MEMORANDUM

DATE: July 19, 2022

TO: Corri Spiegel, City Administrator
Nicole Gleason, Assistant City Administrator and Public Works Director

FROM: Brian Schadt, P.E., City Engineer
Gary Statz, P.E., Traffic Engineer

RE: Technical Memorandum | 3rd & 4th Two-Way Conversion

At the request of the City Council, Public Works staff has evaluated traffic operations and safety along the 3rd and 4th Street corridors from Telegraph Road to River Drive (U.S. Highway 67). The study examined existing traffic volumes, speeds, intersection patterns, existing and potential lane configurations and traffic control within the corridors. In addition, staff evaluated the feasibility of converting the current one-way roadways to two-way traffic patterns within the project limits based upon roadway capacities, anticipated volumes, signalization warrants and possible corridor cross sections.

EXISTING CONDITIONS

The existing traffic signals are coordinated to provide consistent movement of vehicles. Staff recorded existing vehicular speeds with equipment that was placed at midblock locations to provide accurate speed of moving traffic without the impact of traffic signals or turning vehicle movements. Exhibit 1 showcases the observed average speed data alongside posted speed limits.

Exhibit 1 | Speed Limits and Observed Speeds

To calculate travel times, staff drove 3rd Street, 4th Street and River Drive with multiple passes, on multiple days at peak and non-peak hours to provide an average trip simulation. Variables such as signal preemptions or lane closures impacting normal travel were eliminated from the testing. Exhibit 2 provides the timing that was gathered.

Exhibit 2 | Existing Travel Times

The Iowa Department of Transporation (IDOT) performs vehicle traffic counts at four year intervals with the last count occurring in 2018. Based on that count, the busiest sections of roadway are east of Gaines Street. The observed volumes are:

- 4th Street | 7,000 to 10,000 vehicles per day
- 3rd Street | 8,000 to 11,000 vehicles per day
- 2nd Street | 5,000 to 8,000 vehicles per day
- River Drive | 13,000 to 28,000 vehicles per day

Engineering standards state that the following roadways can safely accomdate the following roadway capacities:

- 4 Lane, Two-Way Street | 35,000 vehicles per day
- 3 Lane, One-Way Street | 25,000 vehicles per day
- 3 Lane, Two-Way Street with a Center Left Turn Lane | 15,000 vehicles per day
- 2 Lane, Two-Way Street | 12,000 vehicles per day

Upon reviewing existing traffic volumes and comparing them to current engineering standards, both streets have sufficient capacity on the existing roadways to accommodate traffic flow should the roadways be converted to three lane, two way streets with a center left turn lane. In addition, data indicates that River Drive also has additional capacity should traffic relocate to that roadway.

IMPACTS AND CONSIDERATIONS

Changes to the existing traffic system will have impacts in a number of areas and considerations will need to be made to adequately address or mitigate these items. The areas of public safety, loading zones/vehicle queuing, parking zones, operations/maintenance and flood detour traffic movement are listed below.

Public Safety

The Davenport Fire Department's Central Station is located at the southeast corner of 4th Street and Scott Street. Egress from the facility is currently accommodated with a Fire Department initiated traffic signal. When activated, this stops civilian traffic on 4th Street to allow a safe and quick exit from the engine bays. Should the two-way conversion occur, eastbound traffic would be added on 4th Street at Scott Street, thereby necessitating an additional signal span to stop all traffic between Scott Street and Ripley Street on 4th Street. This, along with the existing signal from westbound traffic will continue to provide safe egress from Central Fire for emergency response.

Changes in roadway configuration that could impact vehicular flow along the corridors must also be considered. All public safety vehicles (police, fire, EMS, etc...) must be able to safely access all directions to limit response time. Currently 3rd and 4th Streets, depending on which section, each has three to four lanes of traffic. If a roadway cross section utilizing one lane of traffic in each direction along with a continuous left turn center lane is chosen, vehicles within the corridor should be able to slow and stop in the travel lanes while allowing emergency services to travel down the middle of the roadway to reach their response location. This is common through other areas of the City.

Normal emergency response travel at signalized intersections is accommodated by use of a preemption system. This utilizes a vehicle mounted sensor to control traffic signals, giving the emergency vehicle green passage while holding conflicting traffic movements with a red signal. While reviewing signal warrants, it has been determined that a number of existing traffic signals could be converted to four way stop signs. Stop signs compared to preemption of traffic signals slow response time to calls as emergency vehicles need to clear each intersection for safety. As an alternative, pending call destination location, responders could utilize River Drive as signal preemption will remain in place.

Loading Zones/Vehicle Queueing

Both commercial businesses and residents require delivery of goods and packages from small delivery vehicles up to and including semi-trailers. Typical residential shipping can vary in size and weight as well as frequency. These residential deliveries should be coordinated with building and property management. Regularly scheduled delivery to businesses will need to be addressed further as these likely required significant more time and volume to deliver goods and confirm receipt. Staff recommends that a full study of delivery and shipping needs among the downtown commercial businesses be performed. This will identify volume, location and frequency of deliveries within the proposed conversion area. This data will then need to be utilized to identify targeted loading zones which could best serve the businesses. These loading zones could be

converted from existing on-street parking spaces. Existing alleys within the downtown area do not appear to be sufficient to provide space for loading zones due to existing parking, dumpster locations and narrow traveled ways. It is recommended that trucks not park within the traveled way along 3rd or 4th Streets. This includes the center continuous left turn lane. Allowing shipping vehicles to park in the traveled lanes would introduce pedestrian/vehicles conflicts, impact roadway volume capacity and ultimately could impact emergency response time. It is further recommended that scheduled restocking shipping be restricted to non-peak travel times within the downtown area.

Vehicle parking and queueing of both brick and mortar and e-commerce within the roadway must also be taken into consideration. Existing commercial businesses that serve the public via drive-thru windows require vehicle stacking during peak hours. Currently the one-way traffic direction with multiple lanes can accommodate vehicle stacking onto the roadway during peak hours. The remaining lanes provide capacity to avoid traffic backing up. Should the existing roadways be converted to one-lane in each direction, stacking onto the roadway must not be allowed. Businesses requiring stacking will need to provide adequate areas on private property that comply with current zoning codes.

Ride sharing or app based delivery businesses, including but not limited to Lyft, Uber and GrubHub, provide additional challenges in busy commercial centers. The nature of these businesses require short term parking to either pick up or drop off riders or patron orders from restaurants or eateries. These vehicles will need to either compete with existing parking spaces or be provided a short term loading zone that does not compete with transit loading. As detailed with freight and deliveries, stopping in the traveled way is not recommended and must be prohibited to provide safe vehicle travel and emergency vehicle access.

Parking Zones

Parking can be found in numerous varieties within the downtown area. Individual businesses and residential buildings have on-site parking for their users. The City of Davenport provides a number of parking ramps for residents, employees, as well as visitors. Additional parallel parking can be found on the main roadways with some angles parking also being available on East 2nd Street and various side streets. With the current width of both 3rd and 4th Streets, angled parking cannot be accommodated without removing the proposed center left turn lane of traffic. This is not a recommended strategy as this will directly impact traffic capacities as well as emergency vehicle access. The number of parking stalls gained would not significantly increase total number of parking spaces.

Operation and Maintenance

Current City snow removal operations include plowing snow to the curb lines of the roadways. When significant snow accumulates, the current policy is for the Public Works Director to enact an emergency parking ban in the downtown area. Then staff will utilize plowing, loading and trucking equipment to remove the snow from the area. These operations will largely be unaffected by converting the area to two-way traffic. The parking bays will likely still be in place, giving storage opportunities for the snow.

Utility excavations, building maintenance, street operations, streetscape construction, dumpster placement and other lane closures within the area will require additional scrutiny during the permit process. Current operations allow for partial street closures on 3rd and 4th Streets due to the availability of other lanes for vehicular movement. With only one lane of traffic in each direction, closures would either require head to head traffic utilizing the center left turn lane or traffic must be routed around the block. This detour could cause delays and congestion on adjacent blocks.

Much like the operations above, special events for the downtown area will need to have additional review and consideration for routing and usage of the right-of-way. Traffic circulation and emergency access should be evaluated with each submission and coordinated with concurrent events.

Lastly, the City utilizes contractors to remove traffic signal mast arms during the Festival of Trees Parade to facilitate the helium balloons. Currently this cost is $6,000 annually. Should the roadway be converted to two-way traffic, the mast arms would be offset, thereby allowing passage of the balloons without removal and relocation of the mast arms.

Flood Detour Traffic Movement

When the Mississippi River is anticipated to rise above river stage 17, current flood operations initiate placement of HESCO barriers along River Drive from Perry Street to Pershing Avenue. Traffic movement is still permissible through the 3rd and 4th Street couplet.

As the river approaches stage 18, flood waters continue to rise in the 3rd Street intersection with River Drive. At this time, the official through traffic detour utilizes Locust Street while the Iowa DOT detours Highway 61 to Interstate 80. The local/downtown traffic flood detour routes through the residential neighborhoods along Federal Street and/or 6th Street to Iowa Street. Through stop signs, narrow streets and multiple turns, traffic movement is slowed through the residential neighborhood.

The City is in the early process of performing preliminary engineering work for proposed underground improvements along River Drive from 3rd Street to Carey Avenue. The intent of this project is to delay Mississippi River flood waters from backing up the storm sewer into the roadway during high river stage events. When this is completed, the roadway will remain open longer to facilitate traffic into the downtown area, thereby avoiding the residential neighborhoods. Converting 4th Street to two-way traffic would further reinforce this traffic movement into and out of the downtown area, minimizing the effect of Mississippi River flooding.

Exhibit 3 | Flood Detour Map with Existing Conditions

DECISION POINTS

If the City Council decides to move the conversion process forward, there is decision point that needs to be addressed. The limits of the conversion process will have a direct impact on staff's recommendation for which intersections remain signalized or are converted to a four-way stop. Information is provided below on both topics along with updated cost estimates.

Two-Way Conversion Limits

Initial discussion of the two-way conversion indicated project limits of Marquette Street to River Drive. These limits can be scalable depending on additional interest in conversion. Proper transition from one-way to two-way traffic must limit confusion and conflict points for vehicular traffic. Clear signage and pavement markings consistent with the Manual on Uniform Traffic Control Devices (MUTCD) must be installed to indicate the change in lane configuration. Based upon the existing street networks, these transitions could occur at several different locations:

- Brady/Harrison Streets
- Gaines Street
- Marquette Street
- Division Street
- Western termini at Telegraph Road

To minimize confusion, it is recommended that the two-way conversion, if instituted, be completed no shorter than from Marquette Street to River Drive. Ending the conversion at Gaines Street would likely introduce confusion due to interaction with the large volume of traffic exiting the Centennial Bridge. Likewise, stopping at the intersection of Harrison/Brady Streets would introduce possible conflict points of the traffic transitioning from one-way to two-way between two existing one-way couplets in the east/west travel direction. Ending the two-way conversion at Marquette Street marks the first major north-south arterial which allows for a logical transition for traffic moving across the city to the downtown area.

The two exhibits below are maps that showcase proposed transition space for the Marquette intersections at both 3rd and 4th Street.

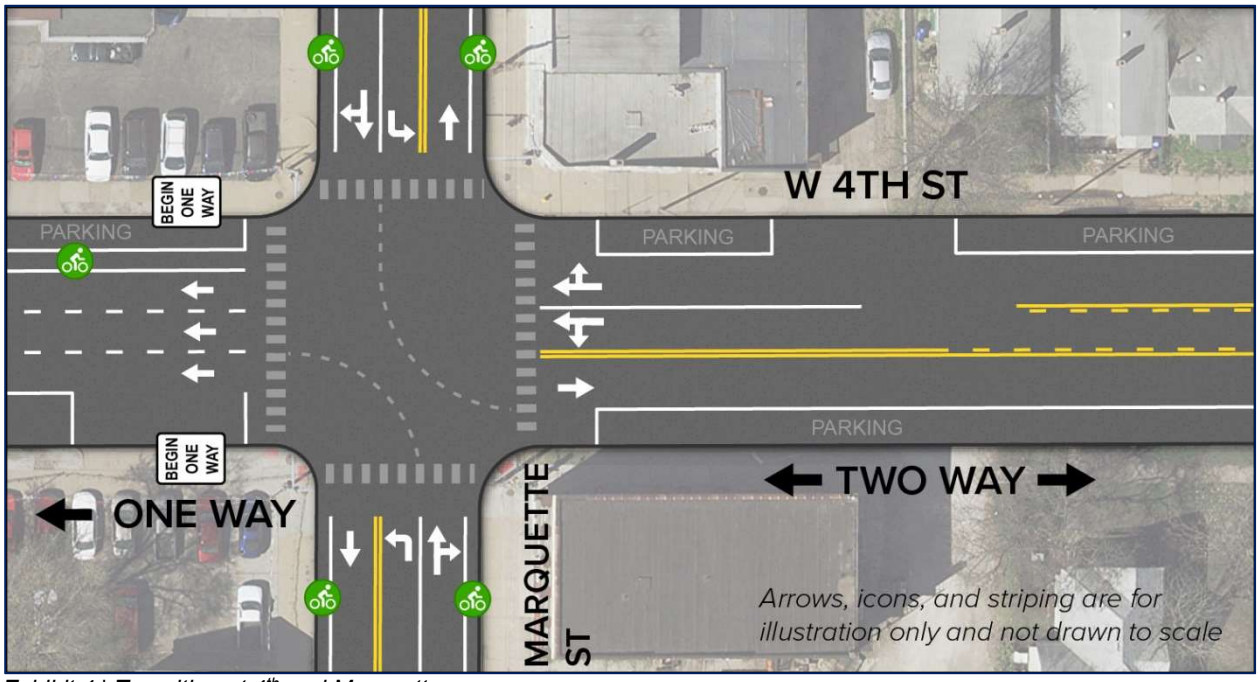

Exhibit 4 | Transition at 4th and Marquette

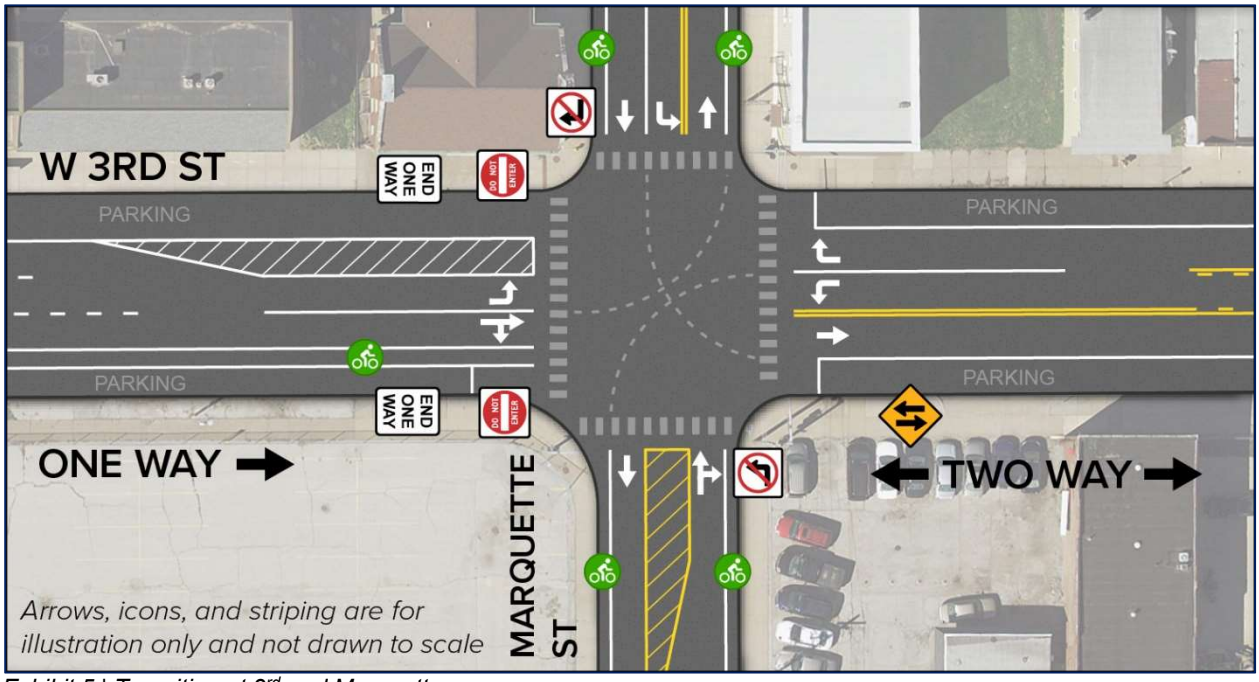

Exhibit 5 | Transition at 3rd and Marquette

Should the decision be made to continue the conversion process westward, the next major north-south arterial would be Division Street. Division connects the northwest section of the City to the

3rd and 4th Street corridors and eventually Rockingham Road. The two exhibits below are maps that showcase proposed transition space for the Division intersections at both 3rd and 4th Street.

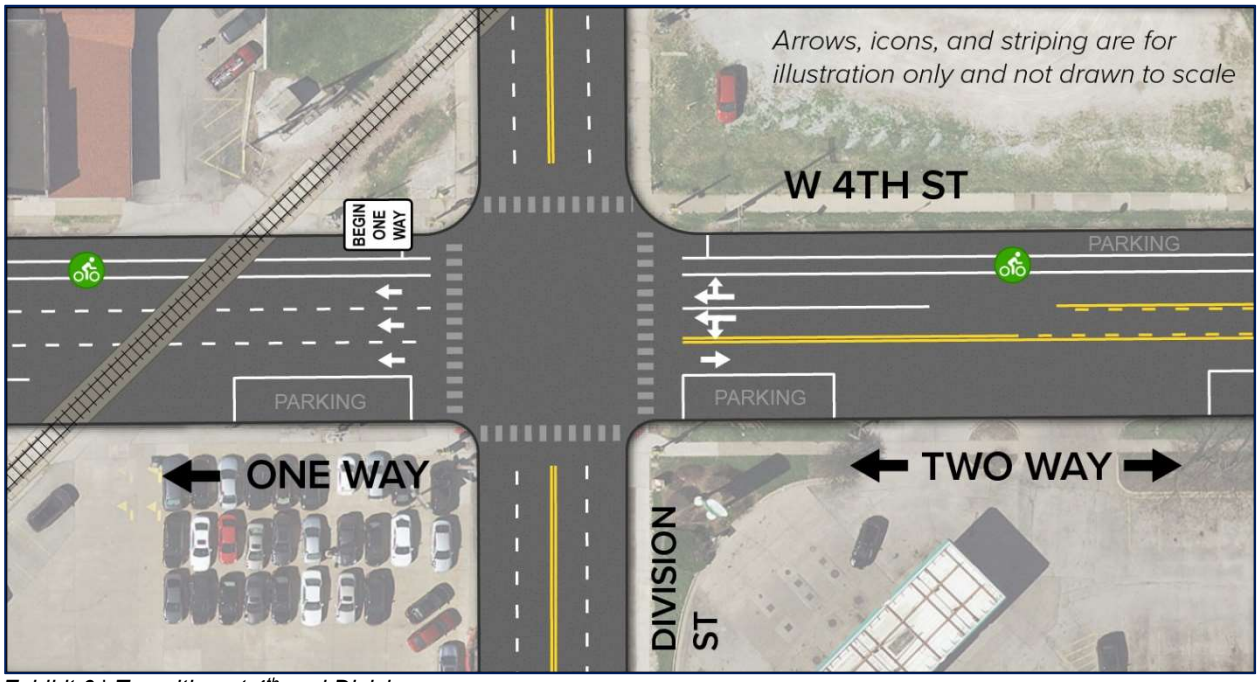

Exhibit 6 | Transition at 4th and Division

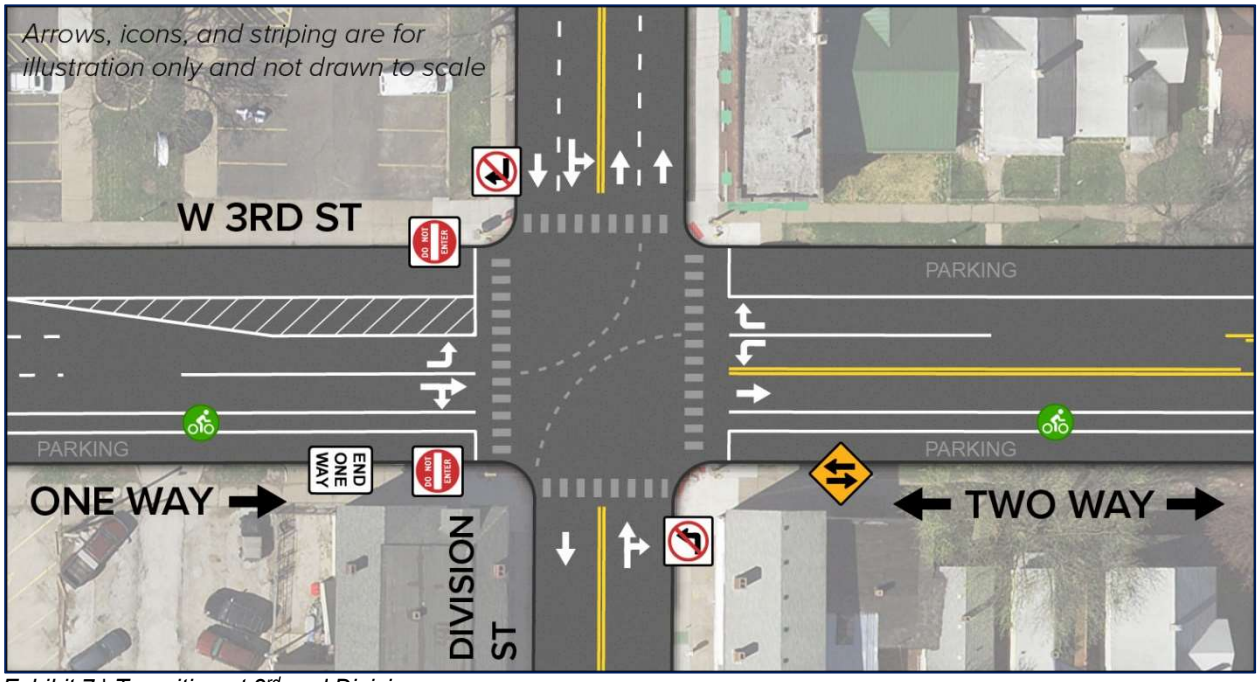

Exhibit 7 | Transition at 3rd and Division

Finally, the last logical transition point on the far west end of the project would be Pine Street and Telegraph Road. Due to the geometry of West 4th Street to Lincoln Avenue, the two-way conversion should end at Pine Street. This will still allow for west bound traffic to Telegraph as it exists today as well as east bound traffic to connect from the south. The two exhibits below are maps that showcase proposed transition space for these intersections.

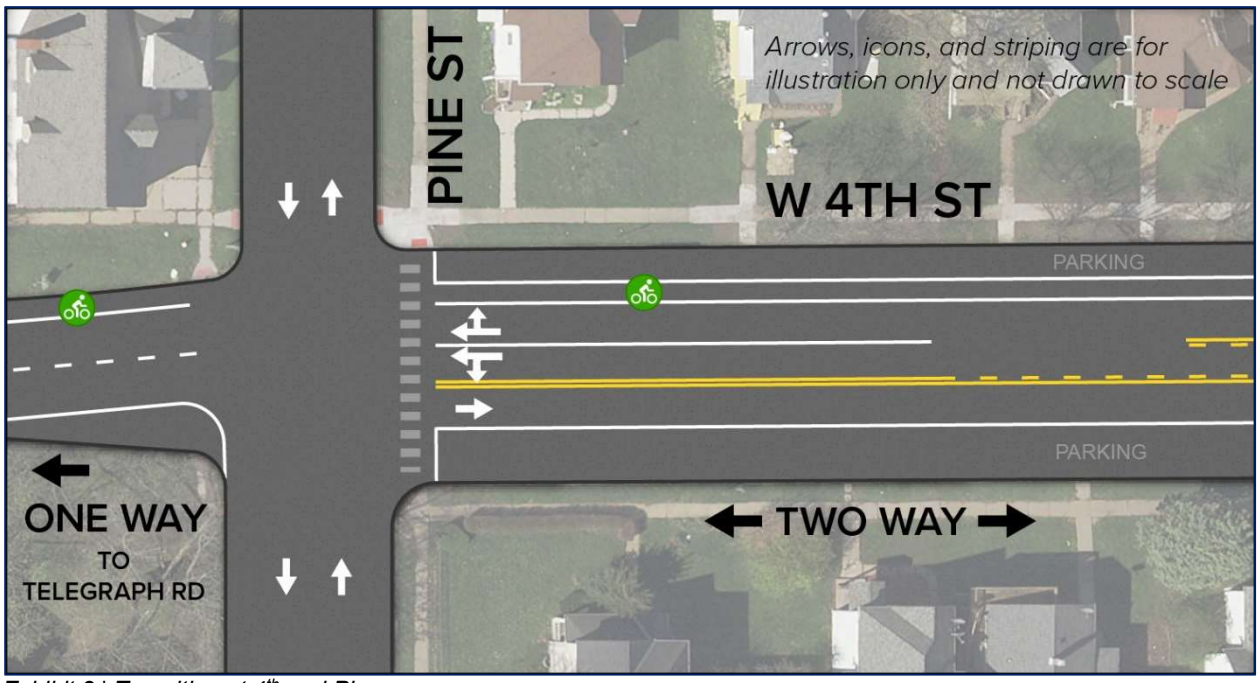

Exhibit 8 | Transition at 4th and Pine

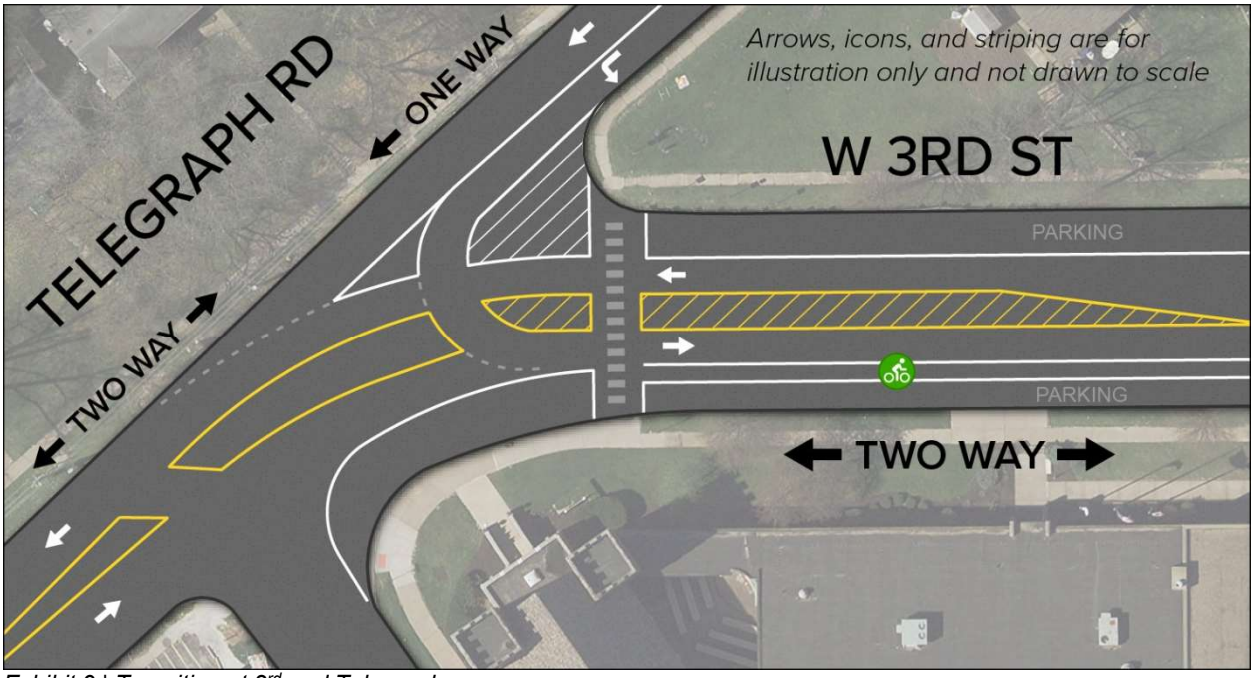

Exhibit 9 | Transition at 3rd and Telegraph

Intersection Signalization

Currently 3rd and 4th Street intersection controls utilize traffic signals to provide coordinated travel through the corridor. If vehicles maintain 25 mph travel speed through the downtown area, and the light coordination has not been interrupted through the emergency preemption procedure, vehicles should travel through the corridor without stopping. This provides efficient vehicle movement as well as minimize air pollution through exhaust emissions from repeated stopping and starting. Intersections without traffic signals are controlled through the use of stop signs on the side streets. At these locations, vehicles can cross or merge onto the major roadways via gaps provided by the signals.

Existing traffic counts and turning movements were investigated to determine potential signalization changes within the corridor should the two way conversion be approved. In addition, potential traffic volumes shifts were forecasted to provide modified signal needs. Listed below is the recommendation for traffic signalization; some of these are dependent on the limits of the project:

Traffic Signal Locations (Definite)

- Gaines Street and 3rd Street/4th Street
- Harrison Street and 3rd Street/4th Street
- Brady Street and 3rd Street/4th Street
- River Drive and 3rd Street/4th Street
- Division Street and 3rd Street/4th Street
- Marquette Street and 3rd Street/4th Street

Four Way Stop Locations

- Fillmore Street and 3rd Street/4th Street
- Ripley Street and 3rd Street/4th Street
- Main Street and 3rd Street/4th Street
- Pershing Street and 3rd Street/4th Street
- Iowa Street and 3rd Street/4th Street

Pedestrian Crossing Movement

- Cedar Street and 3rd Street/4th Street (Monroe Elementary/Smart Intermediate Schools)

It would be recommended that the remaining side streets of the corridor be controlled with stop signs with 3rd/4th Streets remaining the major roadway route.

Traffic travel was calculated utilizing Synchro software. This software allows for building a corridor and placement of various traffic signalization types to simulate traffic flow. This signalization was then configured to what staff would recommend should the two-way conversion be implemented. The following exhibit shows the previously observed traffic travel times along with times calculated with the corridors configured as two-way traffic.

Exhibit 10 | Estimated Travel Times Under Two-Way Conversion

For example, on 4th Street from Marquette to River Drive, the travel time is estimated to increase from 3 minutes, 15 seconds to 5 minutes, 10 seconds. As the reader can see, travel times are increased over the existing experience. The existing coordination is configured to facilitate movement of vehicles. Four way stop intersections would be proposed for a number of existing traffic signal locations based on existing side street volumes.

River Drive Intersections

The existing intersections of 4th Street and 3rd Street intersect with East River Drive at a 48 degree and 36 degree angle, respectively. Per the American Association of State Highway and Transportation Officials (AASHTO) roadway design standards, ideal intersection angles would be at 90 degree with acceptable angles ranging from 60 degrees to 90 degrees.

For two way traffic, the acute angles fall below typical design standards. As such, with standard signal timing, it's anticipated that conflict accidents could occur from left turning vehicles across oncoming traffic. Staff recommends that if the conversion occurs, split phase timing of traffic signals on River Drive should be programmed into the controllers. This would allow separate southbound and northbound moves on River Drive to provide conflict free left turns. In addition, the 3rd and 4th Street signals should be coordinated to facilitate movement of traffic on River Drive. The two exhibits below are maps that showcase proposed transition space for these intersections.

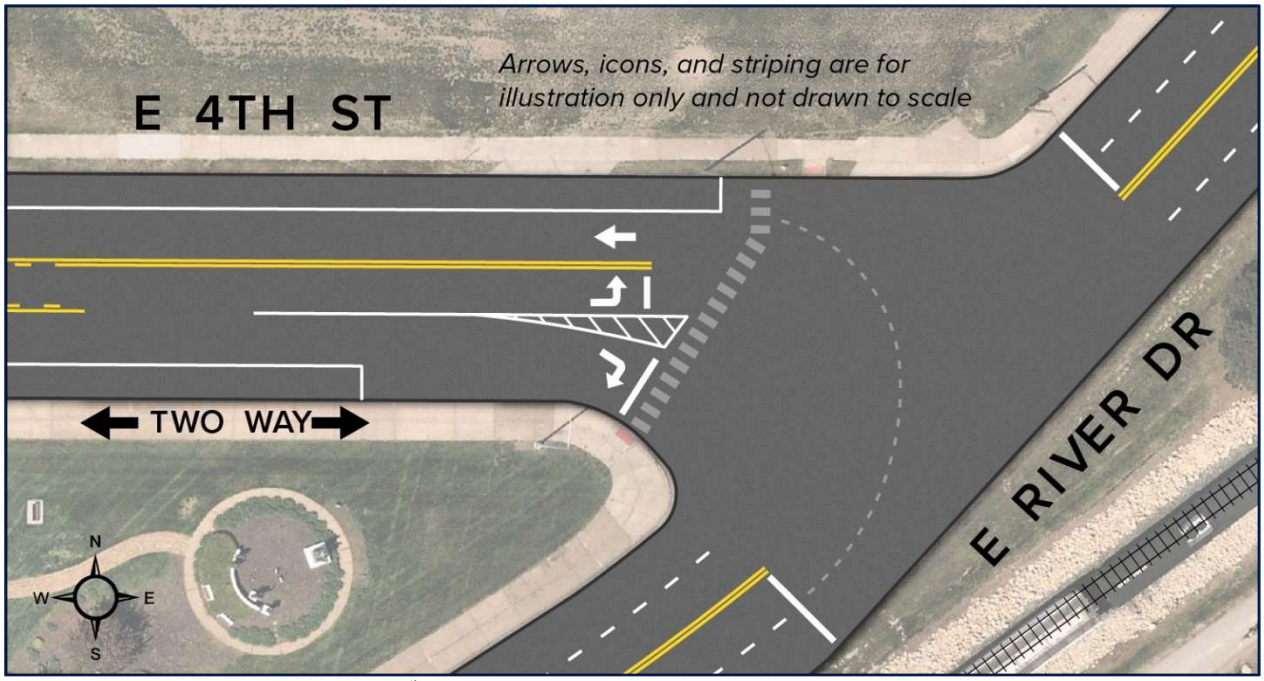

Exhibit 11 | Proposed Intersection of 4th and River Drive

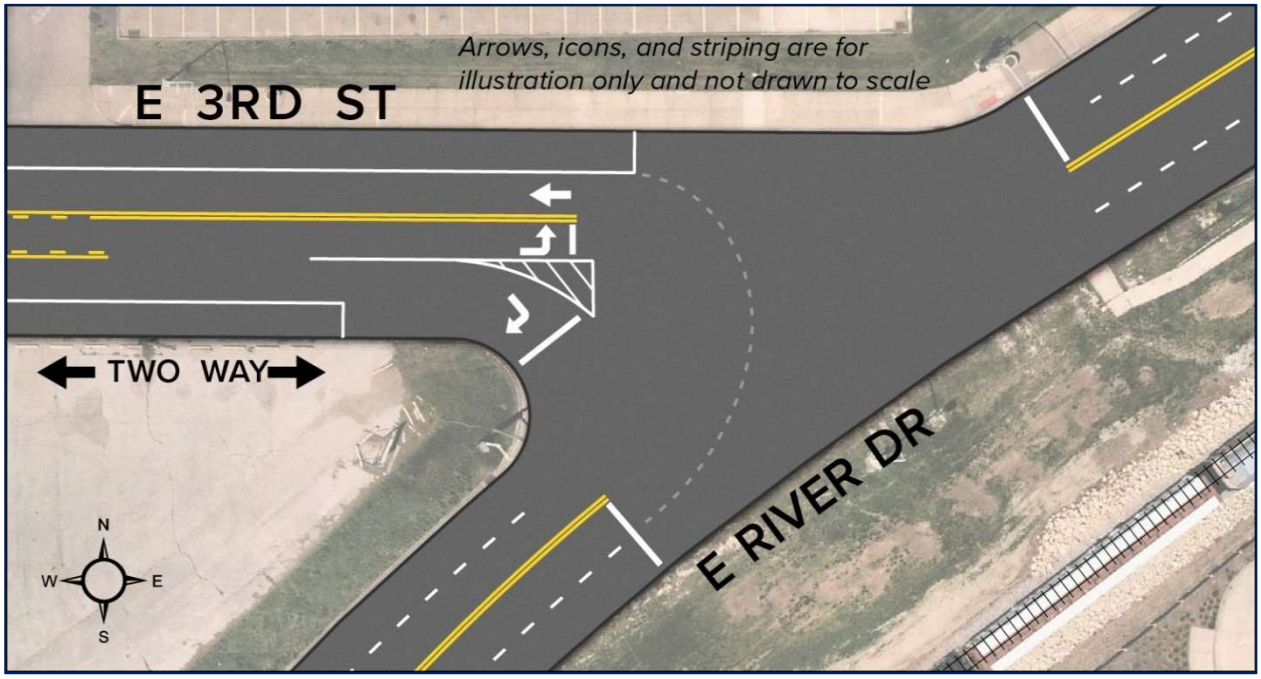

Exhibit 12 | Proposed Intersection of 3rd and River Drive

Cost Estimates

The below exhibit shows the estimated cost for each conversion limit. These costs are based on the required pavement markings, traffic signalization upgrades and signage installation and modification. Extending the limit to Telegraph Road shows a substantial increase in cost due to necessary upgrades to the Iowa Interstate Railroad crossing signals. These numbers do not include contingency for unknown items found in the field, fluxions in pricing due to unpredictable market conditions or the timing it would take to acquire the necessary materials to perform the project.

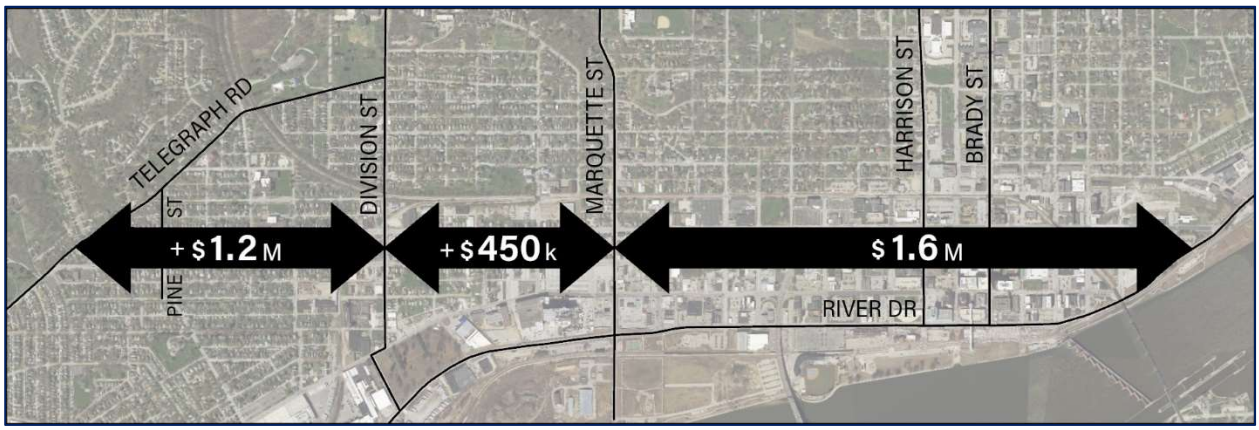

Exhibit 13 | Cost Estimates for Each Section