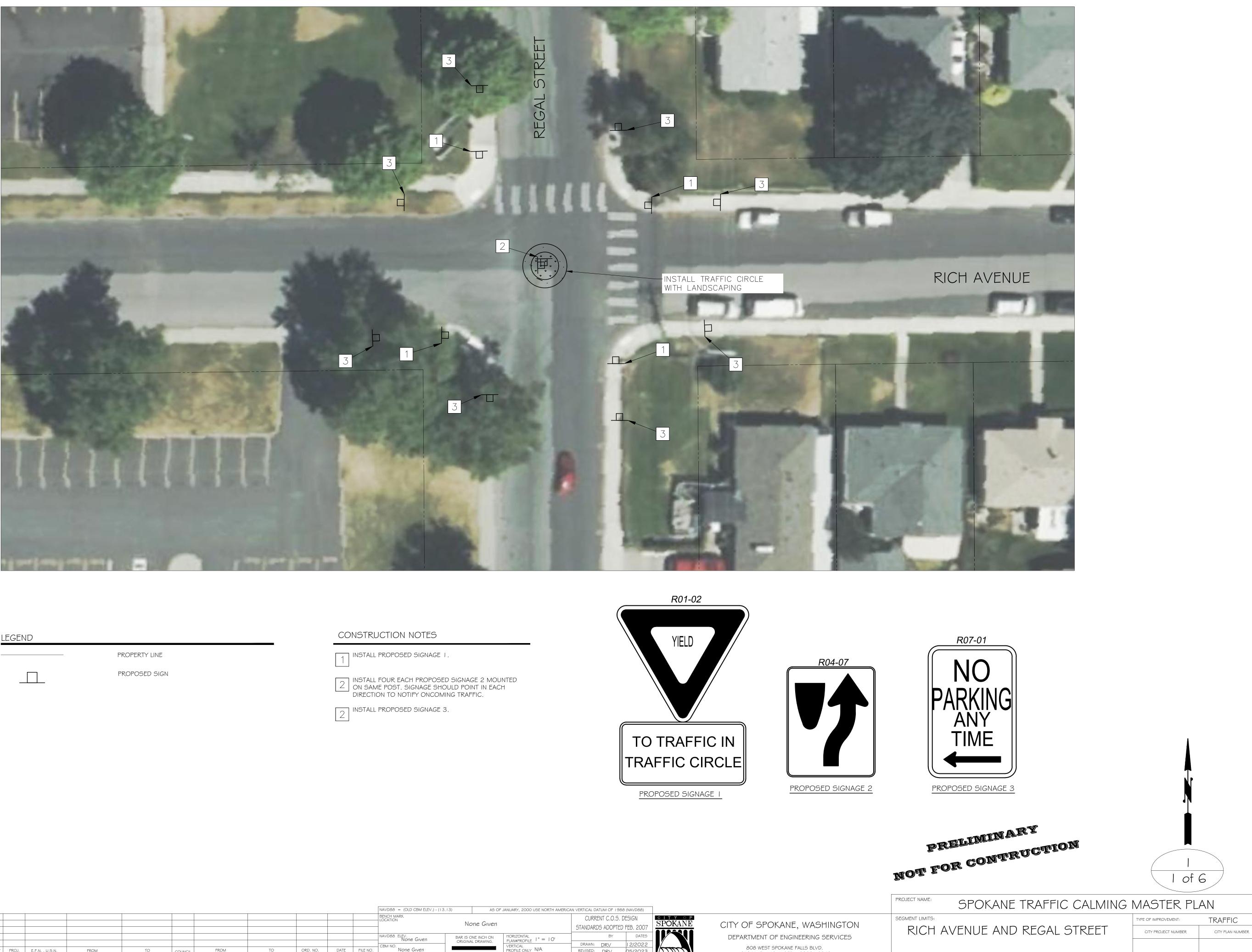
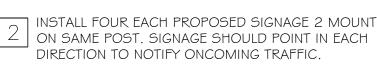
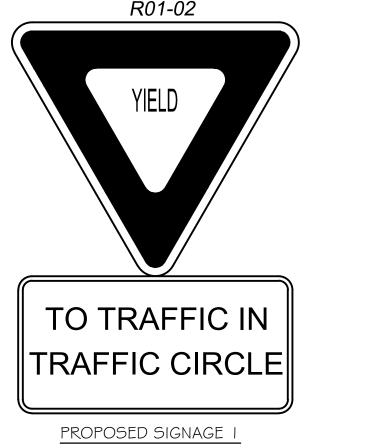
District 1, Bemiss: Rich Avenue and Regal Street Estimate: \$59,000





CONSTRUCTION NOTES	







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808 WEST SPOKANE FALLS BLVD. SPOKANE, WASHINGTON 99201-3343 (509) 625-6700

PROJECT LIMITS:

BEMISS NEIGHBORHOOD

EFN: TRAFFIC DESIGN CALL BEFORE YOU DIG 1-800-424-5555

District:	1
Neighborhood:	Bemiss
Project Extent:	Market Street from Garland Avenue to Illinois Avenue
	Estimate: \$50,000

Problem Statement: Residents of the Bemiss neighborhood raised particular concern regarding sight distance and safety at the Illinois Avenue/Market Street/Greene Street intersection at the south end of the study area. Additionally, residents had concerns over speeding and traffic volumes on Market Street from Garland Avenue to Illinois Avenue (0.7 miles). Market Street is classified as a major arterial through the project area with a speed limit of 35 miles per hour. Southwest of the Market Street intersection, Illinois Avenue is classified as a minor arterial with a 30 mph speed limit, while Greene Street is a major arterial with a 35 mph speed limit. Market Street is currently serving as the primary detour route for north-south traffic from Interstate 90 to US 2 and will continue to have higher than usual traffic volumes until the completion of the North Spokane Corridor project (expected in 2029). There are two traffic signals on the corridor, located at Garland Avenue and Euclid Avenue (0.5 mile spacing).

Traffic Analysis

The table below shows estimated 2022 daily traffic volumes and 85th percentile speeds on Market Street (north of Cleveland Avenue). As shown in the table, there are about 31,000 vehicles per day on Market Street with an 85th percentile speed of 34 mph (1 mph below the speed limit). This is a relatively high daily traffic volume; as a point of reference, the planning level capacity of a four-lane urban arterial is 36,800 vehicles per day (assuming left-turn lanes are provided on the mainline at signalized intersections).¹

Direction	# Lanes	Estimated 2022 Daily Traffic (vehicles per day) ^a	85 th Percentile Speed (mph)	Posted Speed (mph)
NB	2	13,949	34	35
SB	2	16,839	33	35
Both Dir.	4	30,788		

2022 Daily Traffic and 85th Percentile Speeds on Market Street (North of Cleveland Avenue)

^a Traffic data collected on March 21, 2019. Traffic volumes were grown at a 1.0% annual growth rate, to estimate 2022 traffic conditions. A seasonal adjustment factor of 1.02 was applied to the traffic count, based on historical traffic data from the city to estimate average daily traffic.

Particular concerns were identified regarding sight distance and safety at the Illinois Avenue/Market Street/Greene Street intersection at the south end of the corridor. The table below shows the most recent five years of crash data at this intersection. Turning-related crashes represent the most common crash type (40% of all crashes).

¹ *Highway Capacity Manual 6th Edition: A Guide for Multimodal Mobility Analysis.* Page 16-30, Exhibit 16-16. Washington, DC: The National Academies Press.

Crash Type		Total			
	Fatal	Major Injury	Minor Injury	Property Damage Only	TOLAT
Rear End	-	-	2	1	3
Turning	-	-	1	7	8
Sideswipe	-	-	-	4	4
Fixed Object	-	-	2	2	4
Overturned	-	-	-	1	1
Total	-	-	5	15	20

Crashes at Market Street / Illinois Avenue / Greene Street Intersection (2017 to 2021)

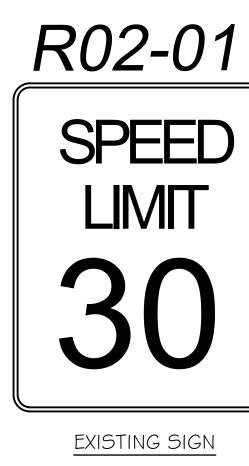
A roundabout at the Illinois Avenue/Market Street/Greene Street intersection could be considered to improve intersection safety; however, this would be a costly project which may not be feasible given the existing intersection grades. A speed feedback sign could be considered on the south leg, for traffic heading southbound from Market Street to Illinois Avenue. This feedback sign would alert drivers that they are leaving a four-lane principal arterial and entering a two-lane minor arterial. Based on speed measurements from 2019, the 85th percentile travel speed on Illinois Avenue is relatively high (39 mph at Cook Street, or 9 mph over the posted speed limit).

In addition, prohibiting the westbound left (from Greene Street to Illinois Avenue) at this intersection may improve intersection safety. However, traffic count data is needed to determine how many vehicles would be impacted by this turn prohibition.

Recommended Solution:

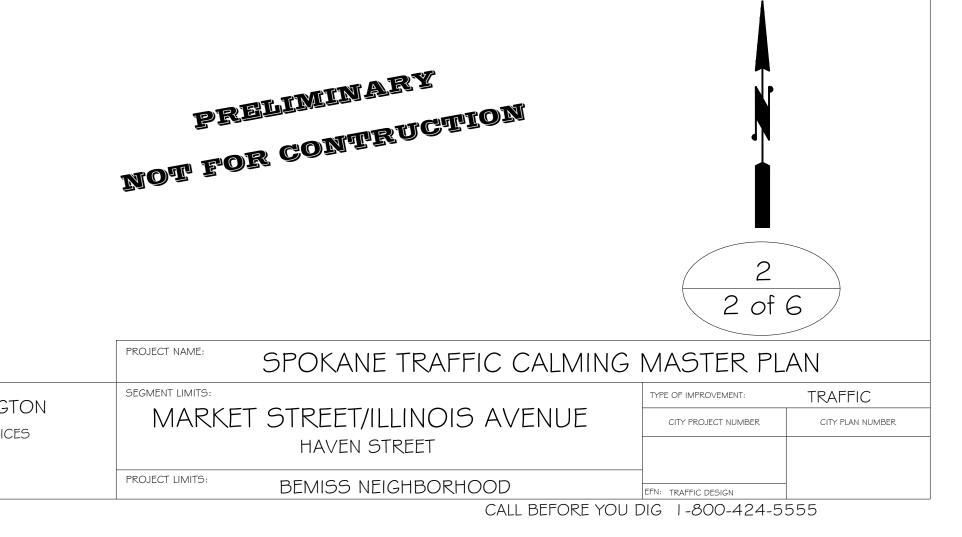
Particular concerns were identified regarding sight distance and safety at the Illinois Avenue/Market Street/Greene Street intersection at the south end of the corridor. A speed feedback sign could be considered on the south leg, to alert drivers that they are leaving a four-lane principal arterial and entering a two-lane minor arterial. In addition, prohibiting the westbound left (from Greene Street to Illinois Avenue) at this intersection may improve intersection safety. It is recommended that a traffic count be conducted to determine how many vehicles would be impacted by this turn prohibition.

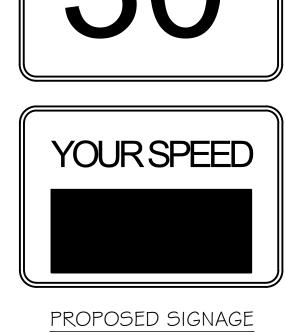




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CITY OF SPOKANE, WASHINGTON DEPARTMENT OF ENGINEERING SERVICES 808 WEST SPOKANE FALLS BLVD. SPOKANE, WASHINGTON 99201-3343 (509) 625-6700





R02-01 SPEED LIMIT

LEGEND

PROPERTY LINE

INSTALL SIGN (SEE PROPOSED)

District:	1
Neighborhood:	Bemiss
Project Extent:	Wellesley Avenue and Crestline Street Intersection
	Estimate: \$62,000

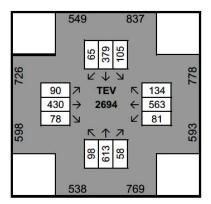
Problem Statement: Residents of the Bemiss neighborhood raised concerns over left-turn queues and safety at the Wellesley Avenue and Crestline Street intersection. Wellesley Avenue is classified as a major arterial with a speed limit of 30 mph. Crestline Street is classified as a minor arterial with a speed limit of 30 mph. The intersection is currently signalized with protected-permitted left-turn phasing on all approaches.



Wellesley Avenue and Crestline Avenue Intersection

Traffic Analysis

The figure below shows the PM peak hour traffic volumes at the Wellesley Avenue and Crestline Street intersection (traffic count conducted on April 10, 2019). Traffic volumes were grown at a 1.0% annual growth rate, to estimate 2022 traffic conditions. A seasonal adjustment factor of 1.02 was applied to the traffic count, based on historical traffic data from the city to estimate the 30th highest hour volume. As shown in the figure, existing left-turn volumes are around 100 vehicles per hour. Queue lengths were examined using Synchro/SimTraffic, revealing that the primary issue may relate to left-turn lanes being blocked by through traffic. Left-turn pocket lengths may need to be increased to resolve this issue. Turn pocket blockage appears to primarily be an issue for the North and South legs due to only having one thru vehicle lane. Therefore, it is recommended that the turn pockets on these legs be extended. Further intersection analysis is recommended to better understand existing operational issues, analyze signal timings, and determine the feasibility of extending left-turn pockets.



PM Peak Hour Traffic at Wellesley Avenue and Crestline Street

The table below shows the severity and types of crashes occurring at the Wellesley Avenue and Crestline Street intersection over the last five years. There were 42 total crashes, including one fatal pedestrian crash, and 17 injury crashes. Turning-related crashes were the most common crash type, making up 45% of all crashes.

Crash Type		Total			
	Fatal	Major Injury	Minor Injury	Property Damage Only	TOLAT
Rear End	-	-	5	8	13
Turning	-	2	6	11	19
Sideswipe	-	-	1	3	4
Fixed Object	-	-	-	2	2
Pedestrian	1	-	3	-	4
Total	1	2	15	24	42

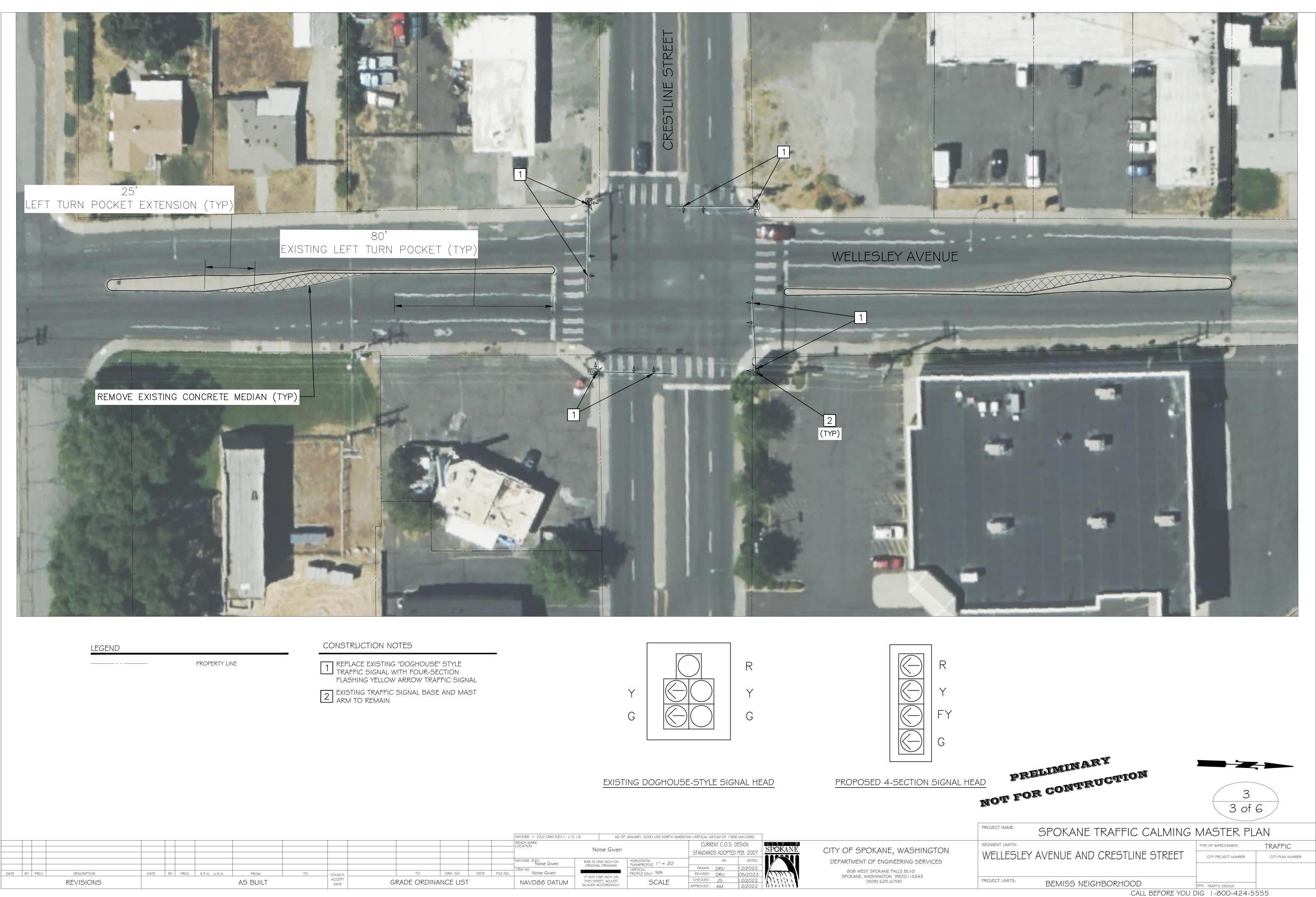
Crashes at Wellesley Avenue and Crestline Street Intersection (2017 to 2021)

Left turn crashes could be reduced by converting the existing "doghouse" style left-turn signal heads to flashing yellow arrow signal heads. According to the Crash Modification Factors Clearinghouse, this upgrade has a crash reduction factor of 16% for left-turning vehicles.¹

Recommended Solution:

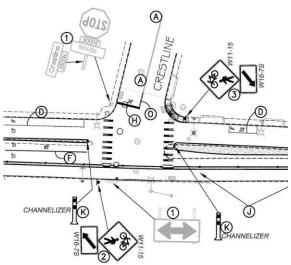
It is recommended that the existing left-turn signal heads at the Wellesley Avenue and Crestline Street intersection be upgraded from "doghouse" style signal heads to flashing yellow arrow signal heads. Additionally, it is recommended that the turn pockets on the north and south legs of the intersection be extended to provide more access to vehicles trying to make left turns. Further intersection analysis is recommended to better understand existing operational issues, analyze existing signal timings, and determine the feasibility of extending left-turn pockets

¹ Crash Modification Factors Clearinghouse, <u>https://www.cmfclearinghouse.org/detail.cfm?facid=7696</u>



District:	1
Neighborhood:	Bemiss
Project Extent:	Illinois Avenue and Crestline Street Intersection
	Estimate: \$186,000

Problem Statement: Residents of the Bemiss neighborhood raised concerns over vehicle and pedestrian safety at the Illinois Avenue and Crestline Street intersection. The main intersection concern was related to the need for enhanced pedestrian crossings treatments across Illinois Avenue. The intersection is currently stop-controlled on Crestline Street, with free-flowing traffic on Illinois Avenue. Both Illinois Avenue and Crestline Street are two-lane facilities, classified as minor arterials, with 30 mph speed limits. The intersection was upgraded in the fall of 2022 through a city project, adding a shared use path on the south side of Illinois Ave and crosswalks and warning signs on the east and west legs (as shown in the figure below).



Illinois Avenue and Crestline Street Intersection (Plans from Recent Upgrade)

Traffic Analysis

The table below shows daily traffic volumes and 85th percentile vehicle speeds on Illinois Avenue at Madella Street and Cook Street (west and east of Crestline Street). This data was collected in 2019, prior to the city intersection upgrade project. The 85th percentile vehicle speeds on Illinois Avenue in 2019 are 39 to 42 mph (9 to 12 mph higher than the 30 mph posted speed limit).

Location	2022 Estimated Daily Traffic (Vehicles per day) ^a	85 th Percentile Speed (mph)	Posted Speed (mph)
Illinois Avenue at Madella Street	6,913	42	30
Illinois Avenue at Cook Street	4,450	39	30

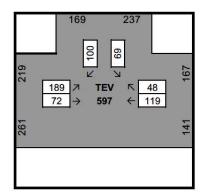
^a Traffic data collected on May 2, 2019. Traffic volumes were grown at a 1.0% annual growth rate, to estimate 2022 traffic conditions. A seasonal adjustment factor of 0.96 was applied to the traffic count, based on historical traffic data from the city to estimate average daily traffic.

The table below shows the severity and types of crashes occurring at the Illinois Avenue and Crestline Street intersection from 2017 through 2021 (prior to the city intersection upgrade project in 2022). There were seven total crashes, with sideswipes representing the most common crash type.

Crash Type		Total			
	Fatal	Major Injury	Minor Injury	Property Damage Only	Total
Rear End	-	-	-	1	1
Left Turn	-	-	1	-	1
Sideswipe	-	-	-	4	4
Guardrail	-	-	1	-	1
Total	-	-	2	5	7

Crashes at Illinois Avenue and Crestline Street Intersection (2017 to 2021)

The figure below shows the existing PM peak hour traffic volumes at the Illinois Avenue and Crestline Street intersection, based on a traffic count from November 16, 2022 (after the city upgrade project had been completed). These volumes were adjusted with a seasonal adjustment factor of 1.05, based on historical traffic data from the city to estimate the 30th highest hour.



PM Peak Hour Traffic at Illinois Avenue and Crestline Street

The need for enhanced pedestrian crossing treatments (across Illinois Avenue) was analyzed based on the National Cooperative Highway Research Program (NCHRP) Report 562.¹ This report uses four main criteria to identify appropriate crossing treatment: peak hour pedestrian volumes, conflicting vehicle volumes, conflicting vehicle speed, and crossing distance/number of travel lanes to be crossed. No pedestrians were observed crossing Illinois Avenue during the traffic count (data collected between 4:00 and 6:00 PM on November 16, 2022). However, it's worth noting that pedestrian volumes are likely higher during the warmer summer months. Based on NCHRP 562 using volumes and speeds collected from the 2019 counts, rapid rectangular flashing beacons would be recommended if there are 20 or more pedestrian crossings during the peak hour. This recommendation is based primarily due to the high speeds that were observed prior to implementation of the intersection upgrade. If this crossing was evaluated with the posted speeds or speeds below 35 mph the recommendation would be a signed and

¹ NCHRP Report 562: Improving Pedestrian Safety and Unsignalized Crossings. National Cooperative Highway Research Program, 2006. https://nacto.org/wp-content/uploads/2010/08/NCHRP-562-Improving-Pedestrian-Safety-at-Unsignalized-Crossings.pdf

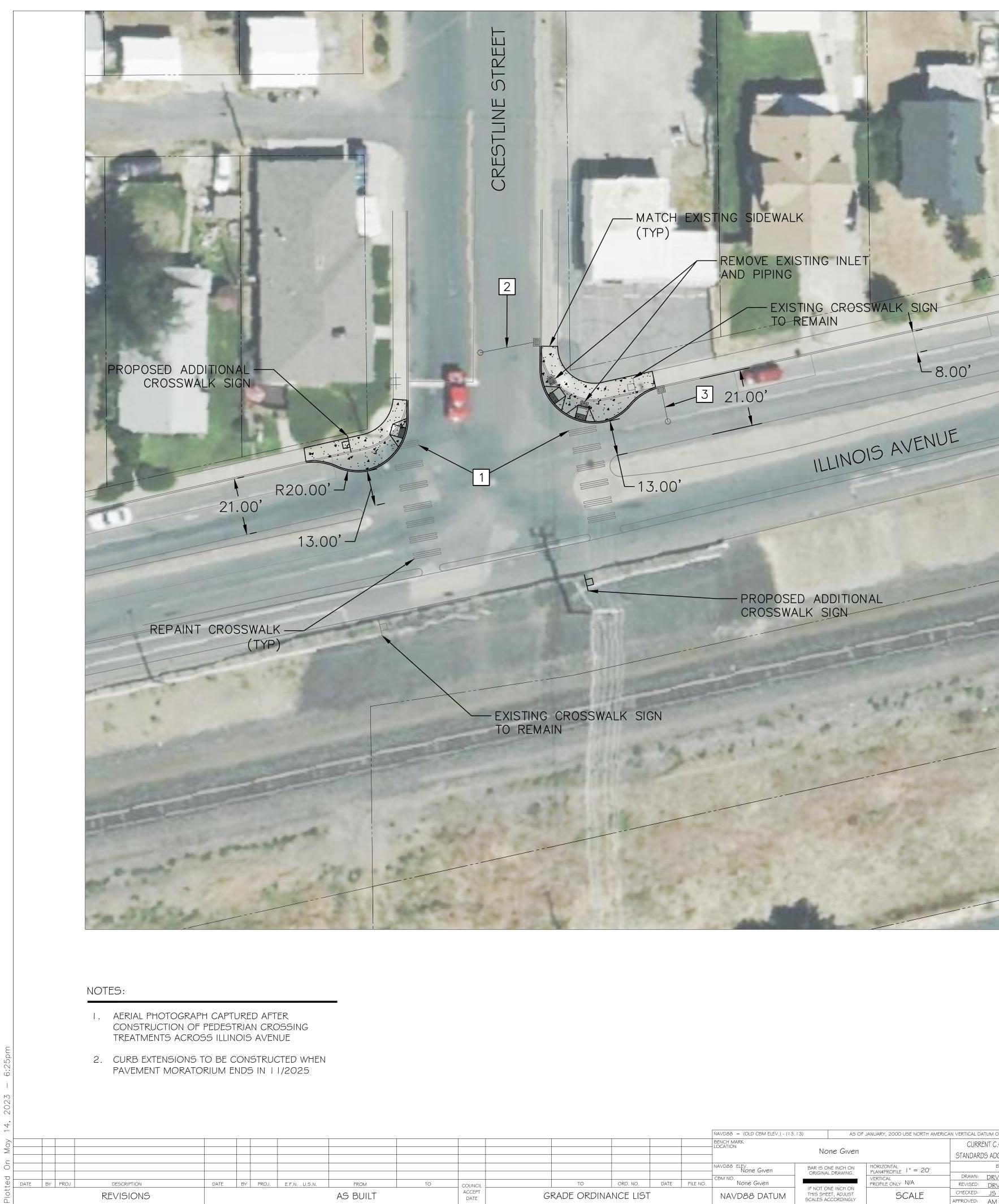
striped crosswalk. It is recommended that pedestrians and vehicle volume and speed data be collected now that treatment has been installed to determine proper crossing treatment.

The crosswalks on the east and west legs currently have only a single pedestrian crossing warning sign (on the right side of the roadway). A second warning sign could be considered on the left side of the roadway (at each crossing), to alert drivers in the opposing direction. Additionally, bumpouts on the north corners should be considered as a mean to additionally lower speeds on Illinois Avenue. However, these upgrades cannot be installed until after the pavement moratorium is up at these corners in November 2025 due to their recent upgrades.

Recommended Solution:

The Illinois Avenue and Crestline intersection was recently upgraded through a city project, adding crosswalks on the east and west legs. These crosswalks currently have only a single pedestrian crossing warning sign (on the right side of the roadway). A second warning sign could be considered on the left side of the roadway (at each crossing), to alert drivers in the opposing direction. It is also recommended that pedestrian volumes as well as vehicle speeds and volumes be recollected now that intersection upgrades have been completed to determine the appropriate crossing treatment.

Curb extensions on the north corners on the intersection should also be considered to lower speeds on Illinois Avenue. These cannot be constructed until November 2025 due to the pavement moratorium.



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CITY OF SPOKANE, WASHING DEPARTMENT OF ENGINEERING SERVICI 808 WEST SPOKANE FALLS BLVD. SPOKANE, WASHINGTON 99201-3343 (509) 625-6700

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	44 	INSTALL NEW CONCRETE SIDEWALK PER COS STD PLAN F-102B		
		INSTALL NEW CURB PER COS STD PLAN F-106B		
	7	INSTALL CURB RAMP PER COS STD PLAN F-105		
		INSTALL CROSSWALK PER COS STD PLAN G-G I		
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 EXISTING CURB
INSTALL SIGN (SEE PROPOSED)
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 INSTALL NEW CURB PER COS STD PLAN F-106B
INSTALL CURB RAMP PER COS STD PLAN F-105

LEGEND

District:	1
Neighborhood:	Bemiss
Project Extent:	Euclid Avenue from Market Street to Crestline Street
	Estimate: \$430,000

Problem Statement: Residents of the Bemiss neighborhood raised concerns over speeding and traffic volumes on Euclid Avenue from Crestline Street to Market Street (0.6 miles). Euclid Avenue is classified as a minor arterial through the project area with a speed limit of 30 mph.

Traffic Analysis

The table below shows estimated 2022 daily traffic volumes and 85th percentile speeds on Euclid Avenue (east of Cook Street). As shown in the table, there are about 12,400 vehicles per day on Euclid Avenue with an 85th percentile speed of 38 mph (8 mph higher than the posted speed limit).

Direction	# Lanes	2022 Estimated Daily Traffic (Vehicles per day) ^a	85 th Percentile Speed (mph)	Posted Speed (mph)	
EB	2	6,439			
WB	2	5,984			
Both Dir.	4	12,423	38	30	

2022 Daily Traffic and 85th Percentile Speeds on Euclid Avenue (East of Cook Street)

^a Traffic data collected on March 21, 2019. Traffic volumes were grown at a 1.0% annual growth rate, to estimate 2022 traffic conditions. A seasonal adjustment factor of 1.02 was applied to the traffic count, based on historical traffic data from the city to estimate average daily traffic.

The table below shows the severity and types of crashes occurring on Euclid Avenue between Crestline Street and Market Street over the last five-years (excluding intersection crashes at the east and west ends). As shown in the table, there were a total of 35 crashes, including 11 injury crashes. Angle collisions were the most common crash type (representing 57% of all crashes).

Create Turne	Crash Severity						
Crash Type	Fatal Major Injury Minor Injury Property Dam		Property Damage Only	Total			
From Opposite Direction	-	-	-	1	1		
Rear End	-	-	1	3	4		
Angle	-	1	7	12	20		
Left Turn	-	-	1	2	3		
Sideswipe	-	-	1	1	2		
Stationary Object or Car	-	-	-	5	5		
Total	0	1	10	24	35		

Crashes on Euclid Avenue, between Crestline Street and Market Street (2017 to 2021)

Given the relatively high 85th percentile speed and the high number of angle crashes, a road diet was considered as means to reduce travel speeds and enhance safety on the Euclid Avenue corridor. With an estimated 12,400 vehicles per day, Euclid Avenue could be reduced to a three-lane cross section with a center two-way left-turn lane. As a point of reference, the planning level capacity of a two-lane urban

arterial is 18,300 vehicles per day (assuming left-turn lanes are provided on the mainline at signalized intersections).¹

A road diet is expected to reduce crashes by 29%, per the Crash Modification Factors Clearinghouse.² A road diet on Euclid Avenue may also result in more uniform travel speeds on the corridor and is expected to reduce the average travel speed by 3 mph.³ Road diets are more successful when implemented on longer stretches of roadway, therefore this lane reduction should continue outside the project extents, to both the west and east (west of Crestline Street, the street name changes from Euclid Avenue to North Foothills Drive). When analyzing the cross section and daily traffic volumes east and west of the study area, it is recommended that the road diet extend 2.6 miles, from North Foothills Drive and Division Street (at the west end) to Euclid Avenue and Freya Street (at the east end). Freya Street is a logical terminus on the east end because Euclid Avenue transitions to a two-lane cross section east of this intersection. Division Street was recommended as the western terminus because North Foothills Drive transitions to a three-lane cross section west of this intersection.

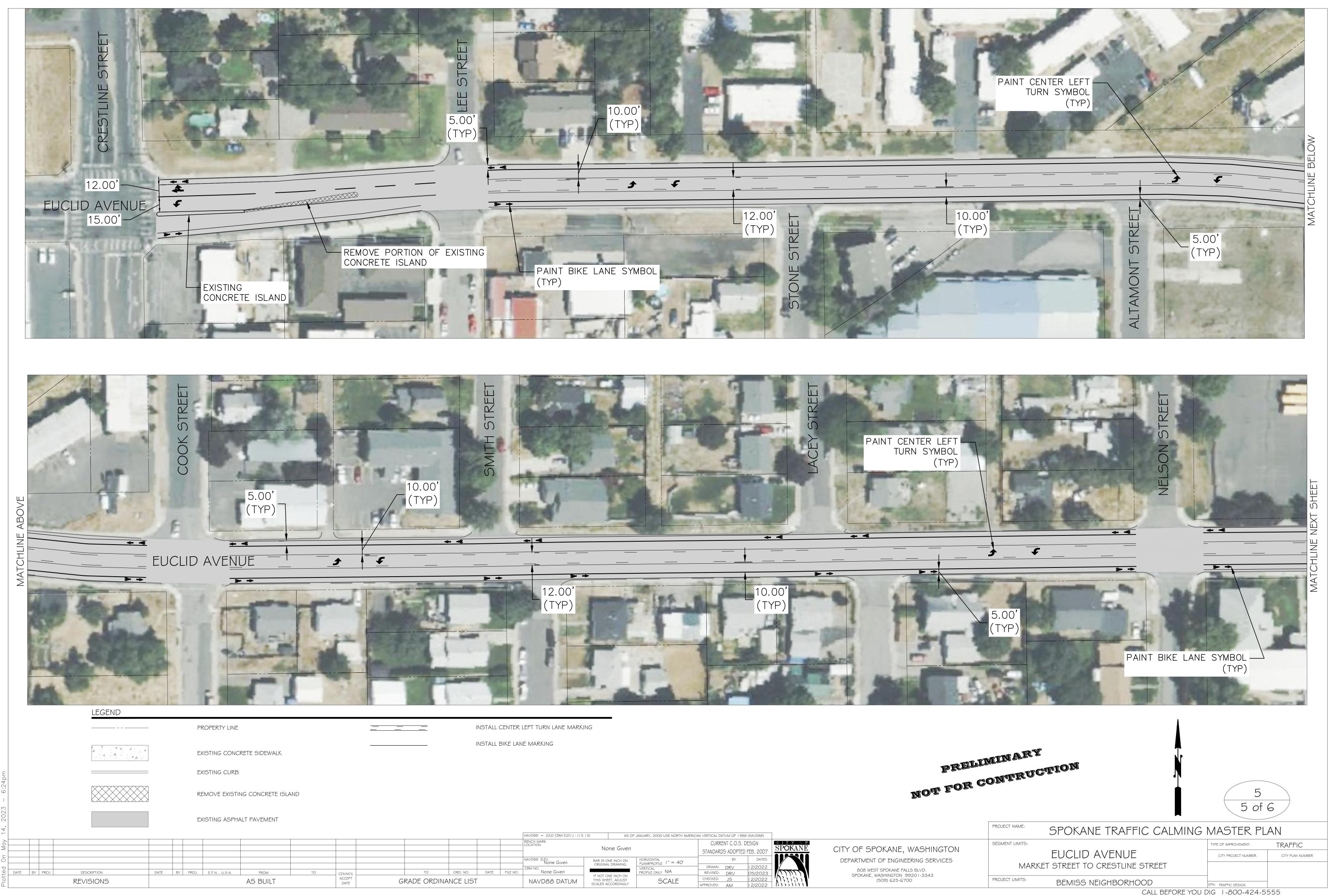
Recommended Solution:

It is recommended that a road diet be considered on Euclid Avenue, reducing the current four-lane cross section to a three-lane cross section with a center turn-lane and bike lanes. The addition of a center turn-lane is expected to reduce crashes, while the lane reduction is expected to reduce vehicle speeds on Euclid Avenue. It is recommended that the City of Spokane further study the expected impacts of the road diet. The road diet can be considered along the 2.6 mile segment from North Foothills Drive and Division Street (at the west end) to Euclid Avenue and Freya Street (at the east end).

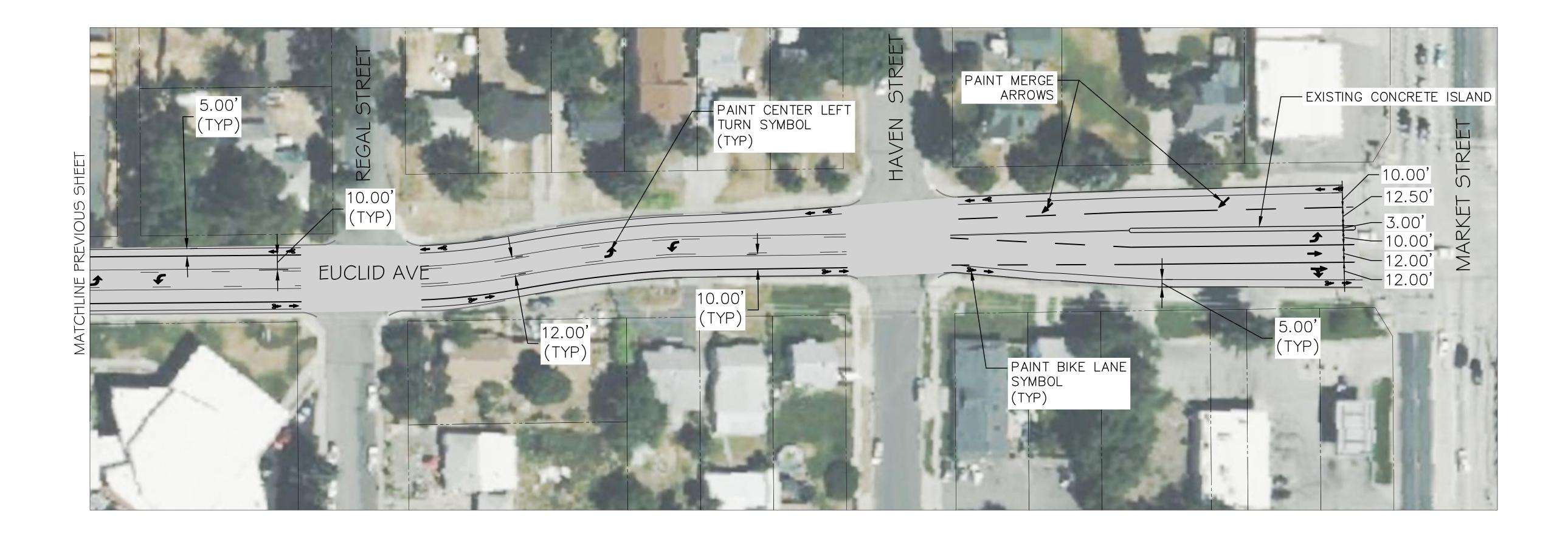
¹ *Highway Capacity Manual 6th Edition: A Guide for Multimodal Mobility Analysis.* Page 16-30, Exhibit 16-16. Washington, DC: The National Academies Press.

² Crash Modification Factors Clearinghouse, <u>https://www.cmfclearinghouse.org/detail.cfm?facid=199</u>

³ Engineering Speed Management Countermeasures: A Desktop Reference of Potential Effectiveness in Reducing Speed. Federal Highway Administration. July 2014.



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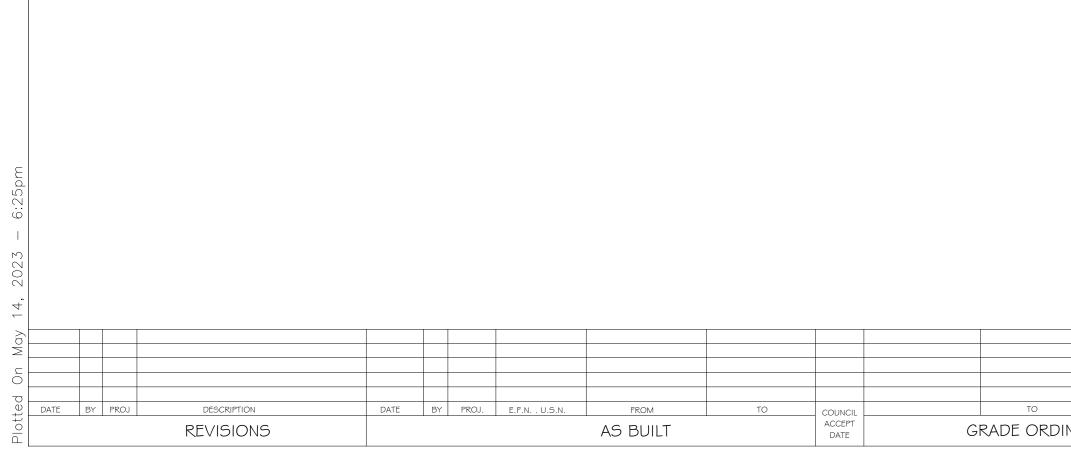
PROPERTY LINE

EXISTING CONCRETE SIDEWALK

EXISTING CURB

EXISTING ASPHALT PAVEMENT

INSTALL CENTER LEFT TURN LANE MARKING INSTALL BIKE LANE MARKING



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