



**NOTICE OF OPEN WORK SESSION
OF THE CITY COUNCIL OF THE CITY OF
NORTH KANSAS CITY, MISSOURI,**

**December 15, 2020
6:00 PM**

As a precautionary measure during the Covid-19 Pandemic, this meeting will be held virtually, with the Mayor, City Council members and City staff joining the meeting through an on-line platform.

The tentative agenda of this meeting includes:

1. Call Meeting to Order

2. Alternatives for Armour Road Complete Street Improvements 

At the conclusion of the September 22 special City Council meeting, the City Council directed staff to examine a list of possible adjustments to the Armour Road Complete Street project based on community feedback. That list included geometric improvements such as adjusting turning radii at the Post Office drop boxes, adjusting turning radii at street intersections, and re-introducing the right-turn lane at Fayette; non-geometric improvements such as island landscaping, bike lane pavement markings, and replacing the delineator guideposts; and evaluating signal operation improvements at Iron and Howell to reduce queueing at red lights. In its memo, staff presents data regarding each potential adjustment, including cost estimates for implementation. Staff seeks Council direction as to how to proceed on these elements.

3. Adjournment

This open work session of the City Council of the City of North Kansas City, Missouri, has been duly called pursuant to the provisions of Section 2.04.030 of the Code of the City of North Kansas City, Missouri, by the undersigned Mayor of the City of North Kansas City, Missouri.

DONE this 11th day of December 2020, at 5:00 p.m.



Don Stielow, *Mayor*

Representatives of the news media may obtain copies of this notice by contacting:

Crystal Doss, City Clerk, City Hall
2010 Howell Street
North Kansas City, Missouri 64116
Telephone No. (816) 274-6000

**Minutes of the North Kansas City, Missouri City Council Work Session
Meeting of December 15, 2020**

The City Council met in work session on Tuesday, December 15, 2020, via an on-line platform at 6:00 p.m. As a precautionary measure during the Covid-19 Pandemic, this meeting was held virtually, with the Mayor, City Council members and City staff joining the meeting through an on-line platform.

The following were present:

Mayor: Don Stielow
Councilmembers: Bryant DeLong
Anthony Saper
Jesse Smith
Lisa Tull
Zachary Clevenger
Rick Stewart
Amie Clarke
Tom Farr

Staff Present: Eric Berlin, City Administrator
Kim Nakahodo, Assistant City Administrator
Sara Copeland, Community Development Director

Mayor Stielow called the meeting to order at 6:00 p.m.

City Administrator Eric Berlin stated that at the conclusion of the September 22 special City Council meeting, the City Council directed staff to examine a list of possible adjustments to the Armour Road Complete Street project based on community feedback.

Mr. Berlin asked Community Development Director Sara Copeland to present this item to Council. Ms. Copeland stated that the list of adjustments included geometric improvements such as adjusting turning radii at the Post Office drop boxes, adjusting turning radii at street intersections, and re-introducing the right-turn lane at Fayette; non-geometric improvements such as island landscaping, bike lane pavement markings, and replacing the delineator guideposts; and evaluating signal operation improvements at Iron and Howell to reduce queueing at red lights. In its memo, staff presents data regarding each potential adjustment, including cost estimates for implementation. Jay Aber, Senior Traffic Engineer with WSP, was also present to help answer

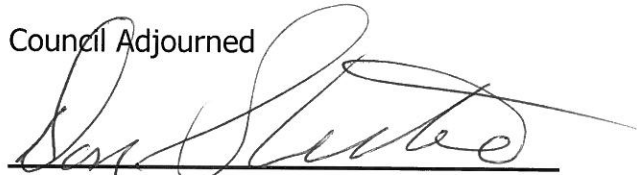
Alternatives for Armour
Road Complete Street
Improvements

questions. Discussion ensued. Consensus was to discuss this further at the January 5, 2021, Work Session.

Mayor Stielow declared the meeting adjourned at 7:57 PM.

Adjournment

Council Adjourned



Mayor

Attest:



City Clerk

Approved this 5th day of January 2021.

MEMORANDUM



TO: Mayor and City Council
City Administrator

FROM: Sara Copeland, AICP; Community Development Director
Jay Aber, PE, PTOE; Lead Traffic Engineer, WSP

DATE: December 15, 2020

RE: Alternatives for Armour Road Complete Street Improvements

At the conclusion of the September 22 virtual town hall meeting, the City Council directed staff to examine a list of possible adjustments to the Armour Road Complete Street project based on community feedback. That list included geometric improvements such as adjusting turning radii at the Post Office drop boxes, adjusting turning radii at street intersections, and re-introducing the right-turn lane at Fayette; non-geometric improvements such as island landscaping, bike lane pavement markings, and replacing the delineator guideposts; and evaluating signal operation improvements at Iron and Howell to reduce queueing at red lights.

This memo presents data regarding each potential adjustment, including cost estimates for implementation.

Turning Radii at Post Office Drop Boxes

The current pavement markings at the Post Office drop boxes, shown in Figure 1, provide an awkward turning movement for drivers based on the current pavement markings. Minor pavement marking modifications may be made to this driveway to create a more natural path for drivers entering the drop box lane. Proposed adjustments consist of aligning the pavement markings at the entrance with the extension of the curb lines on the driveway. This will promote faster speeds crossing the bike lane, but will provide a more comfortable experience for drivers. Proposed modifications are shown in Figure 2.

This work could be accomplished used City crews, as the changes are relatively minor, and the cost of materials would be minimal. Doing this work in-house will be more cost effective than contracting due to mobilization costs.



Figure 1: Current pavement marking at post office drop box entrance

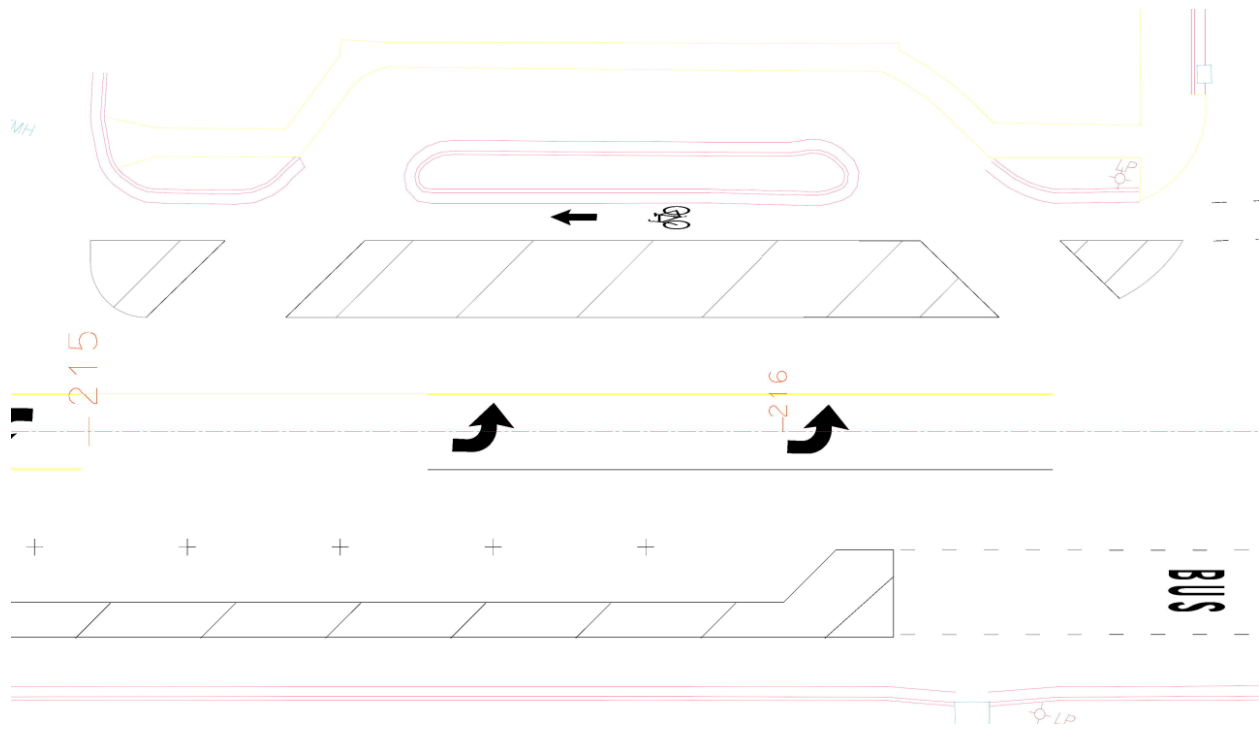


Figure 2: Proposed pavement markings at the post office drop box driveways

Turning Radii at Street Intersections

The islands at Armour Road and Iron Street were designed to accommodate turning movements of standard school buses which also closely resemble the turning movements of fire trucks. School bus right-turn movements (the controlling movement for design) are shown in Figure 3. Modification of the turning radius may ease turning movements at the intersection and help drivers avoid scraping the curb with their wheels.

The proposed modification to the islands at Iron is to enlarge the radius at the end of the islands and construct tapered island ends. A tapered island end slopes down from the center of the island towards the end of the island so that if a driver does hit the island with their wheels, the jolt to the vehicle is reduced. Figure 4 and Figure 5 show a layout of proposed modification to the islands at Iron Street and an example photo of a tapered median island nose.

Modifications to the islands at Iron Street are estimated at \$10,000 per island, for a total of \$40,000 to reconstruct all four islands at the Iron Street intersection. If this design is preferred, it may also be incorporated into future intersection improvements along the corridor, such as the Phase 2 improvements at the Howell Street intersection.

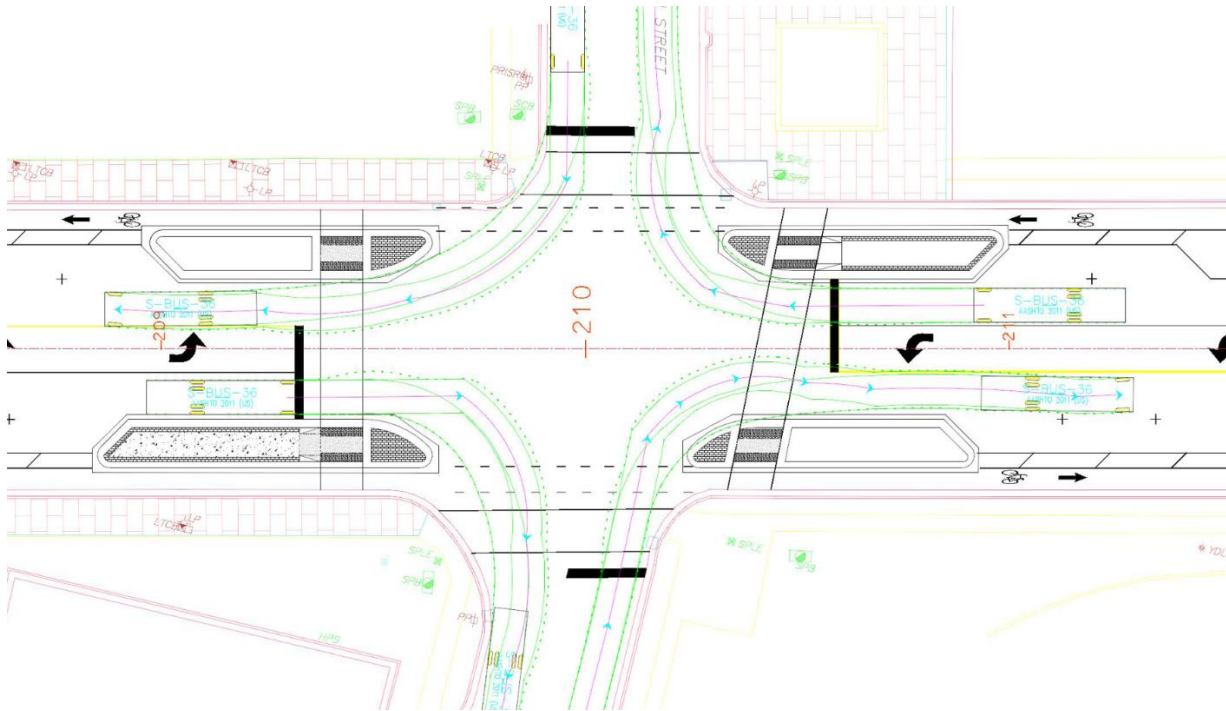


Figure 3: School bus right-turn tracks at Armour Road and Iron Street

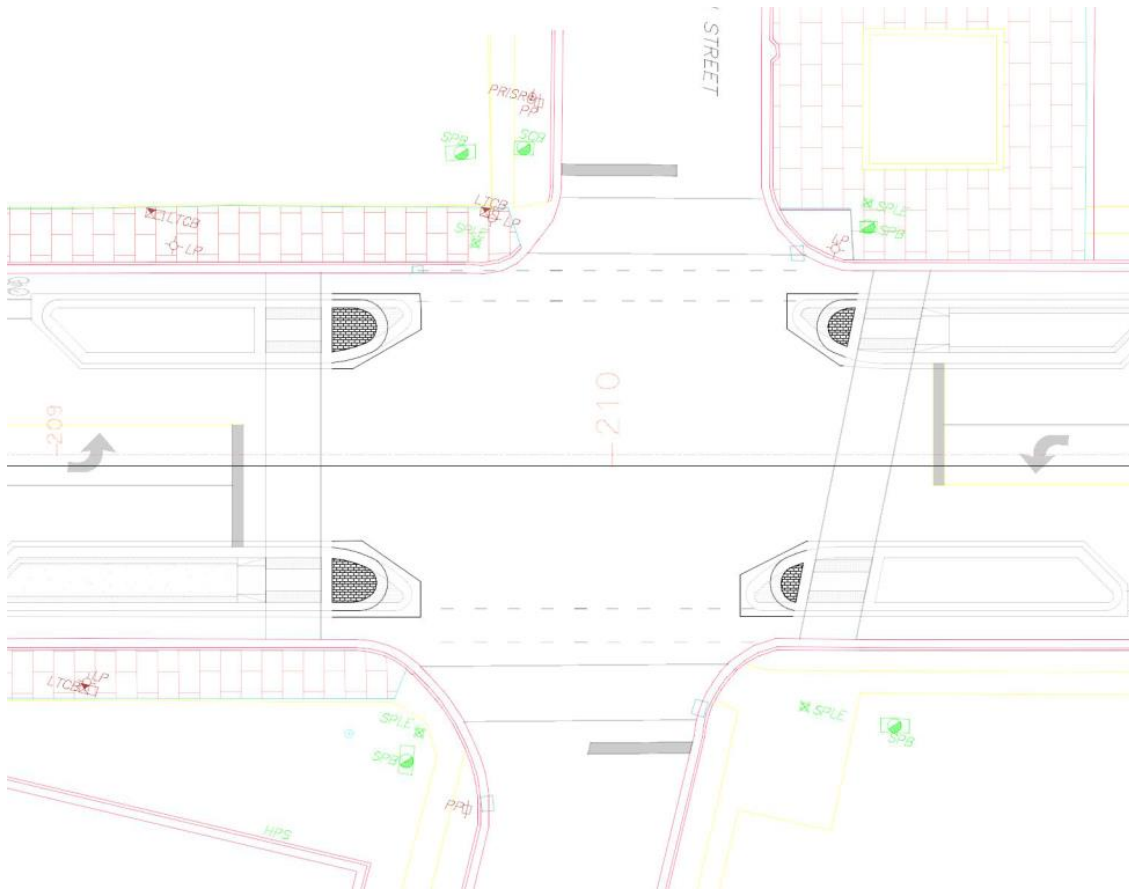


Figure 4: Proposed modification to curb island noses at Armour Road and Iron Street



Figure 5: Example tapered median nose in Overland Park, KS (Image source: Google Earth)

Right-Turn Lane at Fayette

When the Armour Road Bike Lanes project was implemented, the western terminus of the bike lane replaced the previous right turn lane onto Fayette Street with the bike lane against the curb and a buffer space. The driveway spacing in this block prevented the addition of on-street parallel parking. There is interest in re-introducing the right turn at this location in a way that allows cyclists to more easily turn left or continue straight down Armour in the vehicle lane. Figure 6 depicts a proposed pavement marking layout for this intersection which includes a bike lane lateral shift from the edge of the curb to the edge of the travel lane between Fayette and Gentry, the introduction of a right-turn lane, and the installation of a “bike box” at Fayette. This bike box allows cyclists to more safely and easily make left turns or through-movements at the westbound approach to Fayette. Cyclists who feel uncomfortable utilizing this bike box could simply leave the roadway and continue on the sidewalk just before Fayette and utilize the pedestrian crossings to cross Armour Road.

To accommodate this change safely for both people on bicycles and for busses using the nearby bus stop, bicycle protection must be installed in advance of the right turn lane to restrict cars from crossing the bike lane before the shift occurs. If cars cross the bike lane where the shift occurs, a safety issue is created due to limited visibility for both cyclists and drivers. Protection at this location will encourage drivers to cross the bike lane at a safer location with increased visibility of cyclists and preserve the bus stop location immediately prior to this area. Bicycle protection may be provided utilizing artful barriers as detailed later in this memorandum.

The cost estimate for changing the markings in this location and adding the bicycle protection is \$12,000.

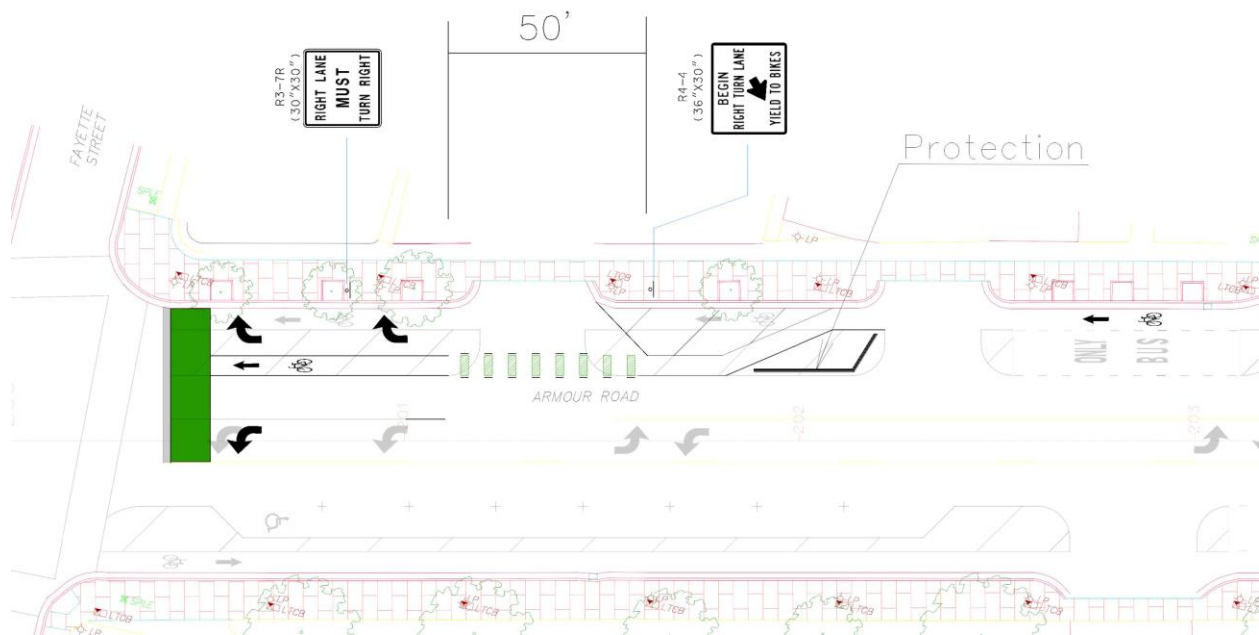


Figure 6: Proposed pavement marking configuration for the westbound bike lane terminus at Fayette

Island Landscaping

The landscaping in the islands at Armour Road and Iron Street has matured since installation. In particular, the “Karl Foerster” feather reed grass has grown to several feet tall as shown in Figure 7. While the landscaping areas are not within the areas that would be measured for sight distance, these grasses have created a perception of insufficient sight distance for drivers. Several alternative plantings are available that will not exceed two to three feet in height.



Figure 7 - Existing landscaping in Iron Street islands

If the City Council prefers to replace the feather reed grass, recommended replacement plants include:

- Grass:
 - Blond Ambition Blue Grama grass (*Bouteloua gracilis*), mature height 0.75 to 2.5 feet
- Flowering:
 - Eastern Beebalm (*Monarda bradburiana*), flowers in May, mature height 1 to 2 feet
 - Butterfly weed (*Asclepias tuberosa*), flowers June through August, mature height 1 to 2.5 feet
 - Aromatic Aster (*Symphotrichum oblongifolium*), flowers August through September, mature height 1 to 3 feet

Example photos of the preferred plants are included in Figure 8. These species are recommended for being drought and salt tolerant and providing vibrant color to the corridor. The cost estimate for replacement landscape is approximately \$4,000.



Figure 8 – Preferred plantings for the Armour Road and Iron Street islands – top left: *monarda bradburiana*, top right: *symphyotrichum oblogifolium*, bottom left: *asclepias tuberosa*, bottom right: *bouteloua gracilis* “Blonde Ambition”

Bike Lane Pavement Markings

A desire has been expressed to increase the visibility of the Armour Road bicycle lanes through the use of colored pavement marking. Green colored pavement marking is the standard practice accepted as part of the Manual on Uniform Traffic Control Devices. The green pavement marking must be skid resistant, retroreflective, and satisfy certain chromaticity standards. This is usually achieved through the use of durable pavement marking, in particular multi-component epoxy pavement marking such as methyl methacrylate (MMA). MMA pavement marking is the type of durable pavement marking that was utilized in the construction of the Armour Road complete street improvements. The green retroreflective anti-skid green pavement marking costs approximately \$12 per square foot. There are two options for adding green markings:

- Mark the entire bike lane from Fayette to Linn – this would provide excellent visibility for the bike lane and comply with MUTCD standards. This improvement would require approximately 20,700 square feet of pavement marking and cost approximately \$250,000.
- Mark conflict areas as shown in Armour Road Bike Lane bid documents dated February 27, 2019 – this would provide excellent visibility for high-conflict areas such as driveways (where vehicles will regularly cross the bike lanes) and comply with MUTCD standards. This improvement would require approximately 2,500 square feet of pavement marking and cost approximately \$30,000.

Example plan segments depict these two marking options in Figure 9 and Figure 10.

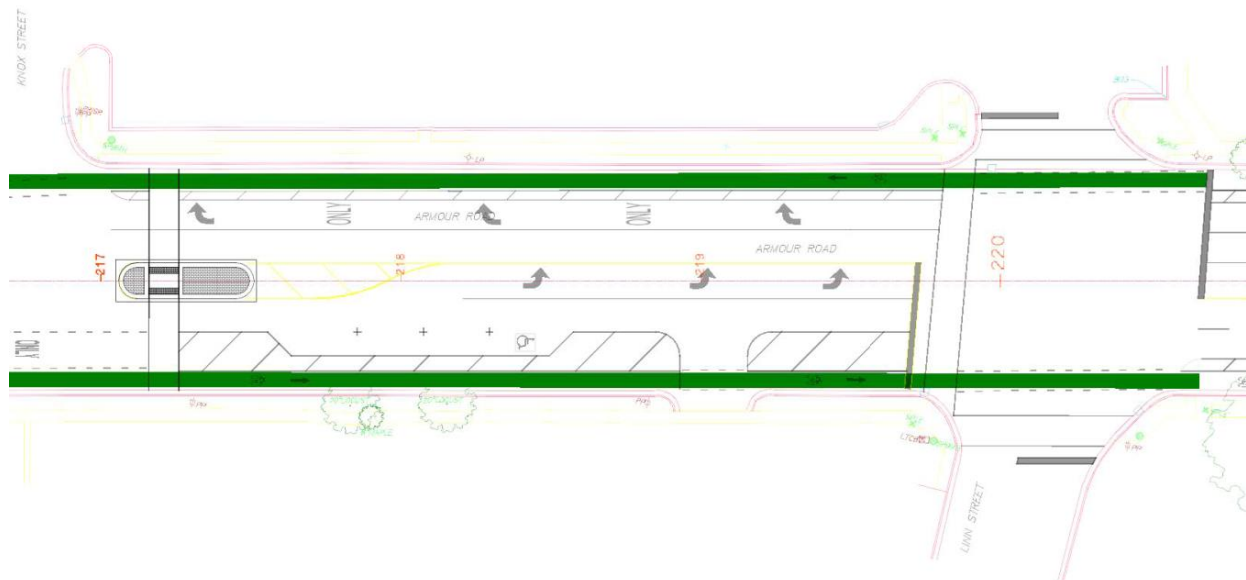


Figure 9: Green markings for entire bike lane, shown between Knox and Linn

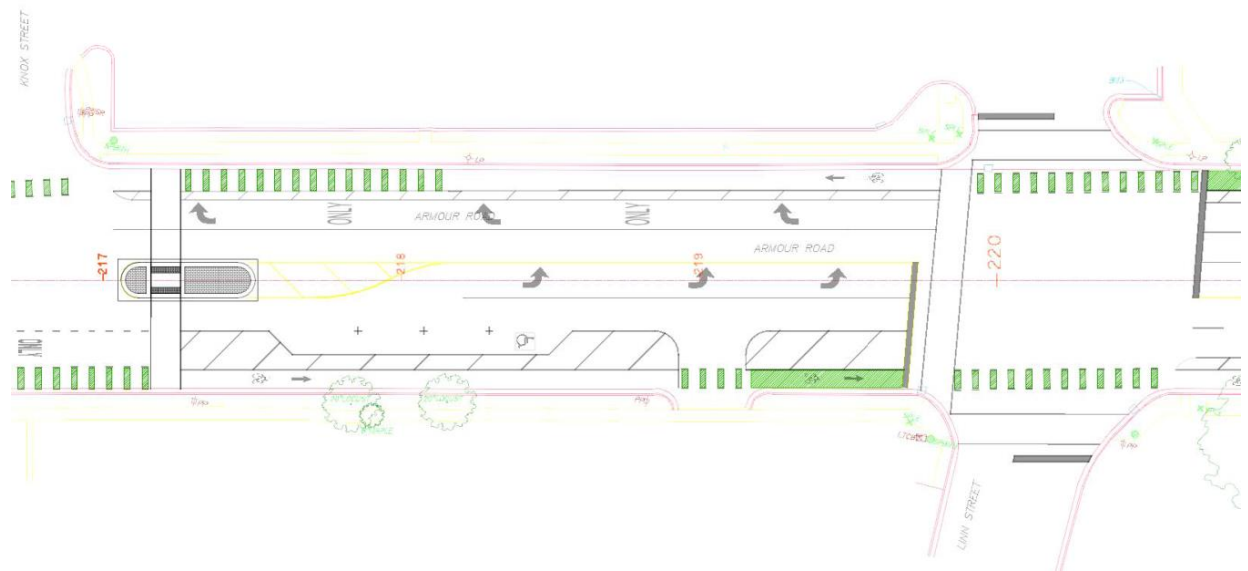


Figure 10: Green markings for high conflict areas, shown between Knox and Linn

Replacements for Delineator Posts

The white delineator posts were installed at the conclusion of Phase 1 in order to increase the visibility of the new lane configurations. In some areas, such as at the Howell Street intersection, the delineators outline buffer areas that are planned for upgraded replacement in future phases. The community has clearly indicated that the delineators are undesirable. There are several options to replace the white delineator posts.

Removal without Replacement

The simplest option is to remove the delineator posts and not replace them with anything. In this scenario, the pavement markings on the street would guide drivers to stay in the drive lanes, but no other guidance would be provided for appropriate street operations. The drawback to this alternative is that bike lanes and buffer areas often become de facto right-turn lanes and parking areas. Use of the buffer area and bike lane for right turns creates safety issues with cars entering the bike lane with very limited visibility to see if a cyclist is approaching from the side. Parking in the buffer areas/bike lanes limits sight distance and creates safety issues if cars park too close to intersections or driveways. Removal of delineator posts is a less desirable scenario but represents the lowest cost, requiring only Municipal Services staff time to remove the delineator posts.

Removal with Replacement

The delineator posts might be replaced with different barrier elements to encourage proper motor vehicle operations and maintain safety for all users on the street. The greatest need for buffer area protection is at right-turning locations approaching intersections. These are the locations where drivers may attempt to use the buffer area and bike lanes as a de facto right turn lane and collide with cyclists. These areas are also where the greatest sight distance issues would be created by cars parked close to intersections. Based on these concerns, there are three areas where significant bicycle protections are most desirable. These locations include:

- Between Knox and Linn Streets
- Howell Street Intersection
- Gentry Street Intersection

These locations are highlighted in Figure 11 and Figure 12 below.

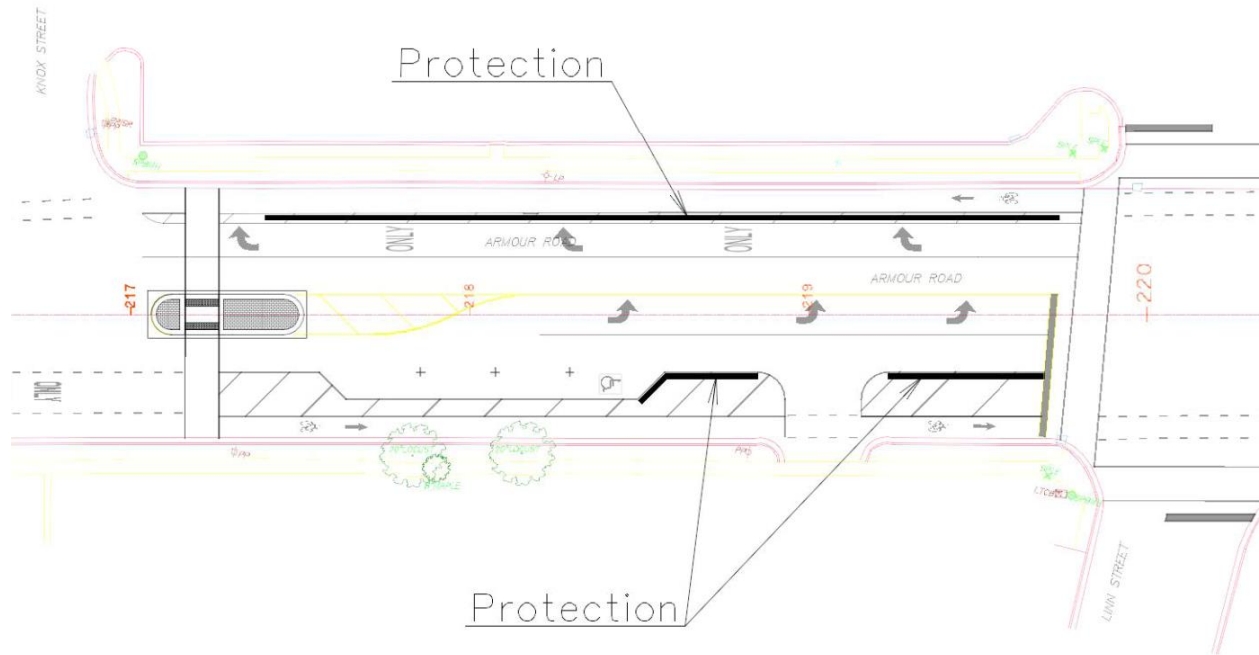


Figure 11: Area of high priority protection between Knox and Linn Street

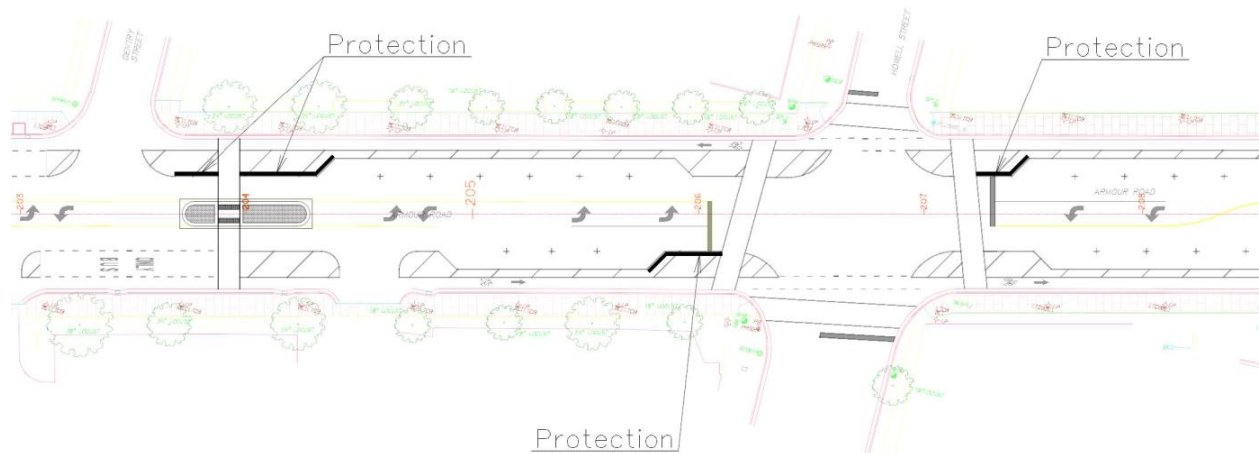


Figure 12: Area of high priority protection at Gentry and Howell Street

Protection Replacement Options

Many options exist for bike lane/buffer area protection. Two different solutions are likely necessary to provide protection along Armour Road. On the north side of Armour between Knox and Linn Streets, the bike lane has a narrow buffer that will require a narrow, linear solution. The buffer areas at Gentry, Howell, and on the south side of Armour between Knox and Linn

Street can accommodate wider spot treatments (such as large concrete features like planter boxes).

Several options exist for the narrow linear protection needs between Knox and Linn Street. Representative pictures of these options are shown in Figure 13. The preferred options include:

- **Wheel stops intermixed with flexible delineators.** This alternative is not preferred aesthetically but would provide good protection for cyclists at a relatively low cost.
 - Approximate cost: \$12,000 for Knox to Linn segment (\$50/linear foot)
- **Bumps.** This alternative is more aesthetically pleasing and provides good protection for cyclists with a cost similar to concrete wheel stops.
 - Approximate cost: \$12,000 for Knox to Linn segment (\$50/linear foot)
- **Cast-in-place/Pre-cast Curb.** This alternative is more aesthetically pleasing and provides the best protection for cyclists. However. The cost is higher than other options.
 - Approximate cost: \$18,000 for Knox to Linn segment (\$75/linear foot)
- **Wave Delineator.** This alternative is visually unique provides good protection for cyclists. However, it is the most expensive because it is a proprietary product.
 - Approximate cost \$32,000 for Knox to Linn segment (\$130/linear foot)



Figure 13: Representative photos of linear bike protection options. Top left: Wave Delineator, top right: bumps, bottom left: pre-cast curb, bottom right: wheel stops (Picture Source: Saris, People for Bikes, WSP)

For the wider buffer areas, there are more options. All of the alternatives for the linear area are also possible alternatives for buffer areas. Other options also exist, and artistic options could be included as well. Artistic options would need to be carefully considered because of the possibility that the objects may be struck by a vehicle and replacement costs may be a concern. Any objects placed in the buffer area should maintain a total overall height of less than 2.5-feet tall to avoid sight distance issues and be placed a minimum of 2-feet from the edge of the motor vehicle travel lanes. Representative pictures of these options are shown in Figure 14. The preferred options include:

- **Curb Islands.** Curb islands were installed at Armour Road and Iron Street as part of Phase 1 improvements. This option is the most aesthetically pleasing and provides the best protection. However, it is the most expensive.
 - Approximate cost: \$380,000 for areas at Howell, Gentry, and Linn (approximately \$54,000 per island)

- **Planter boxes.** Several proprietary planter box solutions exist that provide good aesthetics and good protection. Cost is high for this option and it requires ongoing maintenance of the plantings including yearly re-planting of annuals and continuous watering throughout the growing season.
 - Approximate cost: \$30,000 for areas at Howell, Gentry, and Linn (approximately \$2,000/box)
- **Limestone Block** (or other stone block). This alternative entails simply placing large cut limestone (or other stone) blocks in the buffer areas. These blocks have a modern aesthetic appeal that may fit well with the modern landscaping and other artistic elements along Armour but may not be viewed as aesthetically pleasing to some residents. Cost is minimal for this option.
 - Approximate cost: \$15,000 for areas at Howell, Gentry, and Linn (approximately \$225/block)
- **Concrete Spheres.** This alternative entails casting in place or placing pre-cast concrete spheres in the buffer areas. These blocks have a modern aesthetic appeal that may fit well with the modern landscaping and other artistic elements along Armour. Cost is average for this option.
 - Approximate cost: \$23,000 for areas at Howell, Gentry, and Linn (approximately \$350/sphere)



Figure 14: Representative photos of wide area bike protection options. Top left: Concrete spheres, top right: planter boxes, bottom left: curb island, bottom right: limestone blocks. (Picture Source: Street Smarts Design + Build, People for Bikes, WSP)

Reducing Red Light Queuing between Iron and Howell

Traffic signal timing on Armour Road is coordinated as part of the Operation Green Light program. As part of Phase 1 of the complete street improvements on Armour Road from Fayette Street to Ozark Street, signal timing was adjusted and travel time studies show that overall, the amount of time required to travel between Burlington and Ozark is shorter than travel times before construction. However, traffic queueing between Howell and Iron for red lights sometimes exceeds the distance between these two signals. Signal timing in this segment of the corridor was studied to identify possible improvements.

Methodology

A Synchro traffic simulation model for the corridor was created and used to model three separate volume conditions throughout the corridor. This model was calibrated on empirical travel time runs and field visits during the PM peak hour to best model the conditions in the field. The three volume conditions modeled are focused around the COVID-19 pandemic. The three scenarios include:

- Pre-COVID-19 traffic volumes – traffic volumes collected in 2018
- Peak COVID-19 traffic volumes – traffic volumes collected in June 2020.
- Post-COVID-19 traffic volumes – estimated traffic volumes based on a 10% reduction in total pre-COVID-19 traffic volume (current best estimate for long-term impact of COVID-19 pandemic)

The traffic model was utilized to determine whether a different timing sequence would provide better traffic flow along Armour Road and to measure the potential benefit of any proposed improvements for the signals.

Analysis

Several different signal cycle lengths were considered for the corridor. The option which in all scenarios minimized the number of stops and queueing along eastbound and westbound Armour Road was found to be the 140-second cycle that was implemented with the complete streets project. The average travel time for each direction and volume scenario are shown in Figure 15, while the delay per vehicle per intersection compared to the Highway Capacity Manual's Level of Service is shown Figure 16. Overall, even with the pre-COVID-19 volumes, it is only expected to take approximately 2.5 minutes to travel eastbound and just over 2 minutes to travel westbound. All intersections are expected to operate at a LOS of B or better, with the exception of Linn Street during the pre-COVID-19 condition, which is still operating at a LOS of C.

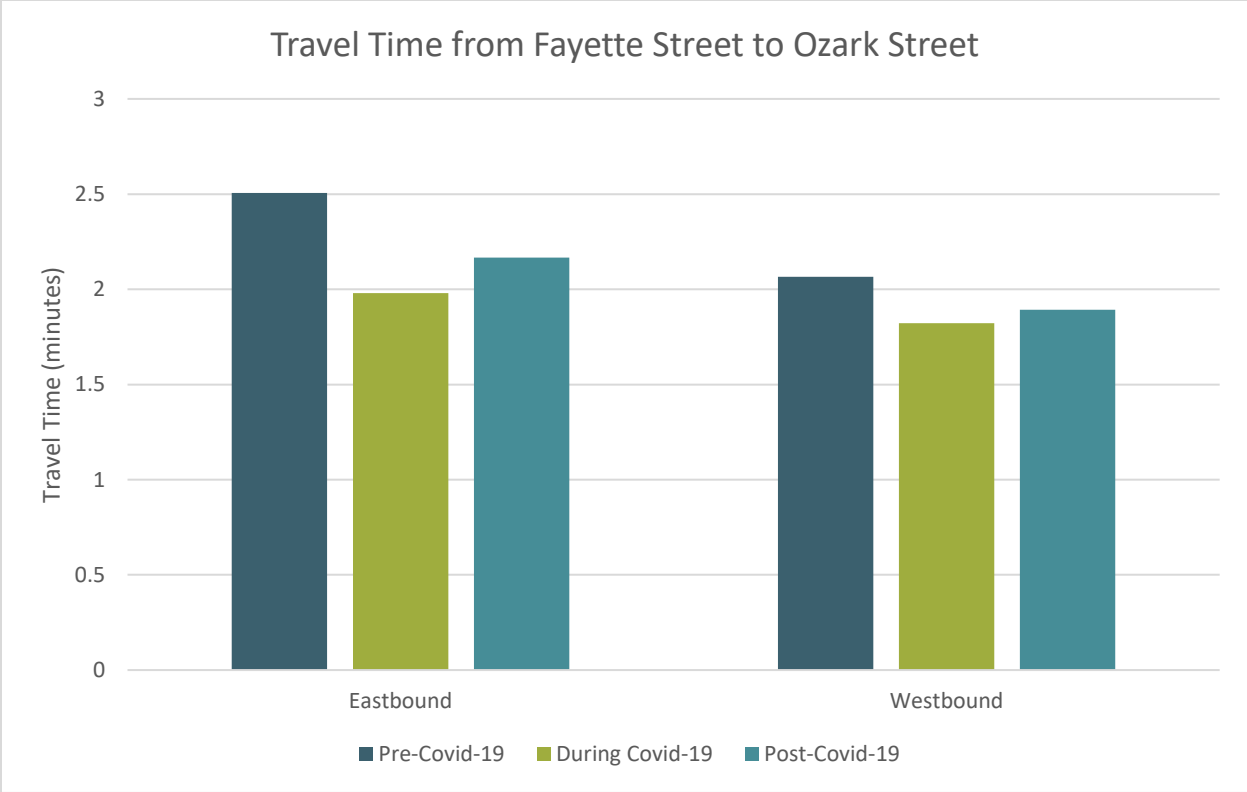


Figure 15 – Modeled travel time along Armour Road from Fayette Street to Ozark Street

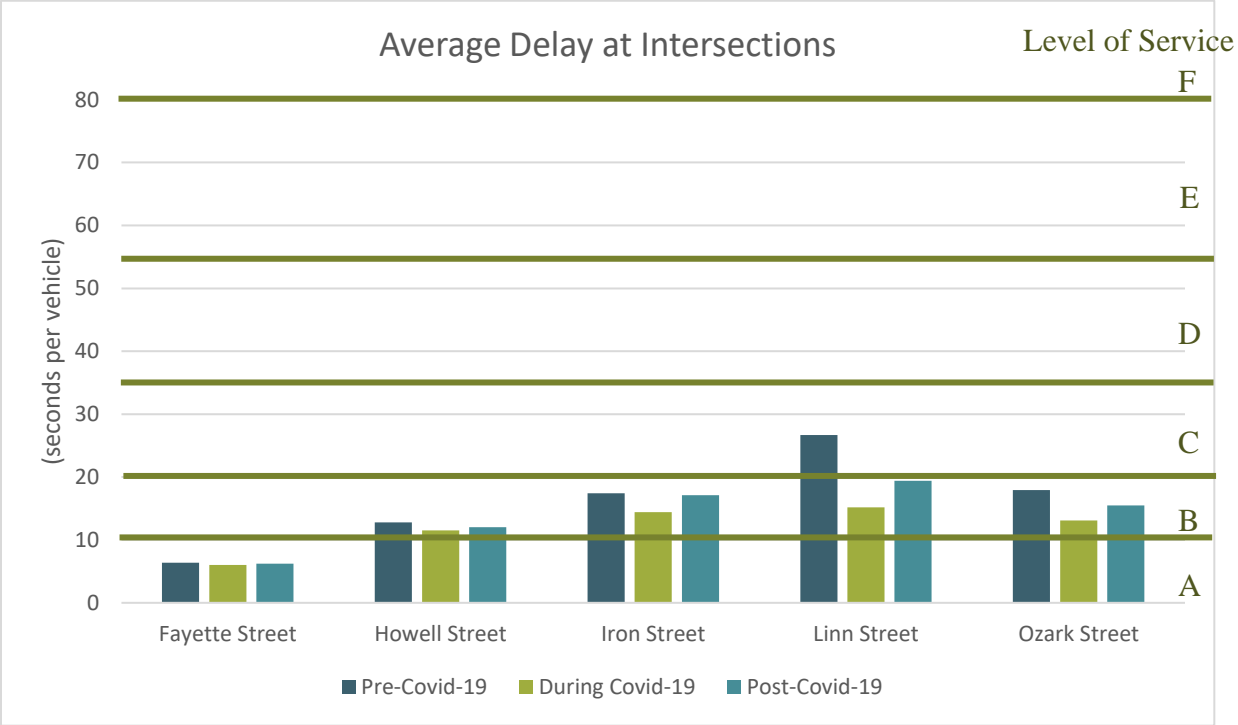


Figure 16 – Average delay per Vehicle at Intersections on Armour Road

During many of the simulations and during field observations, the eastbound traffic at Iron Street would occasionally extend to the west through Howell Street intersection. This queueing occurred when there was more traffic on Iron Street than on Howell Street, causing the eastbound traffic at the Howell intersection to get a green light but not be able to start driving because of the queue from Iron Street.

The ideal operations for the signals of Howell and Iron are for the Iron signal to turn green first to clear the queue of cars between the signals, then for the Howell signal to turn green second. This ideal situation is depicted in Figure 17. However, the unsatisfactory signal operations occasionally occur as described above, with the signal at Howell turning green while the signal at Iron is still red for Armour Road traffic. This scenario is depicted in Figure 18. This situation occurs primarily because there is approximately three times more northbound and southbound traffic on Iron Street than on Howell Street. When there is north-south traffic at Iron, but no north-south traffic at Howell, the signal at Iron remains red to clear the north-south traffic but the signal at Howell turns green for Armour Road traffic.

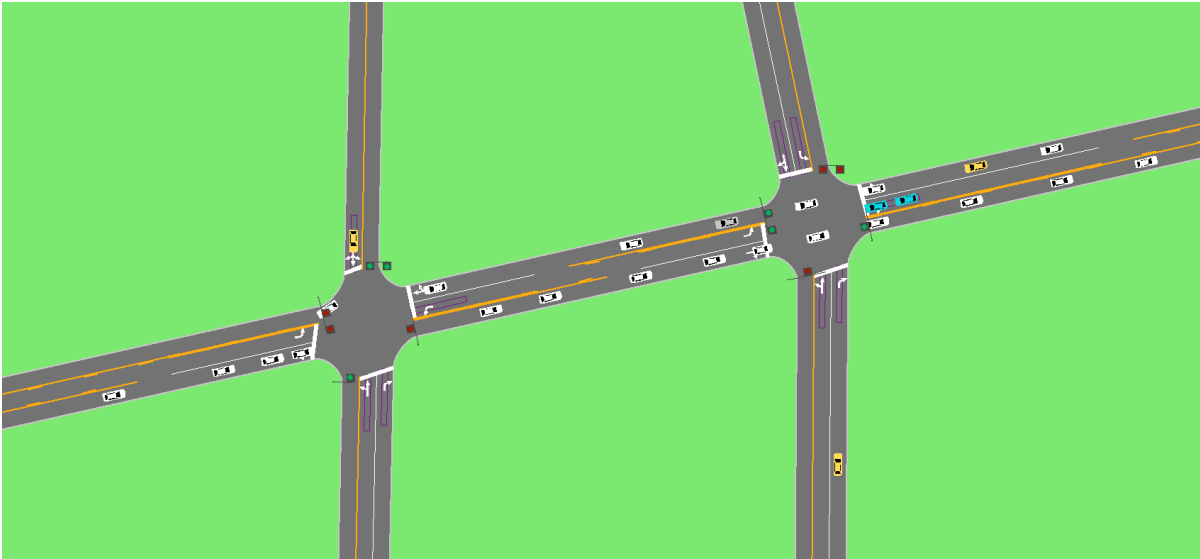


Figure 17 – Ideal operations at Howell and Iron. Iron signal turns green first for Armour to clear the queue of cars between the signals and then the Howell signal turns green second.

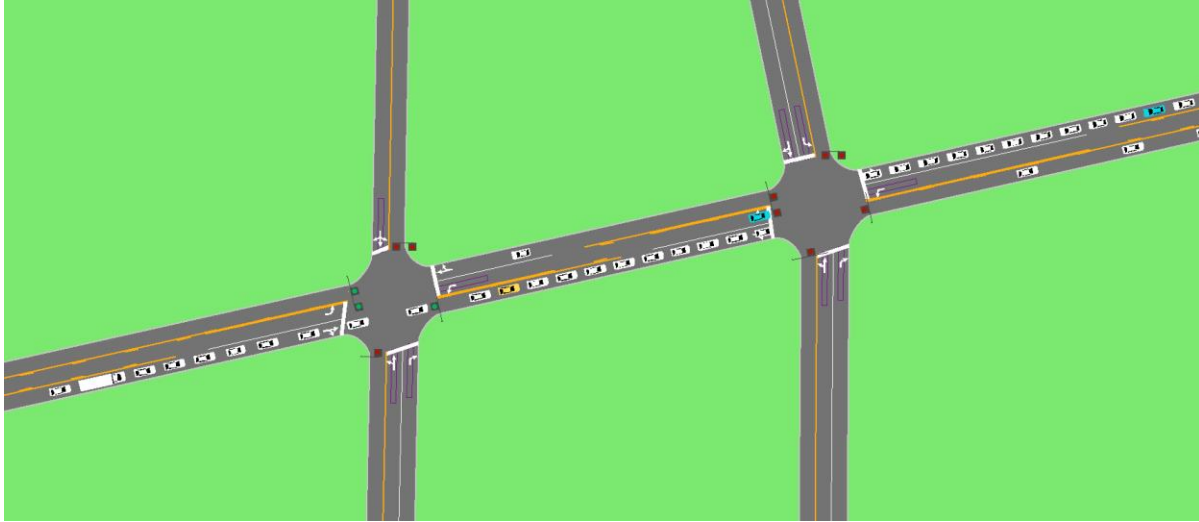


Figure 18 – Unsatisfactory operations at Howell and Iron. Howell signal turns green first when Iron signal remains red. Queue from Iron signal blocks cars at Howell signal.

Signal Operation Improvements Conclusions

Based on the traffic modeling of the network, the existing timing is providing the least queuing and stopping along Armour Road possible for all three volume scenarios. In general, Armour Road experiences good traffic operations and is expected to have good traffic operations well after the COVID-19 pandemic is contained. It appears that the signal timing currently being utilized on the corridor is the most efficient timing plan.

However, the close spacing of the traffic signals at Howell Street and Iron Street will continue to experience intermittent queuing between the signals. There are limited options to mitigate the issues at the signals because the issues are primarily due to very low traffic volumes on Howell Street and not due to inherently poor traffic operations. Potential options to mitigate the interaction between the intersections are:

- Remove the signal at Howell Street. This option would eliminate the queuing issues, improve traffic operations overall, and cause minimal disruption to north-south traffic access in the area. However, both the Police and Fire Departments have concerns about the impact of this option and it may not be acceptable to the public.
- Set the signal timing on Howell such that the light stays green for the north-south movements even if no traffic exists to necessitate that green time. This change would facilitate proper signal coordination between the signals and reduce the instances of the Howell Street signal turning green before the Iron Street signal. This option will largely mitigate queuing between the signals but may reduce slightly increase travel times along Armour Road. This option has no additional cost.
- Add signal detection for the westbound traffic at Howell Street and Iron Street (none exists today) to allow different signal timing strategies to extend the north-south green time on Howell when queues have not cleared at Iron Street. This option may reduce

queuing issues and cause minimal disruption to overall traffic operations. The cost estimate for this option is approximately \$40,000.

Summary of Alternatives

The options above are presented for improvement to Armour Road as a corridor that is safe, serves all users, incorporates sustainable measures, is visually appealing, and is economically vibrant. Cost estimates provided are based on expected costs from contractors¹. However, Municipal Services should be consulted regarding replacement landscaping and adding the right-turn lane at Fayette to see if in-house capacity is available. "Next Step" indicates when engineering plans are required for a particular alternative. Table 1 summarizes the improvement options outlined in this memorandum.

¹ The estimates for the construction and maintenance cost in this memorandum are based on WSP's professional experience and judgment and shall be deemed to represent the company's opinion. WSP has no control over the cost of labor, material, equipment, and other relevant factors that could influence the ultimate construction costs. Thus, our company does not guarantee that proposals, bids, or the actual facility cost will be the same as the estimate of probable construction cost or that construction costs will not vary from its opinions of probable cost.

Table 1: Summary of Improvement Options

Improvement	Alternatives	Next Step
Turning radii at post office drop boxes	Adjust markings to facilitate turning – minimal cost (in-house)	Revise plans for Municipal Services crews
Turning radii at intersections	Replace island ends closest to intersection with tapered island ends – \$40,000	Revised plans for bidding
Right turn lane at Fayette	Shift bike lane to provide right turn lane – \$12,000	Prepare plans
Landscaping	Replace feather reed grass with alternate landscaping – \$4,000	Consult with Municipal Services crews re: in-house capacity versus contractor services
Bike Lane Visibility	<ul style="list-style-type: none"> • Green markings at conflict points only – \$30,000 • Green markings for entire corridor – \$250,000 	<ul style="list-style-type: none"> • Use existing plans for bidding • Revise plans for bidding
Replace Delineators	<ul style="list-style-type: none"> • Removal without replacement - minimal cost (in-house) • Wheel stops with posts (linear area) - \$12,000 • Bumps (linear area) - \$12,000 • Cast-in-place/Pre-cast curb (linear area) - \$18,000 • Wave delineator (linear area) - \$32,000 • Curb islands (buffer areas) - \$380,000 • Planter boxes (buffer areas) - \$30,000 • Limestone block (buffer areas) - \$15,000 • Concrete spheres (buffer areas) - \$23,000 	Evaluate possible procurement needs
Iron-Howell Queueing	<ul style="list-style-type: none"> • Set signal timing on Howell to coordinate with Iron traffic – no cost • Install new detection for Iron and Howell westbound traffic – \$40,000 	<ul style="list-style-type: none"> • Coordinate with Operation Green Light • Prepare plans for new detection for bidding

Next Steps

The adopted Fiscal Year 2021 Budget includes Armour Road Phase 2 improvements, which is planned as improvements to the Howell Street intersection to shorten pedestrian crossing distances, replace delineators by installing landscaped islands similar to those at Iron Street, and decorative crosswalks. There is \$66,575 remaining in the budget for Phase 2 improvements. There are two primary options for improvements to Armour Road in 2021:

- Make adjustments to Armour Road based on Council direction within the seven categories described above, but defer planned Phase 2 improvements to 2022.
- Make adjustments and move forward on Phase 2 improvements at Howell Street both during 2021. Howell Street intersection improvements will incorporate Council direction regarding turning radii and landscaping.

If Council directs staff to advance any of the above improvements that would total more than the amount remaining in this year's budget, a budget amendment will be prepared for consideration at a future Council meeting. Next steps may also include a task order for further engineering services, as outlined in the table above.