IA 122 Corridor Feasibility Study
Mason City, Iowa

IA 122 (4TH STREET SW) CORRIDOR FROM LARK AVENUE (S34) TO CERRO GORDO/WINNEBAGO WAY

whks
engineers + planners + land surveyors

PREPARED BY » WHKS & Co.
DATE » August 2022

Contents

Background

WHKS & Co. was retained to develop a feasibility study to evaluate the future reconstruction of the IA 122 (4th Street SW) corridor in Mason City, IA. IA 122 is a National Highway System corridor and is functionally classified as an "Other Principal Arterial".

The study area is bounded by Lark Avenue (County Road S34) on the west to Cerro Gordo/Winnebago Way on the east. WHKS' client for this feasibility study is the City of Mason City (hereinafter, City, when referring to the City as a government entity). The study was developed in close coordination with the Iowa Department of Transportation (hereinafter referred to as Iowa DOT).

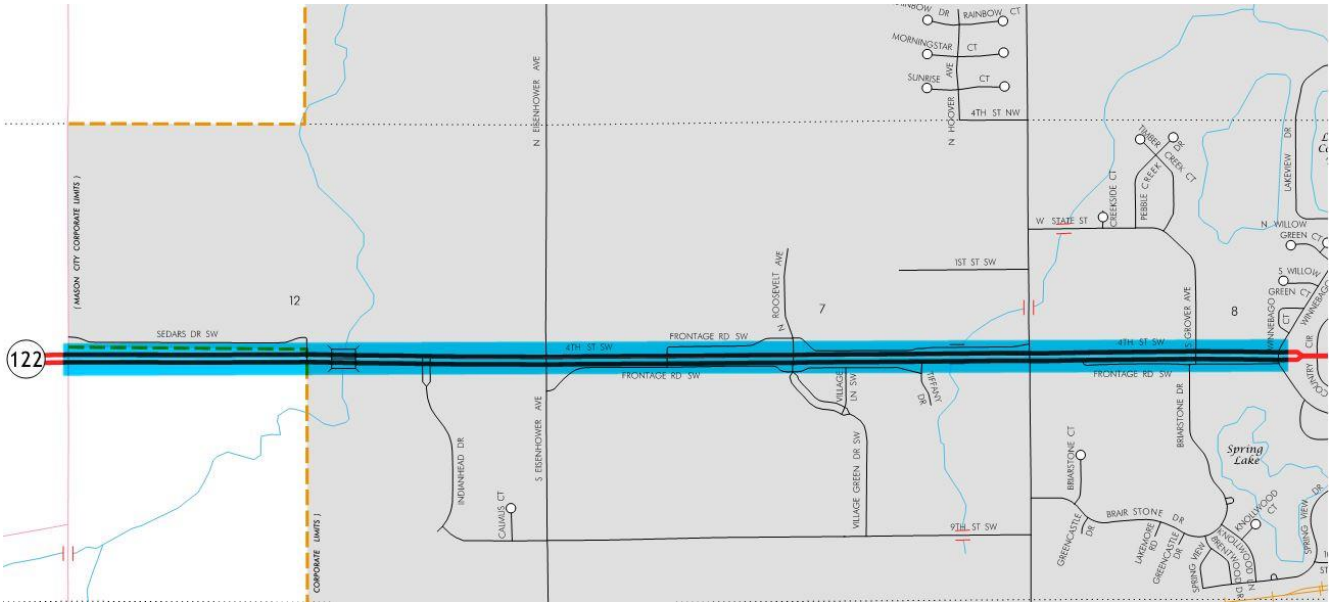


Figure 1 – Study Map

2017 Average Daily Traffic (ADT) for the corridor is estimated at 13,700 vehicles per day (vpd) on the western portion west of S. Eisenhower Avenue, increasing to 18,100 vpd near S. Taft Avenue in the middle of the study corridor. Trucks/buses constitute less than 5% of the traffic stream.

The community of Mason City has a population of approximately 28,000 citizens. Mason City is the largest retail shopping hub in north central Iowa. It's home to many manufacturing and industrial facilities, a large regional medical center, a regional community college, and attractions. The area's significant transportation facilities include a regional commercial airport, multiple railroads, and access to an interstate highway. Mason City is the county seat of Cerro Gordo County.

Guiding Principles

The IA Highway 122 Corridor Feasibility Study was conducted by WHKS & Co. for the City, in cooperation with Cerro Gordo County and the Iowa DOT.

Intending to preserve Federal-Aid eligibility for eventual construction, the study was developed under Federal-Aid procedures for a Categorical Exclusion improvement project.

The study limits include the IA 122 corridor between the intersection with Lark Avenue as the western boundary and the intersection with Cerro Gordo/Winnebago Way as the eastern boundary. The study limits include the IA 122 corridor, adjacent frontage roads, all intersecting roadways, and private accesses.

The study included one public input meeting conducted to gather feedback on the report, traffic and operations analysis, and alternatives. As additional stakeholder groups are identified during the public input process, additional public outreach activities will be conducted.

The report evaluates existing conditions within the corridor limits and provides recommendations to improve traffic operations and safety, pavement conditions, highway drainage, and utilization of the corridor by non-motorized users.

The study evaluates cultural resources, threatened and endangered species, regulated materials, and other environmental resources which may exist in the corridor.

The study considers a no-build alternative and two reconstruction alternatives. Each alternative has been evaluated for environmental impacts, right-of-way needs, cost and feasibility of construction.

The study assumes Iowa DOT “preferred” design criteria, though the participating agencies are open to “acceptable” design criteria, where appropriate.[1]

Existing major intersections and those currently signalized were evaluated for both traffic signal and roundabout improvements.

[1] Iowa Department of Transportation, Design Manual, Section 1.C1, Selecting Design Criteria. Refer to Appendix A for project design criteria worksheet.

Study Scope

WHKS is performing a feasibility study for the existing IA 122 corridor and providing possible reconstruction alternatives while also evaluating the challenges, constraints, costs, and other opportunities applicable.

Goals of Feasibility Study

- Provide safe efficient travel through the IA 122 corridor.
- Improve pavement conditions and drainage systems.
- Connect the City to the airport, I-35, and a nearby lake/recreational area.
- Support the regional medical center by providing a corridor optimized for efficient ambulance travel.
- Support the vibrancy of several businesses located along or adjacent to the corridor by maintaining and/or improving access to the highway.
- Promote economic development for the City of Mason City and surrounding areas.
- Promote Mason City as a tourist and entertainment destination.
- Improve, where possible, the function of the frontage road system.
- Provide longitudinal transportation facilities and improved crossings for non-motorized users.
- Enhance the IA 122 corridor as a “gateway” into Mason City, seeking opportunities for landscaping and aesthetic treatments.
- Seek to develop an environmentally responsible and resilient corridor with ongoing maintenance needs typical of similar corridors.

Assets of the Existing Corridor

- Generally wide rights-of-way.
- Vibrant, well-diversified mix of commercial, retail, service, and medical care developments along the corridor.
- Extensive but incomplete frontage road system, providing several business properties convenient access to and from the highway.
- Reasonable traffic volumes for the through capacity of the existing facility.
- Good sight-distances, gentle vertical alignment, and straight horizontal alignment throughout the corridor.
- Desirable and consistent access control throughout the corridor, with a few exceptions.
- Reasonable mix of existing utilities to address/accommodate.

Concerns with the Existing Corridor, for which Solutions are Sought

- Operational and capacity problems evident in certain locations and expected to become more prevalent under projected future traffic growth.
- A roadway cross-section consisting of a depressed median, unpaved shoulders, and an open-ditch drainage system, all of which are inconsistent with a developed urban corridor.
- Widely spaced signalized intersections making signal coordination and progression difficult to achieve.
- Crash history, relatively high in crash rate and relatively moderate in crash severity, which provides opportunities for improvement.
- Closely spaced frontage road intersections resulting in many operational and capacity concerns.
- Inconsistent mix of right-turn lanes and left-turn lanes, provision of median crossings, sideroad lane configurations, signal phasing, and other features.

- Lack of longitudinal facilities for non-motorized transportation in the corridor.
- Aging existing pavement with original construction in the 1960's.
- Drainage concerns in areas due to several existing shallow open ditches.

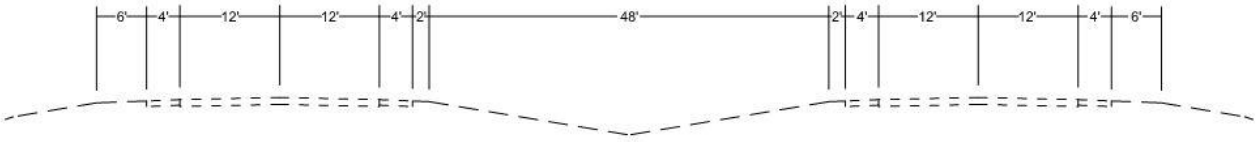
Infrastructure in the Existing Corridor

General Cross Section

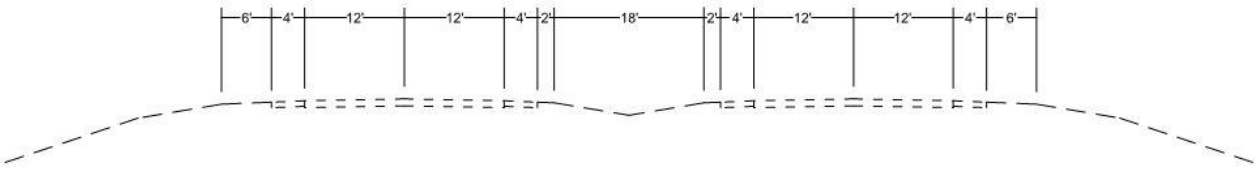
Existing IA 122 enters Mason City from the west as a divided four-lane rural expressway with a depressed median. It consists of two 12-foot travel lanes in each direction with partially paved shoulders, nominally 4-foot paved/2-foot granular median shoulders, and 4-foot paved/6-foot granular outside shoulders. Depressed median width is 60-feet, inclusive of median shoulders, measuring 84-feet from center of roadway to center of roadway.

In the area of Indianhead Drive, the roadway narrows down by transitioning the median width to a depressed median 30 feet in width, inclusive of median shoulders. Partial paved shoulders end effectively at the Willow Creek bridges.

In the area of Cerro Gordo/Winnebago Way, which is at the east end of the study area, the median narrows to 16 feet in width as IA 122 transitions to a five-lane section, with a two-way, center left-turn lane, east of this intersection.



Existing Typical Section
Lark Avenue to Indianhead Drive



Existing Typical Section
Indianhead Drive to Cerro Gordo/Winnebago Way

Figure 2 – Existing Typical Section with 60 ft. and 30 ft. Medians

Pavement History[2]

From the west terminus of the study area at Lark Avenue (approximate Milepost (MP) 4.20) to immediately west of Indianhead Drive at MP 4.93, the pavement history is:

- Eastbound (EB) IA 122: The pavement consists of a 7.5-inch Portland Cement Concrete (PCC) pavement listed as being constructed in 1918, with the following Hot-Mix Asphalt (HMA) resurfacings: 3 inches in 1948, 3 inches in 1963, 2 inches in 1977, and 3 inches in 1991.
- Westbound (WB) IA 122: The pavement consists of a 9-inch PCC pavement constructed in 1971, resurfaced with 3 inches of HMA in 1991.

For most of the corridor, from MP 4.93 (immediately west of Indianhead Drive) to MP 6.63 (immediately east of the Cerro Gordo/Winnebago Way intersection), the pavement history is

- EB IA 122: The pavement consists of a 10-inch PCC pavement constructed in 1963, resurfaced with 2 inches of HMA in 1977, and an additional 3-inches of HMA in 1991.
- WB IA 122: The pavement consists of a 10-inch PCC pavement constructed in 1962, resurfaced with 3-inches of HMA in 1991.

All IA 122 pavements in the study area were microsurfaced in 2018.

Current condition ratings (2021) of the EB roadway's pavement include a Pavement Condition Index (PCI) of 56 and an International Roughness Index (IRI) of 110. 2021 condition ratings for the WB roadway were a PCI of 70, and an IRI of 109.

The EB roadway is rated to be in Fair condition and the WB roadway is rated to be in Good condition for PCI (an overall pavement condition rating) within the study limits. Both the EB and WB IA 122 pavements are rated to be in FAIR condition in terms of IRI (i.e., roughness) within the study limits.

Bridges

Two bridges exist in the corridor, a pair of dual bridges located between Sedars Drive and Indianhead Drive.

The EB bridge crossing Willow Creek near Sedars Drive is a 53-ft x 40-ft concrete slab bridge (Maint # 1704.7R122, FHWA #18780). Constructed in 1933 and widened in 1963, the existing bridge is rated in Fair condition. This bridge is programmed for replacement in FY 2024[3] under Iowa DOT Project BRFN-122-1(24)- -39-17. The proposed bridge will be a 100-ft x 40-ft continuous concrete slab bridge built on existing horizontal and vertical alignments.

The WB bridge crossing Willow Creek near Sedars Drive is a 52-ft x 40-ft concrete slab bridge (Maint. # 1704.7L122, FHWA #18785). Constructed in 1970, this existing bridge is rated in Fair condition. This bridge was rehabilitated in 2022 with a deck-overlay project.

Drainage

The drainage of the existing highway facility is based on an open-ditch system, with a depressed median of varying widths, and open longitudinal ditches on each side of the IA 122 travel lanes. Each roadway is crowned at centerline, to facilitate pavement drainage to the median and roadside. Adequate longitudinal grade exists to facilitate drainage; however, many existing ditch sections are quite shallow.

[2] Iowa Department of Transportation, *Test Sections by Milepost*, February 2016.
[3] Iowa Department of Transportation, 2022-2026 Iowa Transportation Improvement Program.

Drainage from the corridor predominantly outlets in four spots: at Willow Creek, a small drainage way east of Tiffany Drive, a storm sewer pipe draining north from Taft Avenue, and a storm sewer pipe draining south near Cerro Gordo Way.

Environmental Considerations

A desktop environmental review was completed for the project corridor (See Appendix A for a map of environmental hazards). The desktop review was completed with readily available datasets gathered from various agency websites.

It is expected that the project will have no significant environmental impacts due to roadway remaining the same width (or narrowing) and staying within the existing right-of-way and previously developed property.

Emergency Response Issues

There are no police or fire department facilities immediately within the study corridor from which emergency response services are dispatched.

Cerro Gordo County operates a Law Enforcement Center immediately south of the corridor on Lark Avenue. Located adjacent to the Law Enforcement Center, the County Engineer's Office/Garage dispatches vehicles for emergency response and winter maintenance activities.

Though not located within the study area, IA 122 serves as a main transportation corridor for access to MercyOne North Iowa Medical Center, a 342-bed regional referral teaching hospital. The facility has a service area that spans 15 counties in north Iowa and south Minnesota, serving a population over 260,000 people. This facility offers ambulatory care, home health agency, hospice, regional referral laboratory, regional rehabilitation and diagnostic technology services, pharmacies, an emergency services network with air medical operations, and many other health care services. Specialties include cancer care, cardiology, cardio thoracic surgery, gastroenterology, neurosurgery, orthopedics, otolaryngology, plastic and reconstructive surgery, pulmonology, rheumatology, vascular and wound services.

Meetings were conducted with the Mason City Fire Chief and the Mason City Police Chief regarding the estimated impact all 3 alternatives would have on response times. Both Chiefs indicated they do not see a negative impact to response times with any of the alternatives.

The Mason City emergency response departments utilize emergency preemption for calls that require travel through the corridor. Preemption allows the emergency vehicles to change the traffic signals which allows them to move more quickly through the corridor. Out of town units do not have access to the preemption codes, so they often times are slowed down going through the traffic signals. Since IA 122 is the main route to the hospital for communities west of Mason City, this lack of preemption can increase travel time to the hospital.

Adjacent Development

The corridor is characterized by mixed agricultural/commercial development west of Eisenhower Avenue and heavy commercial/service/retail development east of Eisenhower Avenue. East of Eisenhower Avenue, the corridor includes an extensive but incomplete system of closely- spaced two-way frontage roads. Most of the business properties are accessed via the frontage road system.

Major Intersection Characteristics

Six major intersections are signalized including (from the west) Indianhead Drive, Eisenhower Avenue, Village Green Drive/Roosevelt Avenue, Taft Avenue, Briarstone Drive/South Grover Avenue, and Cerro

Gordo/Winnebago Way. These six intersections are widely spaced, ranging from 900 feet up to ½ mile between signalized intersections. All other intersections/accesses are side-road STOP controlled only, with YIELD controls for any unsignalized median crossings due to the narrow median widths.

		Southbound Approach		Northbound Approach		Median			Mainline		
Intersection	Control	Jurisdiction	Lane Config.	Jurisdiction	Lane Config.	Width	Left-Turn Lanes?	Restricted Movements?	Trail Crossings?	Speed, MPH	Right-Turn Lanes?
Lark Avenue	Two-Way STOP	County	Single Lane	County	Single Lane	60 ft	WB and EB, parallel	None	No	55	None
Senco Equpment Access	One-Way STOP	Private	Single Lane	None	N/A	60 ft	WB Only, parallel	None	No	55	None
Sedars Drive	Two-Way STOP	Private	Single Lane	City	Single Lane	60 ft	WB and EB, parallel	None	No	55	WB Only, Parallel
Indianhead	Signalized	City	Left Only, Thru/Right	City	Left Only, Thru/Right	Variable	WB and EB, parallel	None	No	45	WB and EB, Parallel
Eisenhower Ave.	Signalized	City	Left Only, Thru, Right Only	City	Left Only, Thru, Right Only	30 ft	WB and EB, parallel	None	No	45	None, WB Right Under Construction
N Iowa Events Center Access	Two-Way STOP	City	Single Lane	City	Single Lane	30 ft	WB and EB, parallel	None	No	45	WB Only, Parallel
Village Green/Roosevelt	Signalized	City	Dual Left Only, Thru, Right Only	City	Dual Left Only, Thru, Right Only	30 ft	WB and EB, parallel	None	No	45	WB Only, Parallel
Tiffany Drive	Two-Way STOP	City	Right-Only	City	Single Lane	30 ft	WB and EB, offset	No Crossings, no LT onto mainline	No	45	None
Willow Inn Access	Two-Way STOP	City	Single Lane	City	Single Lane	30 ft	WB and EB, parallel	None	No	35	None
Taft Ave.	Signalized	City	Left/Thru, Thru/Right	City	Left-Thru, RT Only	30 ft	WB and EB, parallel	None	Yes	35	WB and EB, Parallel
Briarstone/Grover	Signalized	City	Thru/Left, RT Only	City	Left Only, Left/Thru, Right Only	30 ft	WB and EB, parallel	None	No	35	WB Only, Parallel
Cerro Gordo/ Winnebago Way	Signalized	City	Thru/Left, RT Only	City	Left-Thru, RT Only	30 ft	WB and EB, parallel	None	Yes	35	None

Table 1 – Major Intersection Characteristics

Comparing the intersections

- Two intersections have dual left-turn sideroad approaches: both NB and SB approaches at Village Green/Roosevelt and the SB approach only at S. Grover Avenue.
- Lane configurations for the sideroad approaches vary throughout the corridor.
- One intersection, Tiffany Drive, has positively offset mainline left-turns and restrictions on median crossing and left-turns onto the highway.
- The provision of mainline right-turn lanes varies among the intersections. The only intersection in the study corridor with an EB right-turn lane is Taft Avenue, whereas seven intersections will have WB right-turn lanes once the WB right turn, currently under contract, is built at Eisenhower Avenue.
- There are several considerations for turning lanes:
    - Criteria for constructing turning lanes differs between rural and urban areas, and this study corridor has both.
    - The cost responsibility for constructing turning lanes to privately-owned accesses typically lies with private property owners served by the access. Privately-owned accesses may have lower traffic volumes and be less likely to warrant turning lanes.
    - Closely-spaced frontage roads at some locations may make construction of right-turn lanes impactable.
    - In urban areas, right-turn lanes are generally justified on a capacity analysis, while in rural areas, the decision to provide right-turn lanes is typically a function of turning volumes in comparison to thru volumes.
    - Offset right turn lanes are generally preferred for multi-lane corridors to prevent shadowing. Parallel right turn lanes have potential to result in a situation where a vehicle exiting the mainline via a parallel right-turn lane “shadows” mainline thru vehicles from the viewpoint of a sideroad vehicle seeking to cross to the median or make a right-turn to enter the highway. Refer to Appendix A for a diagram.

Access Management

The IA 122 corridor exhibits a high degree of access control which has generally been well-managed by the Iowa DOT and City. Between Lark Avenue and Tiffany Drive, access spacing is consistently provided at approximately ¼ mile spacings, with no direct access to individual properties. These properties are reached through intersections with public streets or via frontage roads. Each access point in this area includes a full-movement median crossing, except for the median crossing at Tiffany Drive, which provides left-turn movements off the IA 122 facility but restricts left-turns onto the mainline.

East of Tiffany Drive, good access management provides access points at spacings in the 400-to-600-foot range. Major street intersections at Taft Avenue, Briarstone Drive/S. Grover Avenue, and Cerro Gordo/Winnebago Way provide full movements across the median. Other accesses provided are generally right-in/right-out only serving multiple businesses located within strip-mall facilities or connect to the frontage road system. Exceptions include:

- A full movement median crossing 600 feet west of S. Taft Avenue, which serves as a frontage road connection on the north.
- Access to an individual business property (Willow Inn) on the south side with two right-in/right out connections to the Willow Inn and another right-in/right-out access to adjacent businesses; this series of existing accesses provides a possible opportunity for driveway consolidation.

While access spacings are well-managed, there is an opportunity to improve the consistency of the access points. Right turn lanes are inconsistently provided at the existing access points. One median crossing (at Tiffany Drive) provides a ¾-intersection with off-set left-turn lanes and has been successfully accepted by corridor motorists. However, while it works, it is inconsistent with other median crossings.

Frontage Road System

The frontage road system is extensive, though incomplete. Where it exists, the frontage road provides two-way travel. One significant shortcoming of the system is the limited offset of the frontage roads from the mainline highway, resulting in minimal throat distances available for vehicle storage on the sideroad/access approaches.

North Side of IA 122

- Frontage Road from Lark Avenue (S34) to Sedars Drive. Offset is 100 feet from the near edge of mainline pavement.
- Gap from Sedars Drive to Indianhead Drive. This gap includes the Willow Creek crossing.
- Frontage Road from Indianhead Drive partially towards Eisenhower. Offset is approximately 50 feet from the near edge of mainline pavement.
- Gap from S. Eisenhower Avenue to the North Iowa Events Center access.
- Frontage Road from North Iowa Events Center access to Taft Avenue. Offset is approximately 95 feet from the near edge of mainline pavement near the Target Development, approximately 30 feet near Mills Fleet/Farm and Applebee's, and 60 feet between the Stone Creek Office Park and Boulder Tap House.
- Gap from S. Taft Avenue to Cerro Gordo/Winnebago Way. In this area, the businesses are mostly in strip-mall facilities where the parking lots provide longitudinal circulation.

South Side of IA 122

- Gap from Lark Avenue (S34) to Sanco Equipment Access.
- Partial frontage road from Sanco Equipment to another private access opposite Sedars Drive where another partial frontage road serves two businesses, Outlaw Truck Parts and Mason City Powersports. Offset is approximately 60 feet from the near edge of mainline pavement.
- Gap from Sedars Drive to Indianhead Drive. This gap includes the Willow Creek crossing.

- Backage road, from Willow Creek crossing to S. Eisenhower Avenue. An approximate offset from the mainline of 250 feet.
- Frontage Road from S. Eisenhower Avenue to Tiffany Drive. Offset from the near edge of mainline pavement is approximately 30 feet from Eisenhower Avenue to Village Green Drive, and approximately 55 feet from Village Green Drive to Tiffany Drive.
- Gap from Tiffany Drive to S. Taft Avenue. The parking areas for multiple businesses in this area likely serve a frontage road function, but it is unknown whether the properties have any legally-defined access agreement among them.
- Frontage Road from S. Taft Avenue to Cerro Gordo Way. Offset is approximately 60 feet from the near edge of mainline pavement. Offset varies from 50 to 40 feet in this section.

Speed Zoning [4]

Following completion of a 2020 Traffic Engineering Assistance Program (TEAP) study[5], the Iowa DOT conducted a speed study in the IA 122 corridor. Prior to the most recent speed study, posted regulatory speeds were as follows:

- Lark Avenue (S34) to Sedars Drive – 55 miles per hour (MPH)
- Sedars Drive to just East of Tiffany Drive – 50 MPH
- Just East of Tiffany Drive to just west of Briarstone/S. Grover – 40 MPH
- Just west of S. Grover/Briarstone Drive continuing east of Cerro Gordo/Winnebago Way – 35 MPH

Speeds Measured on May 13, 2020

- **Site M1 near Indianhead Drive:**
  range = 32-59 MPH, pace = 42-51 MPH, 85th percentile = 51 MPH
- **Site M2 near the North Iowa Events Center Access:**
  range = 30-56 MPH, pace = 40-49 MPH, 85th percentile = 49 MPH
- **Site M3 near Tiffany Drive:**
  range = 30-67 MPH, pace = 39-48 MPH, 85th percentile = 49 MPH
- **Site M4 at Taft Avenue:**
  range = 30-51 MPH, pace = 32-41 MPH, 85th percentile = 43 MPH

Based on the results of the 2020 Iowa DOT speed study, the previous 50 MPH speed limit was lowered to 45 MPH. All other regulatory posted speeds within the study area remained the same.

[4] Iowa Department of Transportation, letter from Kurtis Younkin, Office of Traffic and Safety, to Craig Wood/Jon Ranney, District 2 Office, June 5, 2020. See Appendix A.

[5] *IA 122 Corridor Study,* Snyder and Associates, Inc., Ankeny, IA. June 1, 2020, conducted for the City of Mason City under the Iowa Department of Transportation's Traffic Engineering Assistance Program.

Corridor Crash History (2017-2021)

The crash history was reviewed for the IA 122 corridor, from the intersection with Lark Avenue to the intersection with Cerro Gordo/Winnebago Way. The corridor crash history was generated from the Iowa Crash Analysis Tool (ICAT) for the full calendar years of 2017 to 2021. The crashes were selected using the line tool, with a 75–foot buffer, intending to minimize the inclusion of crashes occurring on the closely-spaced frontage roads.

Corridor	Crashes (Injury), # of crashes	Crash Severity, # of crashes by highest injury	Crash Rate, C/HMVM	Predominent Manners of Crash (# Crashes)	Predominent Major Causes (# Crashes)
Lark Avenue to Cerro Gordo/Winnebago Way	280 (79)	1 Fatal	384	Rear End (137)	Following Too Close (55)
		3 Major		Broadside (48)	Other (48)
		14 Minor		Sideswipe, Same Direction (38)	FTYROW Left Turn (21)
		61 Possible		Single-Vehicle, Non-Collision (22)	Ran Traffic Signal (21)
		PDO (201)		Angle, Oncoming Left Turn (15)	Lost Control (18)

Table 2 – Corridor Crash History (2017-2021) [6]

For the corridor over the 5-year period (2017-2021), there were a total of 280 reported crashes, resulting in the following:

- 1 fatal crash resulting in 1 fatal injury
- 3 major injury crashes resulting in 3 major injuries
- 14 minor injury crashes resulting in 18 minor injuries
- 61 possible injury crashes resulting in 80 possible injuries
- 201 property damage only crashes
- Accumulated property damage losses of $1,626,263 as estimated by the reporting police officers, an average property damage loss of $5,787 per crash.

Using the latest traffic volumes available from the Iowa DOT (2017), the corridor crash rate was calculated as 384 crashes per hundred million vehicle miles of travel (C/HMVM), significantly higher than a historical statewide average crash rate of 296 C/HMVM for similar corridors.[7]

The corridor's "Fatal+Injury" crash rate was calculated at 108 C/HMVM compared to a historical statewide average of 86. Despite the rate of injury crashes being relatively high, the crashes tend to be less severe than might be expected. This may be explained by the relatively few multiple injury and rear-end crashes being the predominant manner of crash.

[6] "Fatal" refers to the number of fatal injuries, "Major" to incapacitating injuries, "Minor" to recoverable injuries, and "Possible" to possible or unknown injuries as reported by the investigating police officer. Crash rate is calculated as the number of crashes per hundred vehicle miles of travel, C/HMVM.

[7] Iowa Department of Transportation, *Crash Rates and Crash Densities in Iowa by Road System 2007 – 2016*, 10-year averages (2007-2016) for Municipal Iowa Primary Highways. See Appendix A.

Of the 280 total crashes occurring in the 5-year period, most crashes occurred in the mid-morning to mid-afternoon periods:

- 45 crashes between 10:00 am and Noon
- 57 crashes between Noon and 2:00 pm
- 53 crashes between 2:00 pm and 4:00 pm
- 49 crashes between 4:00 pm and 6:00 pm
- 76 crashes during the other hours of the day.

Surface conditions for the crashes were listed as:

- 204 – dry
- 46 – wet
- 6 – ice/frost covered
- 12 – snow
- 3 – slush
- 8 – 'other' or not reported

There were 22 single-vehicle, non-collision crashes 10 crash reports identified the specific fixed-objects struck, including:

- Traffic Signs (3)
- Ditch (1)
- Bridge Overhead Structure (1)
- Ground (1)
- Guardrail (1)
- Utility Pole (1)
- Traffic Signal Pole (1)
- Fence (1)

Roadside-related crashes do not appear to be a significant issue in the corridor.

Alcohol-related crashes appear to be minimal. Out of 569 drivers involved in these crashes, 5 alcohol tests were given, and 3 drivers refused testing. 4 citations were given for alcohol impairment. Drug-related crashes appear to be minimal. Out of 569 drivers involved in these crashes, no drug tests were given, and no citations were issued for drug impairment.

Crash frequency varied considerably by year, with no clear explanation for the variation. Traffic volumes are relatively consistent and only minor engineered improvements have occurred in the corridor during this time. The lower frequency of crashes in 2020 could be attributed to a reduced traffic volume associated with the COVID-19 Pandemic; however, these crash frequencies were matched in 2012-2013 when there was no such traffic-volume reduction, and the same infrastructure was effectively in place. Crash frequency history includes:

- 2021 – 44 crashes
- 2020 – 38 crashes
- 2019 – 51 crashes
- 2018 – 75 crashes
- 2017 – 72 crashes
- 2016 – 98 crashes
- 2015 – 64 crashes
- 2014 – 73 crashes
- 2013 – 57 crashes
- 2012 – 38 crashes

An analysis of the major crash causes shows the following:

- **Aggressive Driving** – Related major causes were identified in 97 of the 269 crashes for which a major cause was reported. Included were crashes caused by: Following Too Close (55), Ran Traffic Signal (21), Improper or Erratic Lane Changing (12), Reckless Operation (4), Too Fast for Conditions (3), and Ran Stop Sign (2). No crashes were attributed to major speeding-related causes including Exceeding Authorized Speeds or Driving Less than the Posted Speed Limit.
- **Failure to Yield (FTY)** – Major causes were identified in 51 crashes as follows: FTYROW Making Left Turn (21), From Stop Sign (10), Right Turn on Red Signal (6), At Uncontrolled Intersection (5), From Yield Sign (1), Yield to Pedestrian (1), and (7) crashes were attributed as FTYROW from "other".
- **Driver Error** – Related major causes were the major causes listed for 31 crashes, including Lost Control (18 crashes), Made Improper Turn (4), Vision Obstructed (3), and (6) other miscellaneous causes.
- **Distracted Driver** – Major causes were identified in 16 crashes, including crashes where a driver was distracted by such things as using a mobile phone or by a passenger or an unrestrained animal in the vehicle.
- **Equipment Failure** – 1 crash was attributed to equipment failure.
- **Other** - 48 crashes were attributed to "other" major causes that were not identifiable by the several dozen standard selections available to reporting officers.

The 2017-2021 corridor crash history is normal in terms of crash rate. The average crash severity is somewhat lower than expected for a corridor such as this:

- Average property damage losses of under $5,800 per crash, compared to $7,000 statewide average.
- The proportion of crashes in the corridor resulting in property damage only losses is 72%, matching the statewide crash experience.
- Relatively infrequent occurrence of serious injuries because of the crashes that occur.

Crash History at Major Intersections

Crash histories were evaluated for every intersection where a crossing of the IA 122 median is provided.

Intersection	Crashes (Injury), # of crashes	Crash Severity, # of crashes by highest injury	Daily Entering Vehicles, DEV	Crash Rate, C/MEV	Predominent Major Causes (# Crashes)	Predominent Manners of Crash (# Crashes)
Lark Avenue	5 (1)	0 Fatal 0 Major 0 Minor 1 Possible 4 PDO	16,745 vehicles per day	0.16	Following Too Close (3) Swerving/Evasive Action (1) FTYROW Stop Sign (1)	Rear End (3) Broadside (1) Angle, Oncoming Left Turn (1)
Frontage Road Access (Senco Equipment)	1 (0)	0 Fatal 0 Major 0 Minor 0 Possible 1 PDO	15,234 vehicles per day	0.04	Made Improper Turn (1)	Sideswipe Same Direction (1)
Sedars Drive and South Frontage Road Access (MC Power Sports)	7 (4)	0 Fatal 0 Major 0 Minor 4 Possible 3 PDO	16,134 vehicles per day	0.24	FTYROW Stop Sign (2) Driver Distraction (1) Lost Control (1) Erratic Lane Change (1) Followed Too Close (1)	Rear End (3) Broadside (2) Sideswipe Same Direction (1) Single Vehicle (1)
Indianhead Drive	13 (4)	0 Fatal 1 Major 0 Minor 3 Possible 9 PDO	15,786 vehicles per day	0.45	Followed Too Close (3) Driver Distraction (3) Other (2) Too Fast for Conditons (1) Lost Control (1)	Rear End (9) Broadside (2) Sideswipe Same Direction (2)
Eisenhower Avenue	50 (14)	1 Fatal 0 Major 2 Minor 11 Possible 36 PDO	22,349 vehicles per day	1.23	Following Too Close (13) Other (8) Lost Control (4) Ran Traffic Signal (4) FTYROW Right Turn (3)	Rear End (31) Broadside (6) Sideswipe, Same Direction (6) Angle Oncoming Left-turn (2) Head-on (1)
North Iowa Events Center and South Frontage Road Access	31 (14)	0 Fatal 1 Major 4 Minor 9 Possible 17 PDO	22,584 vehicles per day	0.74	FTYROW Left Turn (10) Other (6) FTYROW Stop Sign (4) Ran Traffic Signal (4) FTYROW at Uncontrolled Intersection (2)	Broadside (16) Rear-End 6) Sideswipe, Same Direction (3) Angle Oncoming Left-turn (3) Sideswipe, Opposite Direction(1)
Village Green Drive/Roosevelt Avenue	32 (11)	0 Fatal 0 Major 3 Minor 7 Possible 21 PDO	19,275 vehicles per day	0.91	Followed Too Close (8) Lost Control (3) Other (3) FTYROW Left-Turn (2) Improper Lane Change (1)	Rear-End (16) Non-Collision (Single Vehicle) (4) Sideswipe, Same Direction (3) Broadside (3) Sideswipe, Opposite Direction(2)
Tiffany Drive and North Frontage Road Access	9 (1)	0 Fatal 0 Major 0 Minor 1 Possible 8 PDO	18,865 vehicles per day	0.26	Followed Too Close (3) Other (3) FTYROW Making Left-Turn (1) FTYROW at Uncontrolled Intersection (1) Distracted Driver (1)	Rear-End (7) Broadside (1) Angle Oncoming Left-turn (1)
Willow Inn access and North Frontage Road access	5 (3)	0 Fatal 0 Major 1 Minor 2 Possible 2 PDO	17,781 vehicles per day	0.15	Followed Too Close (2) Other (2) FTYROW Stop Sign (1)	Rear-End (3) Broadside (2)
Taft Avenue	45 (17)	0 Fatal 0 Major 3 Minor 14 Possible 28 PDO	23,381 vehicles per day	1.05	Followed Too Close (9) Other (8) Ran Traffic Signal (7) FTYROW Making Left-Turn (6) Lost Control (3)	Rear-End (25) Broadside (7) Sideswipe, Same Direction (6) Angle Oncoming Left-turn (5) Head-on (1)
Briarstone Drive/Grover Avenue	40 (5)	0 Fatal 0 Major 1 Minor 4 Possible 35 PDO	20,218 vehicles per day	1.08	Followed Too Close (8) Other (8) Ran Traffic Signal (4) Distracted Driver (4) Improper Lane Change (2)	Rear-End (23) Sideswipe, Same Direction (9) Broadside (5) Non-Collision (Single Vehicle) (2) Unknown (1)
Cerro Gordo Way/Winnebago Way	24 (3)	0 Fatal 0 Major 0 Minor 3 Possible 21 PDO	24,972 vehicles per day	0.53	Followed Too Close (4) Other (3) Ran Traffic Signal (2) FTYROW Making Left Turn (1) Lost Control (1)	Rear-End (9) Sideswipe, Same Direction (6) Broadside (3) Non-Collision (Single Vehicle) (2) Angle, Oncoming Left Turn (1)

Table 3 - Crash History at Major Intersections[8]

The intersection crash histories were generated from the Iowa Crash Analysis Tool (ICAT) for the full calendar years of 2017 to 2021. The crashes were selected using the polygon tool, with a 75–foot buffer, intending to minimize the inclusion of crashes occurring on the closely-spaced frontage roads. Following the Iowa DOT's *Safety Analysis Guide*[9] (to the extent practical), the polygons used to select crashes were extended to include both approach and departure functional areas of the intersections.

This task proved challenging as:

- Many closely-spaced frontage road connections limited the degree to which full functional areas could be assigned to the side-road approaches.
- Several intersections are spaced so closely that full recognition of the distances over which vehicles will slow, stop, turn, merge, and queue would result in overlapping of one intersection's maneuvers with those of another intersection. Judgement was used to determine reasonable functional areas for each intersection to eliminate any double-counting of crashes.

Due to the closely-spaced urban intersections, a consequence of following the draft procedures of the *Safety Analysis Guide* is that 261 out of the total 280 corridor crashes were found to be within either the approach or departure functional areas of intersections. For this reason, no crash histories or crash rates have been reviewed for the links (the portions of the highway corridor between the intersections).

The intersections with Eisenhower, the North Iowa Events Center access, Village Green/Roosevelt, Taft, and Briarstone/Grover have crash rates that exceed the statewide average crash rate of 0.8 C/HMVM.[10] All other intersections operate below the statewide average crash rate.

The predominant manner of crash at these intersections is rear-end crashes, with "Following Too Close" as the major cause determined by the investigating police officers.

Crash rates were calculated based on latest available turning movements from the Iowa DOT (2017). Exceptions, listed from west to east, include:

- Lark Avenue – 2005 Iowa DOT Turning Movements were used. An additional 1000 vehicles per day were assumed to reflect the development of the Cerro Gordo Law Enforcement Center and the County Engineer's office and garage, both located on Lark Avenue south of IA 122.
- Sanco Access – Mainline volumes from the adjacent Lark Avenue intersection were used and access volumes were assumed.
- North Iowa Events Center Access – Iowa DOT estimated traffic counts were used based on StreetLight, an application using mobile phone data.
- Tiffany Drive - Mainline volumes from the adjacent Village Green/Roosevelt and Taft Avenue intersections were used and access volumes were assumed.
- Willow Inn Access - Mainline volumes from the adjacent Taft Avenue intersection were used and access volumes were assumed.
- Briarstone/S. Grover – Special traffic count conducted as part of the 2020 TEAP study was used.
- Cerro Gordo/Winnebago Way – 2013 Iowa DOT Turning Movements were used.

[8] "Fatal" refers to the number of fatal injuries, "Major" to incapacitating injuries, "Minor" to recoverable injuries, and "Possible" to possible or unknown injuries as reported by the investigating police officer. Crash rate is calculated as the number of crashes per million entering vehicles (C/MEV). Statewide Average Crash Rate for comparable intersections is 0.80 C/MEV. FTYROW means Failure to Yield Right-of-Way.

[9] Iowa Department of Transportation, *Safety Analysis Guide*, (draft – dated December 2021)

[10] Iowa Department of Transportation, *Accident and Related Data for Rural and Municipal Intersections in Iowa*. See Appendix A.

Crash histories indicated fatal crashes at two (2) locations, only one of which was in the IA 122 corridor:

- Eisenhower – A fatal injury crash occurred at the intersection of Eisenhower Avenue and IA 122 involving a passenger vehicle turning left from EB IA 122 to NB Eisenhower, pulling into the path of a WB motorcyclist who died in the crash. The crash report indicates that the WB traffic had the "Green" when the crash occurred. Date of crash was September 2, 2019.
- Village Green/Roosevelt – This fatal crash involved a vehicle/pedestrian fatality and appears in CMAT as being located at the Village Green/Roosevelt intersection. Reviewing the hard-copy crash report, the location of the crash was at the entrance of the Mills Fleet Farm store, and this was not a crash related to, or occurring in, the IA 122 corridor. This crash's location coordinates were incorrectly coded. Date of crash was June 8, 2021.

Major injury crashes occurred as follows:

- **Non-Intersection Related:** One major injury crash involved a WB motorcyclist losing control after encountering rock on the roadway. The motorcyclist was transported to the hospital with shoulder injuries. The location of the crash was given as the 2900 Block of 4th Street SW, which is IA 122. The coordinates place the crash location in the WB roadway, midway between Village Green and Tiffany Drive, which is consistent with the literal description. Date of crash was June 4, 2017.
- **Indianhead:** A passenger vehicle was stopped on the northbound approach, waiting to turn left onto WB IA 122. A motorcyclist was EB. The left-turning passenger vehicle pulled into the path of the motorcyclist. The motorcyclist was transported for medical care. Date of crash was September 2, 2019.
- **North Iowa Events Center Access:** A SB passenger vehicle pulled from the North Iowa Events Center and entered the median. An uninvolved vehicle was stopped in the EB left-turning lane, at the time, noted to be blocking the visibility of oncoming EB traffic. The SB vehicle pulled out from the median into the path of an EB motorcyclist. The motorcyclist was transported with injuries. Date of crash was September 13, 2020.

Of interest, all fatal and major injury crashes involved motorcycles.

Non-Motorized Transportation[11]

Trail #1 (Cross-Town North Route)

Trail #1 (Cross-Town North Route), approximately six miles in length, connects the West Mason City Shopping District, passing through downtown Mason City, to the North Iowa Area Community College. Starting from its western terminus at the intersection of N. Taft Avenue and W State Street, Trail #1 follows W. State Street east to S. Grover Avenue, then crosses the business plaza parking lot immediately adjacent to the north highway right-of-way line toward a short section of dedicated trail leading to the intersection with Winnebago Way. Only this short section of dedicated trail, approximately 120 feet in length, exists within the current highway right-of-way.

At the Cerro Gordo/Winnebago Way intersection, Trail #1 continues north on Winnebago Way via signed and marked on-street bicycle lanes in each direction of travel.

Trail #2 (Taft Avenue Route)

Trail #2 follows Taft Avenue. Its south terminus is at Taft Avenue and 19th Street SW, where it connects with Trail #9 (Trolley Trail). Its north terminus is at 12th Street NW. Trail #2 crosses Trail #3 at Briarstone Drive, and the IA 122 corridor via a dedicated off-roadway trail located on the east side of the intersection.

[11] City of Mason City, Bicycle Trail Map, August 2015. Refer to Appendix A.

Trail #3 (Cross-Town South Route)

Other than its western terminus at the intersection of IA 122 and Indianhead Drive and its connection to Trail #1 at the intersection of Cerro Gordo/Winnebago Way, Trail #3 (Cross-Town South) falls outside the study corridor. At the intersection of Cerro Gordo/Winnebago Way, trail users are in dedicated on-street lanes in each direction of travel.

Transit

The existing IA 122 corridor provides no on-corridor transit facilities such as bus stops. Public transit busses, provided by Mason City Transit (hereinafter referred to as MCT), operate in the corridor via the West Central (Blue) Route, a fixed route/scheduled service. This route serves an average daily ridership of 290 passengers and is the busiest route in the system.

The Blue Route provides scheduled service twice an hour, from 6:30 am to 6:00 pm Monday through Friday, except for seven scheduled holidays.[12]

All scheduled stops occur at various business locations along the corridor, and not on either the highway or frontage road corridors. Specific bus stop locations on/near the study area include:

- Stops #3 and #8 – Hy-Vee West Plaza
- Stop #4 – Target
- Stop #6 – Wal-Mart
- Stop #7 – Salvation Army

Additionally, MCT provides a Paratransit Bus Service for door-to-door services for elderly and disabled customers unable to use the fixed-route service.

MCT completed a *Transit Design Study* in 2021[13], which was reviewed by WHKS staff for preparation of this feasibility study. Per the 2021 study, "*the fixed route service operates with only a few bus stop signs and concrete pads at bus stops. The fixed routes operate primarily using a "flag stop" system, in which the passenger waves at the bus to request a stop at his or her location. A few bus stops are strategically located at sites where there are significant numbers of boarding passengers.*"

The study recommended "*adding additional defined bus stops with signs at defined timepoints along current routes; adding concrete pads will help passengers who use mobility devices"*.

Additionally, this 2021 study developed a recommendation for a new express route, operating non-stop from downtown to Wal-Mart, then stopping EB only at Target and Hy-Vee West.[14]

A second recommendation was to *"modify the West Central route at two locations. It would operate eastbound from Wal-Mart on its current route and then cross 4th SW*" (meaning IA 122) "*to Hy-Vee West. It would then return to the current eastbound route. At Polk, it would continue north and serve MercyOne and then return to downtown via the reverse of the westbound route. Passengers currently boarding/alighting on the south frontage road would be required to walk to the nearest intersection (less than 0.17 mile). There are no sidewalks along the south frontage road and a safe pedestrian path would be available. If a new sidewalk or pedestrian path is not constructed, passengers would be walking in the automobile portion of the roadway."* [15]

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[12] See Appendix A for a map of the MCT Fixed-Route services, as of August 2022.

[13] Mason City Transit, *Transit Design Study*, Bourne Transit Consulting, LLC, etal, 2021. Available at: https://www.masoncity.net/files/documents/MasonCityTransitStudy20211464035325101821PM.pdf

[14] See Appendix A for a map of the proposed West Central Express Service, Figure 7.4, p 82, of the above-named report.

[15] See Appendix A for a map of the proposed modifications to the existing West Central (Blue) route, Figure 7.5, p 83, of the above-named report.

Alternatives Being Considered

Major pavement rehabilitation alternatives were briefly considered but were abandoned for the purposes of this study. Major pavement rehabilitation strategies would incur significant expenses but fail to address many of the concerns identified with the existing corridor, such as drainage and traffic operations. Given the age and condition of the existing pavement structure, it is prudent to consider full pavement reconstruction, providing the City and Iowa DOT an opportunity to reimagine the corridor to best serve the road users and community in the future.

For these reasons, this feasibility study is focused on three main alternatives:

1. No-build, incorporating only improvements identified in a 2020 Traffic Engineering Assistance Program (TEAP) study conducted by Snyder & Associates for the City.
2. Full reconstruction with six major intersections being signalized.
3. Full reconstruction with roundabouts at five of the six major intersections, with Indianhead Drive remaining signalized.

Alternative 1 – No-Build with TEAP Improvements

This alternative assumes:

- Future maintenance and rehabilitation of the existing pavement structure. For the purposes of this feasibility study, we addressed cost of construction for the proposed improvements and did not attempt a life-cycle cost analysis of the future maintenance of the corridor in its existing and future conditions.
- Perpetuation of the open-ditch drainage system and depressed median. However, we will address a potential option to pave existing shoulders through the corridor.
- No longitudinal trail or sidewalk construction.
- Perpetuation of the existing traffic signal system with implementation of improvements as recommended in the 2020 TEAP Study of the IA 122 corridor by Snyder & Associates.
- The TEAP study focused on the IA 122 corridor from Indianhead Avenue to Monroe Avenue. The TEAP study did not consider the westernmost 0.75 miles of this study area and extended approximately 1.1 miles further east. Due to limitations inherent in a TEAP study, it also did not consider significant improvements at the Taft and Cerro Gordo/Winnebago Way intersections.
- If the intersection was addressed in the 2020 TEAP study, it will be indicated in the heading by "(TEAP)". For discussion and justification for the recommendations provided in the 2020 TEAP study, please refer to that study. If the intersection was not addressed, the heading will show "(WHKS)" and reflect the work accomplished in this feasibility study.

Recommended Improvements

1. Lark Avenue (S34) (WHKS)

This intersection lacks right-turning lanes in both the WB and EB directions. Left-turning lanes are of a traditional parallel design with a negative offset, resulting in potential sight-distance restrictions when compared to positive-offset left-turn lanes. Refer to Appendix A for a diagram of offset left-turn lanes.

Despite possible concerns with the lack of right-turn lanes, and configuration of the left-turn lanes, this intersection operates safely with a crash rate of 0.16 C/MEV. Three of the five crashes in the most recent 5-year period were rear-end crashes, only one of which involved mainline vehicles. The county law enforcement center was constructed prior to the 5-year study period, and the county engineer's office/garage was present for part of the study period.

Per the Iowa DOT[16], right-turn lanes are warranted on expressway facilities if right turning traffic flow rate is greater than 30 vehicles per hour measured over a minimum of 15 minutes and either: a)

[16] Iowa Department of Transportation, *Design Manual 6C-5*, Design Bureau, June 18, 2004.

approach volume is greater than 400 vehicles per hour, or b) approach truck traffic volume is greater than 20 vehicles per hour. Conservatively considering available turning movement counts dating from 2005, an EB right-turn lane is marginally warranted. A WB right-turn lane is not warranted.[17]

Conclusions:

- Recommend reconsidering the turning lane warrants in the design phase when updated turning movement counts are available.

2. Sanco Equipment Frontage Road Access (WHKS)

This private access serves as a connection to two business properties on the south side of IA 122: Sanco Equipment and a vacant property that was the former location of Mediacom. There is no EB existing right-turn lane. A WB left-turn lane exists.

This intersection operates safely at a crash rate of 0.04 C/MEV, and with only one property damage only (PDO) crash reported in the 2017-2021 period. This crash involved two EB vehicles caused by a vehicle attempting to enter the median from the outside lane.

Conclusions:

- Given that this is a private access, volumes to the businesses served are low, and no crash history suggests the need for a right-turn lane, no improvements are currently recommended for this location.

3. Sedars Drive and South Frontage Road Connection (WHKS)

This intersection serves Sedars Drive on the north, where several businesses are located, and to the south, an access to a privately-owned frontage road accessing two businesses. A full-movement median crossing is provided. Left-turn lanes for both EB and WB traffic exist. A WB right-turn lane exists, but there is no existing EB right-turn lane into the privately-owned frontage road.

This intersection operates safely at a crash rate of 0.24 C/MEV with only seven crashes reported in the 2017-2021 period.

This intersection is fully-developed with turning lane geometry, other than an EB right-turning lane. The EB right-turn lane serves a privately-owned frontage road, so funding for any right-turn lane would be the responsibility of the property owners. Three of the seven crashes all involved possible/unknown injuries and relate to the lack of a right-turn lane to the south frontage road.

Conclusions:

- Reevaluate this intersection and the need for an EB right-turn lane when the project reaches the design phase.

4. Indianhead Drive (TEAP)

Refer to previous sections for background information on this intersection.

Recommendations include:

- Implement advance warning signs such as a signal ahead sign (W3-3) and a BE PREPARED TO STOP sign (W3-4) with a warning flashing beacon on the EB approach. Estimated cost = $10K to $15K.
- Implement positive offset left-turn lanes for EB and WB traffic, with new traffic signals, to allow the use of protected/permitted left-turn phasing instead of protected-only phasing. Estimated cost = $650K to $900K.

[17] See Lark Avenue – Turning Lane Warrant Analysis – Appendix A.

- WHKS reviewed and agrees with these recommendations. 2017-2021 showed six (6) rear-end crashes on the EB approach, two of which involved personal injuries.

5. Eisenhower Avenue (TEAP)
Refer to previous sections for background information on this intersection.

Recommendations include:

- Implement positive offset left-turn lanes for EB and WB traffic, with new traffic signals, to allow the use of protected/permitted left-turn phasing instead of protected-only phasing. Estimated cost = $650K to $900K. Refer to Exhibit 6 in the TEAP Study.
- WHKS reviewed and agrees with this recommendation.
- At the time of this feasibility study, the City and Iowa DOT are implementing turn lane improvements to this intersection, including adding a SB right-turn lane on Eisenhower Avenue, adding a WB right-turn lane on IA 122, and extending the existing WB left-turn lane on IA 122 to increase the storage capacity.

6. North Iowa Events Center Access and South Frontage Road Access (TEAP)
The TEAP study recommended the construction of positive-offset left-turn lanes for this intersection. This recommendation would improve sight lines for left-turning traffic at this access point and maintain all movements through the median. In the 2017-2021 crash history, there were three (3) crashes involving a vehicle turning left from the mainline into the north or south access. It is these crashes that would potentially be addressed by the TEAP study recommendation for the positive-offset left-turn lanes.

A more aggressive strategy would be to modify the median to provide a "¾" intersection which perpetuates all right-turn movements and allows left-turn movements from the mainline in both directions while prohibiting left-turns and median-crossing maneuvers. One example of a ¾-intersection already exists in the corridor at Tiffany Drive and IA 122. The advantages of a ¾-intersection are:

- Addresses the same three crashes addressed by the TEAP recommended positive-offset left-turn lane improvement.
- Addresses 18 crashes in the 2017-2021 crash history, half of which produced at least one personal injury, for crashes involving a sideroad driver crossing or turning left onto IA 122.
- Design would continue to support current access into the North Iowa Events Center and adjacent business locations.
- For vehicles traveling WB from sites north of IA 122, they would continue to make a right-turn onto IA 122 from the access, as is currently done.
- For vehicles leaving the south side businesses, EB vehicle would continue to make a right turn onto EB IA 122 from the access, as is currently done.

The disadvantages of a ¾-intersection include:

- Vehicles leaving the North Iowa Events Center and adjacent businesses wanting to travel EB would need to circulate via the frontage road system to Roosevelt Avenue to enter IA 122, taking a different path, but incurring no out-of-distance travel.
- Vehicles heading WB from the south side businesses would be directed to the Eisenhower intersection with no out-of-distance travel.

The TEAP study did not address the south frontage road access, which is challenging in terms of its geometry. This access lacks a right-turn lane, the frontage road is closely spaced to the mainline, and there's a considerable elevation difference between the mainline pavement elevation and the parallel frontage road elevation. Despite the awkwardness of the south frontage road access, its presence only contributed to one (1) crash in the 2017-2021 period, a broadside PDO crash involving a NB vehicle pulling into the median and into the path of an EB vehicle.

The south frontage road access could be closed, and motorists directed to either the Eisenhower or Village Green intersections to access those south-side businesses. Based on the current crash history, it would be reasonable to continue monitoring this location for possible future action, especially if the ¾-intersection recommendation is pursued.
Recommendations include (refer to Appendix A for a figure showing the two options):

- Implement positive offset left-turn lanes. Estimated cost = $275K to $300K (TEAP).
- Implement ¾-intersection. Estimated cost = $275K to $300K (WHKS).

7. Village Green Drive/Roosevelt Avenue (TEAP)
Refer to previous sections for background information on this intersection.

Recommendations include:

- Implement positive offset left-turn lanes for EB and WB traffic, with new traffic signals, to allow the use of protected/permitted left-turn phasing instead of protected-only phasing. Estimated cost = $650K to $900K.
- Replace 3-section signal heads on side of pole with 5-section heads for MUTCD18 compliance. Estimated cost = $2K.

8. Tiffany Drive and North Frontage Road Access (WHKS)
This intersection was not addressed in the 2020 TEAP study.

This is a ¾-intersection that allows all right-turn movements and left-turn movements from the mainline in both directions while prohibiting left-turns and median-crossing maneuvers. The intersection operates safely with a crash rate of 0.26 in the 2017-2021 study period.

Of the nine (9) total crashes at this intersection, there were three (3) rear-end crashes in the WB direction and another three (3) rear-end crashes in the EB direction. Only one of these crashes resulted in a personal injury. These crashes could be addressed by the addition of right-turn lanes, at the possible consequence of creating right-turn shadowing concerns for vehicles entering the highway from the sideroad accesses. This intersection is in the area where the regulatory speed limit was reduced by 5 MPH in 2020.

Reviewing other locations where right-turn lanes already exist, including WB right-turn lanes into the Ashley Furniture, Hy-Vee West and the Hobby Lobby parking lots suggests that right-turn lanes generally operate safely in this multi-lane corridor. The 2017-2021 crash history for the:

- Ashley Furniture location shows no crashes related to the presence of the right-in/right-out access.
- Hy-Vee West location shows one (1) WB rear-end crash possibly related to the presence, right-in/right-out access.
- Hobby Lobby location shows two (2) WB rear-end crashes, possibly related to the presence of the right-in/right-out access. It also shows 2 broadside crashes associated with vehicles pulling out of the access into the path of WB mainline vehicles.

Addition of WB and EB right-turn lanes would be feasible.

Recommendations:

- Consider constructing a WB right turn lane at the frontage road connection. Estimated cost = $75K.
- Consider constructing an EB right-turn lane at Tiffany Drive. Estimated cost = $75K.

[18] Federal Highway Administration, Manual on Uniform Traffic Control Devices, 2009 edition.

9. Willow Inn Access and North Frontage Road Access (WHKS)
This is another challenging location involving a full-movement intersection located midway between Tiffany Drive and Taft Avenue, approximately 600 feet from each. Left-turn lanes exist for each direction of travel. Both accesses lack right-turn lanes. The 2017-2021 crash history shows five (5) crashes, but only three (3) of these crashes involved a personal injury.

Three (3) crashes were EB rear-end crashes, which could be addressed by the addition of an EB right-turn lane. Closely spaced frontage roads and parking lots would complicate the construction of right-turn lanes on both sides.

There were two broadside crashes, both "far-side" as they involved a vehicle crossing out of the median into the path of a mainline vehicle. Both broadside crashes occurred during night-time hours so completive lighting from the adjacent businesses may have contributed.

Implementing a ¾-intersection strategy at this location would address the two broadside crashes by eliminating the median crossing and left-turn movement onto the mainline. At this location, vehicles wanting to leave the south side businesses to enter WB IA 122 would be disadvantaged; these vehicles would have two options: navigate through other privately-owned business properties to Taft Avenue or to enter EB IA 122 via a right-turn and weave over quickly to make a U-Turn at Taft to WB IA 122.

The Willow Inn and adjacent business properties have two other right-in/right-out accesses immediately east of this location. It would be desirable to consolidate and remove one of these accesses, preferably the first one immediately east of the median crossing location. It's unknown if these properties have any shared-access agreements among the property owners.

These south side businesses enjoy full-movement access to IA 122 under existing conditions. The essential difference between this location and most other locations in the corridor is that this location does not benefit from the presence of an existing frontage road. Multiple closely-spaced right-in/right-out accesses have been allowed over the years in combination with a full-movement median crossing close to a major signalized intersection.

Recommendations:

- Consider constructing a WB right turn lane at the frontage road connection. (TEAP) Estimated cost = $100K.
- Consider constructing an EB right-turn lane for the westernmost access into the Willow Inn. (TEAP). Estimated cost = $100K, a cost which may be borne by the property owners served by the improvement.
- Close one (1) access into Willow Inn and the median crossing. (TEAP) Estimated cost = $10K.
- Consider removing one (1) right-in/right-out access, near the Advanced Auto Parts store, on the south side of IA 122. Estimated cost = $20K.

10. Taft Avenue (TEAP)
Refer to previous sections for background information on this intersection.

Recommendations:

- Implement positive offset left-turn lanes for EB and WB traffic, including new traffic signals, to allow the use of protected/permitted left-turn phasing instead of protected-only phasing. Estimated cost = $700K to $1 million.
- Lengthen the existing EB right-turn lane at Taft to also serve the easternmost existing access into this grouping of businesses. (TEAP) Estimated cost = $110K.
- Consider re-striping the northbound approach to provide a dedicated left-turn lane and shared thru/right lane for SB vehicles. (TEAP) Estimated cost = $10K.

- Replace the existing SB 5-section signal head with a Flashing Yellow signal head to address SB left-turning crashes. (TEAP) Estimated cost = $2K.

11. Briarstone Drive/Grover Avenue (TEAP)
Refer to previous sections for background information on this intersection.

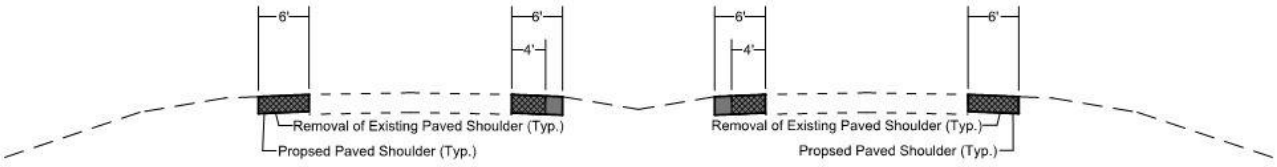
- Implement positive offset left-turn lanes for EB and WB traffic, including new traffic signals, to allow the use of protected/permitted left-turn phasing instead of protected-only phasing. Estimated cost = $700K to $1 million.

12. Winnebago/Cerro Gordo Way
Refer to previous sections for background information on this intersection.

- Consider re-striping the southbound approach to provide a left-turn lane for NB vehicles. This would include implementing protected left-turn phasing for NB vehicles and overlapped protected right-turn phasing for SB vehicles. Consider possible minor widening to the east to accommodate the restriping. Refer to Appendix A for a diagram of the intersection. Estimated cost = $25K.

13. Corridor-Wide Improvements:
Continuous paved shoulders, six feet in width for the outside shoulders and six feet wide for the median shoulders. Estimated cost for this improvement through the corridor is $1.75 million.

Continuous Paved Shoulder Typical Section
Lark Avenue to Indianhead Drive



Continuous Paved Shoulder Typical Section
Indianhead Drive to Cerro Gordo/Winnebago Way

Reconstruction Alternatives – Common Features

There are two reconstruction alternatives evaluated in this feasibility study that share many common features:

- Alternative 2 is based on six (6) major intersections remaining signalized: Indianhead Avenue, Eisenhower Avenue, Village Green Drive/Roosevelt Avenue, Taft Avenue, Briarstone Drive/Grover Avenue, and Cerro Gordo/Winnebago Way.
- Alternative 3 is based on roundabouts at five of these same intersections, with Indianhead Drive being perpetuated as a signalized intersection.

Common features evaluated as part of these reconstruction alternatives include:

1. Full pavement reconstruction from Lark Avenue to Cerro Gordo/Winnebago Way.
2. Perpetuation of the existing 60-foot depressed median from Lark Avenue to the Willow Creek bridges.
3. Transition in median widths/types occurring in the vicinity of Indianhead Drive as it currently does.
4. Construction of a nominal 16-foot-wide raised median on the existing centerline from Eisenhower Avenue to Cerro Gordo/Winnebago Way.
5. Perpetuation of rural, open-ditch drainage system west of Indianhead Drive. In this section, consider constructing full-width paved shoulders, 6-feet in width for outside shoulders and 6-feet in width for median shoulders. [19]
6. Conversion to a storm-sewer drainage system from Indianhead Drive to Cerro Gordo/Winnebago Way.
7. Construction of a ten (10)-foot wide recreational trail in the south right-of-way from Indianhead Drive to Cerro Gordo/Winnebago Way.
8. Construction of a six (6)-foot wide sidewalk in the north right-of-way from Indianhead Drive to Cerro Gordo/Winnebago Way.
9. Provision of trail/pedestrian crossings at all signalized or roundabout intersections.
10. Continuous highway lighting from Indianhead Drive to Cerro Gordo/Winnebago Way.
11. Access management improvements where possible.
12. Feasibility-level designs for both alternatives are consistent with Iowa DOT “preferred” design criteria.[20]

Discussion of Common Features

Together, the narrow median and construction of a storm-sewer drainage system will result in several improvements:

- Marginally improved crossing times for pedestrians, non-motorized users, and motor vehicles crossing the IA 122 corridor which can benefit traffic signal timing and improve safety for those crossing the highway.
- Marginally more physical space available for:
    - Proposed longitudinal trail and sidewalk facilities.
    - Marginally bigger areas for the development of aesthetic and landscaping improvements in the corridor.
    - Accommodation of utilities.
- Marginally improved stacking distances for vehicles on the sideroad and frontage road approaches.

[19] Per Iowa DOT Design Manual Section 1C-1, heavy bicycle use is not anticipated nor planned, so 6-foot paved shoulder is allowed.

[20] Iowa Department of Transportation, Design Manual, Section 1.C1, Selecting Design Criteria. Refer to Appendix A for project design criteria worksheet.

Drainage Analysis

Two drainage alternatives were initially evaluated for the corridor:

1. An open-ditch system
2. A closed-ditch system (i.e. buried storm sewer pipe)

An open-ditch system was evaluated with curbed roadways, intakes, and outlet pipes into open ditches behind the curb. Cross sections were cut, using LiDAR (Light Detection And Ranging) data to evaluate the feasibility of grading ditches behind the trail and sidewalk. Cross sections indicate shallow existing ditches and narrow greenspaces between the highway pavement and frontage roads. These two factors make open ditches infeasible from a drainage capacity and a roadway safety standpoint. The open-ditch option was not further evaluated.

The drainage system for the signalized and roundabout alternatives are similar enough that one analysis will work for both. The typical sections show the median and pavement drain away from the center of the roadway for both alternatives. Intakes will be constructed along the north curb line of the WB lanes and the south curb line of the EB lanes. Longitudinal storm sewer will connect the structures along the south curb line, with transverse storm sewer pipe under the roadways connecting the north intakes to the south intakes.

Intakes and capacity were analyzed using the proposed cross section with a recurrence interval of 10 years. Adjacent to the outside lanes, a 2-foot gutter outside of the traveled lane stores drainage reducing the spread of water on to the travel lanes. The weighted average longitudinal slope of the curbed portion of the corridor (Indianhead Drive to Winnebago Way) is 0.60%. There is a grade break just west of the Village Green Intersection. IA 122 west of the grade break drains to the west, while IA 122 east of the grade break drains to the east. Using peak flow and spread equations, intake spacing was calculated to be about 230 feet, keeping the spread under the maximum allowable (8 feet) under Iowa DOT criterion for roadways under 45 MPH[21]. An additional 4 intakes were included at each major intersection.

This analysis was conducted without the benefit of survey, based on an average longitudinal grade, and without performing preliminary design to identify possible intake locations. The analysis is based on Iowa DOT's preferred criterion of a 10-year design storm recurrence interval. Table 1 in the Iowa DOT *Design Manual* Section 4-A6 allows horizontal spread of up to 6-feet into one pavement lane for multi-lane highways when the posted speed is less than 45 MPH. For roadways posted at 45 MPH and above, no horizontal spread is allowed into the travelled lanes for intakes on a continuous grade.

East of Tiffany Drive, the existing posted speed limits are 40 MPH or below, so this portion of the corridor would meet the Iowa DOT's criteria. From Indianhead Drive to Tiffany Drive, the existing posted speed limit is 45 MPH. In the 45-MPH section, the combination of the preferred design storm interval, the relatively low average longitudinal slope, and the design criteria applied to allow no horizontal spread onto the travel lanes leads to a storm sewer cost that is likely unreasonable given the moderate traffic levels in the corridor. For the purposes of this feasibility study, WHKS assumed that it's reasonable to use the same criteria for the corridor, despite the modest difference in posted speed limit among the various sections. This assumption can be revisited in the project's preliminary design phase, when a more rigorous drainage analysis is conducted.

[21] Iowa Department of Transportation, Design Manual Section 4A-6, Calculating Spread and Checking Intake Location, revised 2-19-17, Table 1. 8-foot criterion is determined by a 6-foot allowable spread into the traveled lane, for roadways with two or more lanes in each direction, plus the 2-foot width of the gutter section.

Outlets were also considered in the drainage analysis. Drainage from the corridor predominately outlets in four spots:

- Willow Creek on the far west end
- The small drainage way east of Tiffany Drive
- A storm sewer pipe draining north from Taft Avenue
- A storm sewer pipe draining south near Winnebago Way

The capacity of these existing outlets will need to be evaluated when the project reaches a design phase. Drainage in a storm sewer system will tend to flow faster than in an open-ditch system, which may result in the need to upgrade the capacity of one or more of the existing outlets.

Continuous Highway Lighting

In a heavily developed commercial corridor such as IA 122, continuous highway lighting may be a desirable improvement, particularly in combination with the proposed non-motorized trail and sidewalk facilities.

For the purposes of this feasibility study, it's assumed that continuous lighting will be considered from Indianhead Drive to Cerro Gordo/Winnebago Way and poles would be located at an average 175-foot longitudinal spacing behind each outside curb. Each line of poles could provide street-side illumination on the IA 122 traffic lanes and backside illumination of the non-motorized trail and sidewalk facilities.

The lighting designs differ somewhat for the two reconstruction alternatives. For Alternative 2 (traffic signals), additional intersection lighting is normally accomplished by mounting the luminaires on combination poles with the traffic signals. For Alternative 3 (roundabouts), there is a need for additional poles since there are no traffic signal poles on which to mount luminaires.
Design of a continuous lighting system will need to consider many factors, including:

- Final geometry of the roadway including the intersections.
- Final geometry and location of the proposed trail and sidewalk facilities.
- Varying levels of competitive lighting from the many adjacent businesses.
- Desired levels of horizontal pavement illumination for the roadway and trail/sidewalk facilities.
- Desired levels of vertical illumination to enhance pedestrian and non-motorized user safety.
- Roadside safety criteria for the selection of pole designs and the placement of poles.
- Maximum luminaire mounting height capable of being maintained by the City.
- Selection of the specific luminaires.

The estimate for continuous highway lighting in this study is a reasonable "ballpark" estimate and is not assumed to be an estimate based on a detailed conceptual design due to the many unknowns.

Alternative 2 – Full Reconstruction with Six Major Signalized Intersections

This alternative assumes:

- Full pavement reconstruction within the study limits, i.e., from Lark Avenue (S34) to just east of the Cerro Gordo/Winnebago Way intersection.
- Perpetuation of the 60-foot wide depressed median and open-ditch drainage system from Lark Avenue to the Willow Creek dual bridges.
- Construction of a raised median, nominally 16-feet in width, from Eisenhower Avenue to Cerro Gordo/Winnebago Way.
- Median transition will continue to occur in the vicinity of Indianhead Drive.
- Conversion of the corridor from an open-ditch drainage system to a storm sewer drainage system between Eisenhower Avenue and Cerro Gordo Way.
- Construction of facilities for non-motorized transportation users, including a proposed ten (10)-foot recreational trail in the south right-of-way and a proposed six (6)-foot sidewalk in the north right-of-way.
- Traffic signal control for the following six (6) intersections: Indianhead Drive, Eisenhower Avenue, Village Green Drive/Roosevelt Avenue, Taft Avenue, Briarstone Drive/Grover Avenue, and Cerro Gordo/Winnebago Way.
- The addition of several EB right-turn lanes intended to improve consistency with driver's expectations as the WB roadway has right-turn lanes at most or all intersections and major access points.

Proposed geometric improvements are described in the following section, beginning at Lark Avenue and proceeding east through the corridor. Please note that individual cost estimates are not provided for these locations. In Alternative 1 (No-Build with TEAP), improvements at each intersection could stand-alone as individual projects as funding became available. For that reason, individual location cost estimates are provided in this feasibility study for Alternative 1 improvements.

In Alternatives 2 and 3 (reconstruction with signalized intersections and roundabouts, respectively), any proposed intersection improvements would be constructed as part of a project extending well beyond the individual intersection or access. For that reason, construction costs at each specific location are reflected in the overall project cost estimate for Alternatives 2 and 3.

Conceptual geometry can be found in the Supplemental Exhibits.

1. Lark Avenue (S34)
Consistent with Alternative 1 (No-Build with TEAP), no intersection improvements are proposed.

2. Sanco Equipment Frontage Road Access
Consistent with Alternative 1 (No-Build with TEAP), no intersection improvements are proposed.

3. Sedars Drive and South Frontage Road Connection
Consistent with Alternative 1 (No-Build with TEAP), no intersection improvements are proposed.

4. Indianhead Drive
Consistent with Alternative 1 (No-Build with TEAP), improvements include:

- Implement advance warning signs such as a signal ahead sign (W3-3) and a BE PREPARED TO STOP sign (W3-4) with a warning flashing beacon on the EB approach.

- Implement positive offset left-turn lanes for EB and WB traffic, with new traffic signals, to allow the use of protected/permitted left-turn phasing instead of protected-only phasing.
- No right-of-way needs are anticipated.

5. Eisenhower Avenue
Improvements include:

- Implement positive offset left-turn lanes for EB and WB traffic, with new traffic signals, to allow the use of protected/permitted left-turn phasing instead of protected-only phasing.
- At the time of this feasibility study, the City and Iowa DOT added a SB right-turn lane on Eisenhower Avenue, and the addition of WB right-turn lane on IA 122 and extension of the existing WB left-turn lane on IA 122 to increase the storage capacity are pending. These improvements will be perpetuated in Alternative 2.
- Beyond the improvements noted above, provide an EB right-turn lane in Alternative 2.
- No right-of-way needs are anticipated.

6. North Iowa Events Center Access and South Frontage Road Access
Improvements include:

- Modify the median to provide a ¾-intersection, which perpetuates all right-turn movements and allows left-turn movements from the mainline in both directions while prohibiting left-turns from the sideroad and median-crossing maneuvers.
- Perpetuate the south frontage road access with the addition of a WB right-turn lane.
- No right-of-way needs are anticipated.

7. Village Green Drive/Roosevelt Avenue
Improvements include:

- Implement positive offset left-turn lanes for EB and WB traffic, with new traffic signals, to allow the use of protected/permitted left-turn phasing instead of protected-only phasing.
- No right-of-way needs are anticipated.

8. Tiffany Drive and North Frontage Road Access
Improvements include:

- Perpetuate the existing ¾-intersection.
- Add a WB right turn lane at Tiffany Drive.
- Add an EB right-turn lane at the north frontage road access opposite Tiffany Drive.
- No right-of-way needs are anticipated.

9. Willow Inn Access and North Frontage Road Access
Improvements include:

- Closing the median through construction of a raised median.
- Consider constructing a WB right turn lane at the north frontage road connection.
- Removing one (1) EB accesses into the Willow Inn.
- Removing one (1) EB access on the south side of IA 122 near Advanced Auto Parts.
- No right-of-way needs are anticipated.
- Effectively, this location offers the same challenges under the Alternative 2, as it does under Alternatives 1 and 3.

10. Taft Avenue

Improvements include:

- Implement positive offset left-turn lanes for EB and WB traffic, including new traffic signals, to allow the use of protected/permitted left-turn phasing instead of protected-only phasing.
- Widen the SB approach (north leg) to include a dedicated SB thru lane. Perpetuate the existing shared left-thru lane and right-only lanes.
- Widen the south leg to provide a receiving lane for the dedicated thru lane being constructed opposite the intersection.
- Minor right-of-way impacts are anticipated in the NE quadrant, approximately 250 square feet (SF), and in the SW quadrant approximately 300 SF potentially involving impacts to a parking lot.

11. Briarstone Drive/Grover Avenue

- Implement positive offset left-turn lanes for EB and WB traffic, including new traffic signals, to allow the use of protected/permitted left-turn phasing instead of protected-only phasing.
- Add a EB right-turn lane at Briarstone Drive.
- Realign the Briarstone and south frontage road connections to align with S. Grover Avenue to the north. The Briarstone Drive/South Grover Avenue intersection would be realigned south of the highway and would increase the storage length between the highway and south frontage road. Traffic often queues along the frontage road blocking traffic exiting the highway or trying to exit Briarstone Drive. This improvement would eliminate an unusual intersection configuration that causes much driver confusion.
- Realigning Briarstone Drive will involve significant right-of-way impacts, including the acquisition of one business property (Pizza Hut) and minor impacts, approximately 2,500 SF in area, to the accesses and parking lots of adjacent business properties.

12. Winnebago/Cerro Gordo Way

Improvements include:

- Addition of an EB right-turn lane to Cerro Gordo Way.
- Modification of a SB right-turn lane on Winnebago Way to continue onto WB IA 122 on a dedicated WB auxiliary lane, creating a free-right-turn for this heavy movement. The WB auxiliary lane would continue past the access for the Ashley Furniture development and terminate at the S. Grover intersection.
- Realign Cerro Gordo Way and the south frontage road to eliminate an intersection approach at a severe skew angle and increase the storage length between the highway and the frontage road. Traffic frequently queues along the frontage road and Cerro Gordo Way, causing confusing operations within the intersection.
- Right-of-way needs include minor acquisitions the NW, NE, and SW quadrants (about 500 SF each) and impacts an estimated 4,300 SF to the Tractor Supply property, including impacts to the' parking lot.

Alternative 3 – Full Reconstruction with Multi-Lane Roundabouts at Five Major Intersections

This alternative assumes:

- Full pavement reconstruction within the study limits, i.e., from Lark Avenue (S34) to just east of the Cerro Gordo/Winnebago Way intersection.
- Perpetuation of the 60-foot wide depressed median and open-ditch drainage system from Lark Avenue to the Willow Creek dual bridges.
- Construction of a raised median, nominally 16-feet in width, from Eisenhower Avenue to Cerro Gordo/Winnebago Way.
- Median transition will continue to occur in the vicinity of Indianhead Drive.
- Conversion of the corridor from an open-ditch drainage system to a storm sewer drainage system between Eisenhower Avenue and Cerro Gordo Way.
- Construction of facilities for non-motorized transportation users, including a proposed ten (10)-foot recreational trail in the south right-of-way and a proposed six (6)-foot sidewalk in the north right-of-way.
- Construction of multi-lane roundabouts for the following five (5) intersections: Eisenhower Avenue, Village Green Drive/Roosevelt Avenue, Taft Avenue, Briarstone Drive/Grover Avenue, and Cerro Gordo/Winnebago Way. Indianhead Drive would continue as a signalized intersection.
- The addition of several EB right-turn lanes intended to improve consistency with driver's expectations as the WB roadway has right-turn lanes at most or all intersections and major access points.
- From a driver expectancy perspective, the five roundabouts will be designed with consistent intersection approaches for the EB and WB, with the one exception being the provision of a free-right turn movement from WB IA 122 onto NB S. Grover Avenue. Otherwise, the mainline approaches for the roundabouts consist of two lanes, a combined left/thru lane and a combined thru/right lane. In contrast, under the signalized alternative, most mainline approaches would consist of 4 lane approaches: a left only, dual thru lanes, and a right only lane. Fewer approach lanes result in simpler decisions for motorists as they approach the intersection.
- The sideroad approaches to the roundabouts vary in terms of lane designations due to a variety of circumstances:
    - Some sideroad approaches are single-lane and others multi-lane.
    - Considerable variation in side-road traffic volumes, and the turning volumes associated with movements.
    - Proximity of frontage road connections, positioning and length of splitter islands, presence for pedestrian crossings, and other considerations.

Proposed geometric improvements are described in the following section, beginning at Lark Avenue and proceeding east through the corridor. Please note that individual cost estimates are not provided for these locations. In Alternative 1 (No-Build with TEAP), improvements at each intersection could stand-alone as individual projects as funding became available. For that reason, individual location cost estimates are provided in this feasibility study for Alternative 1 improvements.

In Alternatives 2 and 3 (reconstruction with signalized intersections and roundabouts, respectively), any proposed intersection improvements would be constructed as part of a project extending well beyond the individual intersection or access. For that reason, construction costs at each specific location are reflected in the overall project cost estimate for Alternatives 2 and 3.

Conceptual geometry can be found in the Supplemental Exhibits.

1. Lark Avenue (S34)
Consistent with Alternative 1 (No-Build with TEAP), no intersection improvements are proposed.

2. Sanco Equipment Frontage Road Access
Consistent with Alternative 1 (No-Build with TEAP), no intersection improvements are proposed.

3. Sedars Drive and South Frontage Road Connection
Consistent with Alternative 1 (No-Build with TEAP), no intersection improvements are proposed.

4. Indianhead Drive
Consistent with Alternative 1 (No-Build with TEAP), improvements include:

- Implement advance warning signs such as a signal ahead sign (W3-3) and a BE PREPARED TO STOP sign (W3-4) with a warning flashing beacon on the EB approach.
- Implement positive offset left-turn lanes for EB and WB traffic, with new traffic signals, to allow the use of protected/permitted left-turn phasing instead of protected-only phasing.
- No right-of-way needs are anticipated.

5. Eisenhower Avenue
Improvements include:

- Construction of a multi-lane roundabout.
- Right-of-way acquisition is anticipated in the NW quadrant, an approximate area of 1,150 SF.
- A free right movement for the NB to EB movement was considered and found to be not necessary based on the traffic capacity analysis. There is available right-of-way for this improvement to be reconsidered in preliminary design or to be added post-construction as a future improvement, should traffic demand grow from present conditions.

6. North Iowa Events Center Access and South Frontage Road Access
Improvements include:

- Modify the median to provide a ¾-intersection, which perpetuates all right-turn movements, and allows left-turn movements from the mainline in both directions while prohibiting left-turns from the sideroad and median-crossing maneuvers.
- Perpetuate the south frontage road access with the addition of a EB right-turn lane.
- No right-of-way needs are anticipated.

7. Village Green Drive/Roosevelt Avenue
Improvements include:

- Construction of a multi-lane roundabout.
- Right-of-way acquisition is tight in the NW quadrant, adjacent to an existing natural gas pipeline substation.
- The north frontage road connections are sufficient offset that no changes to the frontage road connections are anticipated.
- Due to the inadequate frontage road offset on the south side of IA 122, the frontage road connections to Village Green Drive should be terminated. This will necessitate in some changes in routing for vehicles accessing the local businesses.
    - For businesses such as the Salvation Army Store, Dairy Queen, and NAPA Auto Parts:
        - Ingress movements from EB IA 122 could occur via Eisenhower Avenue or the ¾-intersection proposed at the North Iowa Events Center access.
        - Egress movements to EB IA 122 would be directed to the ¾-intersection proposed at the North Iowa Events Center access.
        - Ingress movements from WB IA 122 would occur at the ¾-intersection proposed at the North Iowa Events Center access.

        - Egress movements to WB IA 122 would be directed along the frontage road to the Eisenhower Avenue roundabout with no out-of-distance travel.
    - For businesses, such as Las Palmas and Holiday Inn Express:
        - Ingress movements from EB IA 122 could occur via the ¾-intersection already existing at Tiffany Drive, or via the Village Green roundabout utilizing Village Lane.
        - Egress movements to EB IA 122 would be directed to the ¾-intersection already existing at Tiffany Drive and be unchanged from existing conditions.
        - Ingress movements from WB IA 122 would occur at the ¾-intersection proposed at Tiffany Drive and be effectively unchanged from existing conditions.
        - Egress movements to WB IA 122 would be directed the Village Green roundabout via existing Village Lane rather than the frontage road, which would be closed.
    - Ingress and egress options are presented in detail for this intersection to illustrate the nature of changes in routing that would need to occur. Generally, ingress movements to the businesses are maintained or enhanced through the addition of the ¾-intersections and in-bound left-turns being permitted. If restricted by this alternative, existing egress movements from the businesses are generally redirected to an adjacent roundabout with little or no out-of-distance travel. Other groupings of businesses are impacted similarly, so these locations will not be discussed in detail.

8. Tiffany Drive and North Frontage Road Access

Improvements include:

- The addition of a EB right turn lane at Tiffany Drive, and a corresponding WB right-turn lane at the frontage road connection opposite Tiffany Drive.
- As this ¾-intersection already exists, no other improvements are anticipated.

9. Willow Run/Willow Inn Access and North Frontage Road Access

Improvements include:

- Closing the median to prevent left-turn and median crossing movements at this location. Closing the median crossing will necessitate some changes in routing for vehicles accessing the local businesses.
- Consolidation of driveways into the development containing Willow Run and adjacent businesses.
- Closing the north frontage road connection opposite the Willow Run.
- Effectively, this location offers the same challenges under Alternative 3, as it does under Alternatives 1 and 2.

10. Taft Avenue

Improvements include:

- Construction of a multi-lane roundabout.
- Right-of-way needs are anticipated in the NE and SW quadrants.
    - In the NE quadrant, significant pole-mounted aerial utilities would be affected and an-on-premise advertising sign for NSB Bank may be affected as well. Approximate right-of-way needs are estimated at 500 SF.
    - In the SW quadrant, right-of-way impacts may include an on-premise advertising sign for Advance Auto Parts, a parking lot lighting pole, and minor impacts to the existing parking lot. Approximate right-of-way needs are estimated at 800 SF.
- Constructing of a new ¾-intersection located approximately mid-way between Taft Avenue and Briarstone Drive/Grover Avenue. This improvement would effectively:
    - Relocate an existing right-in/right-out access to the south frontage road.

- Consolidate two existing right-in/right-out accesses to the Hobby Lobby, Plaza West Shopping Center, Hy-Vee West development.
- Provide left-turn ingress movements from the opposite roadway into the north businesses and the south frontage road between the roundabouts. These left-turn ingress movements are currently prohibited by the existing depressed median.

11. Briarstone Drive/Grover Avenue

Improvements include:

- Construction of a multi-lane roundabout. By constructing a roundabout, the existing offset alignments of S. Grover and Briarstone Drive can be accommodated, unlike with a signalized intersection where it's necessary to force alignment through the acquisition of right-of-way. With a roundabout, the Pizza Hut property could potentially be maintained with minimal impacts to its access.
- Closure of the south frontage road connections to Briarstone Drive, eliminating the vehicle conflicts that constantly affect the safety, operations, and capacity of the frontage road intersections and the mainline intersection with Briarstone Drive.
- Construction of a ¾-intersection near the midpoint between the Grover/Briarstone and the Cerro Gordo/Winnebago Way intersections. This improvement would effectively:
  - Add a right-in/right-out access to the south frontage road.
  - Perpetuate an existing right-in/right-out access to the north development which includes Ashley Furniture, Harbor Freight, and other adjacent businesses.
  - Provide left-turn ingress movements from the opposite roadway into the north businesses and the south frontage road between the roundabouts. These left-turn ingress movements are currently prohibited by the existing depressed median.
- Closure of the frontage road connections will necessitate some changes in routing for motorists accessing the businesses, but these changes will be mitigated through the construction of the ¾ intersections at the midpoints between the roundabouts.
- Minor right-of-way needs will likely be needed in the NE and NW quadrants, approximately 500 SF and 750 SF, respectively.

12. Winnebago/Cerro Gordo Way

Improvements include:

- Construction of a multi-lane roundabout.
- A unique feature of this roundabout will be a free-right turn lane for the SB to WB movement, including the construction of a receiving lane, which continues onward to the roundabout with Grover.
- The south frontage road connection to Cerro Gordo Way would be eliminated with those movements being redirected to other paths.
- Right-of-way needs include minor needs in the NE and NW quadrants, approximately 425 SF and 150 SF, respectively. In the SE quadrant, right-of-way needs may affect an existing on-premise advertising sign for Schoneman Realtors; approximate right-of-way needs amount to 925 SF. In the SW quadrant, right-of-way needs, approximately 350 SF in area, would affect the storage/display area for Tractor Supply to a limited extent.

Traffic Analysis

The capacity of the intersections was analyzed using the procedures outlined in the *Highway Capacity Manual, 6th Edition (HCM)*, the intersections were modeled using Synchro Studio 11 with SimTraffic 11. The roundabout intersections were modeled using Sidra Intersection 8.

Level of Service (LOS) at intersections is primarily a function of peak hour turning movement volumes, intersection lane configuration, and traffic control. For intersection analysis, the *HCM* defines LOS in terms of the average control delay at the intersection in seconds per vehicle. Level of service is broken down into letter grades, with LOS A representing good operations and LOS F representing poor operations. LOS E is considered to be at capacity, reflecting the delay resulting from the maximum traffic volumes that can be accommodated at the intersection during peak hours. LOS D is acceptable in urban areas based on Iowa DOT design criteria derived from the *AASHTO*[22] *Policy on Geometric Design*. Table 4 shows the level of service correlations to seconds of delay for signalized intersections and stop control (unsignalized) intersections. Currently in the United States, roundabout control is also categorized as unsignalized.

LOS	Signalized Intersection Control Delay (seconds/vehicle)	Unsignalized Intersection Control Delay (seconds/vehicle)
A	≤ 10 sec.	≤ 10 sec.
B	10 - 20 sec.	10 - 15 sec.
C	20 - 35 sec.	15 - 25 sec.
D	35 - 55 sec.	25 - 35 sec.
E	55 - 80 sec.	35 - 50 sec.
F	> 80 sec.	> 50 sec.

Table 4 – Intersection LOS Criteria

The City provided AM and PM peak hour volumes for the IA 122 study area from a 2020 TEAP study. Using a 1% compound growth factor, the traffic count volumes were factored up to obtain 2047 volumes. The PM peak hour volumes are higher than the AM peak hour volumes, therefore, the remainder of the analysis focuses on PM peak hour volumes. See Appendix C for PM peak hour volumes and a summary of the traffic data.

During the analysis for this feasibility study, it was noticed that the northbound and southbound traffic counts at the IA 122 / Grover Avenue intersection may have been transposed in the TEAP study. The previous study shows that the northbound left traffic volume is higher than the southbound left traffic volume. Based on familiarity with the area, the southbound left volume should be higher. Due to the questionable traffic counts, the Grover Avenue intersection was evaluated with the volumes as provided and with the northbound and southbound volumes transposed. Prior to beginning preliminary and final design, we recommend that updated traffic counts be taken.

The following alternatives were analyzed:

- Alternative 1 - 2047 No Build with TEAP
  The no build scenario traffic analysis includes the 2047 traffic volumes shown in Appendix C. The TEAP study had recommended modifications to lane configurations and signal timings. Those recommendations were included in this scenario.

[22] American Association of State Highway and Transportation Officials.

- Alternative 2 - 2047 Reconstruction with Signalized Intersections
  The build scenario with signalized intersections analysis includes the 2047 traffic volumes shown in Appendix C. This scenario includes modifications as required to improve the level of service.

- Alternative 3 - 2047 Build with Roundabout Intersections
  The build scenario with roundabout intersections analysis includes the 2047 traffic volumes shown in Appendix C. This scenario includes modifications as required to provide adequate level of service.

Alternative 1 – No-Build with TEAP

The no-build scenario was analyzed using the 2047 traffic volumes shown in Appendix C. The analysis determined the existing lane configuration and optimized signal phasing will not provide an acceptable LOS for some movements. A summary of the detailed LOS results for each intersection is shown in Table 5. Detailed capacity reports are shown in Appendix C.

IA 122 CORRIDOR INTERSECTION	2047			
	NO BUILD WITH TEAP			
	DELAY (S/VEH) / LOS			
	NB	SB	EB	WB
INDIANHEAD DR / 9TH	44.9 / D	38.1 / D	29.8 / C	2.3 / A
EISENHOWER	129.3 / F	40.6 / D	40.5 / D	36.9 / D
VILLAGE GREEN/ROOSEVELT	36.7 / D	44.9 / D	21.1 / C	3.1 / A
TAFT	79.4 / E	39.3 / D	28.9 / C	43.6 / D
BRIARSTONE/GROVER (as provided)	65.4 / E	49.9 / D	49.6 / D	4.4 / A
BRIARSTONE/GROVER (transposed)	51.6 / D	53.1 / D	31.0 / C	2.8 / A
CERRO GORDO/WINNEBAGO	56.0 / E	30.9 / C	5.8 / A	42.5 / D

Excellent LOS Acceptable LOS Failing LOS

Table 5 - LOS Summary, Alternative 1 – No-Build with TEAP

Alternative 2 – 2047 Reconstruction with Signalized Intersections

The 2047 reconstruction with signalized intersections alternative was analyzed using the 2047 traffic volumes shown in Appendix C. The analysis determined that with improvements, signalized intersections will provide an acceptable LOS. A summary of the detailed LOS results for each intersection is shown in Table 6. Detailed capacity reports are shown in Appendix C. The following improvements were needed to provide an acceptable LOS:

- East and westbound flashing yellow arrow phasing for left turn lanes at all intersections. Offset eastbound and westbound left turn lanes to obtain sight distance.
- At the Taft Avenue intersection, add a southbound thru lane and receiving lane on south leg.
- At the Grover Avenue intersection (as provided), add northbound thru lane and change phasing from split to standard phasing, realign southbound approach to intersection to connect to Briarstone Drive.

- At the Grover Avenue intersection (transposed), add northbound thru lane, change southbound dual left to single left and change phasing from split to standard phasing with permissive NB and SB left turns, realign southbound approach to intersection to connect to Briarstone Drive.
- At the Winnebago Way intersection, channelize the southbound right turn lane making it a free right turn with an added lane on IA 122.
- Optimize signal timing at all intersections.
- The addition of pedestrian facilities to the corridor will introduce an increased number of pedestrian users. Signal timing will need to be changed to accommodate pedestrian crossings at the intersections. As a result of these signal timing changes, it is reasonable to assume the operations through the corridor will be negatively affected.

Alternative 3 – 2047 Reconstruction with Roundabout Intersections

The 2047 reconstruction with roundabout intersections alternative was analyzed using the 2047 traffic volumes shown in Appendix C. The analysis determined that roundabout intersections would provide an acceptable LOS. A summary of the detailed LOS results for each intersection is shown in Table 6. Detailed capacity reports are shown in Appendix C.

IA 122 CORRIDOR INTERSECTION	**2047** **Alternative 1 SIGNALIZED INTERSECTIONS WITH MODIFICATIONS**				**2047** **Alternative 2 ROUNDABOUT INTERSECTIONS**			
	DELAY (S/VEH) / LOS				DELAY (S/VEH) / LOS			
	NB	SB	EB	WB	NB	SB	EB	WB
INDIANHEAD DR / 9TH	39.0 / D	38.0 / D	17.8 / B	2.4 / A	39.0 / D	38.0 / D	17.8 / B	2.4 / A
EISENHOWER	37.7 / D	33.5 / C	12.9 / B	12.9 / B	11.6 / B	16.9 / C	11.6 / B	11.3 / B
ROOSEVELT / VILLAGE GREEN	37.8 / D	39.5 / D	18.5 / B	18.7 / B	10.3 / B	13.7 / B	9.9 / A	10.4 / B
TAFT	36.4 / D	30.1 / C	3.6 / A	24.5 / C	16.8 / C	17.0 / C	11.2 / B	20.3 / C
GROVER (as provided)	43.8 / D	31.4 / C	1.3 / A	1.1 / A	16.7 / C	9.1 / A	10.0 / A	9.5 / A
GROVER (transposed)	26.4 / C	35.0 / C	5.8 / A	1.4 / A	11.7 / B	13.7 / B	16.4 / C	6.7 / A
CERRO GORDO /WINNEBAGO	32.7 / C	39.5 / D	4.7 / A	33.6 / C	21.3 / C	2.2 / A	10.1 / B	20.3 / C

Excellent LOS Acceptable LOS Failing LOS

Table 6 - LOS Summary – Reconstruction Alternatives

Construction Sequence and Letting

Construction staging was analyzed from a conceptual level. The project will be split into 3 segments. The segment limits are not yet been identified, but are anticipated to be:

1. From Lark Avenue to just east of Eisenhower Avenue.
2. From just east of Eisenhower Avenue to just east of Taft Avenue.
3. From just east of Taft Avenue to the end of the project (just east of Winnebago/Cerro Gordo Way).

It is possible segments 1 and 3 could be constructed at the same time to reduce the length of construction work in the corridor. It is anticipated that each segment would be its own construction package.

Conceptual staging within each construction package will consist of:

- Stage 1 – Construction of the eastbound lanes, while traffic is one lane in each direction on the westbound lanes.
- Stage 2 – Construction of the westbound lanes, while traffic is one lane in each direction on the eastbound lanes.

Alternative 3 will require temporary pavements to allow traffic access through the roundabouts.

Why This Project and Which Alternative?

The following section addresses the compatibility of the alternatives being considered for this corridor with the long-range objectives of the Iowa DOT, as expressed in the Iowa DOT's state transportation plan, *Iowa in Motion 2050*.[23]

The Iowa DOT's plan is focused on mobility, described as "*the ability to utilize the transportation system to get where you want to go or to transport something from one place to another*." Mobility is to be achieved through four system objectives: safety, sustainability, accessibility, and flow. The Iowa DOT's plan further relates the system objectives to ten transportation planning factors described in the FAST Act[24], per Table 7. This table provides a useful framework for evaluating the alternatives developed in this feasibility study.

	Safety	Sustainability	Accessibility	Flow
Economic vitality				
Safety				
Security				
Accessibility and mobility				
Environment, energy, quality of life, and consistency				
Connectivity				
Efficient system management and operation				
System preservation				
Resiliency and reliability				
Travel and tourism				

Source: Iowa DOT

Table 7 – Relationship Between System Objectives and Federal Planning Factors[23]

[23] Iowa Department of Transportation, *Iowa in Motion 2050*, state transportation plan adopted May 2022.
[24] Fixing America's Surface Transportation (FAST) Act.

Economic Vitality

The western part of the corridor, from Lark Avenue (S34) to Indianhead Drive, is partially developed with retail and service businesses, with agricultural parcels intermixed. From Indianhead Drive to Cerro Gordo/Winnebago Way, the corridor is almost fully commercially-developed with a few small parcels of undeveloped property. There is sustained vitality in this commercial corridor and it's an attractive area for new business formation and redevelopment of existing businesses.

From an infrastructure standpoint, the IA 122 corridor is significant to moving freight, providing customer access to the adjacent business developments, providing access from I-35 and the regional airport to downtown Mason City, serving commuter traffic entering Mason City to work, shop, attend school or seek heath care.

There are many available sites for commercial/industrial development adjacent to or near the corridor, including one 145-acre Iowa Certified Site located approximately two miles south of the IA 122 corridor.

As stated in *Iowa in Motion 2050*, "*While transportation networks and economic growth have a clear relationship to each other, it is not straightforward in terms of causality and importance.*" The same is surely true of individual highway projects.

This feasibility study is concerned mostly with removing obstacles to economic vitality that currently exist in the corridor, including:

- Improving safety and minimize economic losses suffered by individuals and employers
- Promoting efficient highway travel through the corridor
- Providing facilities for pedestrians, bicyclists, and those with personal mobility devices to safely travel within the corridor
- Providing safe and efficient access for customers to and from businesses
- Providing consistency and resilience in the highway infrastructure such that it operates as expected by the broad range of users

Alternative 1 (No-Build with TEAP Improvements) effectively provides for the maintenance of the existing corridor; as it does little to remove any existing obstacles to economic vitality.

The reconstruction alternatives (Alternative 2 – Signalized Intersections and Alternative 3 – Roundabouts) both effectively address many existing obstacles to economic vitality and are roughly equal in their impact. Alternative 3 – Roundabouts will likely perform best in terms of safety and efficient travel but will face greater challenges in terms of public acceptance.

Safety (System Objective – Safety)

In the context of this feasibility study, safety is a reduction in fatalities, injuries, and property damage losses. Through improved safety, personal and economic losses are reduced, and quality of life is improved. Safety includes all road users, including those users in motorized vehicles, as well as the more vulnerable users such as pedestrians, bicyclists, and those using personal conveyances or mobility assistive devices.

Within the IA 122 corridor study area, from Lark Avenue (S34) to Cerro Gordo/Winnebago Way, 280 crashes occurred during the study period of 2017 to 2021, inclusive. Of these reported crashes, there was one (1) fatal injury, three (3) major incapacitating injuries, 18 minor injuries, and 81 possible injuries, along with $1,626,000 in property damage losses. Using the Iowa DOT's crash economic loss values[25],

[25] Per Transportation Safety Improvement Program guidelines, economic losses are valued as follows: $4.5 mill per fatal injury, $325,000 per major injury, $65,000 per minor injury, and $35,000 per possible injury.

total economic losses for crashes in the IA 122 corridor total $27.3 million over the most recent five-year period.

Alternative 1 (No-Build with TEAP Improvements) is a strategy directed at implementing reasonable, low-cost safety improvements into an existing corridor. There are several improvements identified in this alternative including the:

- Installation of new signals at major intersections
- Reconfiguration of mainline left-turn lanes at major intersections from a negatively-offset geometry to a positively-offset configuration
- Minor access-control improvements
- An option to construct full-width paved shoulders

Alternative 2 (Reconstruction with Signalized Intersections) expands on the safety improvements possible under Alternative 1, including:

- Narrowing of the median
- Conversion of a large portion of the corridor to a storm-sewer drainage system, which tend to "urbanize" the corridor in the eyes of motorists and may provide some marginal traffic calming benefits
- Better consistency in the corridor for side road lane configurations
- Better consistency in the provision and geometry of mainline left-and-right turn lanes
- Development of longitudinal sidewalk and trail facilities, and for improved crossings at the major intersections
- Considering continuous roadway lighting and lighting for the trails and sidewalks, which would benefit the safety of all road users when competitive lighting from the many adjacent business properties may interfere with safe nighttime highway operations

Alternative 3 (Reconstruction with Roundabouts) incorporates all the safety opportunities listed in Alternative 2. Additionally, roundabouts are generally considered to be safer than the signalized intersections they replace, though the safety improvements identified through research vary considerably from one study to another. Citing three studies, the Insurance Institute for Highway Safety (IIHS) website[26] says, "*Studies of intersections in the United States converted from traffic signals or stop signs to roundabouts have found reductions in injury crashes of 72-80 percent and reductions in all crashes of 35-47 percent."* Further*, "Most U.S. studies have focused primarily on single-lane roundabouts. When included, two-lane roundabouts have been associated with smaller reductions in crashes compared with single-lane roundabouts.*

NCHRP Report 572[27] cautions that the "*safety performance of multi-lane roundabouts appears to be especially sensitive to design details"*. Interestingly, a 2019 IIHS Study[28] of two-lane roundabouts in the State of Washington showed that crashes at two-lane roundabouts decreased an average of 9 percent per year, presumably as motorists became accustomed to them. Further, the study estimated a 32 percent annual reduction in the occurrence of minor, major, and fatal injuries at double-lane roundabouts.

In this feasibility study, we are evaluating alternatives with incomplete or older information on traffic volumes, no survey data, and preliminary proposed geometry. Given this data, it's reasonable to

[26] https://www.iihs.org/topics/roundabouts

[27] Report 572 - *Roundabouts in the United States*, National Cooperative Highway Research Program (NCHRP), Transportation Research Board, Washington, DC, 2007.

[28] *Long-Term crash tends at single- and double-lane roundabouts in Washington State*, Hu, Wen and Cicchino, Jessica B., Journal of Safety Research, August 2019.

conclude that Alternative 3 (Roundabouts) will likely be safer than Alternative 2 (Signalized Intersections), though it's difficult to estimate the improved performance.

Security (Safety)

In the context of this project, security is concerned with protection from a wide-range of vulnerabilities, including criminal and terrorist attacks, and natural and manmade incidents such as floods, storms, and hazardous materials spills.

The project envisioned by this feasibility study will marginally address security. Concerning flood risk, the alternatives being considered (No-build with TEAP improvements, reconstruction with signalized intersections, and reconstruction with roundabouts) all involve preservation or replacement of an existing highway facility on generally existing line and grade. A portion of this corridor near the dual bridges over Willow Creek, which is a regulatory floodway, is mapped as Zone AE indicating a 1% risk of annual chance flood with average depth of less than one foot. None of the project alternatives will change the roadway elevation in this area.

Beyond the risk of roadway inundation is the more localized issue of street flooding. The existing corridor provides for a shallow depressed median in the area from Indianhead Drive to Cerro Gordo/Winnebago Way. Existing surface intakes are easily overwhelmed by moderate storm events, resulting in short-term street flooding often affecting the median areas of the intersections. This condition would be perpetuated by the No-Build with TEAP alternatives. Both reconstruction alternatives, however, would involve modification of the corridor to a raised median, with the roadways sloped to drain to the outside lane/gutter where drainage would be collected by a storm-sewer drainage system. It's feasible to design the storm sewer system, under the Iowa DOT's criteria for a design storm with a 10-year recurrence interval. Conversion of the corridor to a raised-median, storm-sewer based design, would benefit security by reducing the effects of frequent street flooding on the highway operations and safety.

As previously discussed, the Cerro Gordo County Sheriff's Office and the County Engineer's maintenance garage are located immediately south of this corridor on Lark Avenue (S34). Though there are currently no City police, fire or other emergency services located immediately within the study limits, the City's fire department and ambulance services and MercyOne's regional hospital are located on the IA 122 corridor just east of the study limits. Emergency services are frequently dispatched to locations via the IA 122 corridor. Further, IA 122 serves ambulances from surrounding communities for patients seeking emergency care at the hospital. For the purposes of emergency services, all alternatives identified in this feasibility study would improve operations and safety compared to existing conditions.

One noteworthy consideration is that the City has an emergency preemption capability incorporated into the traffic signal system, but that preemption capability is not available to ambulance services from other communities. Alternative 3, reconstruction with roundabouts, would directly improve this situation by improving the ability of external ambulance services to transit the corridor without encountering the delays normally experienced in a signalized corridor.

Accessibility and Mobility (Accessibility and Flow)

Accessibility

Many questions arise when considering the accessibility of a highway corridor. Is the corridor available and accessible by users with different ability levels? Is the system easy to use, safe, and comfortable? Are there barriers to access, physical, functional, or economic? Does the corridor provide access to desired destinations?

It's fair to say that the existing corridor was designed with automobile transportation in mind. The corridor lacks any existing longitudinal sidewalk or trail facilities for pedestrians, bicyclists, or users with personal mobility devices. Such users now must navigate the corridor via the granular-surfaced shoulders, on the frontage roads, or on the grassed right-of-way complicated by open-ditches. Marked crossings of the IA 122 corridor exist only at the intersections with Cerro Gordo/Winnebago Way and Taft Avenue. While public transit serves locations in the corridor, no stops occur on the corridor itself; transit users have restricted access to secondary locations after departing a bus at their primary stop.

Few residential facilities exist directly on this corridor. Two widely-accessed government services are in the Plaza West development, the County Public Health office and the Iowa DOT's Driver's License Center. Several retail and service businesses within the corridor aim to serve customers who live elsewhere in this community while others may need to travel by means other than an automobile.

The No-Build with TEAP Alternative provides minimal improvement to the existing conditions other than recommendations for minor improvements at the few existing marked crossings. Both reconstruction alternatives, with signalized intersections and with roundabouts, include the construction of a continuous sidewalk on the north side of the corridor and a continuous trail on the south side of the corridor, plus crossing improvements at the major intersections. While transit improvements have not been addressed in this feasibility study, narrowing the median and closing the open-ditches provides space where the development of on-highway bus stops could be considered in the project's design phase.

For pedestrians, roundabouts are generally considered safer than signalized intersections for several reasons. At roundabouts, pedestrians and other similar users cross only one direction of highway travel at a time, crossing distances are generally shorter, vehicle speeds at crossing locations tend to be lower, and the splitter islands are wide enough to provide a safe refuge area in the median. Pedestrian safety benefits of roundabouts compared to signalized intersections are better established for single-lane roundabouts than the multi-lane roundabout being considered in this study.

Mobility

Mobility was assessed in this feasibility study through a traffic analysis, considering the three alternatives under current traffic volumes projected at 1% growth to a design year of 2047. In this analysis, Alternative 1 (No-Build with TEAP Improvements) was found to have several intersections with movements evaluated at LOS E or F, including Eisenhower, Taft, Briarstone/Grover, and Cerro Gordo/Winnebago Way. All major intersections had one or more movements projected to LOS D. This analysis of Alternative 1 makes it clear that the corridor will need further improvements at some point between now and 2047.

Alternative 2 (reconstruction with signalized intersections) provides a corridor where the major intersections operate at 2047 peak hour conditions that are acceptable or better. Eight movements at the major intersections were evaluated as being at LOS D, which is the lowest acceptable level-of-service.

These results are partially attributable to the distance between the signalized intersections. Progression is more effective in signalized corridors when the spacing between signalized intersections is ¼ mile or shorter. In a well-coordinated signalized corridor, large concentrations of motor vehicles, i.e., platoons, travelling at a consistent speed, can progress through the corridor together with minimal delay.

In the IA 122 corridor, the spacing between Briarstone/Grover and Cerro Gordo/Winnebago Way is below the desired maximum spacing of ¼ mile, and the spacing between Indianhead and Eisenhower is at the desired spacing. The spacing between the other signal locations well exceeds the desired maximum spacing. With intervening access points and unsignalized median crossings, the platooning

effect, which makes coordinated traffic signal systems efficient, tends to break down. Travel speeds vary considerably, vehicles arrive at the signals at varied times, and travel delay results.

The evaluation of Alternative 3 (reconstruction with roundabouts) resulted in two movements at the six major intersections operating at LOS D, those movements being at the one signalized intersection which is not intended to be converted to a roundabout. All the movements at the five roundabouts generally result in less delay than the corresponding movement in the signalized alternative.

Environment, Energy, Quality of Life, and Consistency (Sustainability)

Environment

This study is a pre-NEPA[29] feasibility study, so decisions to balance the public's need for safe and efficient transportation against potential impacts on the human and natural environment will be evaluated in future phases of the project. The existing corridor right-of-way will support any of the alternatives being considered in this study, with only minor right-of-way acquisitions. All land underlying the existing and proposed highway facilities has been previously disturbed, either by highway construction or by property developments. A preliminary desktop review of environmental resources was conducted as previously discussed in this report. For the purposes of this study, it's assumed that each of the three alternatives will have minor and effectively equal environmental impacts.

It could be argued that there will be environmental impacts associated with Alternatives 2 and 3, since the process of reconstruction will generate short-term environmental impacts greater those of corridor maintenance. Realistically, a decision to pursue Alternative 1 (No-Build with TEAP Improvements) only forestalls the eventual need for corridor reconstruction for a decade or so.

Energy

Per the Iowa DOT's *Iowa in Motion 2050,* energy issues include the cost and availability of fuel, the production and movement of different types of fuel, and the impact of alternative fuel vehicles on transportation. Mason City is home to both biodiesel and ethanol production facilities; however, both facilities are located about two miles south of the IA 122 corridor. It is not a significant consideration as this study concerns an isolated infrastructure improvement project of moderate size, energy, as defined in the Iowa DOT's plan.

Quality of Life

In contrast to the issue of energy considerations discussed above, the relationships between transportation facilities and quality of life are best coordinated at the local level through:

- Land use planning
- Access management
- Providing highway corridors with opportunities for road users to choose among modes of transportation (automobile, transit, pedestrian, bicycle, and others)
- Connecting residents to their jobs, schools, healthcare facilities, businesses from which they can purchase goods and services

Alternative 1 (No-Build with TEAP improvements) will result in only minor improvements in quality of life.

Alternatives 2 (Reconstruction with Signalized Intersections) and 3 (Reconstruction with Roundabouts) will significantly address quality of life issues, largely in equal measures, through improvement of the existing facility by the addition of pedestrian and trail facilities and related crossings, better access management, improved operations and safety, and a more attractive gateway corridor into Mason City.

[29] National Environmental Policy Act (NEPA)

Connectivity (Accessibility and Flow)

Connectivity to modes of transportation other than by personal vehicle was partially addressed in the previous discussion of accessibility concerning sidewalk and trail improvements.

Other modes of transportation serving Mason City include:

- Transit: Described previously.
- Aviation: Mason City Municipal Airport (FAA ID MCW), a commercial airport located directly on the IA 122 corridor west of the study area. 2020 passenger enplanements were reported to be 3,500 passengers, with zero air cargo tonnage reported since 2015.
- Rail: two (2) Class 1 railroads and two commercial short-lines.
- Highway: Primary highways serving Mason City include US 18, IA 122 (Business US 18), and US 65.
- US 18, from I-35 to the east, passing immediately south of Mason City, is classified as a Critical Rural Freight Corridor.[30]
- Mason City Freight Generating Facilities identified in the State Freight Plan include:
    - Iowa Dry Warehouse - a transload, cross-dock, team track, and warehouse facility
    - IATR/Progressive Rail - a transload, cross-dock, and team track facility
    - Cartersville Elevator - a transload facility
    - Golden Gran Energy – ethanol production plant
    - Renewable Energy Group – biodiesel production plant

While significant to the economy of Mason City, none of these facilities are directly accessed by IA 122 within the study corridor. The proposed alternatives considered in this study would likely have minimal measurable impact on these alternate modes of transportation.

Efficient System Management and Operation (Sustainability and Flow)

Per *Iowa in Motion 2050*, optimizing the highway system *"is embodied in the strategic approach of transportation systems management and operations"* (TSMO). The aim of TSMO is to *"proactively manage the performance of the state's transportation system, particularly by managing or mitigating congestion or incidents."*

Congestion may be recurring, in the sense of traditional traffic congestion relating to daily peak hour traffic volumes or on the occurrence of predictable peak traffic events relating to seasonal holiday shopping periods, holiday weekends, sports events, conventions, concerts, etc.

Recurring congestion, if deemed necessary, could potentially be mitigated for Alternatives 1 and 2by implementing technologies to better manage the traffic signal system, including deployment of a mid-level technology Performance Measures traffic control system or a high-level technology Adaptive Traffic Control System.

[30] *2022 State Freight Plan*, Iowa Department of Transportation, Ames, IA.

- **Alternative 1 (No-Build with TEAP Improvements):** Such technologies may be appropriate if Alternative 1 is pursued, as the aim of these technologies would be to maximize the capacity of an existing highway in lieu of pursuing capacity improvements.

- **Alternative 2 (Reconstruction with Signalized Intersections):** The Traffic Analysis of Alternative 2 predicts intersection performance to be LOS D or better at all signalized intersections in 2047, which suggests that advanced signal control technologies may not be necessary.

- **Alternative 3 (Reconstruction with Roundabouts):** The traffic analysis of Alternative 3 predicts LOS C or better performance for all roundabout intersections in 2047, so recurring congestion wouldn't be an issue needing mitigation.

Non-recurring congestion may be caused by disruptions to the system in the form of manmade disaster events such as hazardous material spills or natural events such as storms, floods, and power outages or surges. To some extent, these random events can be addressed by implementation of an incident management plan for the facility. Other non-recurring events, such as traffic crashes, can be mitigated by infrastructure improvements intended to improve traffic safety. Alternative 3 (Reconstruction with Roundabouts) is a desirable alternative from this standpoint.

System Preservation and Resiliency and Reliability (Sustainability and Flow)

To be sustainable, a highway is available and in good condition, meeting the needs of today and the future. To be resilient, the corridor is prepared for and adaptable to changing conditions and will withstand and recover quickly from disruptions. These planning factors are interrelated, and it is reasonable to address them together. Short-term disruptions to the system are mitigated to a considerable degree by issues already addressed, including:

- Designing the corridor for improved safety and capacity for anticipated traffic growth
- Developing incident management plans
- Recognizing this corridor is not prone to regular flooding

Longer term, these planning factors can be addressed in the study corridor by considering opportunities in the selection of gateway plantings, other vegetation, and median surfaces. There may be opportunities to provide for environmental enhancements in the roadsides, such as bioswales and detention basins to slow and filter runoff before it leaves the highway corridor.

Vehicle emissions directly affect air quality and climate change, in two main ways. A reduction in traffic congestion and related intersection delay eliminates engine idling; when the vehicle is stopped, no mobility benefit is gained by the burning of fossil fuels. Maintaining more uniform travel speeds allows motor vehicles to operate more efficiently when moving, further reducing increased emissions due to speed change maneuvers. Long-established programs, including Congestion Mitigation and Air Quality (CMAQ, a Federal program), and Iowa Clean Air Attainment Program (ICAAP – Iowa DOT) are funding programs directed to resolving at this issue.

Alternative 1 (No- Build with TEAP Improvements) provides very limited opportunities to enhance the sustainability and resiliency of the IA 122 corridor, largely because this alternative perpetuates existing conditions and has been evaluated to fail under traffic growth projected to an appropriate design year.

Alternatives 2 and 3 provide significant opportunities to improve the sustainability and resiliency of the corridor by:

- Improving traffic flow and reducing delays for both current traffic and expected traffic growth to design year 2047.
- Improving drainage system to reduce concerns for localized street flooding and its effect on traffic operations and safety.
- Implementing safety improvements to help reduce incidents resulting from vehicle crashes.
- Reducing vehicle emissions by minimizing engine idling through the efficiency of more uniform vehicle speeds.

Installing roundabouts in place of traffic signals or stop signs has been found to reduce carbon monoxide emissions by 15-45 percent, nitrous oxide emissions by 21-44 percent, caron dioxide emissions by 23-34 percent, hydrocarbon emissions by 0-40 percent, and reduced fuel consumption by an estimated 23-34 percent.[31] For these reasons, Alternative 3 would likely be desirable in terms of air quality when compared to Alternative 2.

Travel and Tourism (Accessibility)

2018 visitor spending[32] in Mason City amounted to $136 million, categorized by: transportation spending of $68 million, lodging $16 million, retail $10 million, entertainment and recreation $14 million, and food service $29 million.

The Visit Mason City office is located within the IA 122 study area and served 4,652 guests in the visitor center in 2018.

The IA 122 corridor, including the study area, is likely the predominant corridor by which visitors reach Mason City since it provides the most direct connection to nearby I-35. As such, the study corridor provides many opportunities to pursue gateway enhancements for Mason City.

- Alternative 1 provides limited opportunities to modify the IA 122 corridor to improve its function and appearance as a gateway to the community. The greatest such opportunity lies in paving full-width shoulders from Indianhead Drive east to Cerro Gordo/Winnebago Way to eliminate the existing granular-surfaced shoulders.
- Alternatives 2 and 3 provide many opportunities to enhance the corridor as a community gateway by:
    - Improving the appearance of the physical infrastructure, including pavements, curbs, and traffic signal poles.
    - Improving the appearance and uniformity of the median through construction of a raised median. A raised median would provide options for surface materials, including vegetation or hard-surfaced median options.
    - Construction of a storm-sewer drainage system, eliminating the existing paved shoulders with drainage conveyed by open-ditches, which are difficult to maintain.
    - Narrowing the median and closing the open-ditches will provide:
        - Wider and more functional roadsides within the right-of-way
        - More usable space available for sidewalk and trail improvements
        - Improved landscaping and vegetation
        - Possible public art displays

31 Insurance Institute for Highway Safety (IIHS) website citing (Hu, et al., 2014, published in Transportation Research Record 2402)

32 Visit Mason City (Iowa), Annual Report, FY2018-2019 (most recent available data at the time this report was written).

- Construction of a continuous lighting system would enhance the appearance and safety of the corridor during nighttime hours.

- Such opportunities will exist in either Alternative 2 or 3; however, these will likely differ between the signalized intersection and roundabout alternatives. The signalized intersections will provide for a uniform median width and areas will be available in the intersection quadrants for possible amenities. Roundabouts will provide for a median of varied width as the median narrows in the links between roundabouts and widens on the approaches to the intersections. The center island of a roundabout provides opportunities for aesthetic amenities that do not exist at signalized intersections, but there will likely be less opportunity for amenities in the intersection quadrants.

Federal Planning Factor	Level of Improvement by Alternative		
	Alternative 1	Alternative 2	Alternative 3
	No-Build with TEAP Improvements	Reconstruction with Signalized Intersections	Reconstruction with Roundabouts
Economic Vitality	Limited	Significant	Significant
Safety	Limited	Moderate	Significant
Security	Limited	Moderate	Moderate
Accessibility	Limited	Moderate	Moderate to Significant
Mobility	Limited	Moderate to Significant	Significant
Environment	Limited	Limited	Limited
Energy	Limited	Limited	Limited
Quality of Life	Limited	Moderate to Significant	Moderate to Significant
Connectivity	Limited	Limited	Limited
Efficient System Management and Operation (i.e TSMO)	Limited	Moderate	Moderate to Significant
System Preservation	Limited	Moderate	Significant
Resiliency and Reliability			
Travel and Tourism	Limited	Significant	Significant

Table 8 – Summary Table of Federal Planning Factors by Alternative

Cost Estimates and Cost Comparisons

Concept level projects costs for Alternative 1 are tabulated and summarized in Table 9 below.

Item	Alternative 1
Indianhead Drive Intersection	
Advanced Warning Signs	$ 15,000.00
Offset Left Turn Lanes	$ 900,000.00
Eisenhower Avenue Intersection	
Offset Left Turn Lanes	$ 900,000.00
North Iowa Events Center Access Intersection	
Offset Left Turn Lanes	$ 300,000.00
3/4 Intersection	$ 300,000.00
Village Green Drive Intersection	
Offset Left Turn Lanes	$ 900,000.00
Replace Signal Heads	$ 2,000.00
Tiffany Drive Intersection	
WB Right Turn Lane	$ 75,000.00
EB Right Turn Lane	$ 75,000.00
Willow Inn Access Intersection	
WB Right Turn Lane	$ 100,000.00
EB Right Turn Lane	$ 100,000.00
Close one access to Willow Inn	$ 10,000.00
Remove 1 access on south side of IA 122, near Advanced Auto Parts	$ 20,000.00
Taft Avenue Intersection	
Offset Left Turn Lanes for EB and WB	$ 1,000,000.00
Extend EB Right Turn Lane	$ 110,000.00
Re-Strip Northbound Approach	$ 10,000.00
Replace Signal Heads	$ 2,000.00
Briarstone Drive Intersection	
Offset Left Turn Lanes for EB and WB	$ 1,000,000.00
Winnebago Way Intersection	
Restrip Southbound Approach	$ 25,000.00
Corridor Wide Improvements	
Continuous Paved Shoulder	$ 1,750,000.00

Table 9 – Summary of Alternative 1 Project Costs

Concept level project costs were estimated using the preliminary geometry developed for Alternatives 2 and 3. Estimated project costs will need to be revisited during the NEPA process and preliminary design.

Right-of-way costs were developed using approximate property lines and acquisition lines estimated from the conceptual geometry.

The quantities used to develop these cost estimates are conceptual and do not include all items that will be necessary to construct the project. To account for these smaller, but pertinent quantities, a

contingency of 20% was added to the construction costs, estimated using 2022 costs. An inflation factor of 4.5% per year was applied to better estimate future costs.

The estimated costs for engineering and construction engineering (observation, administration, testing, etc.) were calculated using a typical percentage of construction costs. The cost estimate is summarized in Table 10 below.

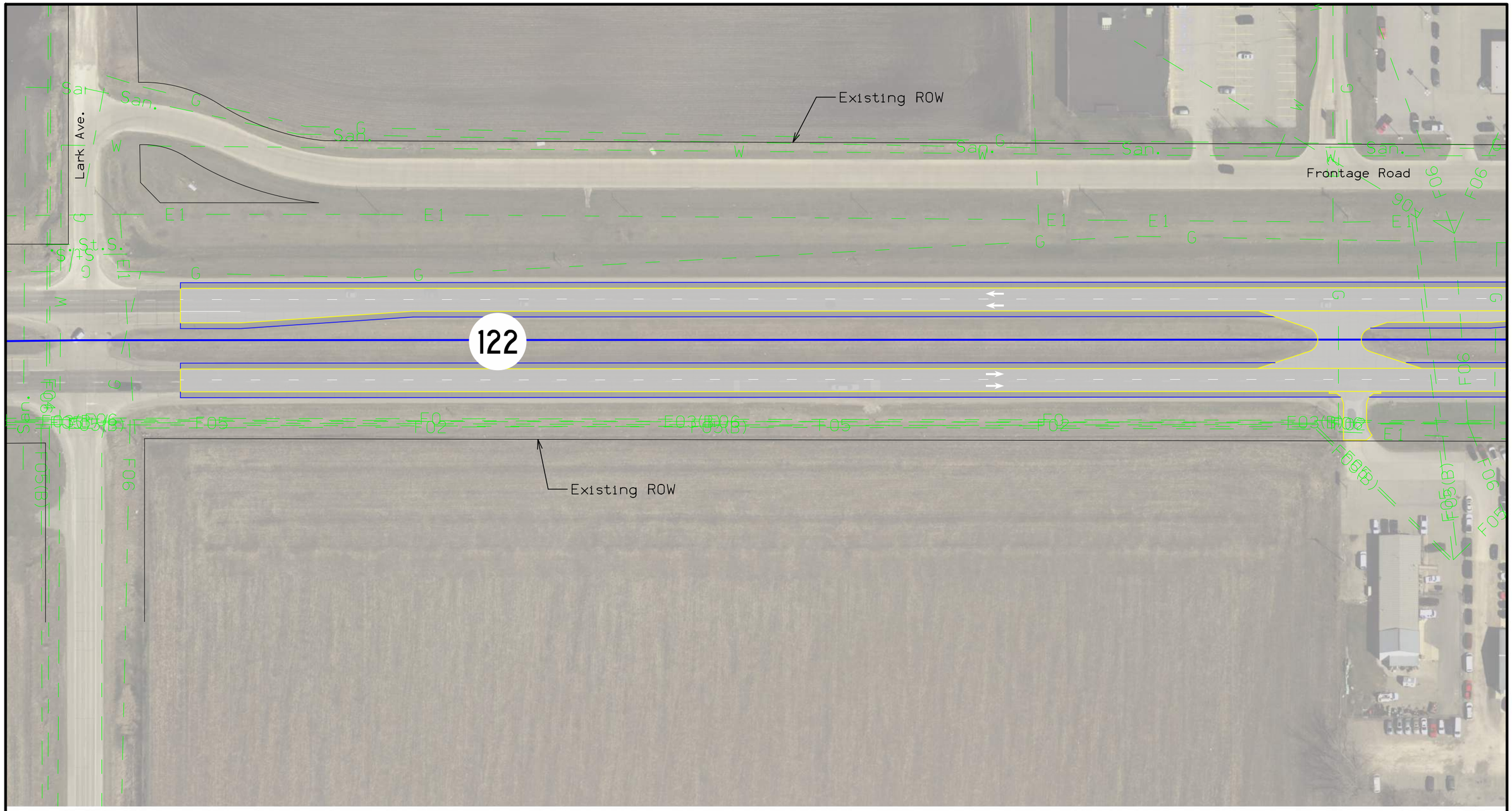
Item	Alternative 2	Alternative 3
Removals and Excavation	$ 1,720,000.00	$ 2,360,000.00
Pavement	$ 9,895,000.00	$ 12,884,000.00
Sidewalk and Trails	$ 1,080,000.00	$ 1,370,000.00
Traffic Signals	$ 3,750,000.00	$ -
Erosion Control (Silt Fence, Seeding, etc.)	$ 230,000.00	$ 230,000.00
Storm Sewer Items	$ 4,460,000.00	$ 4,460,000.00
Lighting Items	$ 1,640,000.00	$ 1,640,000.00
Right of Way	$ 800,000.00	$ 530,000.00
Aesthetic Treatments (5%)	$ 1,180,000.00	$ 1,170,000.00
Construction Sub-Total	$ 24,755,000.00	$ 24,644,000.00
Contingency (20%)	$ 4,950,000.00	$ 4,930,000.00
Construction in 2022 Dollars	$ 29,705,000.00	$ 29,574,000.00
Inflation to 2030 (4.5% per year)	$ 42,250,000.00	$ 42,060,000.00
Engineering Services (8%)	$ 3,380,000.00	$ 3,360,000.00
Construction Engineering Services (10%)	$ 3,380,000.00	$ 3,360,000.00
Total Project Costs in 2030 Dollars	$ 49,010,000.00	$ 48,780,000.00

Table 10 – Summary of Alternatives 2 and 3 Project Costs

whks

engineers + planners + land surveyors

Supplemental Exhibits



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Proposed Direction of Traffic

- Proposed Pavement (Roadway or Driveway)
- Proposed Paved Shoulder
- Proposed Median
- Proposed Sidewalk/Trail
- Proposed ROW Acquisition

Signalized Alternative

FILE NO.	ENGLISH	DESIGN TEAM WHKS & Co.	CERRO GORDO COUNTY	PROJECT NUMBER IA 122 CORRIDOR STUDY	SHEET NUMBER 1

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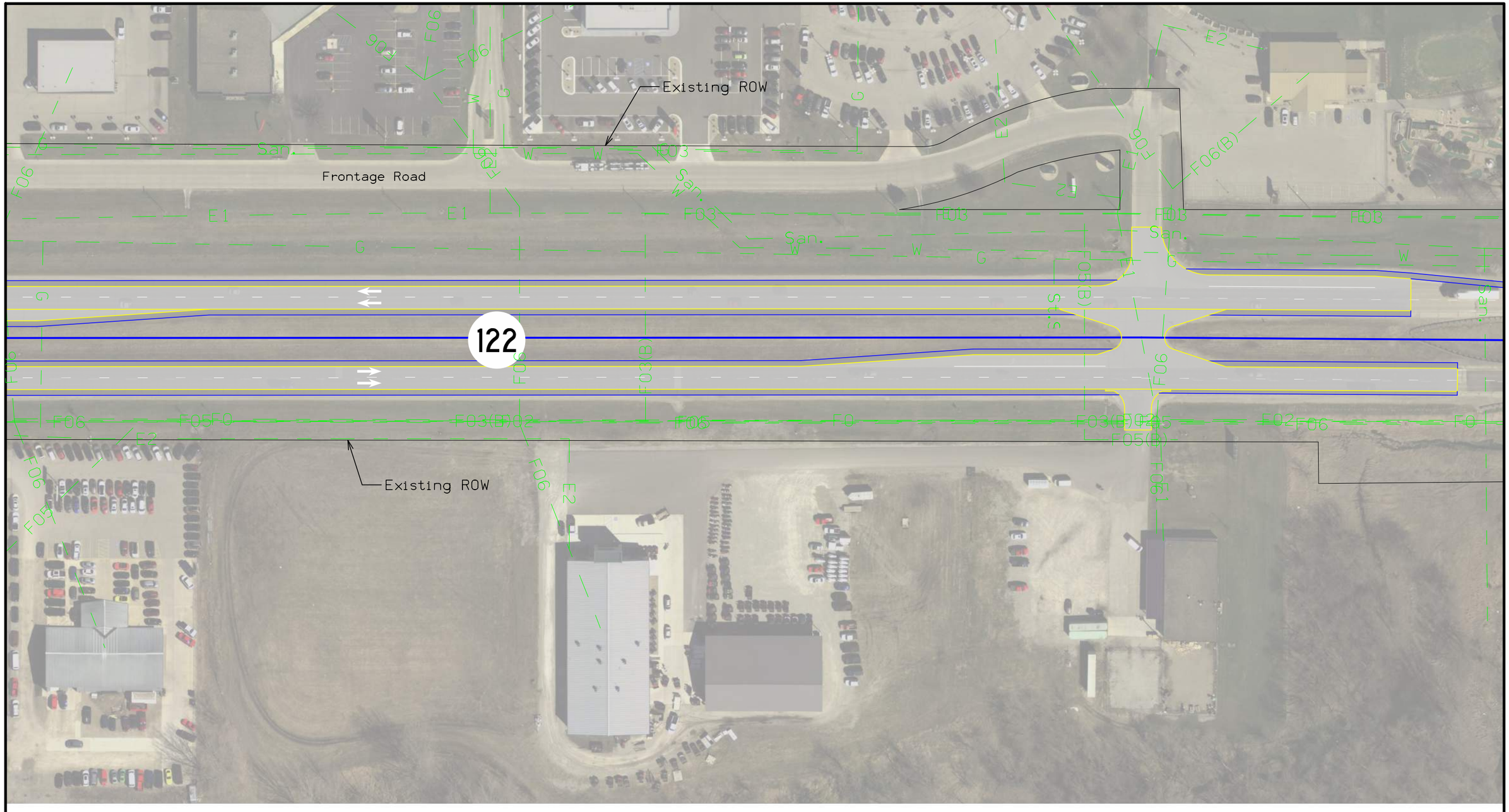

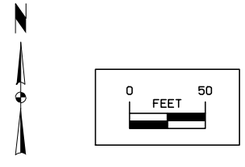

Proposed Direction of Traffic

- Proposed Pavement (Roadway or Driveway)
- Proposed Paved Shoulder
- Proposed Median
- Proposed Sidewalk/Trail
- Proposed ROW Acquisition

Signalized Alternative

FILE NO.	ENGLISH	DESIGN TEAM WHKS & Co.	CERRO GORDO COUNTY	PROJECT NUMBER IA 122 CORRIDOR STUDY	SHEET NUMBER 2

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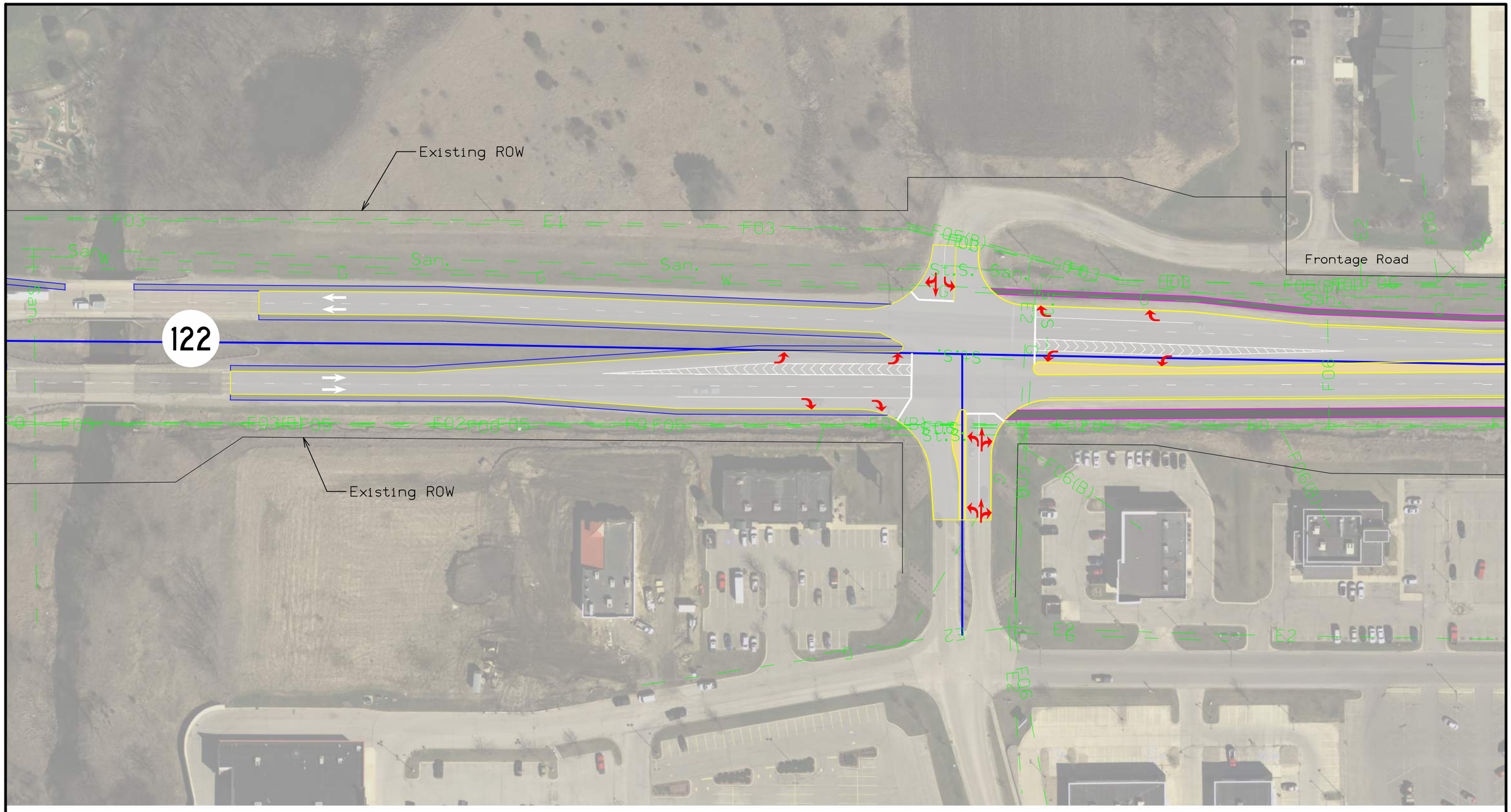

Proposed Direction of Traffic

0 FEET 50

- Proposed Pavement (Roadway or Driveway)
- Proposed Paved Shoulder
- Proposed Median
- Proposed Sidewalk/Trail
- Proposed ROW Acquisition

Signalized Alternative

FILE NO.	ENGLISH	DESIGN TEAM WHKS & Co.	CERRO GORDO COUNTY	PROJECT NUMBER IA 122 CORRIDOR STUDY	SHEET NUMBER 3

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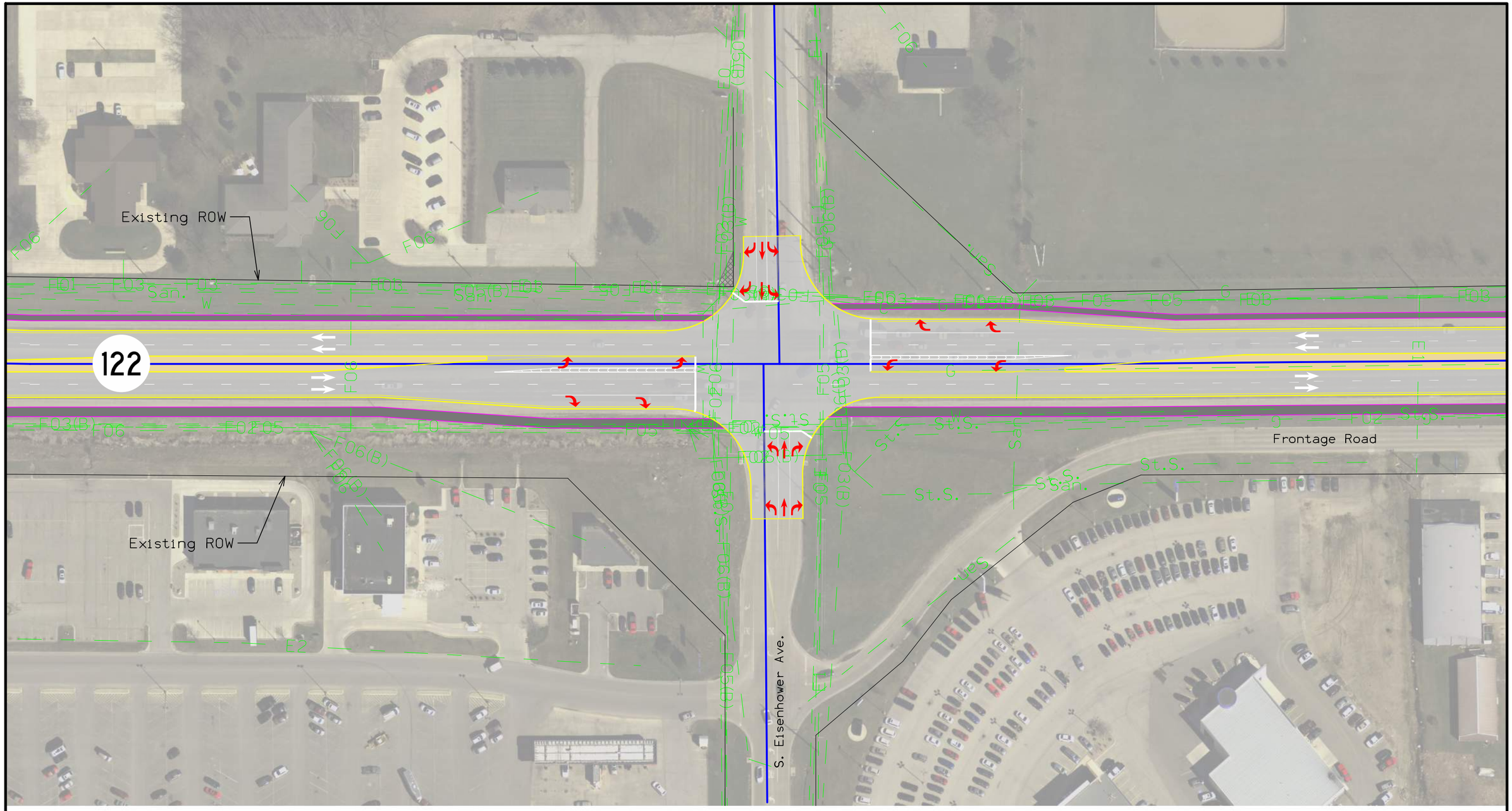

Proposed Direction of Traffic

0 FEET 50

- Proposed Pavement (Roadway or Driveway)
- Proposed Paved Shoulder
- Proposed Median
- Proposed Sidewalk/Trail
- Proposed ROW Acquisition

Signalized Alternative

FILE NO.	ENGLISH	DESIGN TEAM WHKS & Co.	CERRO GORDO COUNTY	PROJECT NUMBER IA 122 CORRIDOR STUDY	SHEET NUMBER 4

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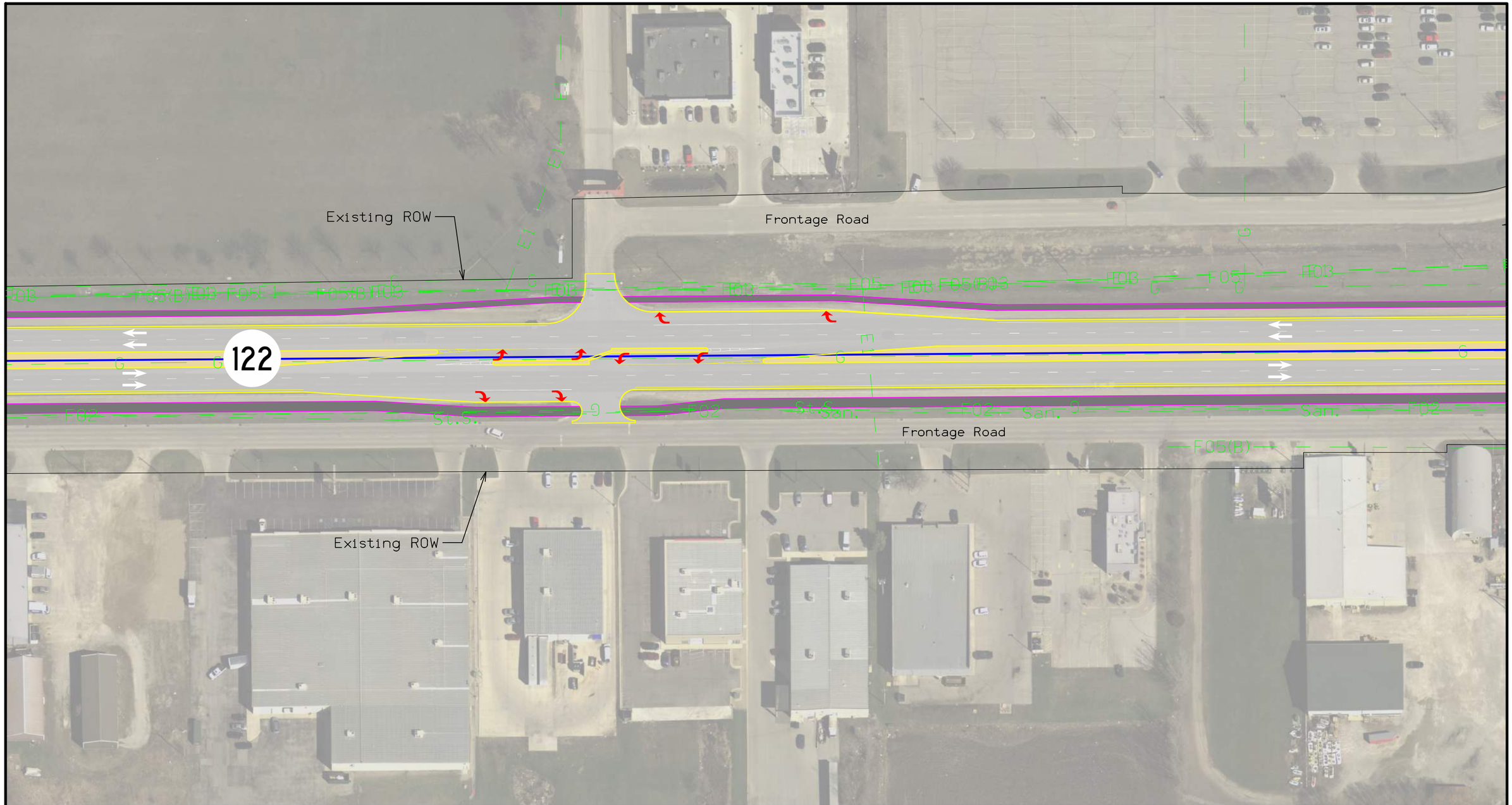

Proposed Direction of Traffic

0 FEET 50

- Proposed Pavement (Roadway or Driveway)
- Proposed Paved Shoulder
- Proposed Median
- Proposed Sidewalk/Trail
- Proposed ROW Acquisition

Signalized Alternative

FILE NO.	ENGLISH	DESIGN TEAM WHKS & Co.	CERRO GORDO COUNTY	PROJECT NUMBER IA 122 CORRIDOR STUDY	SHEET NUMBER 5

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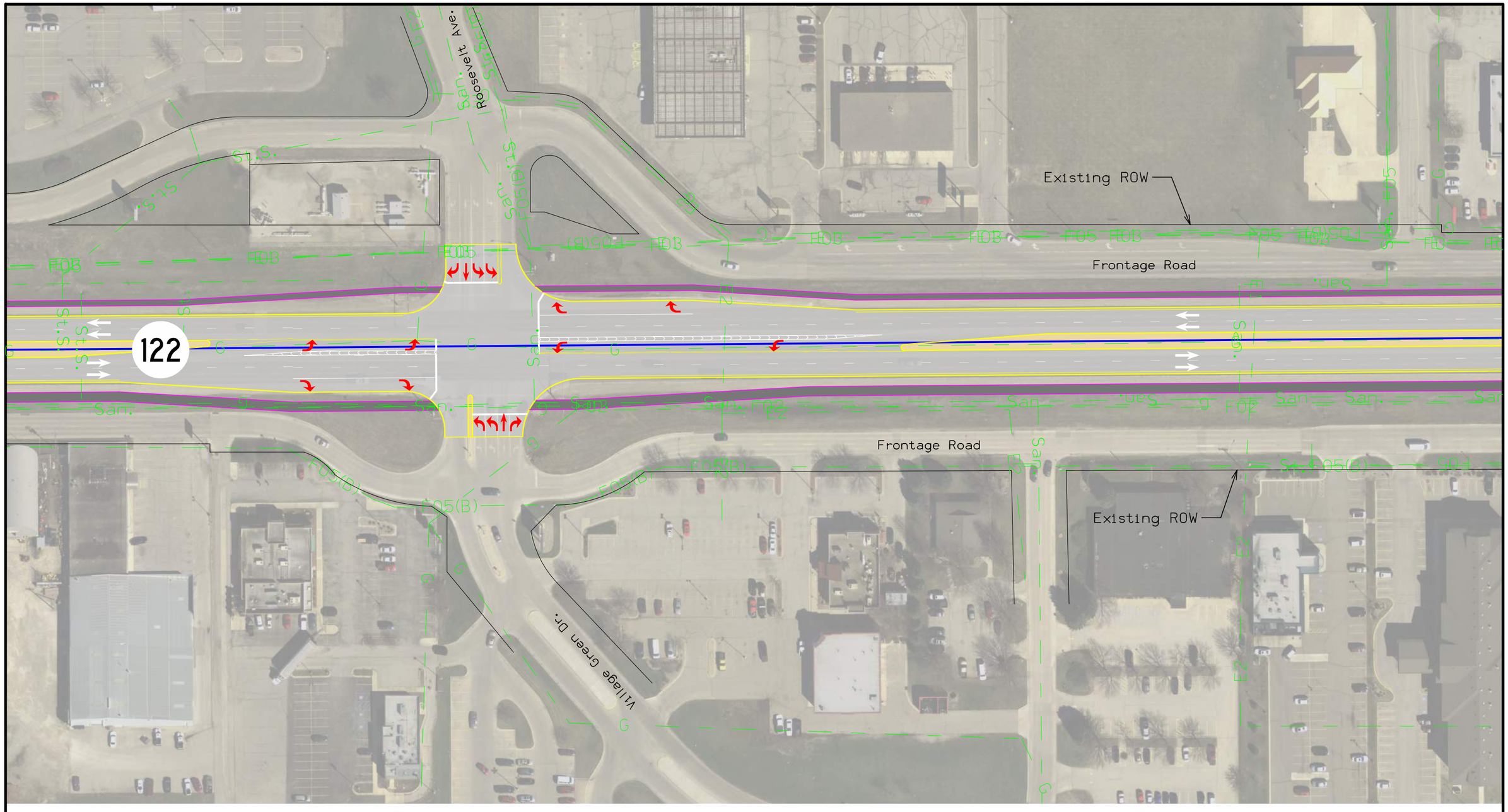


N

0 FEET 50

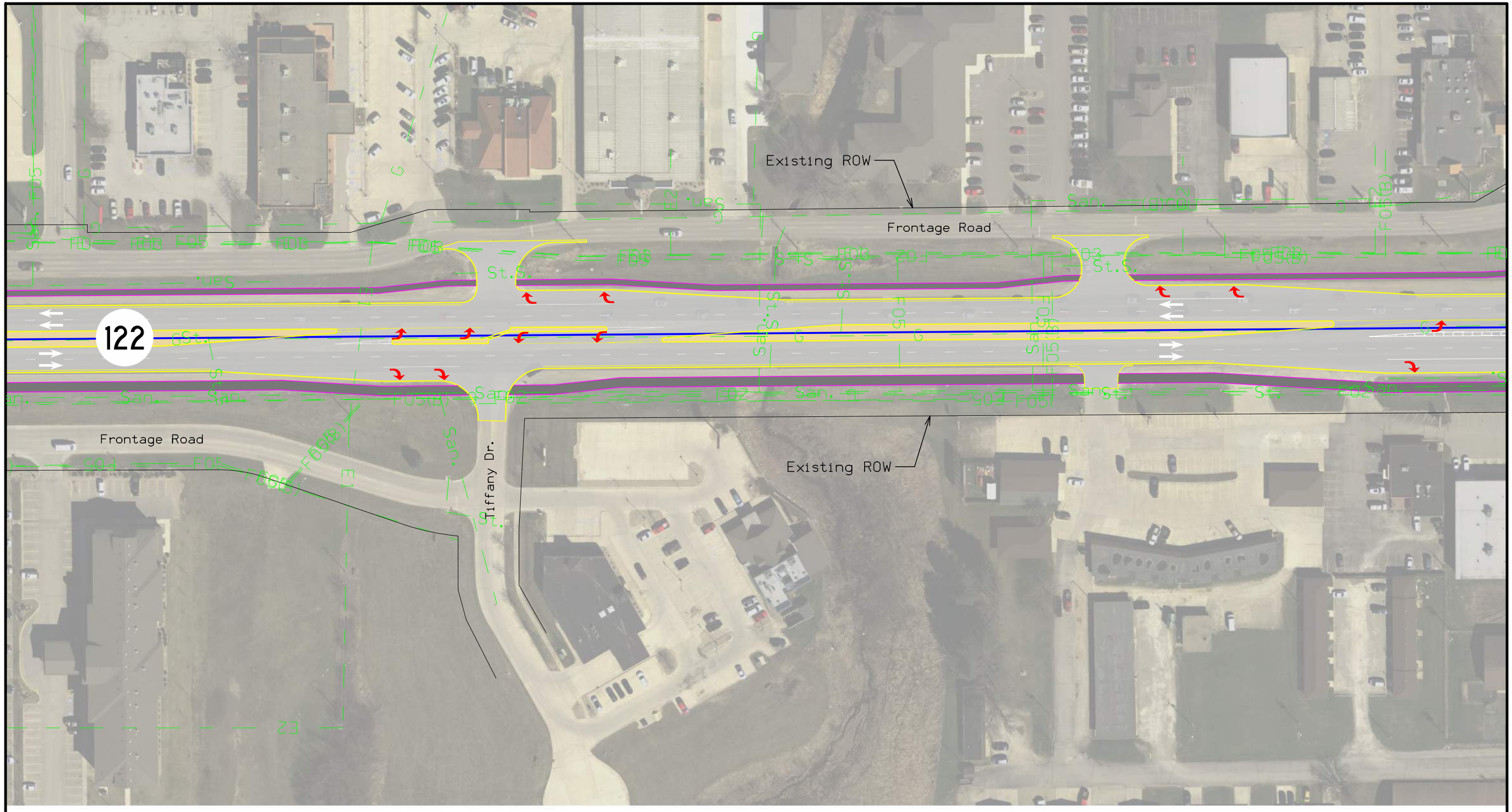
Proposed Direction of Traffic

- Proposed Pavement (Roadway or Driveway)
- Proposed Paved Shoulder
- Proposed Median
- Proposed Sidewalk/Trail
- Proposed ROW Acquisition

Signalized Alternative

FILE NO.	ENGLISH	DESIGN TEAM WHKS & Co.	CERRO GORDO COUNTY	PROJECT NUMBER IA 122 CORRIDOR STUDY	SHEET NUMBER 6

9:16:09 AM 8/30/2022 cholien G:\DEPT\3\9455 - IA Hwy 122 Corridor Feasibility Study\CADD Files\9455_Sheet Displays.dgn



N

0 50 FEET

Proposed Direction of Traffic

Proposed Pavement (Roadway or Driveway)

Proposed Paved Shoulder

Proposed Median

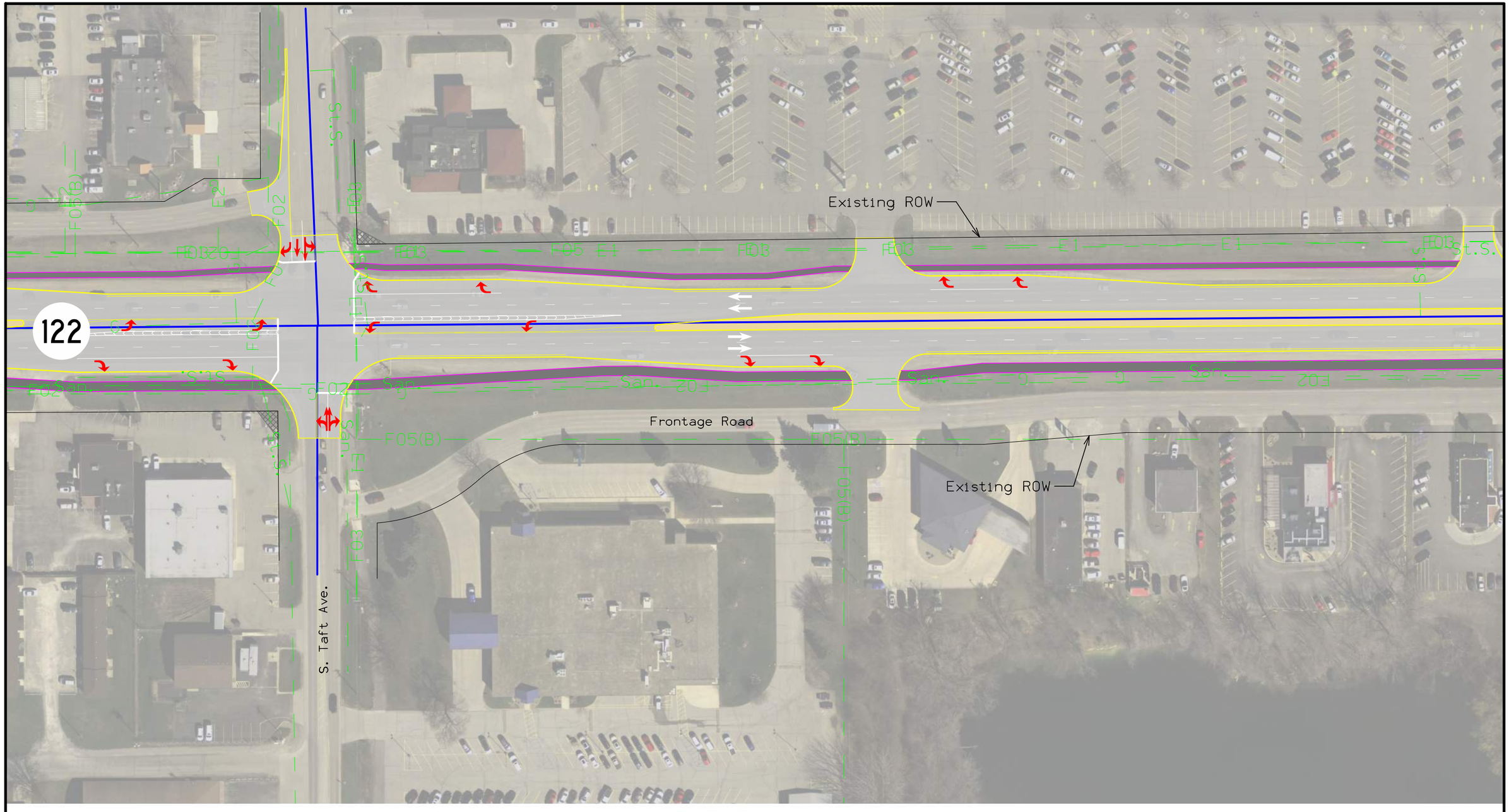
Proposed Sidewalk/Trail

Proposed ROW Acquisition

Signalized Alternative

FILE NO.	ENGLISH	DESIGN TEAM WHKS & Co.	CERRO GORDO COUNTY	PROJECT NUMBER IA 122 CORRIDOR STUDY	SHEET NUMBER 7

9:16:17 AM 8/30/2022 cholien G:\DEPT\3\9455 - IA Hwy 122 Corridor Feasibility Study\CADD Files\9455_Sheet Displays.dgn



N

0 FEET 50

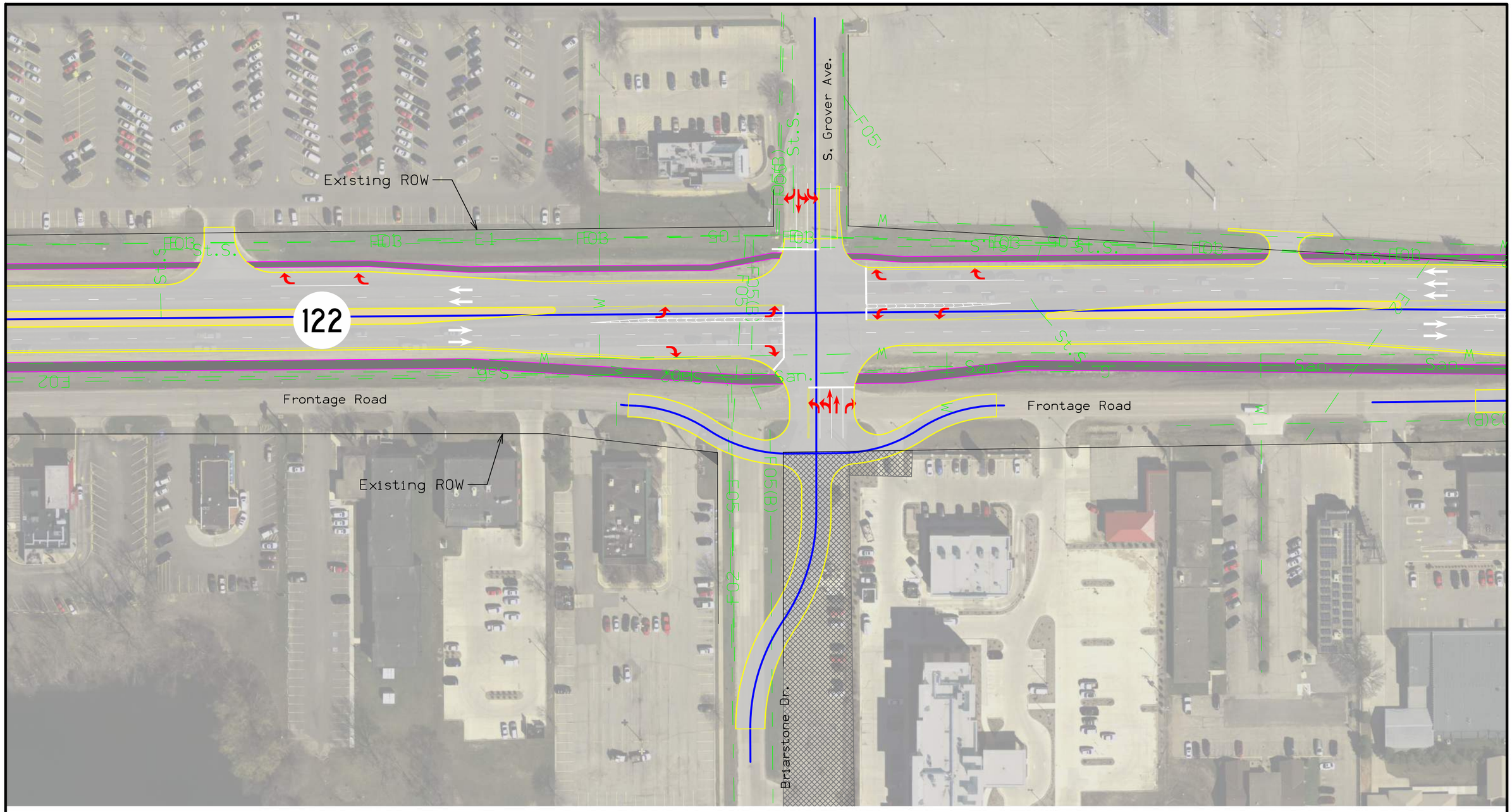
Proposed Direction of Traffic

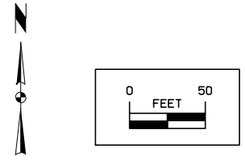
- Proposed Pavement (Roadway or Driveway)
- Proposed Paved Shoulder
- Proposed Median
- Proposed Sidewalk/Trail
- Proposed ROW Acquisition

Signalized Alternative

FILE NO.	ENGLISH	DESIGN TEAM WHKS & Co.	CERRO GORDO COUNTY	PROJECT NUMBER IA 122 CORRIDOR STUDY	SHEET NUMBER 8

9:16:25 AM 8/30/2022 cholien G:\DEPT\3\9455 - IA Hwy 122 Corridor Feasibility Study\CADD Files\9455_Sheet Displays.dgn





Proposed Direction of Traffic

- Proposed Pavement (Roadway or Driveway)
- Proposed Paved Shoulder
- Proposed Median
- Proposed Sidewalk/Trail
- Proposed ROW Acquisition

Signalized Alternative

FILE NO.	ENGLISH	DESIGN TEAM WHKS & Co.	CERRO GORDO COUNTY	PROJECT NUMBER IA 122 CORRIDOR STUDY	SHEET NUMBER 9

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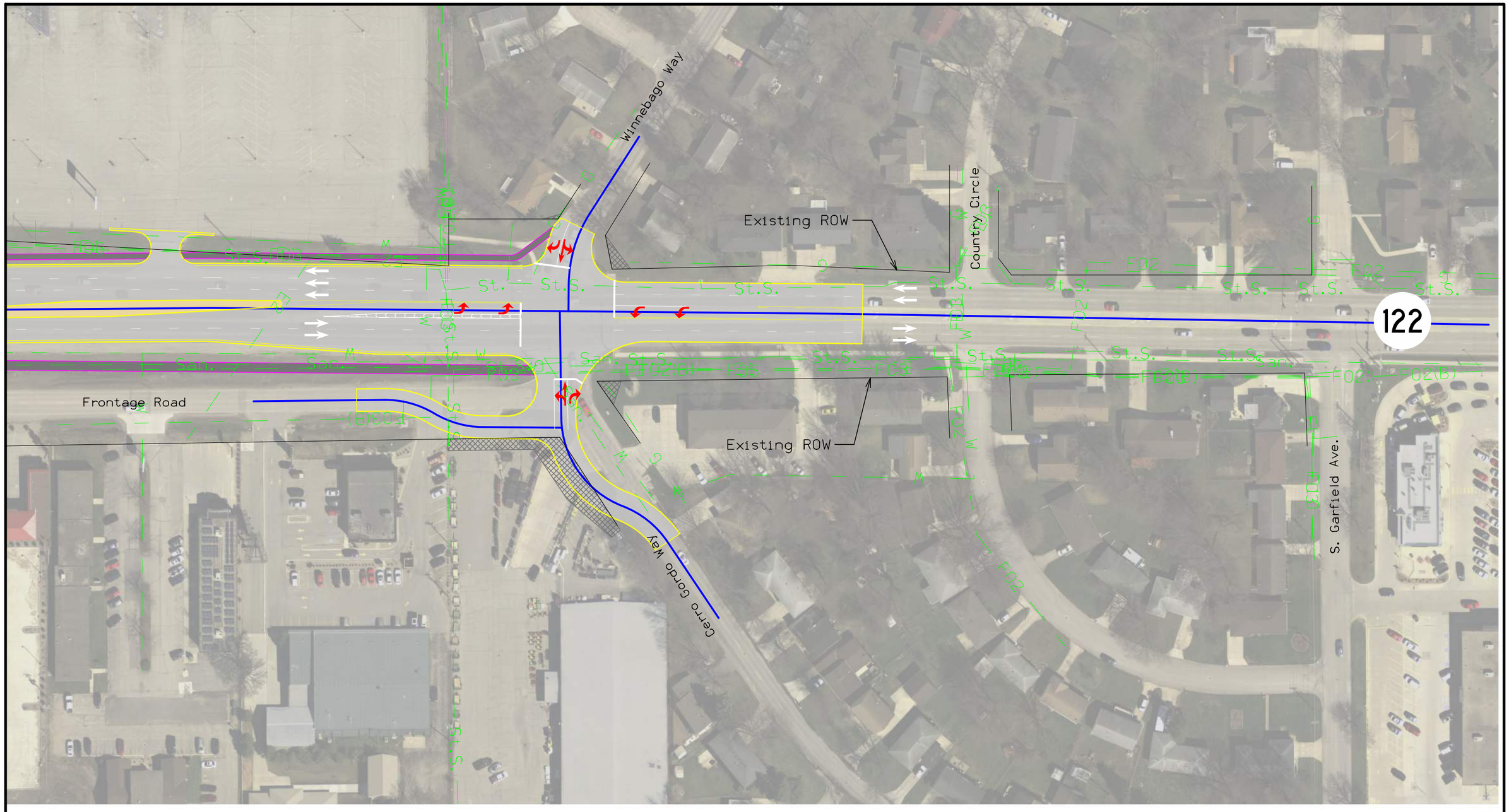

N

0 FEET 50

Proposed Direction of Traffic

- Proposed Pavement (Roadway or Driveway)
- Proposed Paved Shoulder
- Proposed Median
- Proposed Sidewalk/Trail
- Proposed ROW Acquisition

Signalized Alternative

FILE NO.	ENGLISH	DESIGN TEAM WHKS & Co.	CERRO GORDO COUNTY	PROJECT NUMBER IA 122 CORRIDOR STUDY	SHEET NUMBER 10

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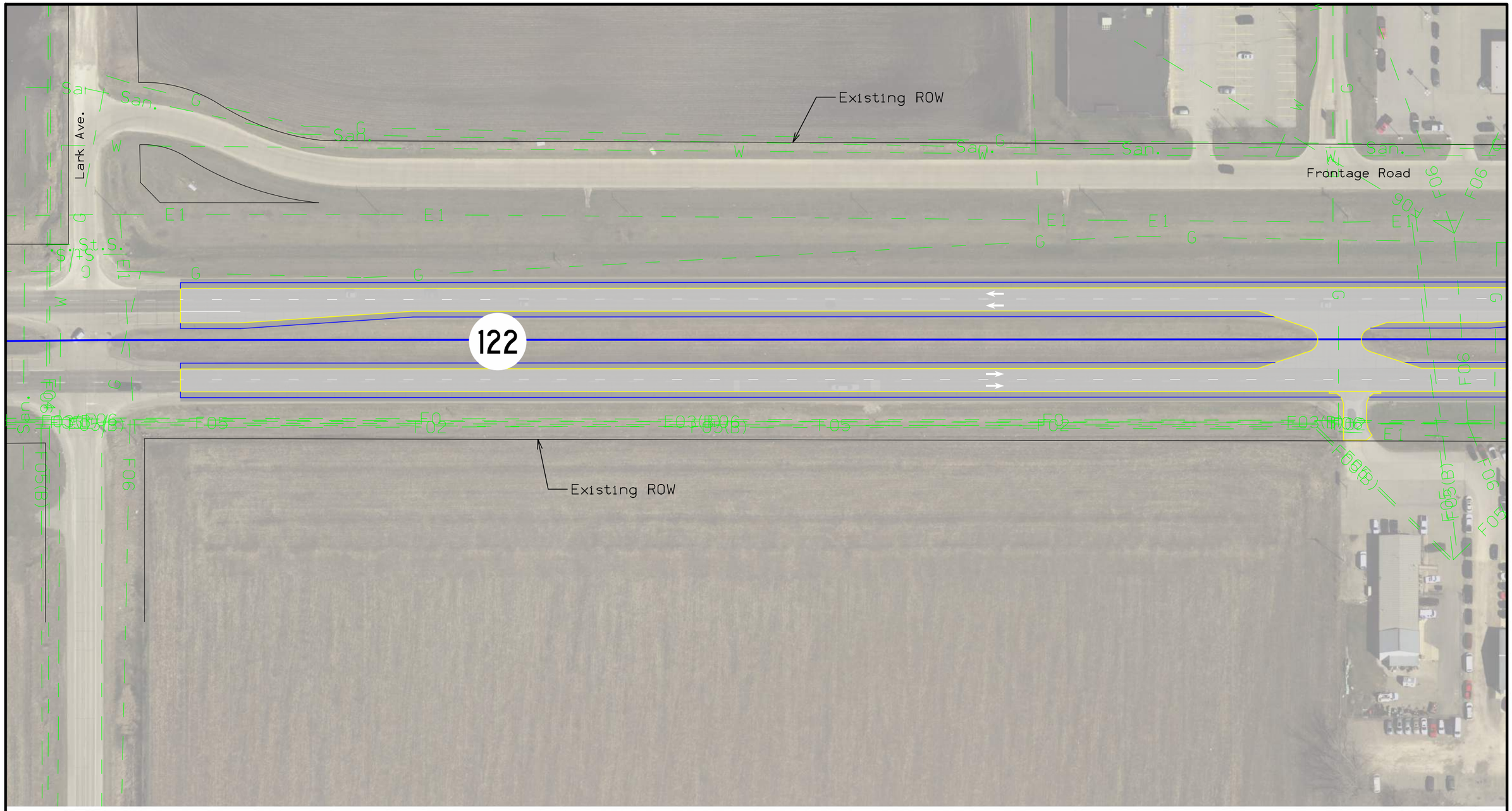


N

0 FEET 50

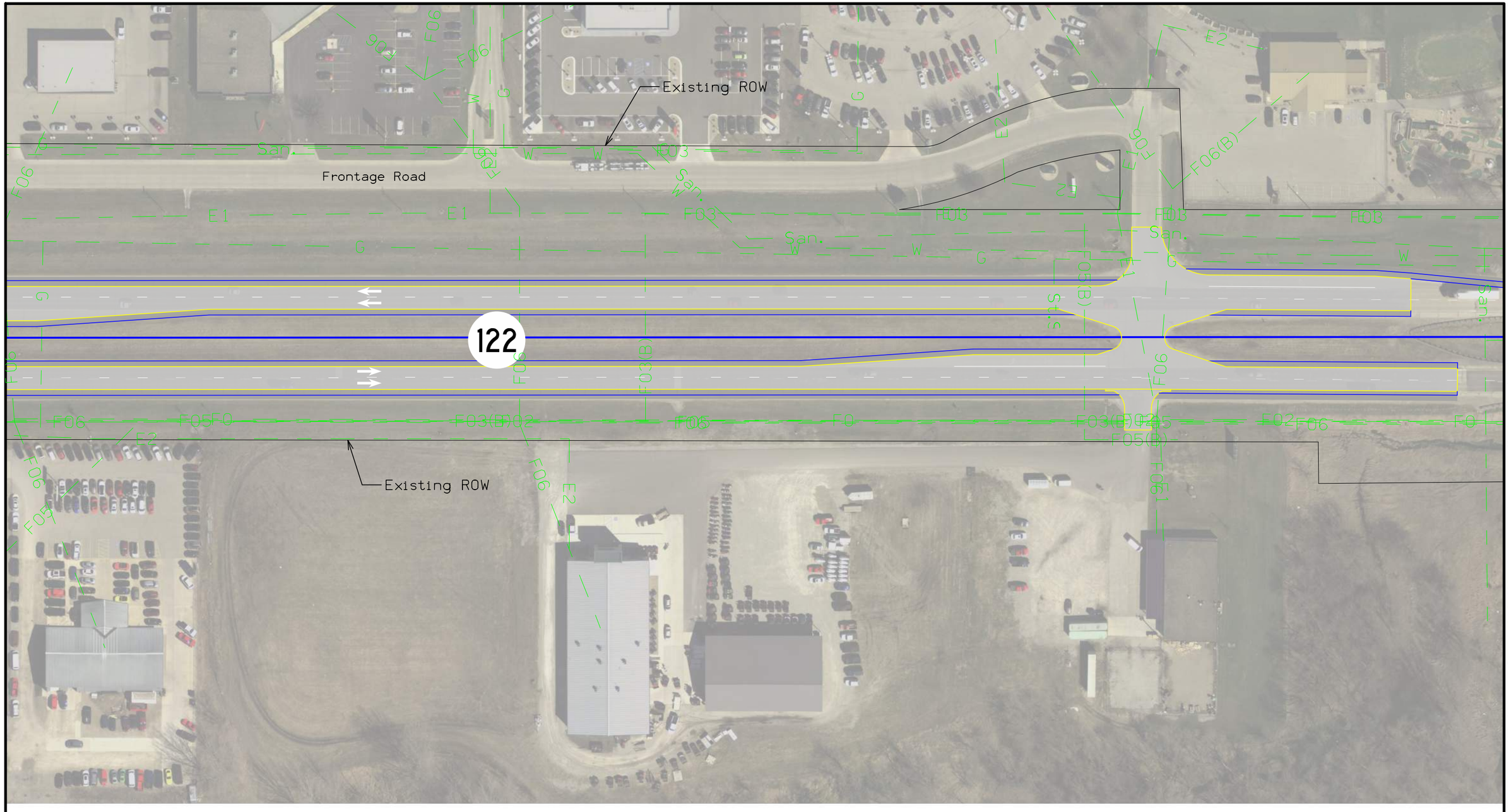
Proposed Direction of Traffic

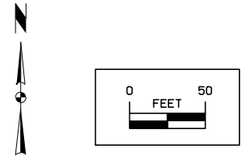
- Proposed Pavement (Roadway or Driveway)
- Proposed Paved Shoulder
- Proposed Median
- Proposed Sidewalk/Trail
- Proposed ROW Acquisition

Roundabout Alternative

FILE NO.	ENGLISH	DESIGN TEAM WHKS & Co.	CERRO GORDO COUNTY	PROJECT NUMBER IA 122 CORRIDOR STUDY	SHEET NUMBER 11

9:16:46 AM 8/30/2022 cholien G:\DEPT\3\9455 - IA Hwy 122 Corridor Feasibility Study\CADD Files\9455_Sheet Displays.dgn





Proposed Direction of Traffic

- Proposed Pavement (Roadway or Driveway)
- Proposed Paved Shoulder
- Proposed Median
- Proposed Sidewalk/Trail
- Proposed ROW Acquisition

Roundabout Alternative

FILE NO.	ENGLISH	DESIGN TEAM WHKS & Co.	CERRO GORDO COUNTY	PROJECT NUMBER IA 122 CORRIDOR STUDY	SHEET NUMBER 12

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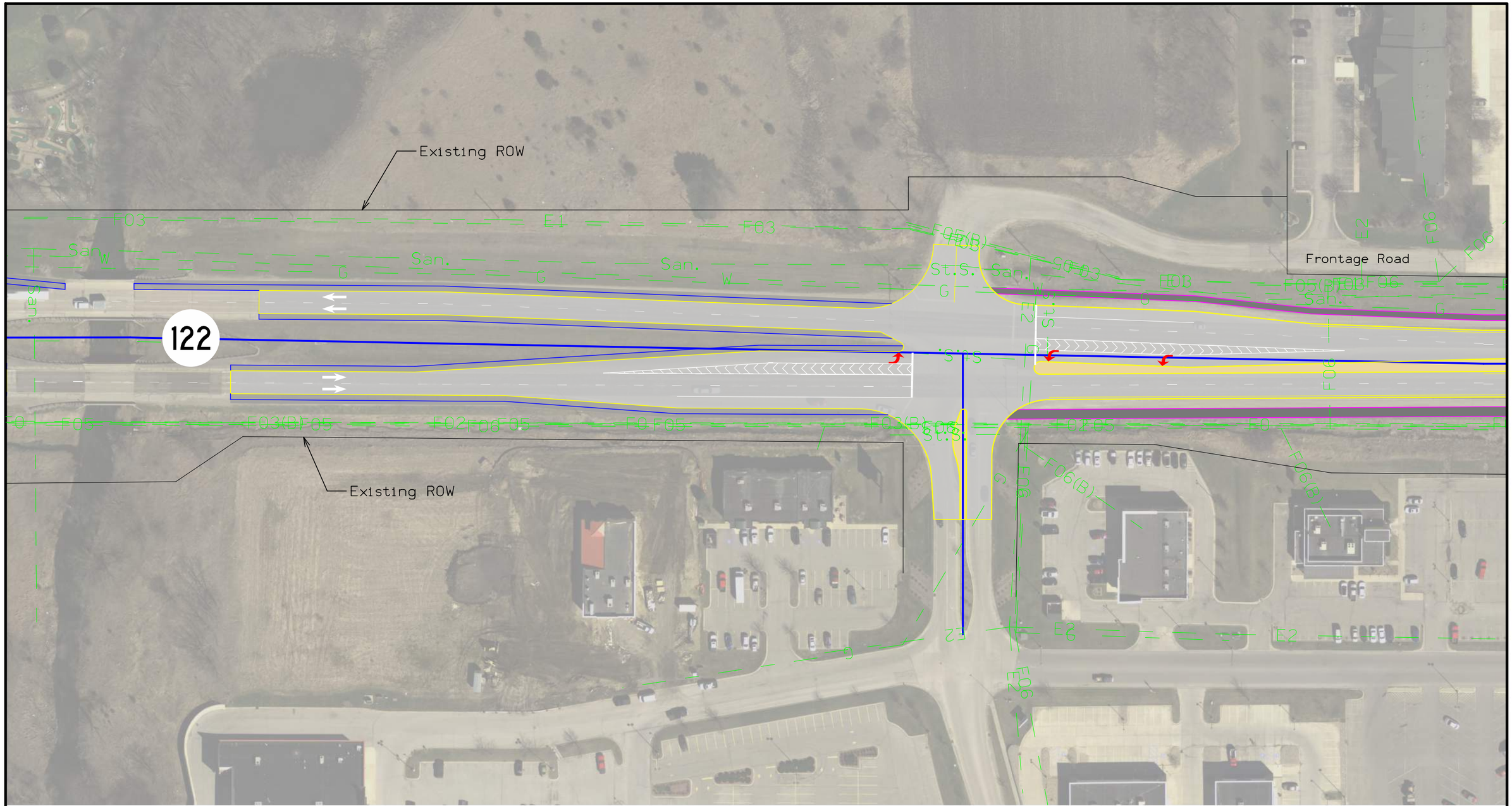

N

0 FEET 50

Proposed Direction of Traffic

Proposed Pavement (Roadway or Driveway)

Proposed Paved Shoulder

Proposed Median

Proposed Sidewalk/Trail

Proposed ROW Acquisition

Roundabout Alternative

FILE NO.	ENGLISH	DESIGN TEAM WHKS & Co.	CERRO GORDO COUNTY	PROJECT NUMBER IA 122 CORRIDOR STUDY	SHEET NUMBER 13

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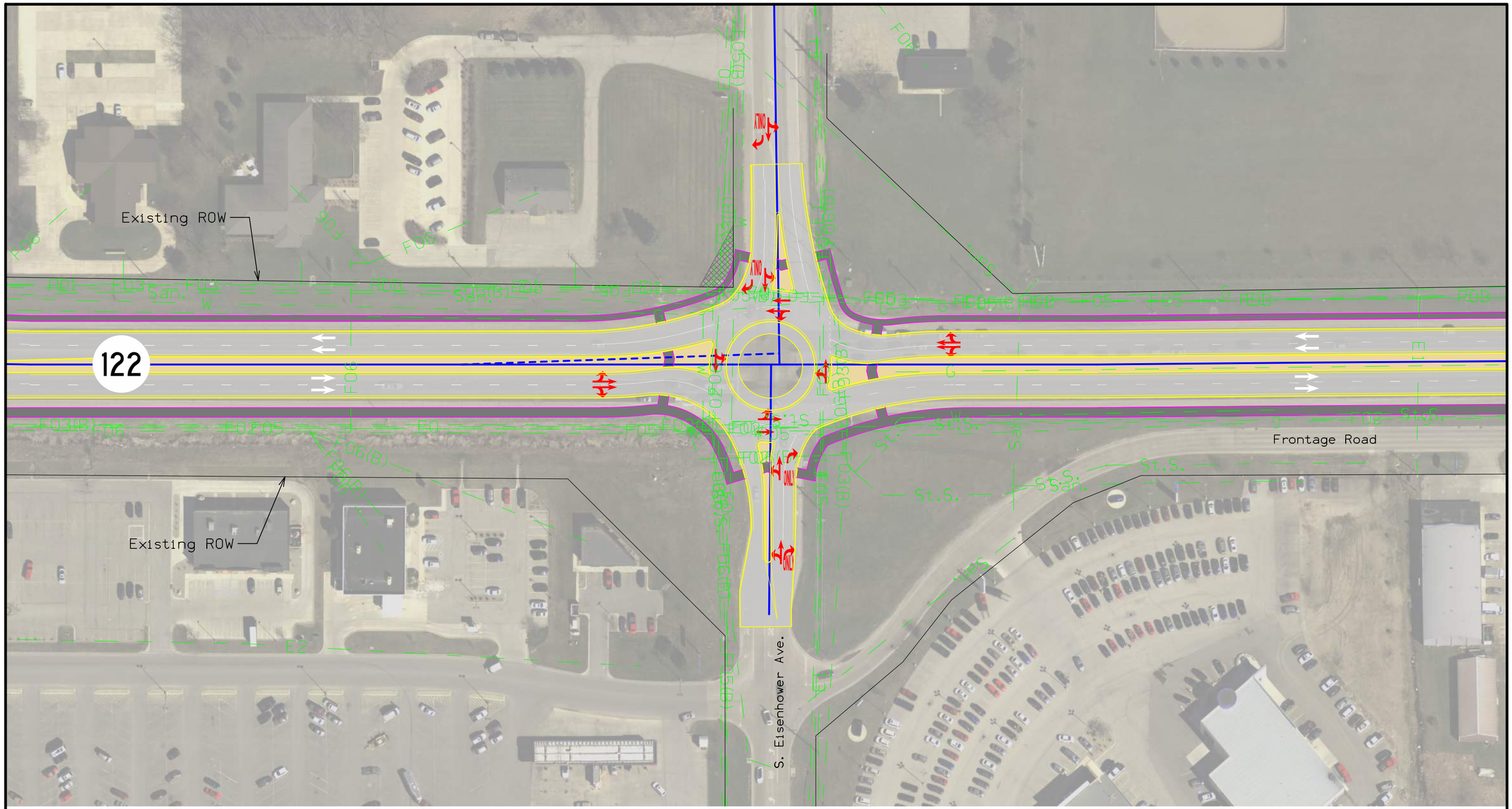


N

0 50 FEET

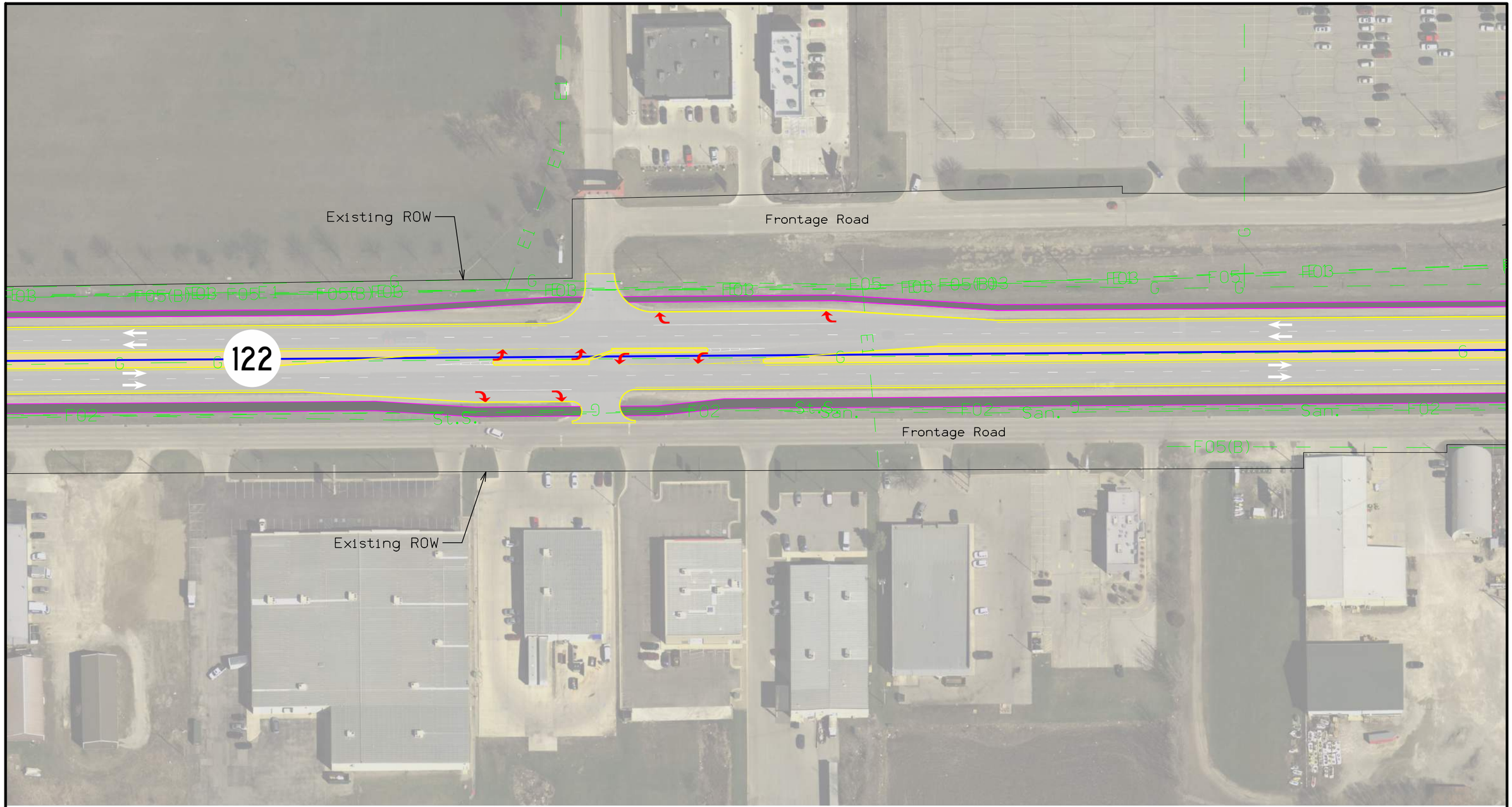
Proposed Direction of Traffic

- Proposed Pavement (Roadway or Driveway)
- Proposed Paved Shoulder
- Proposed Median
- Proposed Sidewalk/Trail
- Proposed ROW Acquisition

Roundabout Alternative

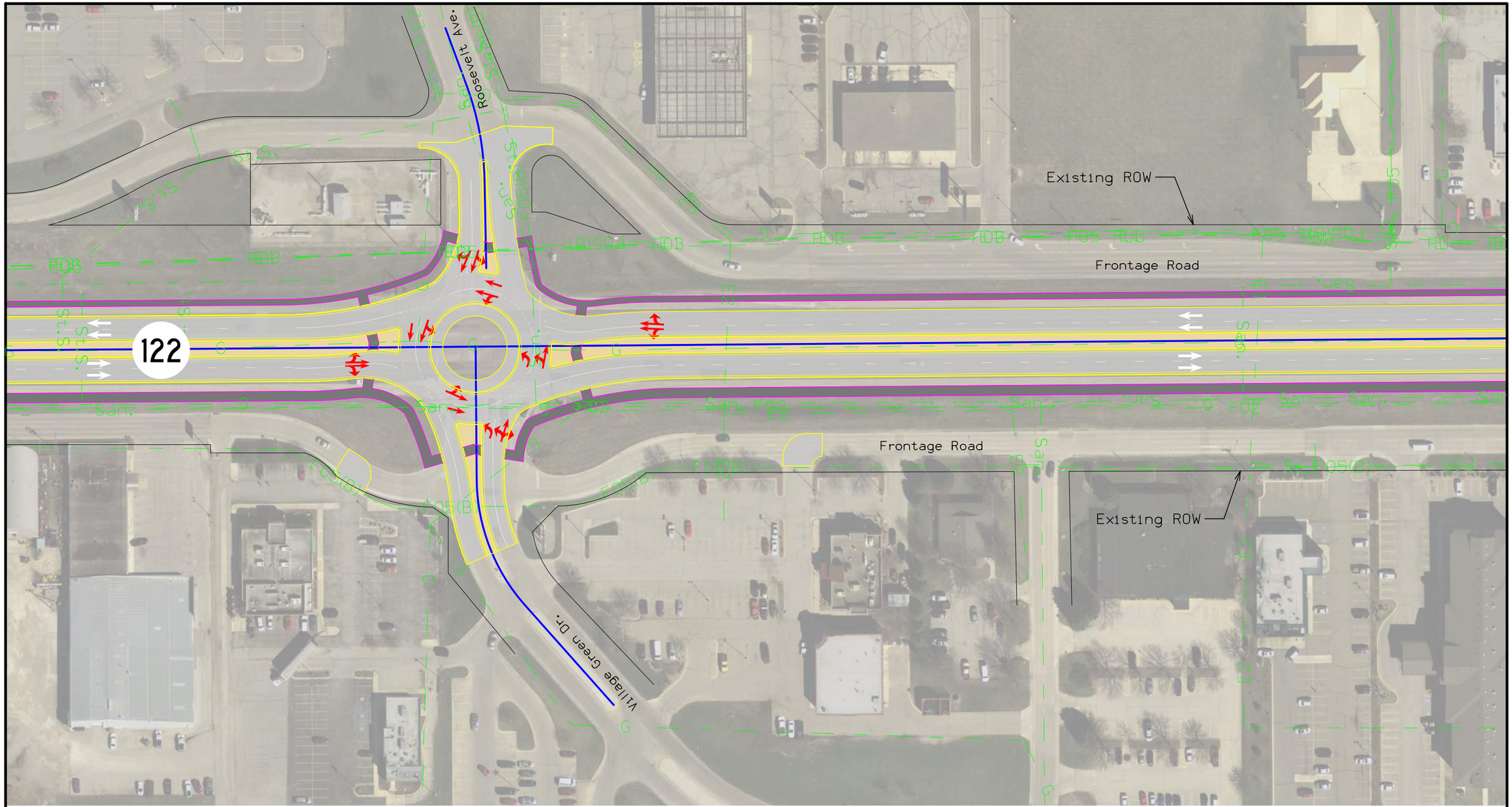
FILE NO.	ENGLISH	DESIGN TEAM WHKS & Co.	CERRO GORDO COUNTY	PROJECT NUMBER IA 122 CORRIDOR STUDY	SHEET NUMBER 14

9:17:08 AM 8/30/2022 cholien G:\DEPT\3\9455 - IA Hwy 122 Corridor Feasibility Study\CADD Files\9455_Sheet Displays.dgn



FILE NO.	ENGLISH	DESIGN TEAM WHKS & Co.	CERRO GORDO COUNTY	PROJECT NUMBER IA 122 CORRIDOR STUDY	SHEET NUMBER 15

9:17:15 AM 8/30/2022 cholien G:\DEPT\3\9455 - IA Hwy 122 Corridor Feasibility Study\CADD Files\9455_Sheet Displays.dgn



0 FEET 50

Proposed Direction of Traffic

Proposed Pavement (Roadway or Driveway)

Proposed Paved Shoulder

Proposed Median

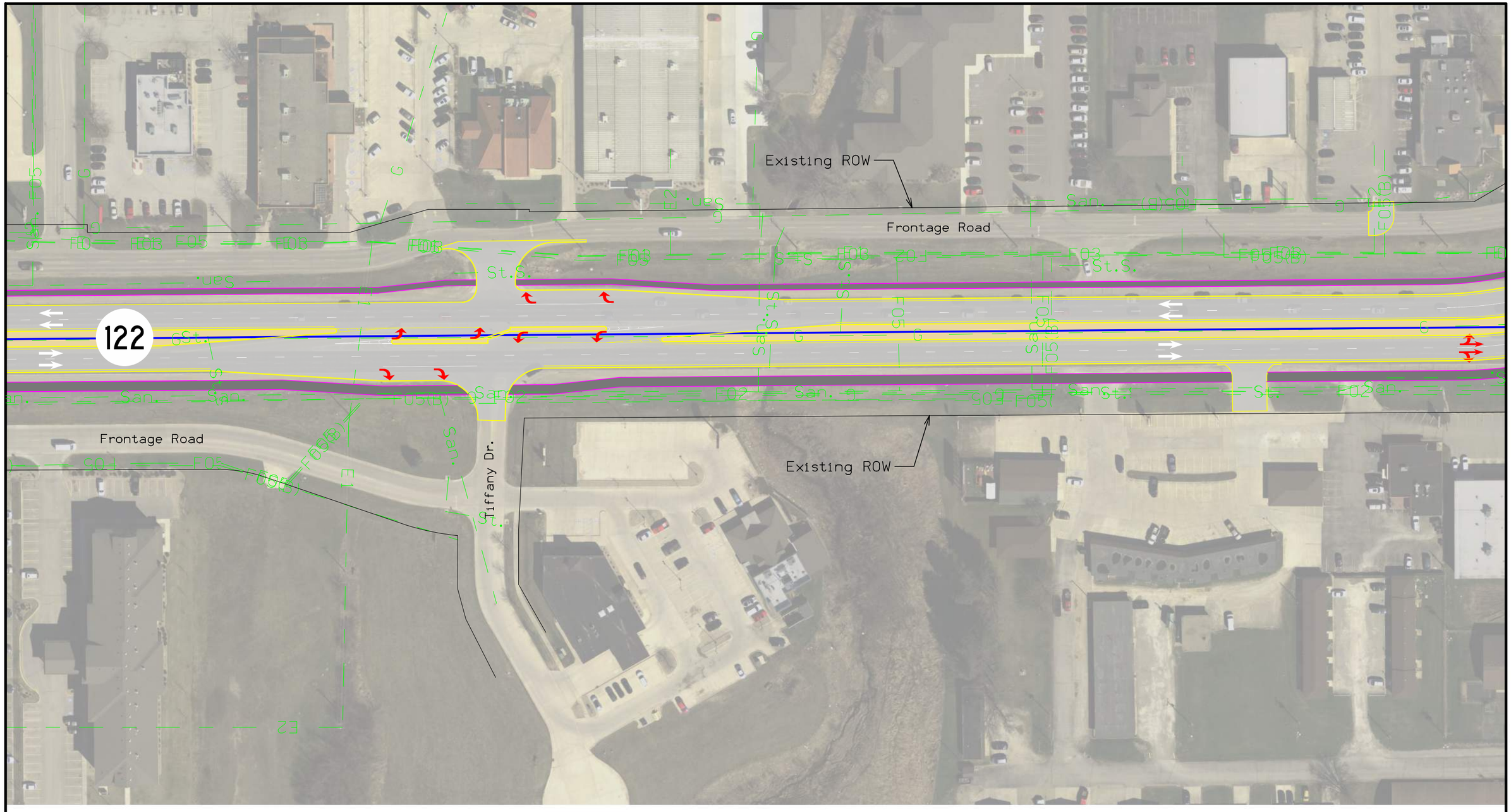
Proposed Sidewalk/Trail

Proposed ROW Acquisition

Roundabout Alternative

FILE NO.	ENGLISH	DESIGN TEAM WHKS & Co.	CERRO GORDO COUNTY	PROJECT NUMBER IA 122 CORRIDOR STUDY	SHEET NUMBER 16

9:17:22 AM 8/30/2022 cholien G:\DEPT\3\9455 - IA Hwy 122 Corridor Feasibility Study\CADD Files\9455_Sheet Displays.dgn



Proposed Direction of Traffic

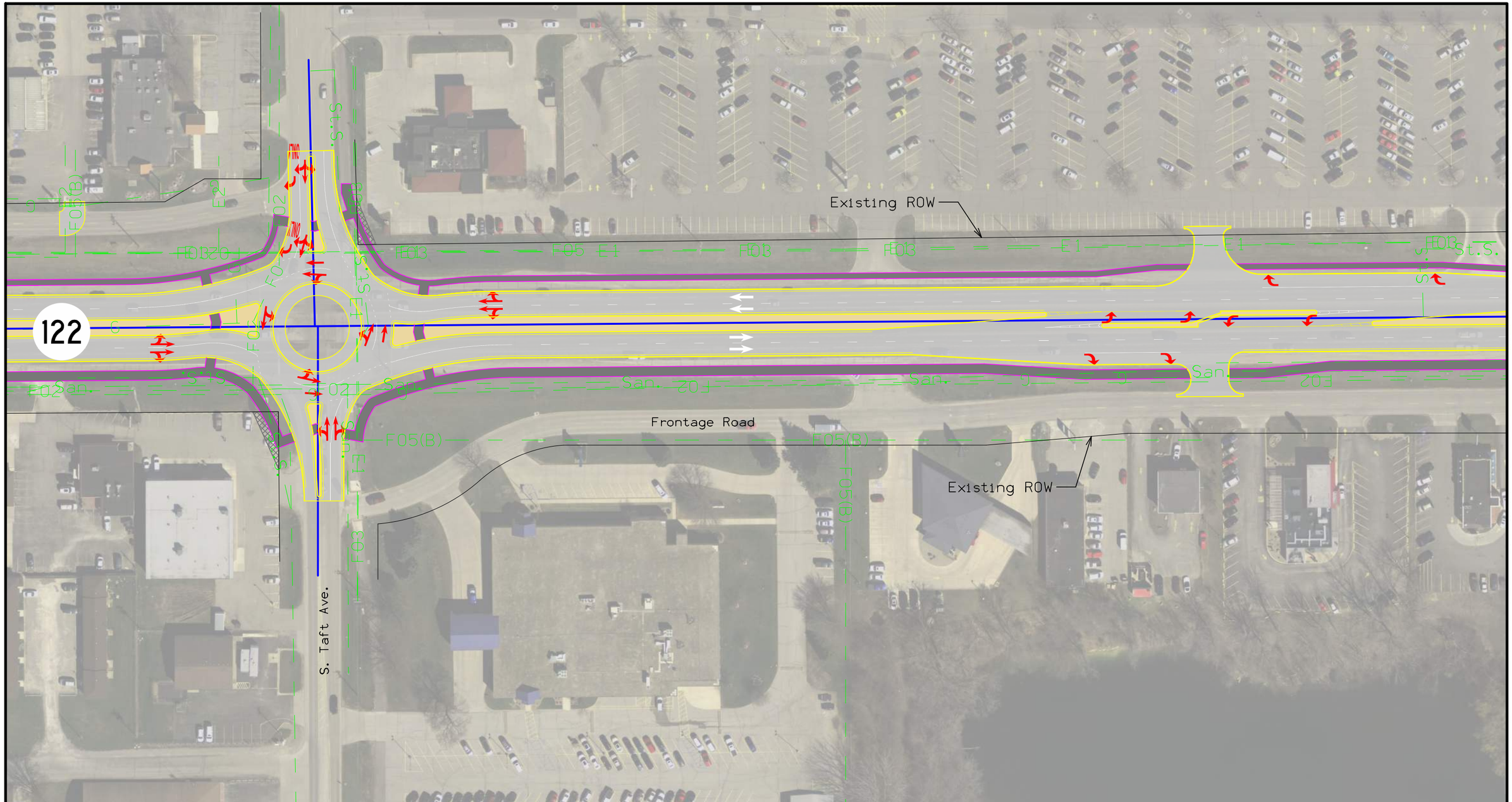
0 FEET 50

- Proposed Pavement (Roadway or Driveway)
- Proposed Paved Shoulder
- Proposed Median
- Proposed Sidewalk/Trail
- Proposed ROW Acquisition

Roundabout Alternative

FILE NO.	ENGLISH	DESIGN TEAM WHKS & Co.	CERRO GORDO COUNTY	PROJECT NUMBER IA 122 CORRIDOR STUDY	SHEET NUMBER 17

9:17:29 AM 8/30/2022 cholien G:\DEPT\3\9455 - IA Hwy 122 Corridor Feasibility Study\CADD Files\9455_Sheet Displays.dgn



N

0 FEET 50

Proposed Direction of Traffic

- Proposed Pavement (Roadway or Driveway)
- Proposed Paved Shoulder
- Proposed Median
- Proposed Sidewalk/Trail
- Proposed ROW Acquisition

Roundabout Alternative

FILE NO.	ENGLISH	DESIGN TEAM WHKS & Co.	CERRO GORDO COUNTY	PROJECT NUMBER IA 122 CORRIDOR STUDY	SHEET NUMBER 18

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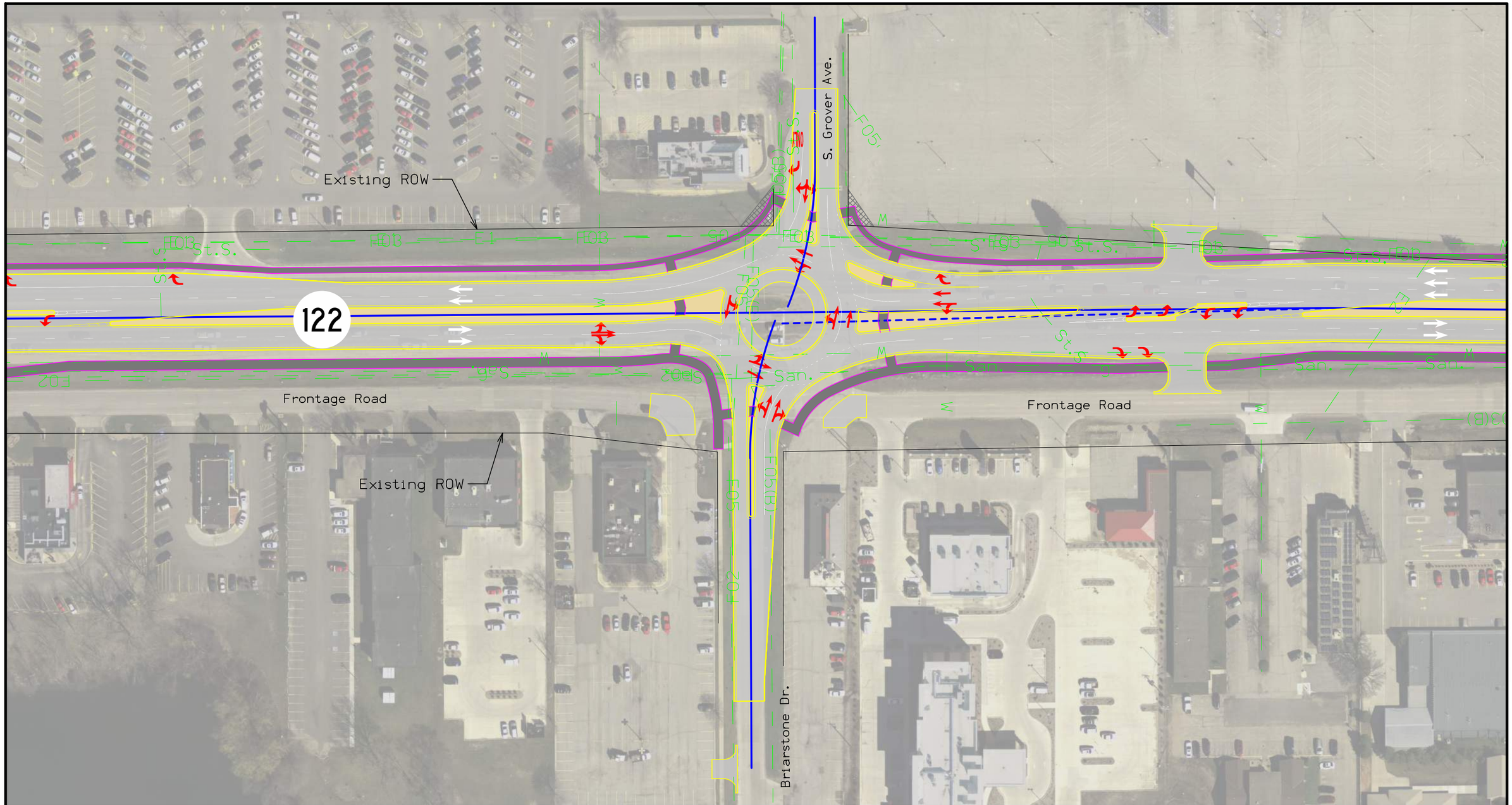


Proposed Pavement (Roadway or Driveway)

Proposed Paved Shoulder

Proposed Median

Proposed Sidewalk/Trail

Proposed ROW Acquisition

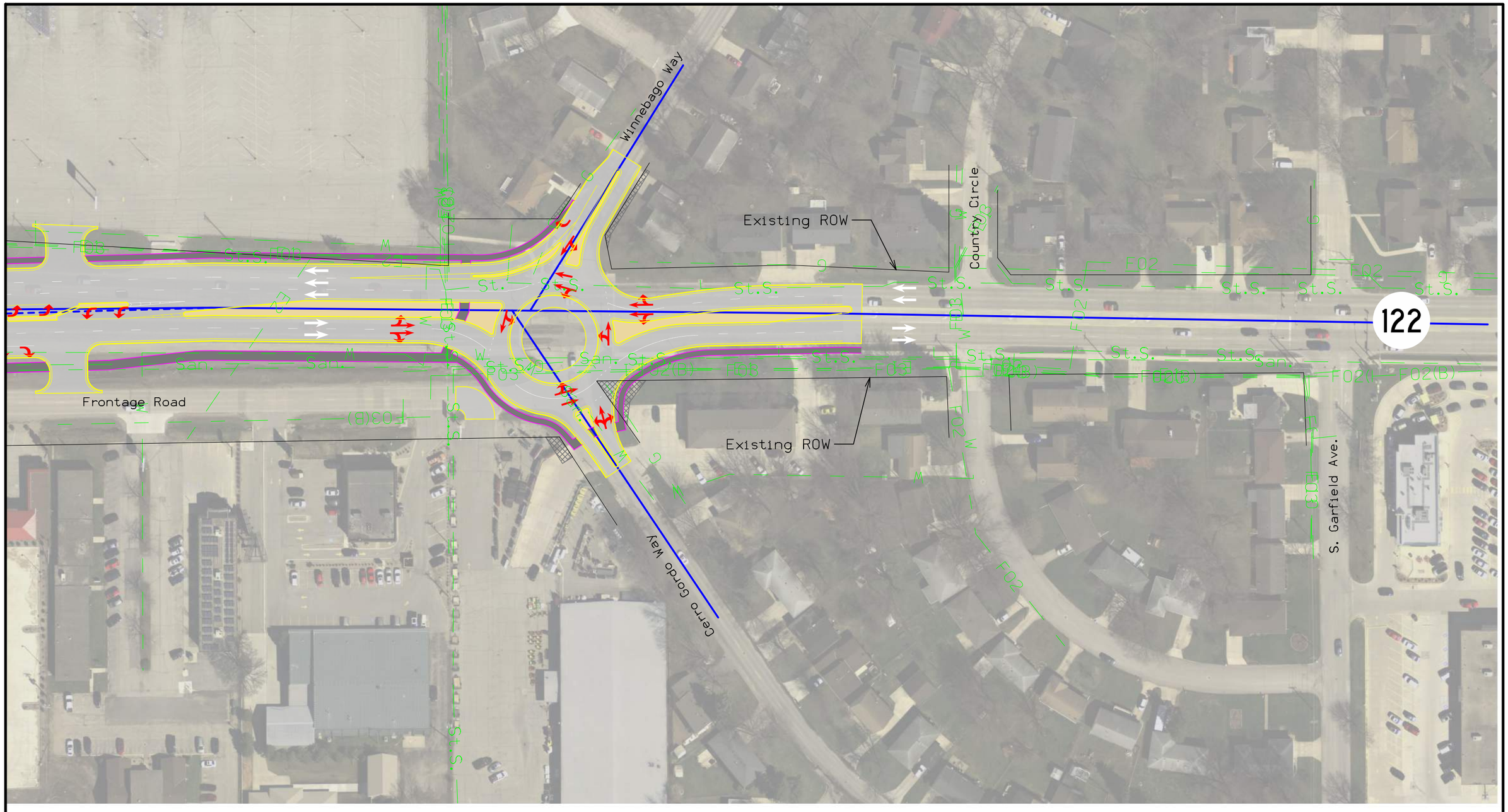
0 FEET 50

Proposed Direction of Traffic

Roundabout Alternative

FILE NO.	ENGLISH	DESIGN TEAM WHKS & Co.	CERRO GORDO COUNTY	PROJECT NUMBER IA 122 CORRIDOR STUDY	SHEET NUMBER 19

9:17:43 AM 8/30/2022 cholien G:\DEPT\3\9455 - IA Hwy 122 Corridor Feasibility Study\CADD Files\9455_Sheet Displays.dgn



N

0 FEET 50

Proposed Direction of Traffic

- Proposed Pavement (Roadway or Driveway)
- Proposed Paved Shoulder
- Proposed Median
- Proposed Sidewalk/Trail
- Proposed ROW Acquisition

Roundabout Alternative

FILE NO.	ENGLISH	DESIGN TEAM WHKS & Co.	CERRO GORDO COUNTY	PROJECT NUMBER IA 122 CORRIDOR STUDY	SHEET NUMBER 20

9:17:50 AM 8/30/2022 cholien G:\DEPT\3\9455 - IA Hwy 122 Corridor Feasibility Study\CADD Files\9455_Sheet Displays.dgn