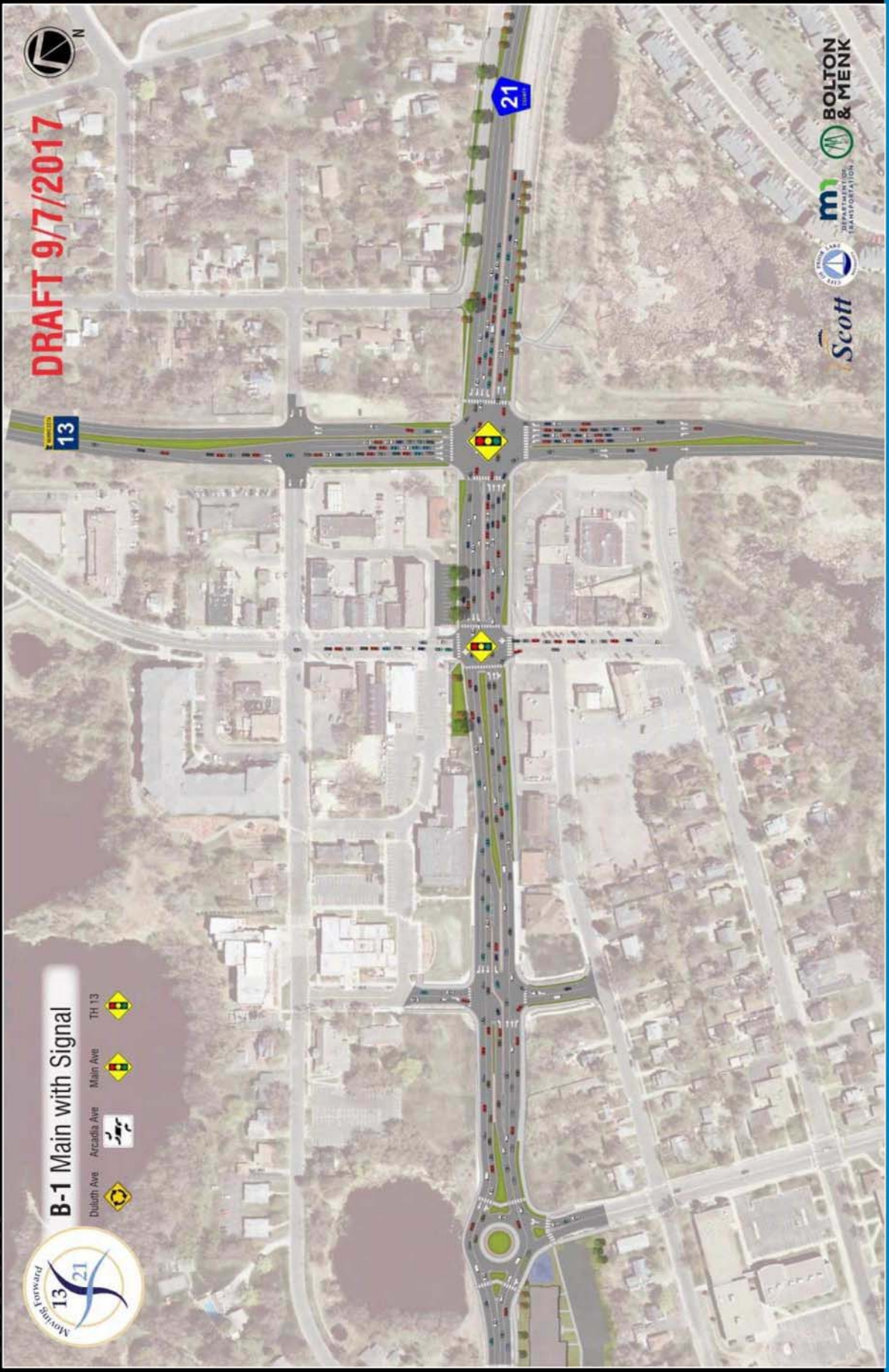
SRF Alternative B-1



B-1 Main with Signal

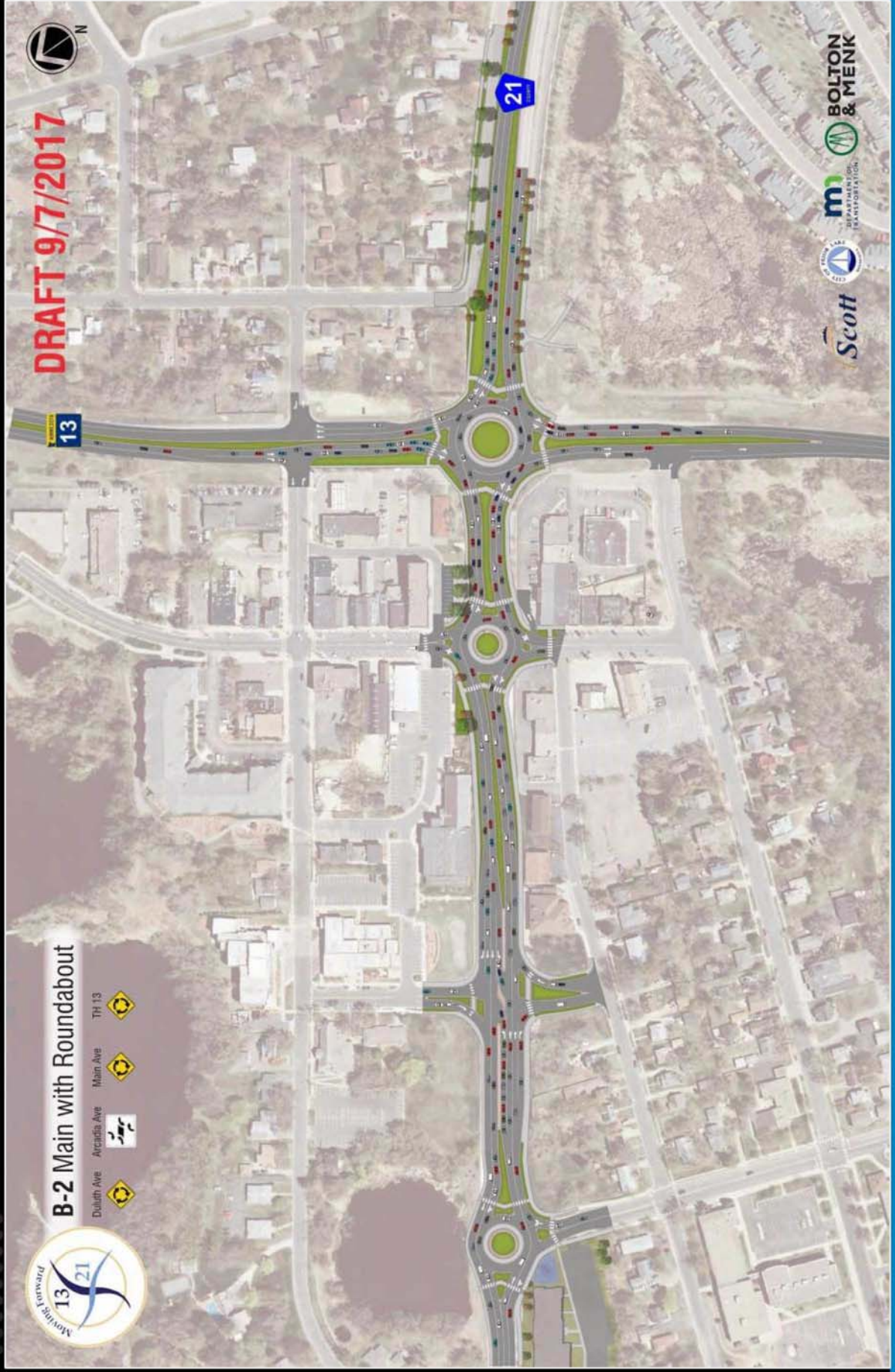
- Duluth Ave - Arcadia Ave
- Main Ave - TH 13

DRAFT 9/7/2017



Scott
CITY OF DULUTH
DEPARTMENT OF TRANSPORTATION
BOLTON & MENK

SRF Alternative B-2 (Removed from Consideration)



Alternative Evaluation (Local Transportation Perspective)

- All alternatives improve mobility on the County and State system (CH 21 and MN Highway 13).
- Local Transportation Perspective
 - *Travel Patterns*
 - *Roadway Capacity*
 - *Safety (Vehicular and Pedestrian)*
 - *Access*
 - *Downtown Compatibility (Land Use, Growth, Etc.)*

Physical - Travel Pattern Changes

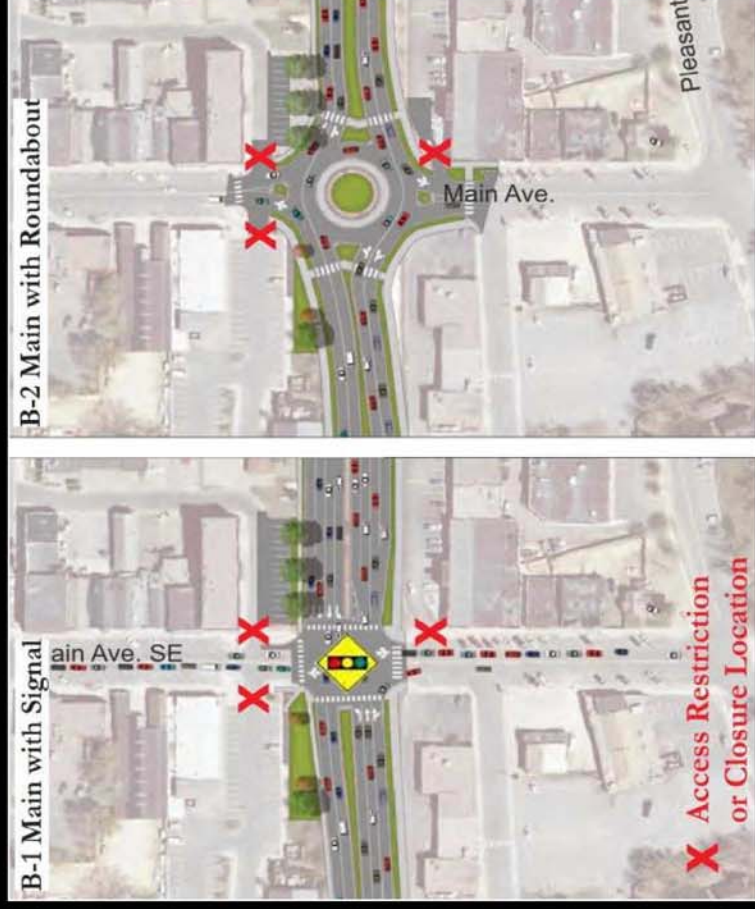
Goal: Motorists and pedestrians traveling to downtown from any direction should have a minimum of two options to access downtown, which is considered reasonable from a transportation perspective.



A-1 Arcadia Signal	A-2 Arcadia Roundabout	A Hybrid	B-1 Main Signal	B-2 Main Roundabout <i>Removed from Further Consideration</i>	Project Goals
Good	Good	Good	Good	Good	Mobility Local

Physical – Driveway Impacts

- Alternatives B-1 and B-2 would negatively impact access, mobility, and circulation within the downtown.

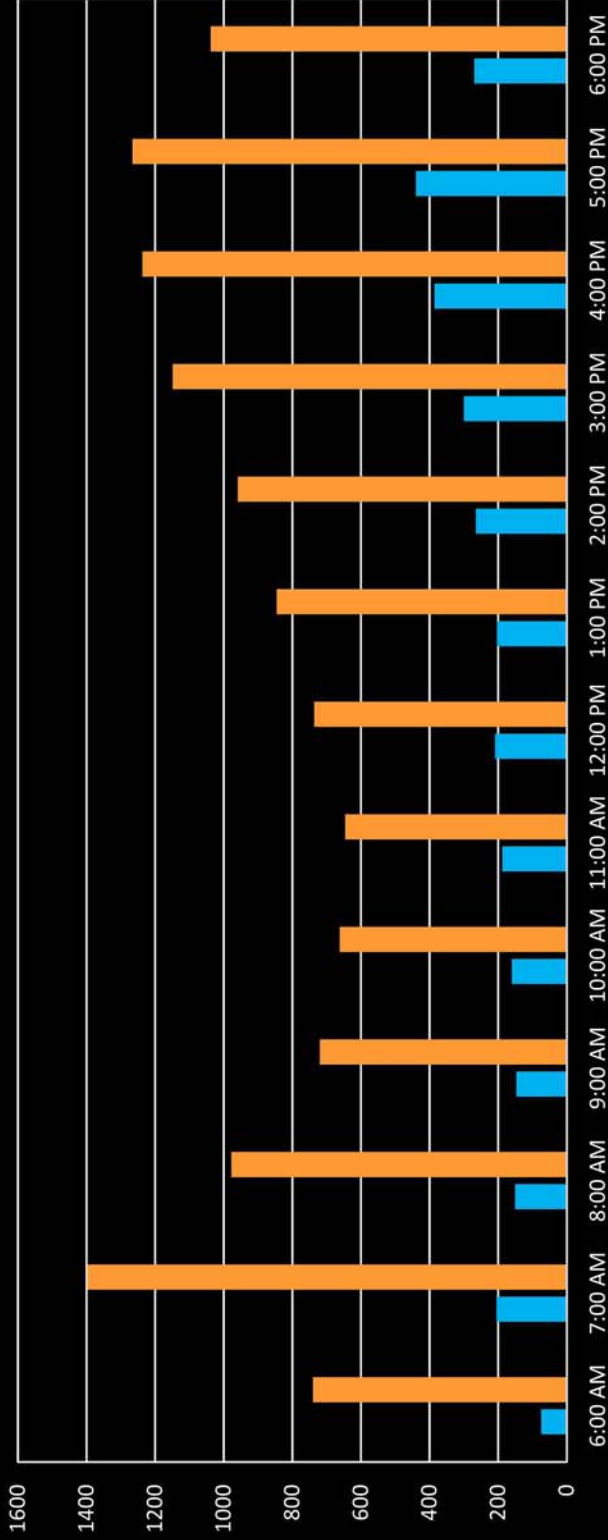


A-1 Arcadia Signal	A-2 Arcadia Roundabout	A Hybrid	B-1 Main Signal	B-2 Main Roundabout <i>Removed from Further Consideration</i>	Project Goals
Good	Good	Good	Poor	Poor	Character Mobility Local

Main Avenue and CH 21 Traffic Volume Profiles

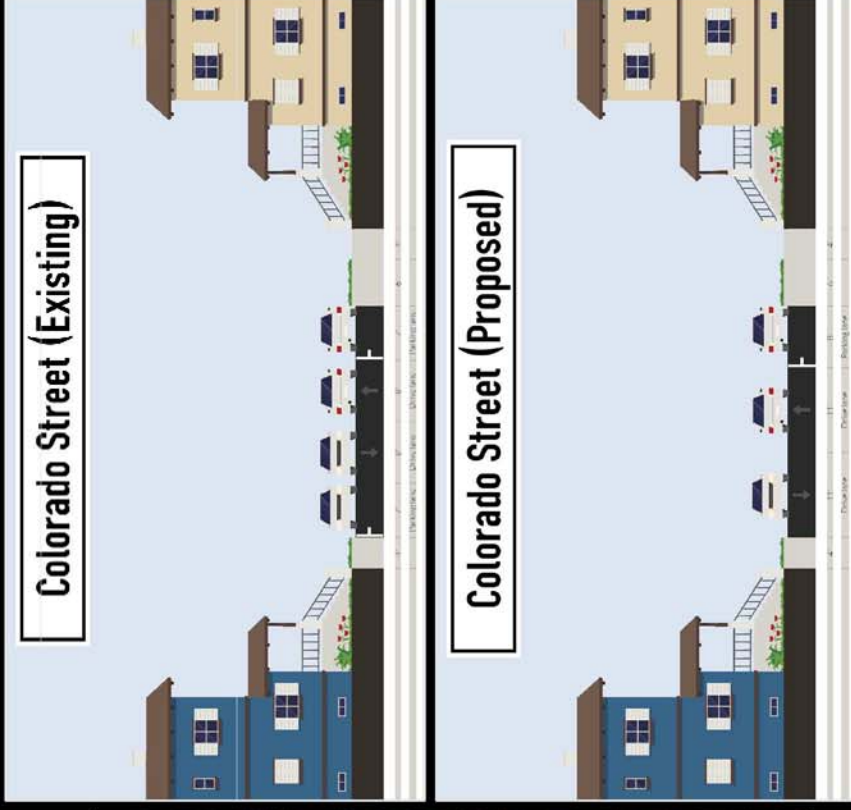
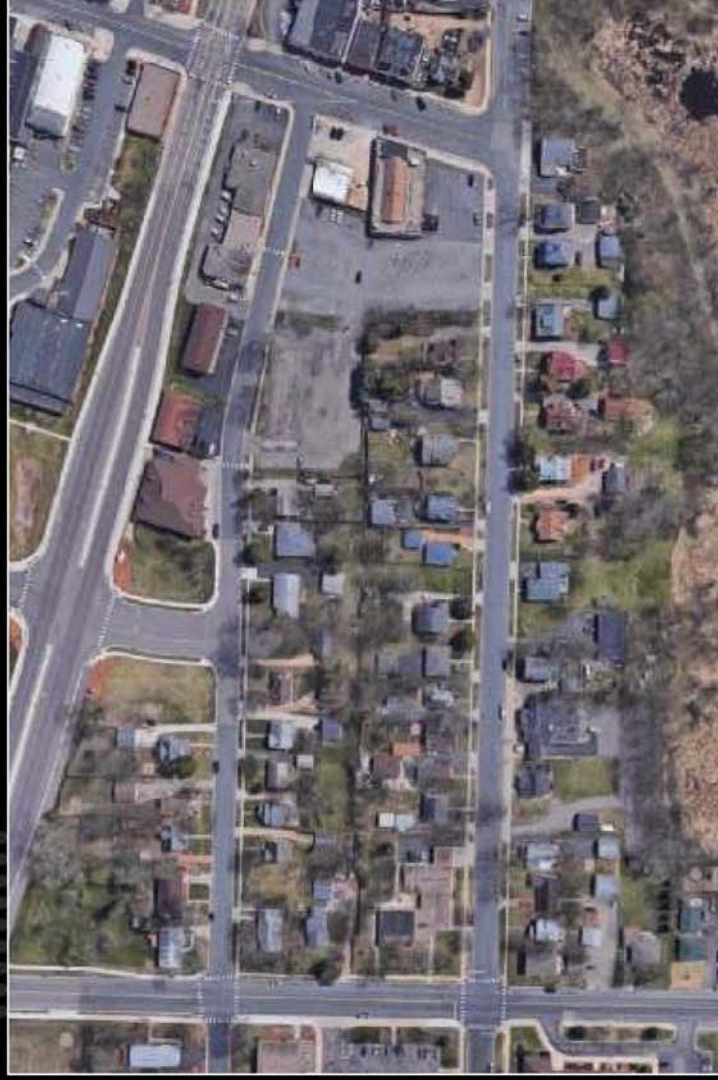
Hourly Entering Traffic Volumes

■ Main Ave ■ CH 21



Location	Character	Project Goals
A-1 Arcadia Signal	Good	Mobility Local
A-2 Arcadia Roundabout	Good	
A Hybrid	Good	Mobility Local
B-1 Main Signal	Poor	
B-2 Main Roundabout <i>Removed from Further Consideration</i>	Poor	

Physical – Roadway Cross-Sections/Parking Impacts



A-1 Arcadia Signal	Fair	A Hybrid	Fair	B-1 Main Signal	Poor	B-2 Main Roundabout <i>Removed from Further Consideration</i>	Project Goals
	Fair	Fair	Fair				Character Local

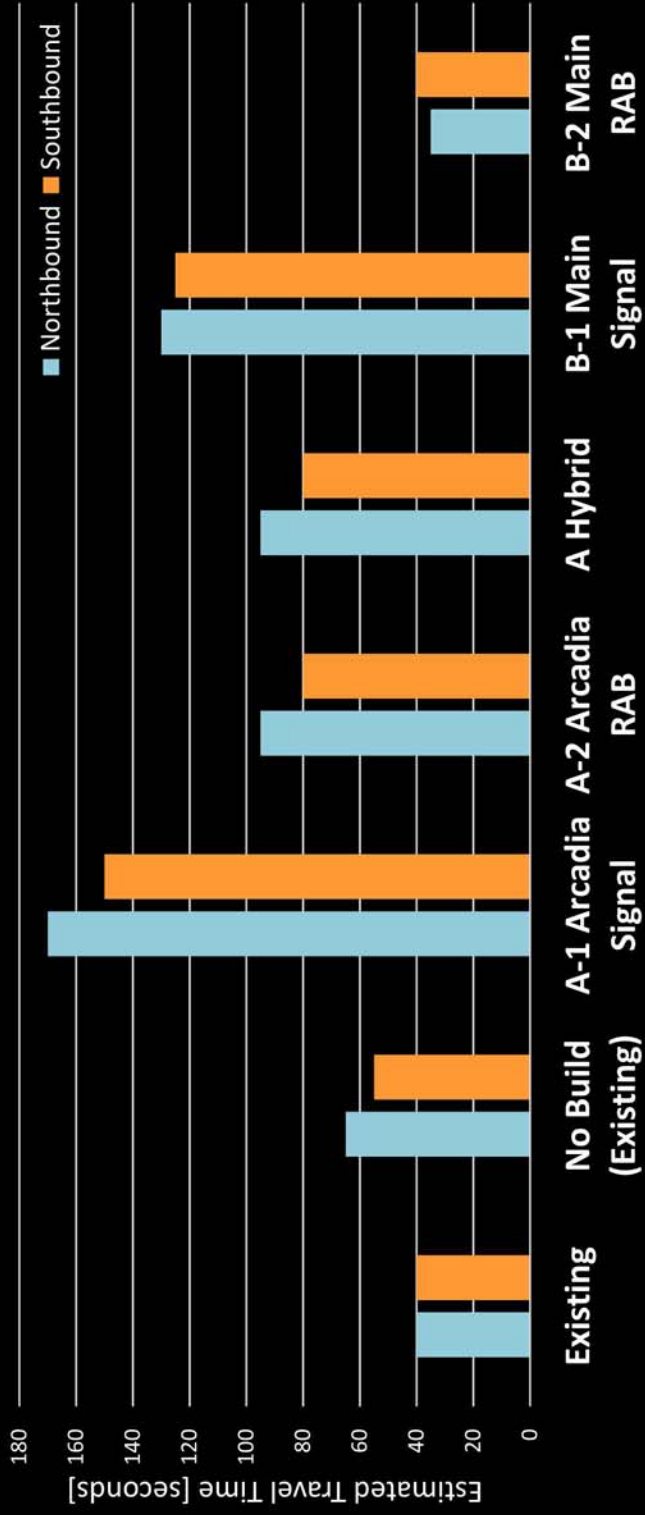
- All four alternatives are expected to improve corridor travel times

Year 2040	Peak Hour	Alternative Travel Time (Percent Improvement from Existing)				
		Existing	A-1	A-2	B-1	B-2
EB Travel Time (s) Duluth Ave to MN 13	AM	175 (0%)	70 (60%)	45 (75%)	75 (55%)	45 (75%)
	PM	420 (0%)	150 (65%)	80 (80%)	225 (50%)	70 (85%)
WB Travel Time (s) Duluth Ave to MN 13	AM	375 (0%)	180 (50%)	110 (70%)	165 (55%)	110 (70%)
	PM	430 (0%)	110 (75%)	55 (85%)	100 (75%)	45 (90%)

A-1 Arcadia Signal	A-2 Arcadia Roundabout	A Hybrid	B-1 Main Signal	B-2 Main Roundabout <i>Removed from Further Consideration</i>	Project Goals
Fair	Good	Fair	Fair	Good	Character Mobility Local

Operational – Main Avenue Travel Times

Main Avenue Travel Time Between Dakota and Pleasant (PM Peak)



A-1 Arcadia Signal	A-2 Arcadia Roundabout	A Hybrid	B-1 Main Signal	B-2 Main Roundabout	Project Goals
Poor	Fair	Fair	Poor	Removed from Further Consideration	Mobility Local
				Good	

Operational – Local Roadway Traffic Volumes

- Local roadway system can accommodate the change in year 2040 traffic volumes.
- Improvements to CH 21 corridor operations would result in less motorists diverting through the downtown than currently occurs.

Facility Type	Daily Capacity Ranges (AADT) *
Two-lane undivided urban	8,000 - 10,000
Two-lane undivided rural	14,000 - 15,000
Three-lane undivided urban (two-lane divided with turn lanes)	15,000 - 17,000
Four-lane undivided urban	18,000 - 22,000
Five-lane undivided urban (four-lane divided with turn lanes)	28,000 - 32,000
Four-lane divided rural	35,000 - 38,000

A-1 Arcadia Signal	A-2 Arcadia Roundabout	A Hybrid	B-1 Main Signal	B-2 Main Roundabout <i>Removed from Further Consideration</i>	Project Goals
Fair	Fair	Fair	Fair	Fair	Mobility Local

SRF Operational – Local Roadway Traffic Volumes



Project Goals	B-2 Main Roundabout	B-1 Main Signal	A Hybrid	A-2 Arcadia Roundabout	A-1 Arcadia Signal
Mobility Local	Fair	Fair	Fair	Fair	Fair

Operational – Year 2040 Delays and Queues

- All alternatives provide overall acceptable levels of service at the study intersections.
- Northbound/southbound queues at the CH 21/Main Avenue intersection under Alternative B-1 will significantly inhibit downtown access, mobility, circulation, and parking.

A-1 Arcadia Signal	A-2 Arcadia Roundabout	A Hybrid	B-1 Main Signal	B-2 Main Roundabout	Project Goals
Good	Good	Good	Poor	Fair	Mobility Local
				Removed from Further Consideration	

- Multi-lane roundabouts (Alternatives A-2/B-2) statistically have a higher frequency of crashes, but fewer high severity (fatal/injury related type crashes) compared to signalized intersections (Alternatives A-1/B-1).
- If the weighted crash costs are the same between the alternatives, the less severe type crash alternatives should be favored.

A-1 Arcadia Signal	A-2 Arcadia Roundabout	A Hybrid	B-1 Main Signal	B-2 Main Roundabout <i>Removed from Further Consideration</i>	Project Goals
Fair	Fair	Fair	Fair	Fair	Safety Local

- All alternatives provide at least three (3) north/south crossings of CH 21. Alternative A-2 and A-Hybrid provide four (4) north/south pedestrian crossings.
- From a pedestrian safety perspective, signals have higher driver yield rates to pedestrians than roundabouts. However, there are opportunities to enhance pedestrian crossings to improve driver yield rates.

A-1 Arcadia Signal	A-2 Arcadia Roundabout	A Hybrid	B-1 Main Signal	B-2 Main Roundabout <i>Removed from Further Consideration</i>	Project Goals
Good	Good	Good	Good	Fair	Non-Motorized Safety Local

- Motorists traveling through signalized intersections at a range between 15 and 50 mph, whereas motorists travel through roundabouts at a range between 15 and 20 mph
- The risk of severe injury of a pedestrian struck by a vehicle increases from 25 percent at 25 mph to 90 percent at 45 mph
- Fewer severe pedestrian-related incidents would be expected under the roundabout alternatives

A-1 Arcadia Signal	A-2 Arcadia Roundabout	A Hybrid	B-1 Main Signal	B-2 Main Roundabout <i>Removed from Further Consideration</i>	Project Goals
Good	Good	Good	Good	Fair	Non-Motorized Safety Local

Operational – Pedestrian Delay at Main Avenue

Alternative	Crossing Treatment	Motorist Yield Rate	Peak Hour Crossing Delay	LOS
No Build (Existing)	All-way-stop	99%	0-5 sec.	A
A-1, A-2, A-Hybrid	Refuge Island	34%	50-55 sec.	F
	RRFB	84%	10-15 sec.	C
	Hawk	97%	5-10 sec.	B
B-1	Signal	99%	85-110 sec.	F
B-1	Roundabout	41%	10-15 sec.	B

A-1 Arcadia Signal	A-2 Arcadia Roundabout	A Hybrid	B-1 Main Signal	B-2 Main Roundabout	Project Goals
Good	Good	Good	Poor	<i>Removed from Further Consideration</i> Good	Non-Motorized Local

Compatibility – Land Use/Downtown Growth

- Improved access at either Arcadia Avenue or Duluth Avenue will help facilitate downtown growth.
- Full-access at Arcadia Avenue provides direct north/south vehicular connectivity in downtown (important under Alternatives A-1 and A-2).



A-1 Arcadia Signal	A-2 Arcadia Roundabout	A Hybrid	B-1 Main Signal	B-2 Main Roundabout <i>Removed from Further Consideration</i>	Project Goals
Good	Good	Good	Good	Fair	Feasibility Local

SRF Operational – Project Phasing



A-1 Arcadia Signal	Fair	A-2 Arcadia Roundabout	Fair	A Hybrid	Fair	B-1 Main Signal	Fair	B-2 Main Roundabout <i>Removed from Further Consideration</i>	Fair	Project Goals	Mobility Local
--------------------	------	------------------------	------	----------	------	-----------------	------	--	------	---------------	-------------------

- Alternatives A-2 and B-2 provides the best opportunity to incorporate streetscaping elements.
- Alternative A-1 provides a good streetscaping opportunity.
- Alternative B-1 provides the lease amount of opportunities.

A-1 Arcadia Signal	A-2 Arcadia Roundabout	A Hybrid	B-1 Main Signal	B-2 Main Roundabout <i>Removed from Further Consideration</i>	Project Goals
Good	Good	Good	Fair	Good	Character Local

Compatibility – Property Impacts

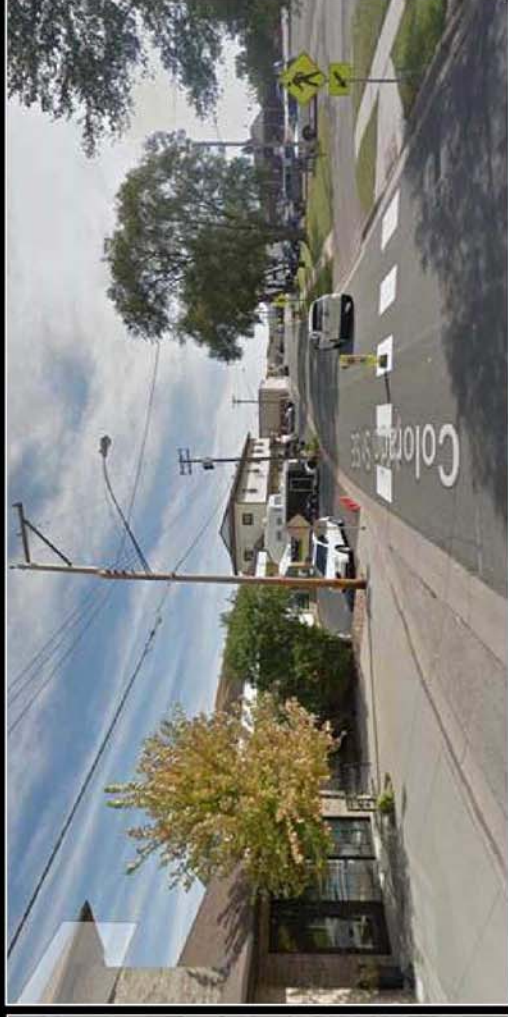
Intersection	Number of Impacted Parcels	Number of Full Acquisition Parcels
No Build (Existing)	0	0
Alternative A-1	10	2
Alternative A-2	14	2
Alternative B-1	19	1
Alternative B-2	23	1

A-1 Arcadia Signal	A-2 Arcadia Roundabout	A Hybrid	B-1 Main Signal	B-2 Main Roundabout <i>Removed from Further Consideration</i>	Project Goals
Fair	Fair	Fair	Poor	Poor	Feasibility Cost Local

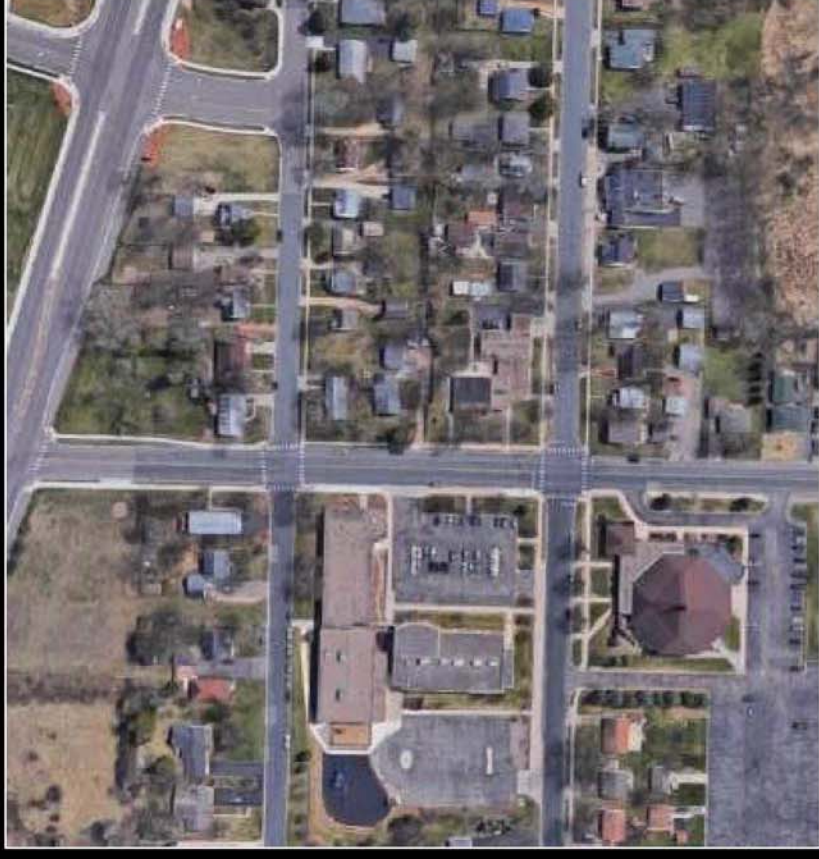
Alternative Evaluation Summary Matrix

Evaluation Criteria	A-1 Arcadia Signal	A-2 Arcadia Roundabout	A Hybrid	B-1 Main Signal	B-2 Main Roundabout <i>Removed</i>	Project Goals
Travel Pattern Changes	Good	Good	Good	Good	Good	Mobility Local
Driveway Impacts	Good	Good	Good	Poor	Poor	Character Mobility Local
Roadway Cross-Section/ Parking Impacts	Fair	Fair	Fair	Poor	Poor	Character Local
Corridor Travel Times	Fair	Good	Good	Fair	Good	Character Mobility Local
Main Ave Travel Times	Poor	Fair	Fair	Poor	Good	Mobility Local
Local Roadway Traffic Volumes	Fair	Fair	Fair	Fair	Fair	Mobility Local
Year 2040 Delays and Queues	Good	Good	Good	Poor	Fair	Mobility Local
Vehicular Safety	Fair	Fair	Fair	Fair	Fair	Safety Local
Pedestrian Safety	Good	Good	Good	Good	Fair	Non-Motorized) Safety Local
Land Use/ Downtown Growth	Good	Good	Good	Good	Fair	Feasibility Local
Planned Transportation Improvements	Good	Good	Good	Fair	Fair	Feasibility Local
Streetscape Opportunities	Good	Good	Good	Fair	Good	Character Local
Compatibility - Property Impacts	Fair	Fair	Fair	Poor	Poor	Feasibility Cost Local

- Pedestrian crossing improvements should be considered regardless of the CH 21/MN Highway 13 project.
- Under Alternatives A1 and A2 traffic volumes on Colorado Street are expected to increase.
- The Arcadia Avenue extension between Colorado Street and Pleasant Street would provide an alternative route for motorists.



- Pedestrian facilities adjacent to St. Michael's could be reviewed separate of the CH 21/MN Highway 13 reconstruction.
- Under all alternatives, the total volume at the Duluth Avenue/ Pleasant Street intersection is relatively similar.



- Existing sight distance issue for northbound vehicles turning onto Dakota Street.
- To address this concern, modifying the intersection to all-way-stop control could be considered.



Questions?



SRF Alternative B-2 (Hybrid)



B-2 Main with Roundabout

- Duluth Ave
- Arcadia Ave
- Main Ave
- TH 13

DRAFT 9/7/2017

