National Transportation Safety Board
Office of Highway Safety
Washington, DC 20594

HWY23FH008

CONSOLIDATED FACTUAL REPORT

Goodyear, Arizona Group Chair's Factual Report

February 15, 2024

Table of Contents

List of Figures

List of Tables

A. CRASH INFORMATION

Location: Goodyear, Maricopa County, AZ
Date: February 25, 2023
Time: 7:55 a.m. mountain standard time (MST)
Vehicle 1: 2019 Ford F-250
Other: 18 Bicycles

B. INVESTIGATION GROUP

Group Chair / IIC	Brian Bragonier National Transportation Safety Board Special Investigations Branch Washington, D.C.
Group Co-Chair	John Humm National Transportation Safety Board Special Investigations Branch Washington, D.C
Group Co-Chair	Eric Gregson National Transportation Safety Board Special Investigations Branch Washington, D.C.
Group Member	Sergeant Curt Raine Goodyear Police Department 14455 W. Van Buren St. Suite E-101 Goodyear, AZ 85338

C. SUMMARY

On Saturday, February 25, 2023, approximately 75-85 bicyclists were engaged in an informally organized weekly ride. The riders departed from a local bicycle store at about 7:30 a.m. mountain standard time (MST) in the city of Goodyear, Maricopa County, Arizona, and traveled towards the Estrella Mountain Range. As a group of 18 bicyclists headed southbound over the Cotton Lane Bridge (6500 block of South Cotton Lane), they were approached from behind by a 2019 Ford F-250 Super Duty SRW 4X2 regular cab XL pickup truck.

The bicyclists were riding in two abreast and single-file formations, primarily on the southbound shoulder. At approximately 7:55 a.m., the pickup truck departed the left lane (Lane 1) and crossed the right southbound lane (Lane 2) and the shoulder before striking the southbound bridge railing. Following the impact, the pickup truck veered left, struck the bicyclists, crossed over both southbound travel lanes, and

stopped in the center median of the roadway. As a result of the crash, two bicyclists were fatally injured, fourteen received injuries ranging from minor to serious, and two were not injured. The pickup truck driver was not injured.

D. DETAILS OF THE INVESTIGATION

1.0 Crash Location

1.1 Highway Construction and Inspection

A daytime inspection of the crash location was conducted on February 27, 2023. Figure 1 shows the scene's location as the red circle at 6500 South Cotton Lane on the Cotton Lane Bridge in Goodyear, Maricopa County, AZ. The crash was approximately one mile south of the intersection of South Cotton Lane and Maricopa County Route 85 (MC-85), at about 33 degrees 23 minutes and 18.5 seconds (33.38847) north latitude and 112 degrees 25 minutes and 28.2 seconds (112.42449) west longitude. Figure 2 shows an aerial view of the crash area on 6500 South Cotton Lane in Goodyear, AZ. The Ford F-250 pickup truck was in the southbound Lane 1. The bicyclists were traveling primarily on the shoulder.

Figure 1: Crash Location

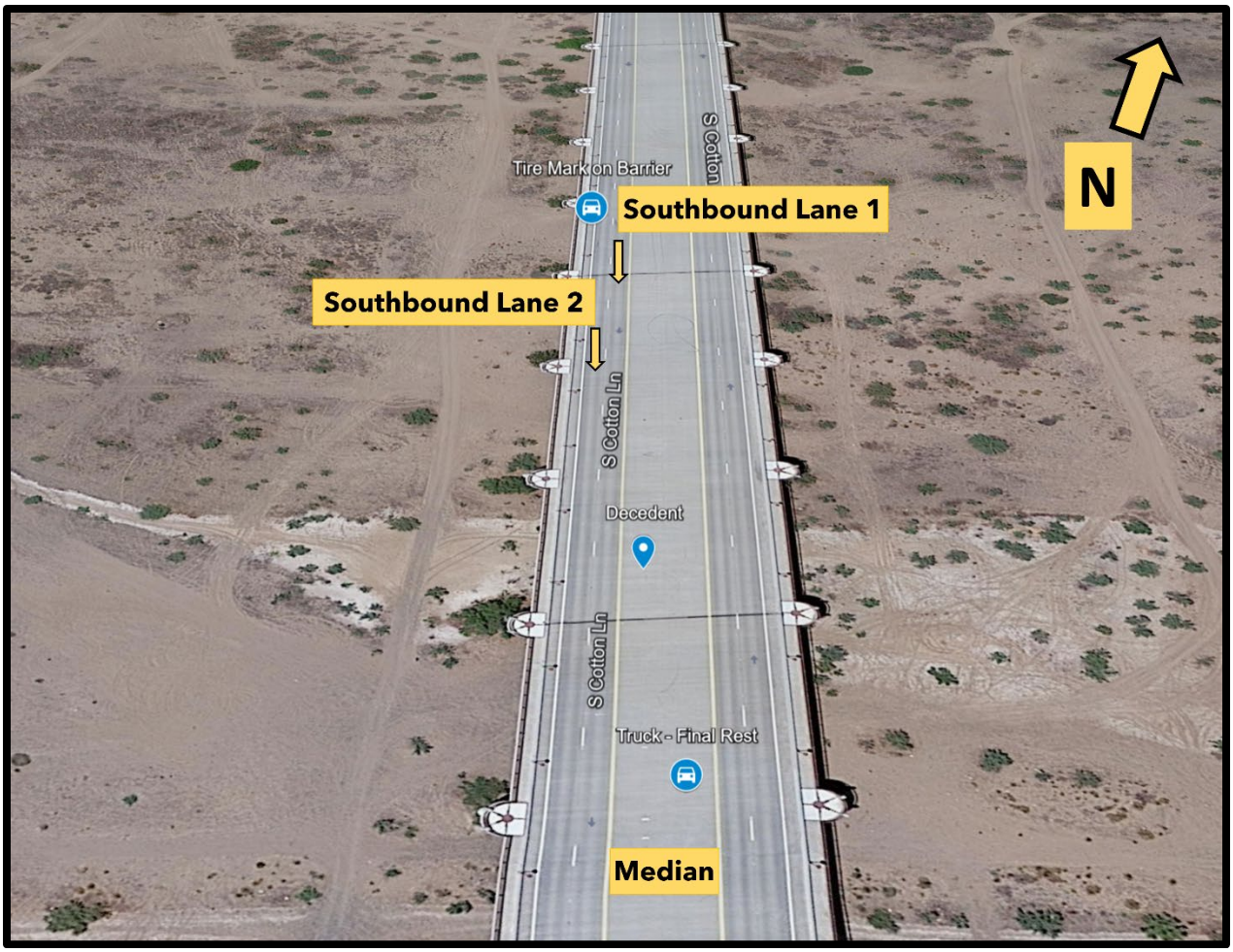

Figure 2: Cotton Lane Bridge
(source modified Google Earth)

The Cotton Lane Bridge was an elevated bridge spanning the Gila River riverbed. It was a 17-span bridge that used 12 lines of the American Association of State Highway and Transportation Officials (AASHTO) Type VI-modified, precast, prestressed concrete girders per span. Each span was approximately 121 feet and 6 inches wide, and the bridge's overall length was 2067 feet. It had two northbound and two southbound travel lanes separated by a large open median identified by double yellow lines on each side. For this report, position on the highway is described using a lane numbering system that is referenced to the direction of travel where Lane 1 is the left lane, and Lane 2 is the right lane (see Figure 2, which shows the southbound Lane 1 and 2 designations on the Cotton Lane Bridge). Adjacent to the outer (Lane 2) lanes of travel was a shoulder marked by a solid white line and a concrete barrier on the right side (relative to the direction of travel).

The 8-inch-thick deck was poured concrete with transverse grooves on the surface (transverse tining), as shown in Figure 3. Further outside the concrete barrier were sidewalks extending along the entire length of the bridge. The concrete barrier protected pedestrians walking on the bridge, redirected vehicles toward the path of

travel, and prevented them from falling off the bridge. The bridge had a low-profile vertical curve whose peak was at the mid-span of the bridge with a vertical rise of 10.5 feet relative to the ends of the bridge. There was minimal lateral curvature. The posted speed limit on the roadway was 45 miles per hour (mph). Light poles extended along both sides of the road and were mounted to the top of the concrete barrier.

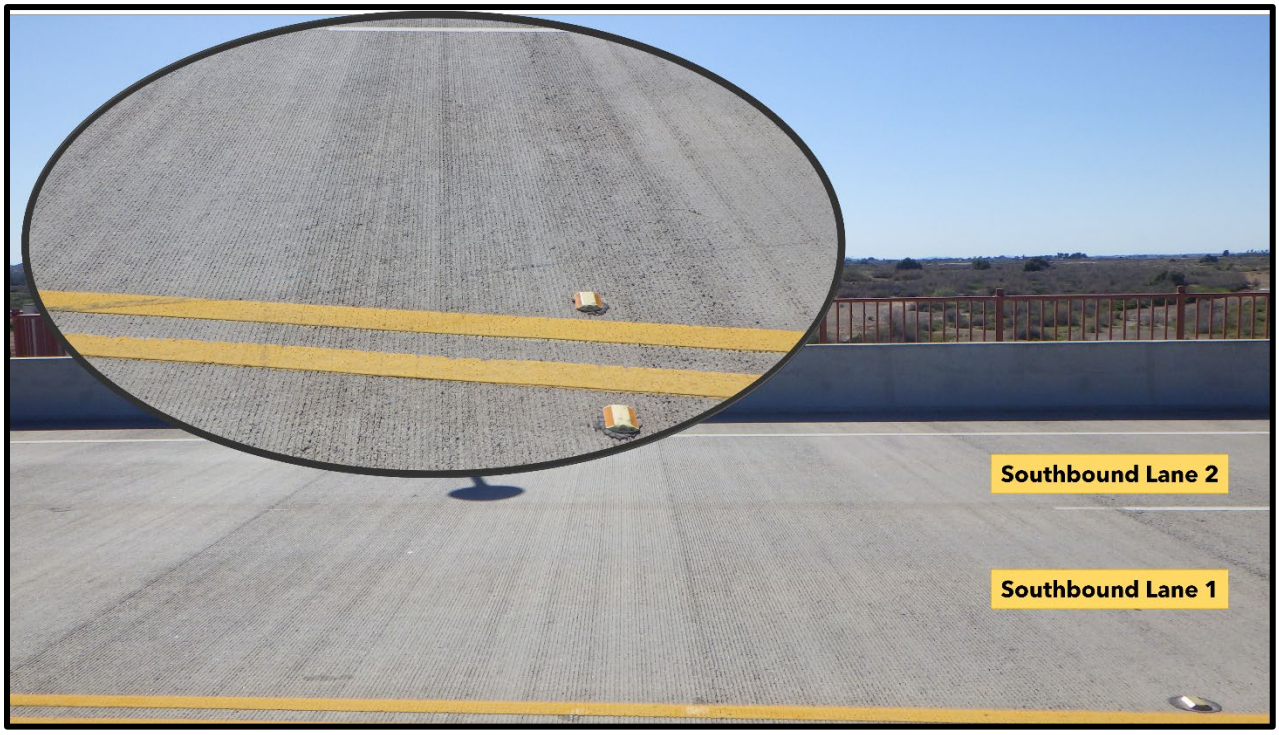

Figure 3: Concrete surface on Cotton Lane Bridge

Highway measurements were obtained at a cross-section of the bridge south of the tire marks on the concrete barrier. The dimensions of the road are summarized in Table 1. The pavement markings on the Cotton Lane Bridge were clear and in good condition. This included the solid double yellow lines between the median and Lane 1, the broken white lane lines between Lane 1 and Lane 2, and the solid white fog line between Lane 2 and the bicycle lane (see Figure 4).

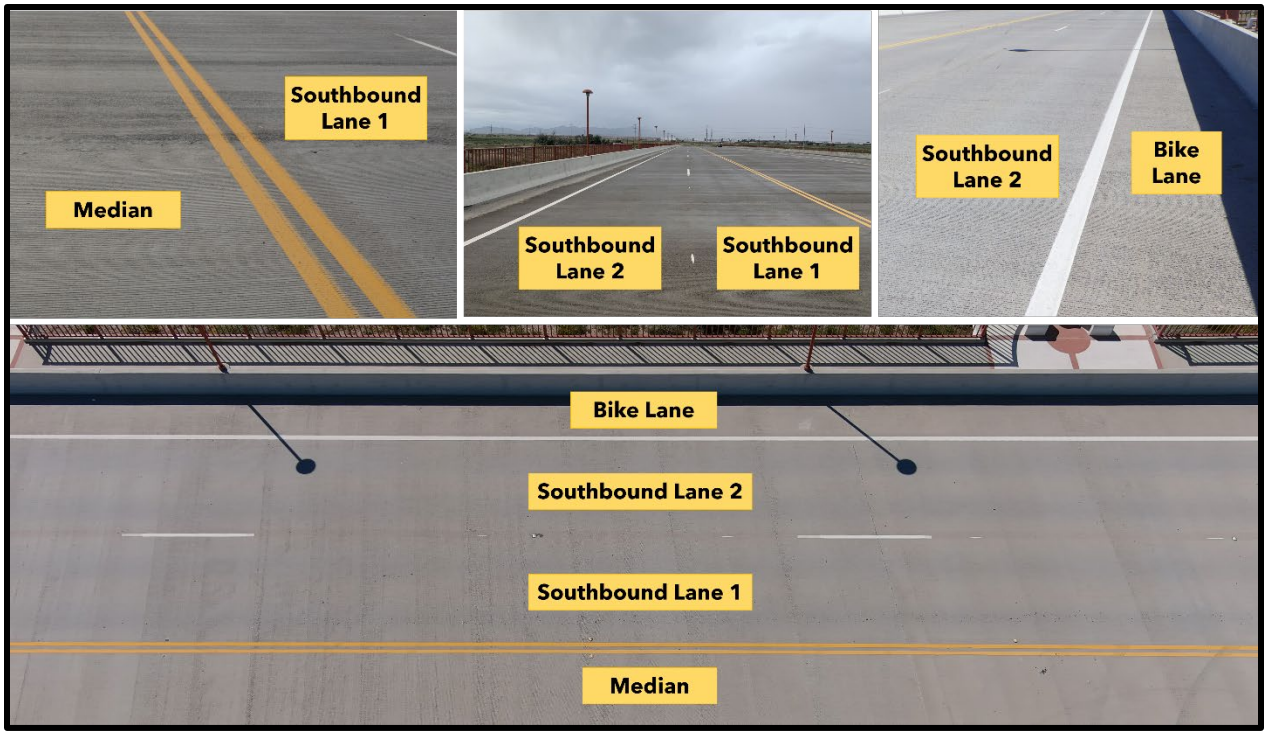

Figure 4: Pavement marking on the Cotton Lane Bridge
(lower picture source GPD)

Table 1: Highway dimensions

Measurement	Dimension	
	Feet	Inches
Sidewalk width (north and southbound)	6	0
Concrete barrier width	0	8
Shoulder width (southbound)	5	6
Shoulder width (northbound)	5	4
Lane width (for each of the four lanes)	11	5
Median width	40	10
Length of broken white lines separating lanes	10	0
Distance between white line stripes	55	4
Distance between light poles	62	0

1.2 Weather

Weather history data were obtained from the Phoenix-Goodyear Airport station (33.4224 N, 112.374 W),[1] approximately two miles from the crash. The data for the last observation before the crash (8 minutes) and the first observation after (52 minutes) are shown in Table 2. Police personnel responding to the scene indicated that the visibility was unlimited, with no rain or condensation on the roadway.

[1] See IEM :: Download ASOS/AWOS/METAR Data (iastate.edu), accessed September 18,2023.

Table 2: Weather observations

	7:47 a.m.	8:47 a.m.
Temperature	51.8° F	51.8° F
Dew Point	37.4° F	39.2° F
Humidity	57.8%	62.0%
Wind	80° from True North	90° from True North
Wind Speed	5 knots	7 knots
Wind Gust	0 knots	0 knots
Pressure	30.01 in	30.01 in
Precipitation	0.0 in	0.0 in
Sky Condition[2]	Scattered	Scattered

Sun data for the South Cotton Lane Bridge on February 25, 2023, is given in Table 3.[3] The sun's position relative to southbound Cotton Lane at the time of the crash is shown in Figure 5.[4]

Table 3: Sun data at crash scene

	Value
Begin Civil Twilight[5]	6:38 a.m.
Rise[6]	7:03 a.m.
Upper Transit[7]	12:43 p.m.
Set	6:23 p.m.
End Civil Twilight	6:48 p.m.
Altitude[8] at 7:55 a.m.	9.6˚
Azimuth[9] at 7:55 a.m.	107.7˚

[2] Sky Condition reported in clear (0-5% sky cover), few (6-25%), scattered (26-50%), broken (51-87%), and overcast (88-100%)

[3] Complete Sun and Moon Data for One Day (navy.mil). Accessed July 19, 2023.

[4] See PD: 3D Sun-Path. Accessed July 19, 2023

[5] Civil twilight is defined as beginning in the morning and ending in the evening when the center of the Sun is geometrically six degrees below the horizon. In the morning before the beginning of civil twilight and in the evening after the end of civil twilight, artificial illumination is normally required to carry on ordinary outdoor activities.

[6] Sunrise and sunset conventionally refer to the times when the upper edge of the disk of the Sun is on the horizon. Atmospheric conditions are assumed to be average, and the location is in a level region on the Earth's surface.

[7] The transit of the Sun is local solar (sundial) noon.

[8] Altitude is the angular distance of a celestial body above or below the horizon, measured along the great circle passing through the body and the zenith.

[9] Azimuth is the angular distance measured eastward along the horizon from a specified reference point (usually north). Azimuth is measured to the point where the great circle determining the altitude of an object meets the horizon.

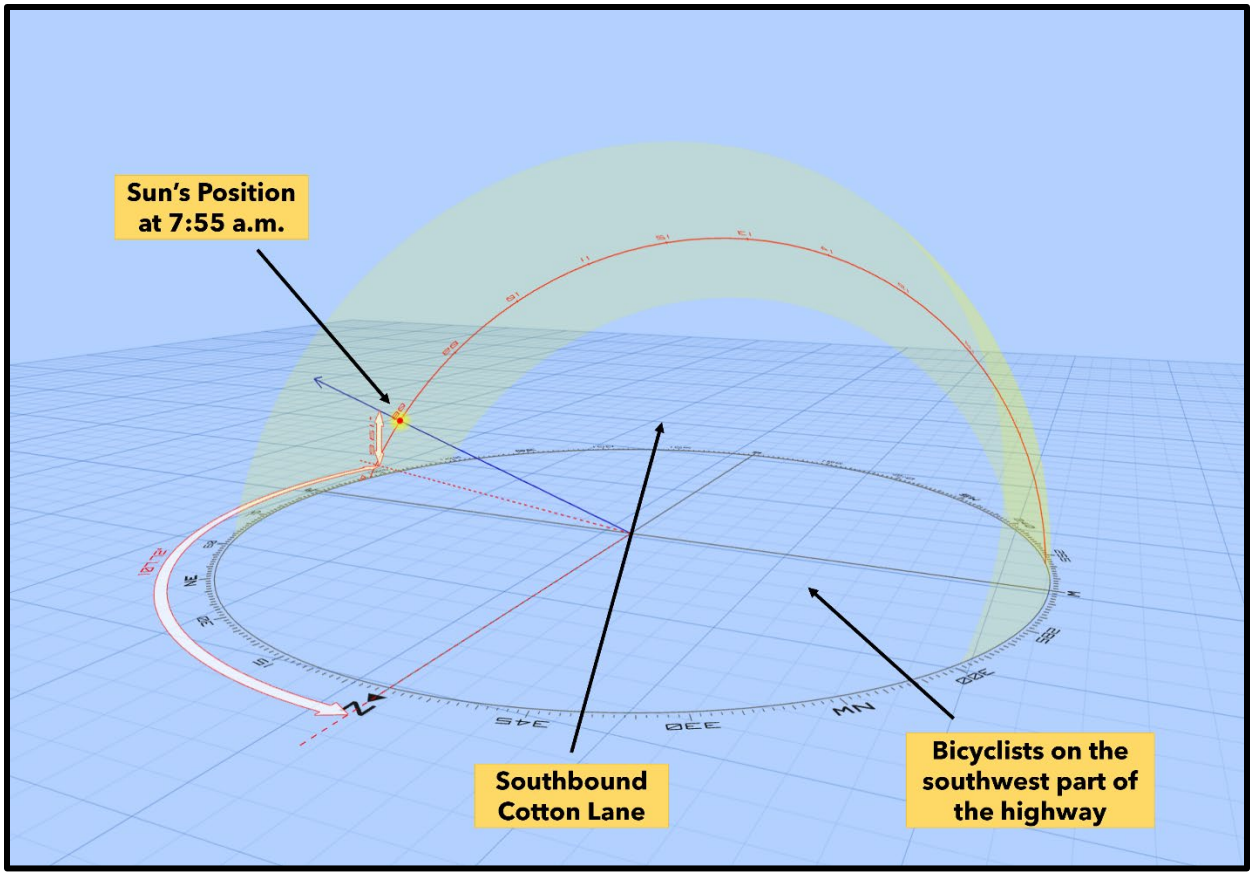

Figure 5: Approximate sun position relative to Cotton Lane at 7:55 a.m.

1.3 Traffic Speed and Volume Study

A traffic speed and volume study was conducted at Cotton Lane between MC-85 and Estrella Parkway for the north- and southbound lanes from Tuesday, January 14, 2020, at 11:00 a.m. to Thursday, January 16, 2020, at 10:00 a.m. [10] The study was conducted in the middle of the week, and the crash occurred on a Saturday.

A summary of the 48-hour study that compares the traffic volume by speed for both travel directions is given in Figure 6. A similar chart is shown in Figure 7 but limited to the hours around the crash (7 to 9 a.m.) during the same 48-hour period (Note the change in scale from Figure 6).

[10] Traffic study data obtained from the City of Goodyear, AZ Traffic and Engineering Department.

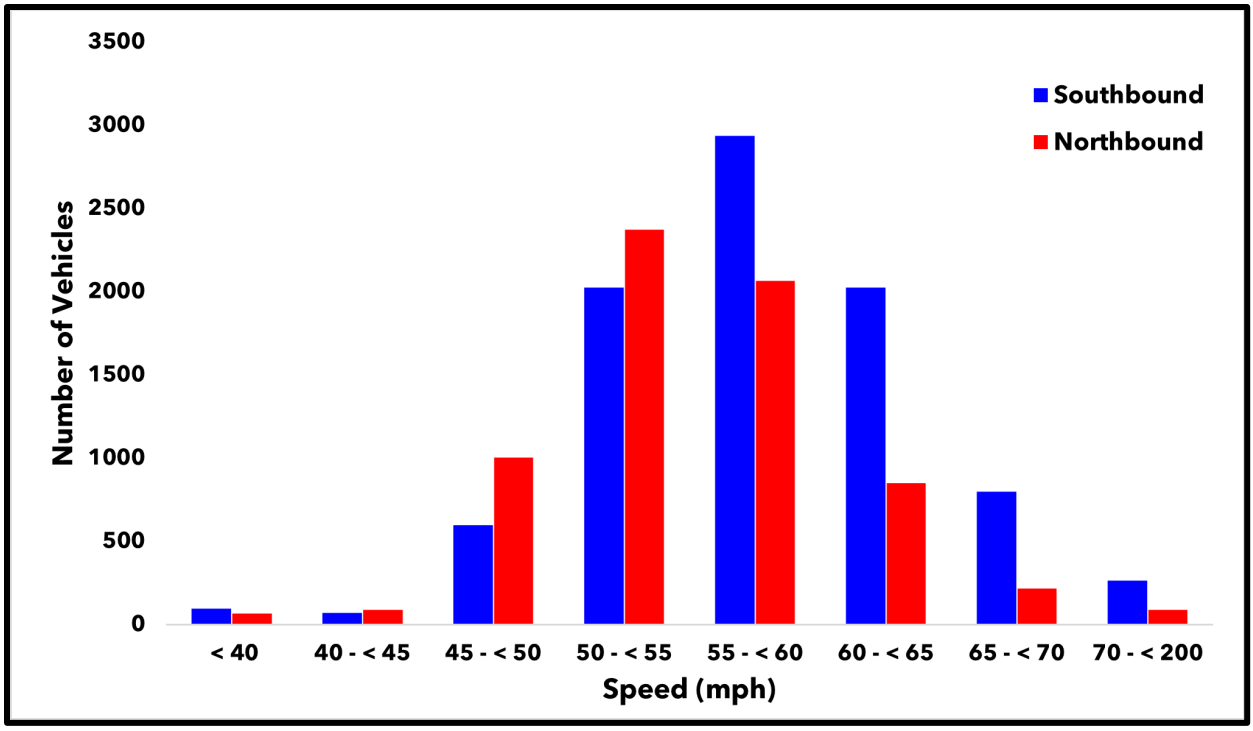

Figure 6: Traffic volume by speed over a two-day period.

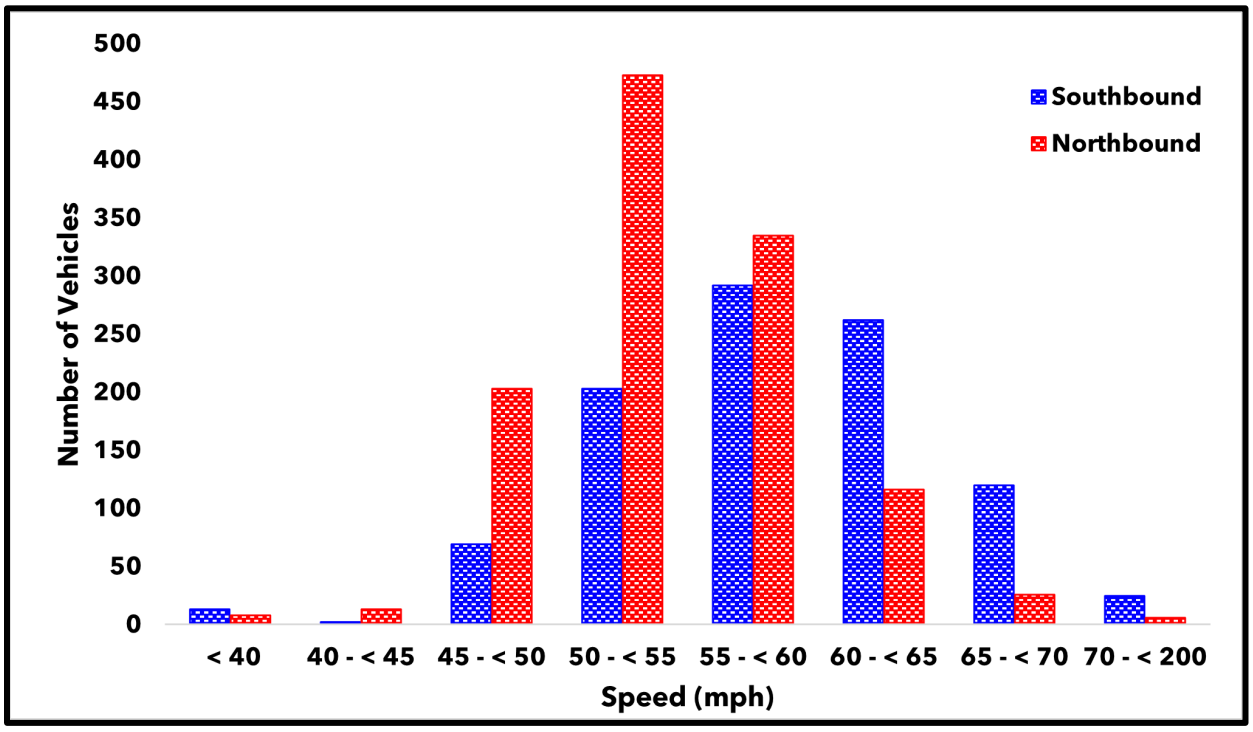

Figure 7: Traffic volume by speed around the crash time.

1.4 Bikeways

The City of Goodyear derived its Engineering Standards[11] for bikeways from the Arizona Bicycle Facilities Planning and Design Guidelines.[12] A bikeway is any road, path, or way which in some manner is specifically designated as being open to bicycle travel, regardless of whether such facilities are designated for the exclusive use of bicycles or are to be shared with other transportation modes. The following are further bikeway definitions.

- Bicycle Lane: A portion of the roadway designated by striping, signing, and pavement markings for bicyclists' preferential or exclusive use. They should be established along streets with significant bicycle demand. Appropriate service levels should be maintained, including sweeping, lane markings, and lighting where required. These lanes shall be one-way and in the same direction as vehicular traffic. A bike lane is defined by a six-inch stripe 5 feet from the curb face.
- Bicycle Route: Shared facilities to provide continuity to other bicycle facilities (usually bicycle lanes) or to designated preferred routes through high-demand corridors. Routes may be signed but not striped. However, they should be marked as connectors to other bike facilities and as touring routes. It is desirable to furnish sign information for directional changes and for distance marking for lone routes.
- Bicycle Path: Physically separated from motor vehicle traffic by an open space or barrier and within either the highway right-of-way or an independent right-of-way. These paths are considered when they serve corridors not served by streets and highways, offer shorter routes not provided by the road system, or where they provide a recreational opportunity or high-speed commuter route. Bicycle paths have several design criteria for width, speed, grading, signage, pavement marking, and pavement type. Notably, they are to have exclusive rights-of-way with minimal cross-flow by motor vehicles.

Wide curb lanes (WCL) are shared between automobiles and bicycles and are at least 14 feet wide to permit passing without changing lanes.[13] WCLs can also be considered for a bikeway. They are placed along streets in corridors with significant bicycle demand on major arterial streets and are unmarked and unsigned. They are appropriate where traffic speeds and volumes are tolerable for shared roadway facilities.

---

[11] Attachment – City of Goodyear, Arizona Engineering Design Standards and Policies Manual Chapter 4, 2017.

[12] Attachment – Arizona Bicycle Facilities Planning & Design Guidelines, Facilities Planning Committee Arizona Bicycle Task Force, November 1, 1988.

[13] Attachment – Should State DOTs Prefer Bicycle Lanes or Wide Curb Lanes?, AL Dennison, June 2009.

1.5 Bicycle Signage

Figure 8 shows bicycle traffic signs and pavement markings in Maricopa County. The pavement marking for a bicycle lane is given in 1a, while the corresponding street sign is displayed in 1b. Note that the Bike Lane sign may include the Ahead or End signs to indicate the start or end of a bike lane.[14] The Bike Route sign is shown in 2.

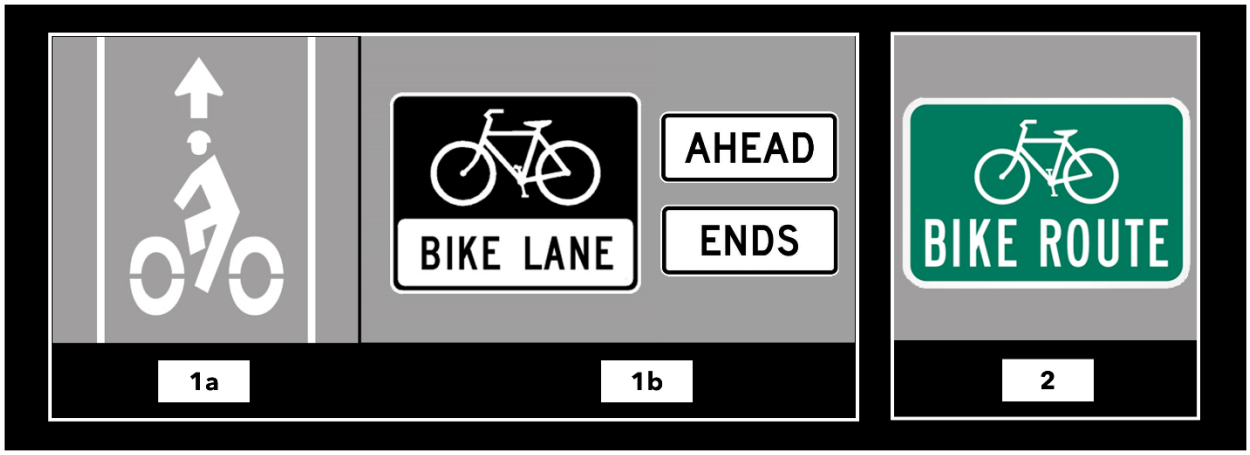

Figure 8: Bicycle traffic signs and pavement marking.

A video approach to the scene was collected, traveling south from 0.1 miles north of the intersection of MC-85 and South Cotton Lane to the roundabout at Estrella Parkway. This corresponded to a southbound approach (travel direction of bicyclists and pickup) that started approximately 1.1 miles before the accident and ended about 2 miles after. A separate video was collected using the same waypoints from the northbound lanes. NTSB investigators collected both videos. Photographs and locations of posted bike lane signage were also obtained and summarized in Figure 9. The southbound signs show the bike lane ending approximately 0.1 miles after the bike lane sign before the intersection at MC-85. There are no other bike lane signs until after the Cotton Lane Bridge. Right before the Estrella Parkway roundabout is another bike lane ends sign. However, there was nothing to indicate a change in the lane designation after the sign north of MC-85 while traveling southbound.

[14] The subsequent information was taken from Conventional Bike Lanes (azmag.gov) accessed September 20, 2023.

Figure 9: Bicycle Lane signage near accident.
(source annotated Google Maps)

1.6 Bicycle Lane Designation

A map of the designated bicycle lanes in the Phoenix area according to Maricopa County, is shown in Figure 10. A closeup of Goodyear and the crash site is given in Figure 11, with the crash scene is marked by a black circle. According to the map, the county has classified all or part of the Cotton Lane Bridge as a bike lane. The signage on Cotton Lane just before the bridge (Figure 9) was inconsistent with the bike lane designation, as the closest sign on the southbound lanes was just before MC-85 and was marked as Bike Lane Ends. No other signs were observed on South Cotton Lane until after the bridge, just before the Estrella Parkway roundabout, which was marked with another Bike Lane Ends sign. During the on-scene investigation by the NTSB, the area to the right of Southbound Lane 2 was referred to as either a bike lane or a shoulder by GPD and bicyclists who participated in the group ride.

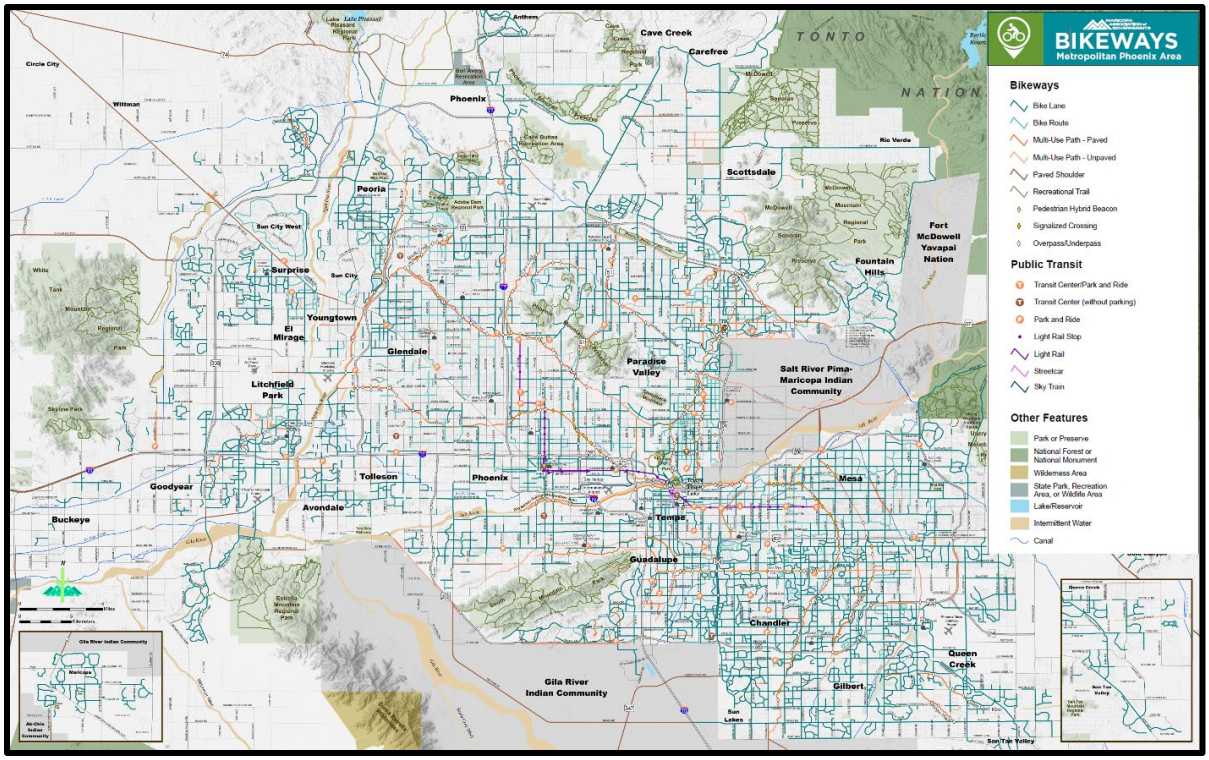

Figure 10: Phoenix area bikeways map
(source Arizona Bikeways Map[15])

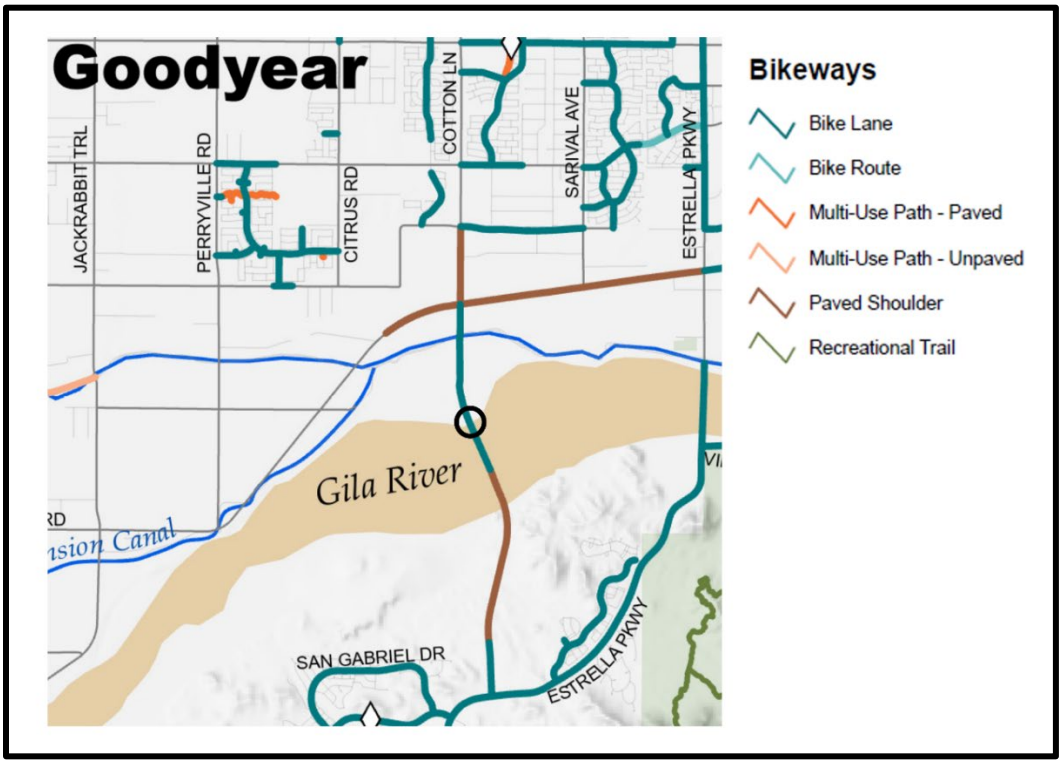

Figure 11: Bikeways map around Goodyear

[15] Attachment – 2022 Arizona Bikeways Map

1.7 Arizona Bicycle Laws

In Arizona, bicycles are legal to ride in traffic lanes, provided they adhere to the same street laws as motorists. Three cities (Tucson, Sierra Vista, and Yuma) and Pima County have mandatory helmet laws for persons under 18 riding a bicycle. (see Figure 12).

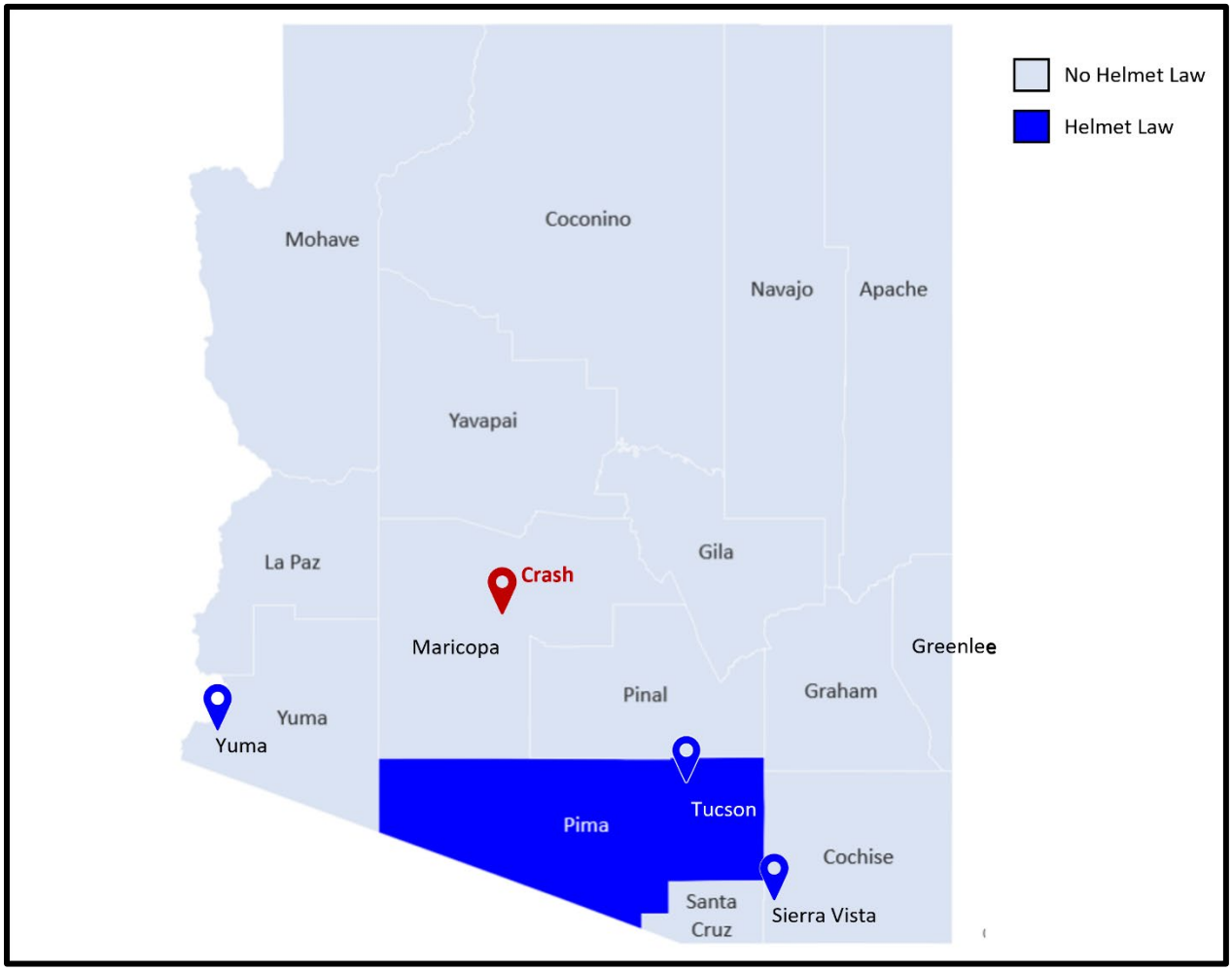

Figure 12: Summary of Arizona helmet law

The following Arizona statutes are relevant to bicyclists operating on a public roadway.

- ARS 28-644: Stop for traffic lights and stop signs.
- ARS 28-704: Any vehicle on a two-lane road with five or more vehicles behind it must pull off at the first safe pullout to allow the vehicles behind to proceed.
- ARS 28-721: Any vehicle moving slower than the normal traffic speed shall drive in the right-hand lane, or "as close as practicable" to the right edge of the road, except when preparing to turn left or when passing.
- ARS 28-735

    - A. When overtaking and passing a bicycle proceeding in the same direction, a person driving a motor vehicle shall exercise due care by leaving a safe distance between the motor vehicle and the bicycle of not less than three feet until the motor vehicle is safely past the overtaken bicycle.
    - B. If a person violates this section and the violation results in a collision causing: (1) Serious physical injury to another person, the violator is subject to a civil penalty of up to five hundred dollars. (2) Death to another person, the violator is subject to a civil penalty of up to one thousand dollars.
    - C. Subsection B does not apply to a bicyclist who is injured in a vehicular traffic lane when a designated bicycle lane or path is present and passable.
- ARS 28-756: Before you turn or change lanes, look behind you, signal to show your plan to turn or change lanes, and yield to any traffic already there. Cyclists may signal their turns by extending either their left arm for a left turn or their right arm for a right turn.
- ARS 28-792 & ARS 28-904: Yield to pedestrians at crosswalks and on sidewalks.
- ARS 28-813: Every person riding a bicycle must have a regular seat to sit on.
- ARS 28-814: You may not attach to, or hold onto, another vehicle on the roadway.
- ARS 28-815:
    - A. A person riding a bicycle on a roadway at less than the normal speed of traffic at the time and place and under the conditions then existing shall ride as close as practicable to the right-hand curb or edge of the roadway, except under any of the following situations: 1. If overtaking and passing another bicycle or vehicle proceeding in the same direction. 2. If preparing for a left turn at an intersection or into a private road or driveway. 3. If reasonably necessary to avoid conditions, including fixed or moving objects, parked or moving vehicles, bicycles, pedestrians, animals or surface hazards. 4. If the lane in which the person is operating the bicycle is too narrow for a bicycle and a vehicle to travel safely side by side within the lane.
    - B. Persons riding bicycles on a roadway shall not ride more than two abreast except on paths or parts of roadways set aside for the exclusive use of bicycles.
    - C. A path or lane that is designated as a bicycle path or lane by state or local authorities is for the exclusive use of bicycles even though other uses are permitted pursuant to subsection D of this section or are otherwise allowed by state or local authorities.
    - D. A person shall not operate, stop, park or leave standing a vehicle, including a neighborhood occupantless electric vehicle, in a path or lane designated as a bicycle path or lane by a state or local authority except in

the case of emergency or for crossing the path or lane to gain access to a public or private road or driveway.
    - E. Subsection D of this section does not prohibit the use of the path or lane by the appropriate local authority.
- ARS 28-816: Bicyclists must always have at least one hand on the handlebars.
- ARS 28-817: Every bicycle must have at least one brake that will make the wheel skid when applied.

1.8 Arizona State Bicycle Plan

The Arizona Department of Transportation (ADOT) Statewide Bicycle and Pedestrian Plan[16] was published in 2013 to guide bicycle and pedestrian travel, planning, and facility development. The plan's goal for the subsequent ten-year period statewide was to double the percentage of bicycling trips, reduce motor vehicle crashes involving bicyclists by 12%, and improve bicycle infrastructure on state highways. The strategies to accomplish these goals include:

- Safety
- Infrastructure
- Education of motorists, bicyclists, and pedestrians
- Policies, Plans, and Programs
- Design Guidelines

A review of the bicycle-motor vehicle crashes in Arizona identified the following areas to improve bicycle safety in the state.

- Reduce the number of bicycle crashes in urbanized and developed areas.
- Reduce crashes in which bicyclists or motor vehicles fail to yield at intersections (signalized and unsignalized).
- Reduce bicycle crashes involving vehicles making a right turn.
- Reduced crashes in which the bicyclist was riding facing traffic.
- Reduce crashes where the bicyclist was riding on the sidewalk.
- Reduce bicycle crashes at dawn, dusk, or dark conditions.

Figure 13 shows the Arizona State Highway Bicycle Route information.

[16] Attachment – ADOT Statewide Bicycle and Pedestrian Plan Update Final Report June 2013.

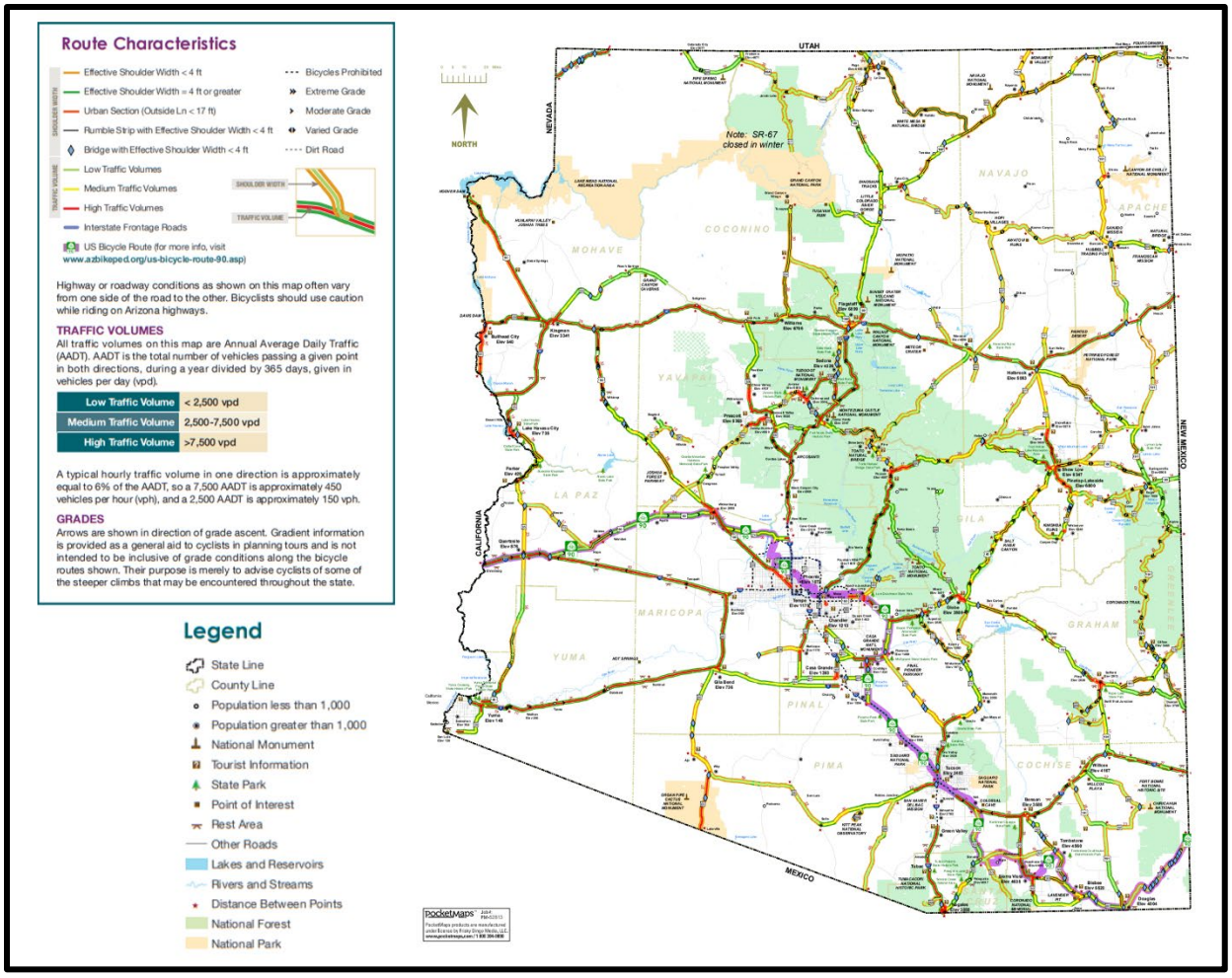

Figure 13: Arizona State Bicycle Plan

2.0 Vehicles

The striking Ford F-250 pickup and sixteen of the eighteen involved bicycles are discussed in this section. Details include vehicle properties, damage, and applicable electronic data and safety features.

2.1 Ford F-250 Pickup

2.1.1 Vehicle Properties

The subject 2019 Ford F-250 Super Duty SRW (single rear wheel) 4X2 regular cab XL (hereafter referred to as pickup) was impounded at the Goodyear Police Department (GPD) Vehicle Evidence Storage Lot, 1146 S. Camino Oro, Goodyear, AZ 85338. No unrepaired recalls were listed in the National Highway Traffic Safety

Administration's (NHTSA) Safety Issues and Recalls database for this vehicle.[17] The pickup properties are documented in Table 4.

Table 4: Pickup properties

Make	Ford
Model	F-250
Model Year	2019
Trim	XL
Drivetrain	4 X 2 RWD[18]
Transmission	6-Speed Automatic
Engine	6.2 L V8 EFI[19]
VIN[20]	1FTBFSA66KEXXXXXX
Manufacture Date	October 2019
GVWR[21]	10,000 lbs.
GAWR[22] (front)	3800 lbs.
GAWR (rear)	6340 lbs.
Braking System	4-wheel disc w/ ABS[23]

2.1.2 Damage and Dealer Inspection

The pickup was inspected on February 28, 2023, at Rodeo Ford, 3680 W Test Dr, Goodyear, AZ, 85338. An Institute of Automotive Service Excellence (ASE) certified dealer mechanic performed the inspection at the request of the GPD. NTSB investigators were present and were allowed to participate in and observe all aspects of the inspection. Standard NTSB post-crash inspection protocol was followed, and data was obtained from all vehicle systems.

Damage to the front of the vehicle was above the bumper and into the radiator and right front headlamp, as shown in Figure 14 with exemplar. The undamaged exemplar is displayed on the left, and the subject vehicle after the accident is indicated on the right. The grille was separated from the vehicle in an intact piece. The peak static crush was approximately 18 inches at the front of the hood line. Figure 15 demonstrates the severe hood buckling in the subject pickup compared to an undamaged exemplar. The peak vertical deformation was approximately in the same horizontal plane as the roof line. As shown in Figure 16, the passenger side mirror was separated from the door; however, the support struts remained intact and retracted against the side of the pickup. The insert in Figure 16 shows the undamaged exemplar

[17] See Check for Recalls: Vehicle, Car Seat, Tire, Equipment | NHTSA accessed November 28, 2023.

[18] Rear wheel drive

[19] Electronic fuel injection

[20] Vehicle Identification Number.

[21] Gross Vehicle Weight Rating (GVWR) is the total maximum weight that a vehicle is designed to carry when loaded, including the weight of the vehicle itself, plus fuel, passengers, and cargo.

[22] Gross Axle Weight Rating (GAWR) is the maximum distributed weight that a given axle is designed to support.

[23] Anti-lock braking system

from a similar perspective. Other notable exterior damage included scrapes along the front of the right-side step bar and scuff marks on the outer sidewall of the right front tire (Figure 17).

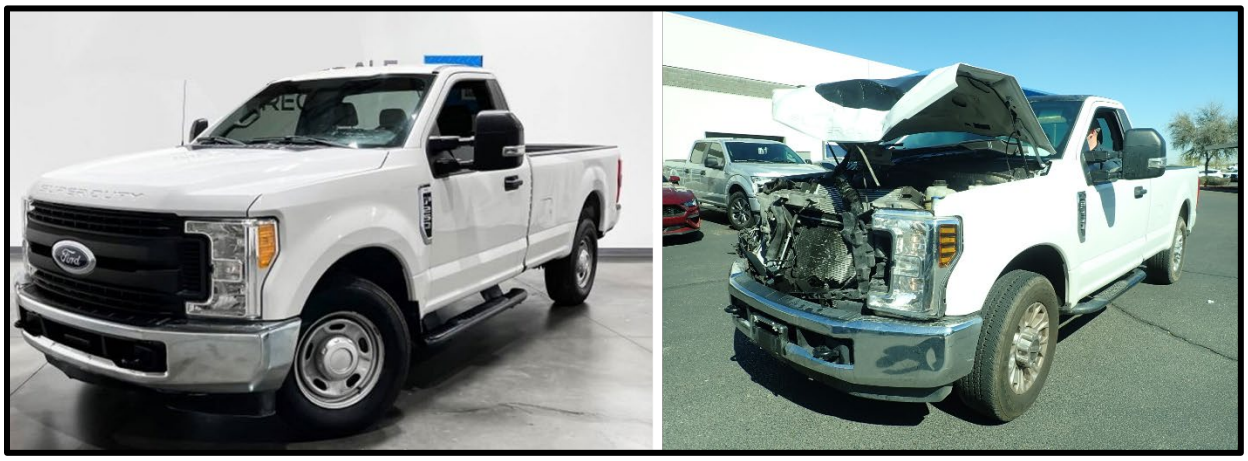

Figure 14: Left-front view of the subject pickup with exemplar.

Figure 15: Left side view of the subject pickup with exemplar.

Figure 16: Passenger side mirror damage subject pickup compared to exemplar.

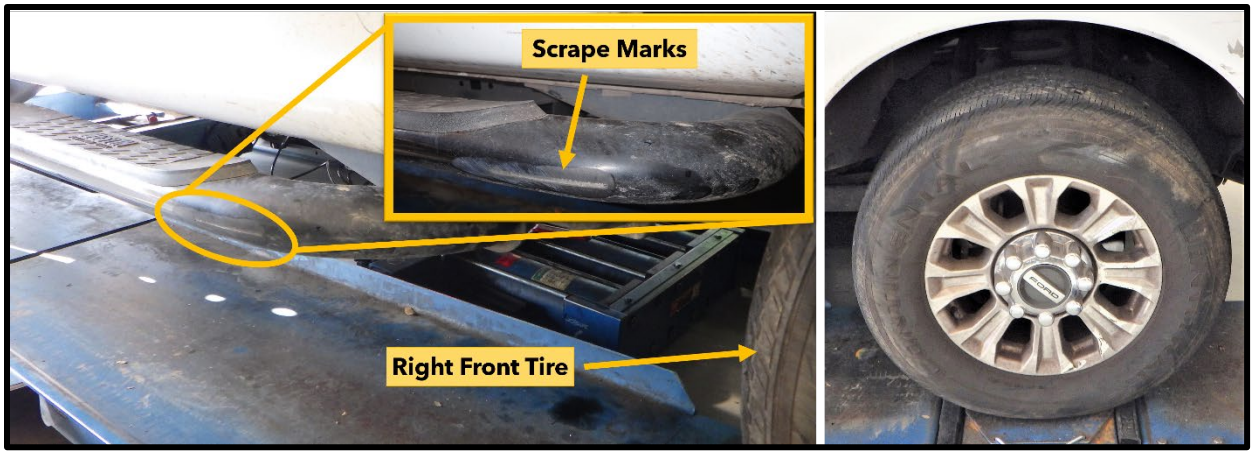

Figure 17: Damage to right side of subject pickup.

No significant damage was observed to the frame of the subject pickup. The front bumper valance had some deformation near the middle consistent with impact to a narrow-width object (Figure 18). Evidence consistent with biological material was found on the muffler, bottom of the gas tank, right rear shock, and the spare tire mounted to the rear undercarriage.

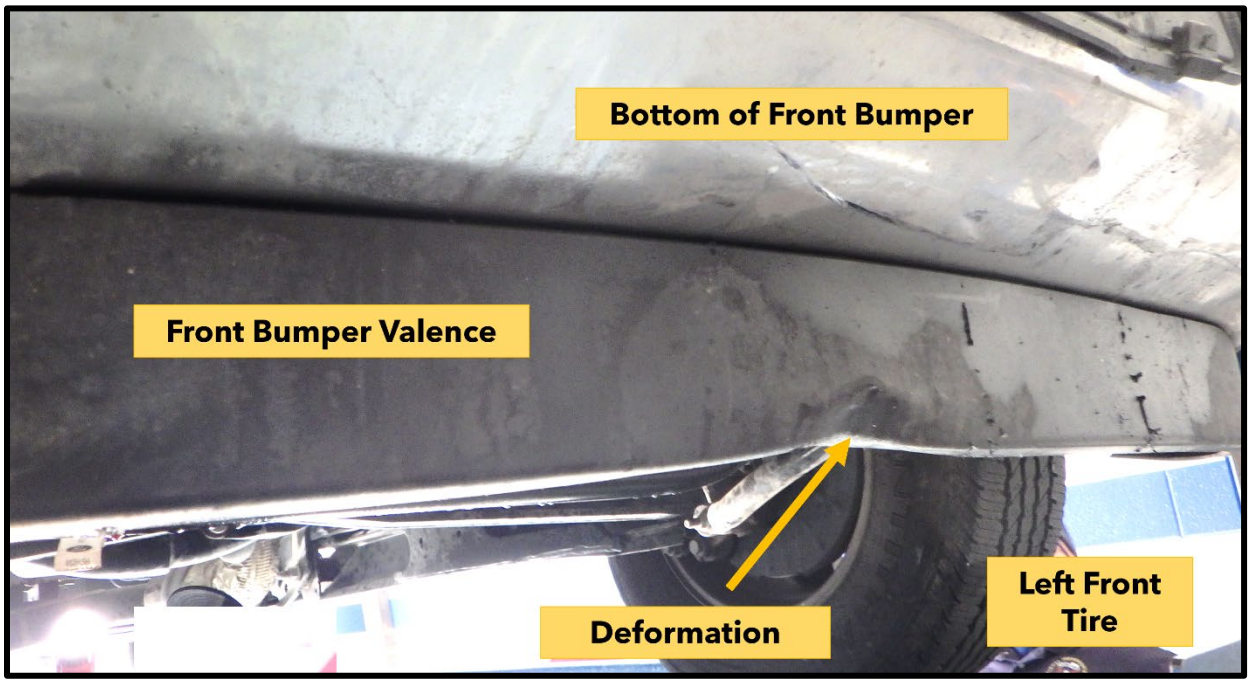

Figure 18: Subject pickup bumper valance.

NTSB Investigators witnessed the mechanic drive the pickup from the parking lot into the service bay. No issues were observed as the mechanic steered the pickup and operated the brakes. The master cylinder brake fluid and power steering fluid reservoirs were checked and found to be undamaged. Both reservoirs held at least the minimum required fluid level.

The steering system was intact and functional. The steering gear assembly, pitman arm, drag link, and steering knuckles were examined, and no damage was found. The steering was checked for looseness at the sector shaft, pitman arm, drag link, and ball joints. There was no looseness, and the steering system was manually rotated from the left stop to the right stop and vice versa via the steering wheel, with no issues observed.

The manufacturer's label for the pickup was located on the driver's door frame. The label contained information specific to this vehicle, which included suggested tire and wheel information. The manufacturer's label suggested the pickup be equipped with LT245/75R17 (E) tires for both axles. The tires were specified to be inflated to 65 psi on the front axle and 80 psi on the rear axle. All wheels were eight-hole aluminum alloy.

General information about each of the tires and brakes on the pickup at the time of the inspection is included in Table 5. All wheels were inspected for cracks, welds, and elongated lug nut holes. No defects or damage were discovered on any of the wheels. The right front tire showed minor scuffing to the upper outside sidewall and the raised letters. Tire pressure measurements were taken using a commercial-grade tire pressure gauge. Tread depth measurements were taken in three locations within the major tread grooves of a given tire, the lowest of which is entered in Table 1 and represents the minimum tread depth.

Table 5: Tire and brake information

	Left Front	Left Rear	Right Front	Right Rear
DOT Tire Code	A3B9HOOR3421	A3B9HOOR3421	A3B9HOOR3421	A3B9HOOR3421
Tire Manufacturer	Continental	Continental	Continental	Continental
Tire Number	LT275/65R18 120 S	LT275/65R18 120 S	LT275/65R18 120 S	LT275/65R18 120 S
Measured Tire Pressure (psi)	52	63	54	63
Recommended Tire	LT245/75R 17E 121/118R	LT245/75R 17E 121/118R	LT245/75R 17E 121/118R	LT245/75R 17E 121/118R
Recommended Tire Pressure (psi)	65	80	65	80
Measured Tire Depth (in)	9/32	9/32	8/32	9/32
Brake Pads (mm)	4	8	4	8

2.1.3 Arizona Department of Public Safety Inspection

GPD requested a second inspection from the Arizona Department of Public Safety (DPS). The inspection was conducted on March 31, 2023, from 9:08 a.m. to 10:40 a.m. at the AZ DPS Knutson Station at 2610 S. 16th St, Phoenix, AZ 85034, by a Sergeant and ASE Master automobile technician. The NTSB was not present at this

inspection. Data were obtained via reports from a Goodyear Police Records Department request.

Tire and brake measurements obtained during the inspection were similar to Table 5. The Sergeant noted that there was sufficient brake pad material to stop the vehicle safely. He observed no signs of excessive wear to the steering and suspension. The steering was manually rotated from left to right without restriction or binding. He found no excessive play in the steering or suspension while manipulating the systems. A short road test was performed, and the vehicle was observed to drive straight. A longer road test was not conducted due to missing coolant and transmission fluid from the damaged radiator and transmission cooler. The Sergeant concluded that the pickup was safe to drive on the road prior to the accident, and there were no indications that would have caused the vehicle to lose steering or braking control.

2.1.4 Vehicle Weight

The pickup driver was carrying concrete forms in the truck bed and on his way to a job site. GPD obtained the pickup weight with and without the concrete forms in the bed on June 9, 2023, using Haenni scales. The vehicle weights are given in Table 6.

Table 6: Pickup wheel loads

Location[24]	With the load in the pickup bed (pounds)	Without the load in the pickup bed (pounds)
Left front	1500	1450
Left rear	1850	1200
Right front	1650	1575
Right rear	1800	1125
Total[25]	6800	5350

The payload was 1,450 lbs. (6800 – 5350), and the payload capacity of the pickup was approximately 3,050 lbs.[26]

2.1.5 Electronic Data

The pickup was equipped with a supplemental restraint control module (RCM). Ford refers to the module as an RCM. However, this module type is generally called an airbag control module (ACM). This report uses the terms RCM and ACM interchangeably. The ACM communicated with various vehicle components and sensors throughout the vehicle and contained an onboard accelerometer. The ACM had the capability to record electronic crash data leading up to a trigger event as well

[24] Left and right are relative to the occupant in a standard driving posture; left refers to the driver's side.

[25] Total weight neglects the driver (~150 lbs. from license).

[26] Payload capacity was determined by GVWR (10,000 lbs.) - Unloaded weight (5350 lbs.) – Driver's Weight (150 lbs.).

as diagnostic system status information. These functions of the ACM are known as an Event Data Recorder (EDR). The EDR functionality is compatible with 49 Code of Federal Regulations Part 563 requirements.[27]

GPD utilized a Bosch Crash Data Retrieval (CDR) CANplus tool and software version 23.0.2 to image any potential electronic crash data recorded by the vehicle's EDR. The ACM was imaged on February 25, 2023, at approximately 2:34 p.m. by GPD. The imaging of the ACM was attempted through the vehicle's diagnostic link connector (DLC), but GPD did not have the required DLC adapter to facilitate this method of download. The subject ACM was near the vehicle's center console and imaged using a direct-to-module download methodology. A direct-to-module cable connected directly to the ACM and a 387 adapter was connected to the CANplus tool. The ACM and recorded hexadecimal data completed three successful passes and were saved locally.

The data limitations of the ACM stated that the subject ACM can store up to two crash events. The subject ACM was capable of recording two event types: non-deployment and deployment events. The threshold for the subject ACM to record an event was a cumulative change in velocity (Delta-V) of five mph or greater within a 150-millisecond time interval.

As the data was imaged from the EDR, the CDR software simultaneously interpreted it, and an output file was generated in a user-readable format. GPD investigators provided the NTSB with a copy of the 14-page EDR report.[28] Figure 19 is a screenshot of the System Status at Time of Retrieval. No events were recorded.

System Status at Time of Retrieval

VIN As Programmed into RCM at Factory	1FTBF2A66KE[redacted]
Current VIN (From PCM)	1FTBF2A66KE[redacted]
Ignition Cycle, Download (First Record)	N/A
Ignition Cycle, Download (Second Record)	N/A
Restraints Control Module Part Number	HC3T-14B321-BF
Restraints Control Module Serial Number	3596962337750000
Restraints Control Module Software Part Number (Version)	HB5T-14C028-BA
Driver Side/Center Frontal Restraints Sensor Serial Number	002C2C80
Driver, Row 1, Side Restraint Sensor 1 Serial Number	000000AD
Driver, Row 2, Side Restraint Sensor 2 Serial Number	00000000
Passenger Frontal Restraints Sensor Serial Number	00000000
Passenger, Row 1, Side Restraint Sensor 1 Serial Number	000000E1
Passenger, Row 2, Side Restraint Sensor 2 Serial Number	00000000

Figure 19: CDR report System Status at Time of Retrieval.

[27] Title 49 *Code of Federal Regulation*, Part 563 event data recorder (EDR) means a device or function in a vehicle that records the vehicle's dynamic time-series data during the time just prior to a crash event (e.g., vehicle speed vs. time) or during a crash event (e.g., delta-V vs. time), intended for retrieval after the crash event. For the purposes of this definition, the event data do not include audio and video data. This part relates to vehicles manufactured on or after September 1st, 2012.

[28] See Attachment – 2019 Ford F250 EDR Report.

2.1.6 Safety Features

2.1.6.1 Model Year 2019

The 2019 Ford F-250[29] Super Duty XL was equipped with driver and passenger frontal airbags, driver and passenger seat-mounted side airbags, and curtain airbags over the front and rear side windows. The front seat belts had pretensioners. The vehicle also had traction, electronic, and roll stability control (Ford's AdvanceTrac with RSC). The anti-lock brake system had dynamic brake support. Lane departure warning and lane-keeping assistance technology were not available as standard equipment or an option on this vehicle.

Additional safety features available on higher-level trim packages and as optional installations for this model year include:

- Adaptive Cruise Control (ACC): This system uses a camera installed on the windshield, forward the interior mirror, and a radar sensor on the lower grille. It utilizes data from these two sensors to adjust the vehicle's speed to match the speed of the car in front up to the limit set by the driver while maintaining a buffer or gap. Four settings control the gap distance to the next vehicle (closest, close, medium, and far). The driver can press the accelerator to override the set speed and gap distance.
- Driver Alert: Monitors driving behavior, and if alertness is below a certain threshold, it will alert the driver by an audible chime and message in the information display.
- Lane Keeping System: Detects when an unintentional drift out of lane is likely to occur, and the system will notify the driver through an audible warning and vibrating of the steering wheel and provide driver assistance through the steering system to stay in the lane. It operates only when the vehicle speed is greater than 40 mph.
- Blind Spot Assist: Provides blind spot (both sides of the vehicle extending rearward from exterior mirrors to approximately 13 feet beyond the rear bumper) warning to help during lane changes. The system illuminates an amber alert indicator in the outside mirror on the side of the vehicle where the blind spot is threatened.
- Pre-Collision Assist: Helps driver mitigate risk when approaching another vehicle by activating a red warning light and an audible warning tone when rapidly approaching another vehicle. The brake support assist prepares the brake systems for rapid braking by charging the brakes. It will not automatically apply the brakes.

[29] See 2019 Super Duty Ford Owner's Manual

2.1.6.2 Available Safety Features Model Year 2023

Ford F-250 MY2023[30] has the following safety systems in addition to the pretensioners and airbags described above. These systems are not standard on the base model but may be installed as an option or part of an equipment group.

- Adaptive Cruise Control (ACC): This system uses a camera installed on the windshield, forward the interior mirror, and a radar sensor on the lower grille. It utilizes data from these two sensors to adjust the vehicle's speed to match the speed of the car in front up to the limit set by the driver while maintaining a buffer or gap. Four settings control the gap distance to the next vehicle (closest, close, medium, and far). The driver can press the accelerator to override the set speed and gap distance.
- Lane Centering: This system works with the ACC and uses the same radar and front camera sensors to apply continuous steering assistance toward driving in the middle of the lane. The driver must keep both hands on the wheel (detected by the steering sensor), and the system must detect valid lane line markings on both sides.
- Predictive Speed Assist: Works with ACC and adjusts the vehicle speed to the road geometry and the speed limit signs detected by the speed sign recognition system.
- Lane Keeping System: Alerts the driver to unintended lane departure by providing temporary steering assistance and/or steering wheel vibration. The system uses the windshield-mounted camera to detect drift out of the travel lane. The driver can select the vehicle's response using one of three modes (Alert, Aid, or Alert + Aid). It operates only when the vehicle speed is greater than 40 mph.
- Blind Spot Assist: Extension of Lane Keeping System that provides blind spot warning and steering assistance to help during lane changes.
- Pre-Collision Assist: Helps drivers mitigate risk when approaching a hazard and provides three levels of assistance: alert, brake support, and automatic emergency braking (AEB). Alert provides a visual warning and audible warning tones. Brake support will apply additional braking up to the maximum braking force to help reduce impact speed. It will not automatically apply the brakes. AEB may activate the brakes if the system determines that a collision is imminent. The system may detect pedestrians and cyclists up to 50 mph. The system performance for cyclists may be reduced in situations where they are fast-moving, partly obscured, have a complex background, or cannot be distinguished from a group.
- Evasive Steering Assist: This system helps the driver steer around a road user (defined as pedestrians or bicyclists in the vehicle's path or another stationary vehicle in the same lane or traveling in the same lane). The system can apply

[30] See 2023 Super Duty Ford Owner's Manual

additional steering torque to steer around the road user and recover from steering back into the lane once the vehicle has passed the road user.

- Driver Alert: Determines the driver's alertness level based on driving behavior in relation to lane markings using the windshield-mounted camera. It warns the driver if it determines drowsy or deteriorated driving. Displays the message "Driver Alert Warning Rest Now" when the recommended action is to stop and rest as soon as it is safe or "Driver Alert Warning Rest Suggested" when the driver should rest soon.
- Onboard Scales: Provides the estimated payload of the vehicle and warns if it is overloaded.

2.1.7 NHTSA Complaint Database

The NHTSA's Office of Defects Investigation maintains a vehicle owner's complaint database.[31] Its purpose is to identify safety issues that may require further investigation and to determine potential safety-related defect trends. Data from 2015-2024[32] was downloaded and consisted of 821,261 complaints. Ford vehicles accounted for 134,471 complaints, of which 30,985 were attributed to either steering, suspension, or brakes. The data was further screened for MY 2017-2022 F-series pickups, resulting in 4,545 complaints. Finally, the VINs were used to determine the drive train,[33] and yielded 71 complaints attributed to 2-wheel drive vehicles. These 71 complaints are given in a separate attachment.[34]

2.2 Bicycles

Of the eighteen bicycles involved in the crash, sixteen were impounded from the scene by GPD and stored in an evidence facility. GPD did not secure the bicycles from occupants B13 and B17. B17 was not struck by the truck and was uninjured. His bike was a rental, and he needed it to return to his hotel after the crash. NTSB investigators inspected the sixteen bicycles at the GPD evidence facility on February 28, 2023. All the bicycles were road bikes. Figure 20 shows the general construction and terms for a road bike. The following is a summary of the bicycles and the inspection photos.

[31] See NHTSA Datasets and APIs | NHTSA
[32] Updated February 6, 2024.
[33] See Ford Truck 17-Digit Vehicle Identification Number (V.I.N.) Decoder - Blue Oval Trucks
[34] Attachment – List of NHTSA complaints on Ford F-Series MY17-22 2 WD pickups.

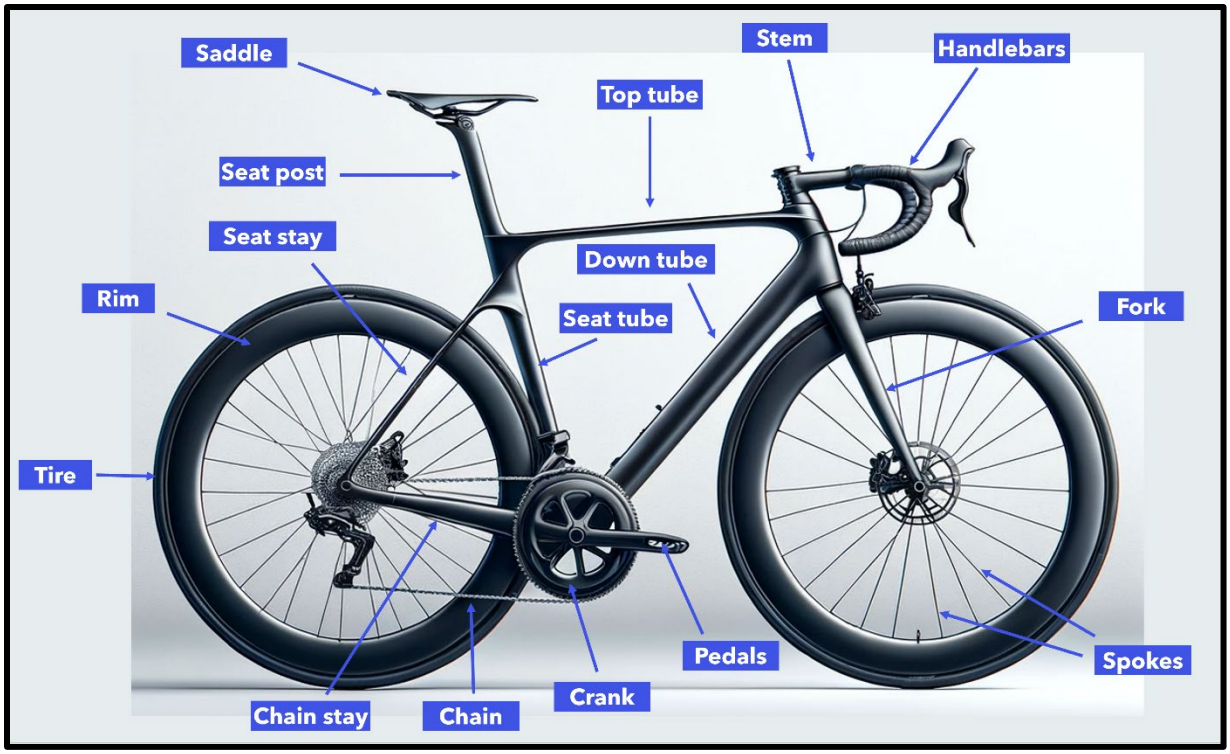

Figure 20: Road bike construction and terms

2.2.1 Specialized Tarmac Disc Sport

Figure 21: Inspection photos of Specialized Tarmac Disc Sport bicycle.

Table 7: Bicycle information – Occupant B01

Brand	Specialized
Model	Tarmac Disc Sport
Serial Number	WSBC604205272P
Owner	B01
Rear reflector/light present	None were present during the inspection.
Seat height from the ground	Not measured
Notes	Both sides of the fork were fractured; the seat was missing; the rear triangle[35] was separated at seat stays and chain stays. The rear rim was broken into several pieces.

[35] The rear triangle consists of the rear stays, chain stays, and the seat tube.,

2.2.2 Specialized Tarmac

Figure 22: Inspection photos of Specialized Tarmac bicycle.

Table 8: Bicycle information – Occupant B02

Brand	Specialized
Model	Tarmac
Serial Number	WUD094023020E
Owner	B02
Rear reflector/light present	Rear light
Seat height from the ground	Not measured
Notes	The rear tire separated from the chain stays and seat stays; the lower half of the front fork fractured on both sides and detached from the bike along with the front tire.

2.2.3 Specialized 2018 S-Works Tarmac

Figure 23: Inspection photos of Specialized 2018 S-Works Tarmac bicycle.

Table 9: Bicycle information – Occupant B03

Brand	Specialized
Model	2018 S-Works Tarmac
Serial Number	WSBC604263539N
Owner	B03
Rear reflector/light present	Ceco T150 light
Seat height from the ground	103 cm
Notes	The front and rear tires rotated freely—no damage to the frame was observed.

2.2.4 Specialized Aethos

Figure 24: Inspection photos of Specialized Aethos bicycle.

Table 10: Bicycle information – Occupant B04

Brand	Specialized
Model	Aethos
Serial Number	WSBC004419773R
Owner	B04
Rear reflector/light present	Bontrager light
Seat height from the ground	107.5 cm
Notes	Front and rear tires rotated freely.

2.2.5 Litespeed

Figure 25: Inspection photos of Litespeed bicycle.

Table 11: Bicycle information – Occupant B05

Brand	Litespeed
Model	Unknown
Serial Number	Unknown
Owner	B05
Rear reflector/light present	Reflector
Seat height from the ground	92 cm
Notes	The front tire was locked; the rear tire rotated freely.

2.2.6 Argon 18 Gallium Pro

Figure 26: Inspection photos of Argon 18 Gallium Pro bicycle.

Table 12: Bicycle information – Occupant B06

Brand	Argon 18
Model	Gallium Pro
Serial Number	Unknown
Owner	B06
Rear reflector/light present	Bontrager rear light
Seat height from the ground	Not measured
Notes	The rear tire was separated at the seat stays and chain stays.

2.2.7 Tommaso Aggraziato

Figure 27: Inspection photos of Tommaso Aggraziato bicycle.

Table 13: Bicycle information – Occupant B07

Brand	Tommaso
Model	Aggraziato
Serial Number	EM11D0506
Owner	B07
Rear reflector/light present	None found
Seat height from the ground	Not measured
Notes	Extensive damage

2.2.8 Trek Madone

Figure 28: Inspection photos of Trek Madone bicycle.

Table 14: Bicycle information – Occupant B08

Brand	Trek
Model	Madone
Serial Number	WTU0202QU0364T
Owner	B08
Rear reflector/light present	None were present during the inspection.
Seat height from the ground	Not measured
Notes	Down tube fractured and missing; chain stays and seat stays missing; seat tube post fractured near seat post.

2.2.9 Unknown make and model

Figure 29: Inspection photos of unknown make and model bicycle.

Table 15: Bicycle information – Occupant B09

Brand	Unknown
Model	Unknown
Serial Number	Unknown
Owner	B09
Rear reflector/light present	None were present during the inspection.
Seat height from the ground	Not measured
Notes	The top tube, down tube, and rear chain stays are dented.

2.2.10 Cervelo R3

Figure 30: Inspection photos of Cervelo R3 bicycle.

Table 16: Bicycle information – Occupant B10

Brand	Cervelo
Model	R3
Serial Number	SNR3F17L00228
Owner	B10
Rear reflector/light present	Magicshine rear light
Seat height from the ground	Not measured
Notes	The upper seat tube was separated from the top tube, and the rear seat stays were fractured; the Rear wheel was broken and separated from the seat stays and chain stays.

2.2.11 Trek Domane SLR7

Figure 31: Inspection photos of Trek Domane SLR7 bicycle.

Table 17: Bicycle information – Occupant B11

Brand	Trek
Model	Domane SLR7
Serial Number	WTU347QU0226R
Owner	B11
Rear reflector/light present	None were present during the inspection.
Seat height from the ground	Not measured
Notes	Fractured top tube, seat post, and half of the seat stay; Fractured chain stays, and half of the seat stay from the bottom bracket shell.[36]

[36] The bottom bracket shell is the lower part of the bike connected to the down tube, seat tube and chain stays.

2.2.12 Trek Emonda SLR

Figure 32: Inspection photos of Trek Emonda SLR bicycle.

Table 18: Bicycle information – Occupant B12

Brand	Trek
Model	Emonda SLR
Serial Number	WTU217T0023R
Owner	B12
The rear reflector/light present	Not found during the inspection
Seat height from the ground	Not measured
Notes	The seat post separated from the seat tube; the Rear wheel detached from the bottom bracket shell at the chain stays, and the seat post at the seat stays.

2.2.13 Trek Domane SLR

Figure 33: Inspection photos of Trek Domane SLR bicycle.

Table 19: Bicycle information – Occupant B14

Brand	Trek
Model	Domane SLR
Serial Number	WTU092T0014P
Owner	B14
Rear reflector/light present	Bontrager Rear Light
Seat height from the ground	Not measured
Notes	None

2.2.14 Trek Madone SL 6

Figure 34: Inspection photo of Trek Madone SL 6 bicycle.

Table 20: Bicycle information - Occupant B15

Brand	Trek
Model	Madone SL 6
Serial Number	WTU033CT3004S0224
Owner	B15
Rear reflector/light present	Bontrager rear light
Seat height from the ground	93 cm
Notes	Both tires rotated freely.

2.2.15 Cervelo S5

Figure 35: Inspection photo of Cervelo S5 bicycle.

Table 21: Bicycle information – Occupant B16

Brand	Cervelo
Model	S5
Serial Number	S5E19E00083
Owner	B16
Rear reflector/light present	Not found during the inspection
Seat height from the ground	101 cm
Notes	Both tires rotated freely The front tire was punctured and torn on the sidewall

2.2.16 Scott S50FB

Figure 36: Inspection photos of Scott S50FB bicycle.

Table 22: Bicycle information – Occupant B18

Brand	Scott
Model	S50FB
Serial Number	EN 14781 F/N GN1G1735
Owner	B18
Rear reflector/light present	Reflector
Seat height from the ground	94 cm
Notes	Front and rear tires rotated freely.

3.0 Scene Evidence

GPD provided terrestrial and aerial photographs of the crash scene along with total station data acquired during their evidentiary documentation of the scene.[37] Photographs collected by NTSB investigators of the accident site and inspection of the pickup were also utilized.

A scaled diagram was created from the total station data provided by the GPD. The following information and measurements were determined by reviewing GPD and NTSB investigators' scene photographs and the scaled diagram. The pickup had been traveling southbound on South Cotton Lane. The first physical evidence area documented was on the vertical portion of the concrete barrier along the southbound roadway. The tire friction mark was about 749-feet south of the bridge's beginning and about 597-feet north of the pickup's final rest. The friction mark (Figure 37) measured approximately 33.5-feet in length and arced upward from the bottom of the barrier to just above the break-point[38] of the barrier and back downwards. The friction mark began dark and transitioned lighter as the mark continued south along the barrier. As stated, the pickup was at final rest 597-feet from the initial tire mark. It stopped facing south within the median.

Figure 37: Friction mark on the barrier.

[37] The total station is a combination of an Electronic Distance Measuring Instrument (EDMI) and a theodolite, which measures vertical and horizontal angles.

[38] Break-point is the transition between the 55-degree and 84-degree slopes built into the barrier.

Two additional tire friction marks were identified and documented by GPD. The two marks terminated at the right front and left front of the pickup. The tire mark associated with the right front measured approximately 99-feet and the left front measured about 110-feet. These two parallel tire marks started approximately in the center of the median and angled southeast to the spot of the pickup's final rest. Each friction mark had an intermittent pattern between light and dark areas. Between the tire mark on the concrete barrier and the final rest of the pickup were numerous bicycle component debris coupled with surface scrapes and narrow rubber smears. Figure 38 is an image of the scaled diagram showing the location of the initial tire mark on the barrier, the tire friction marks, and the final rest of the pickup. The top inset photograph is an image from the three-dimensional point cloud depicting the mark on the barrier. The lower inset photograph is an aerial photograph showing the final rest of the pickup. The fluid on the ground next to the pickup is radiator coolant that leaked out of the vehicle after the crash.

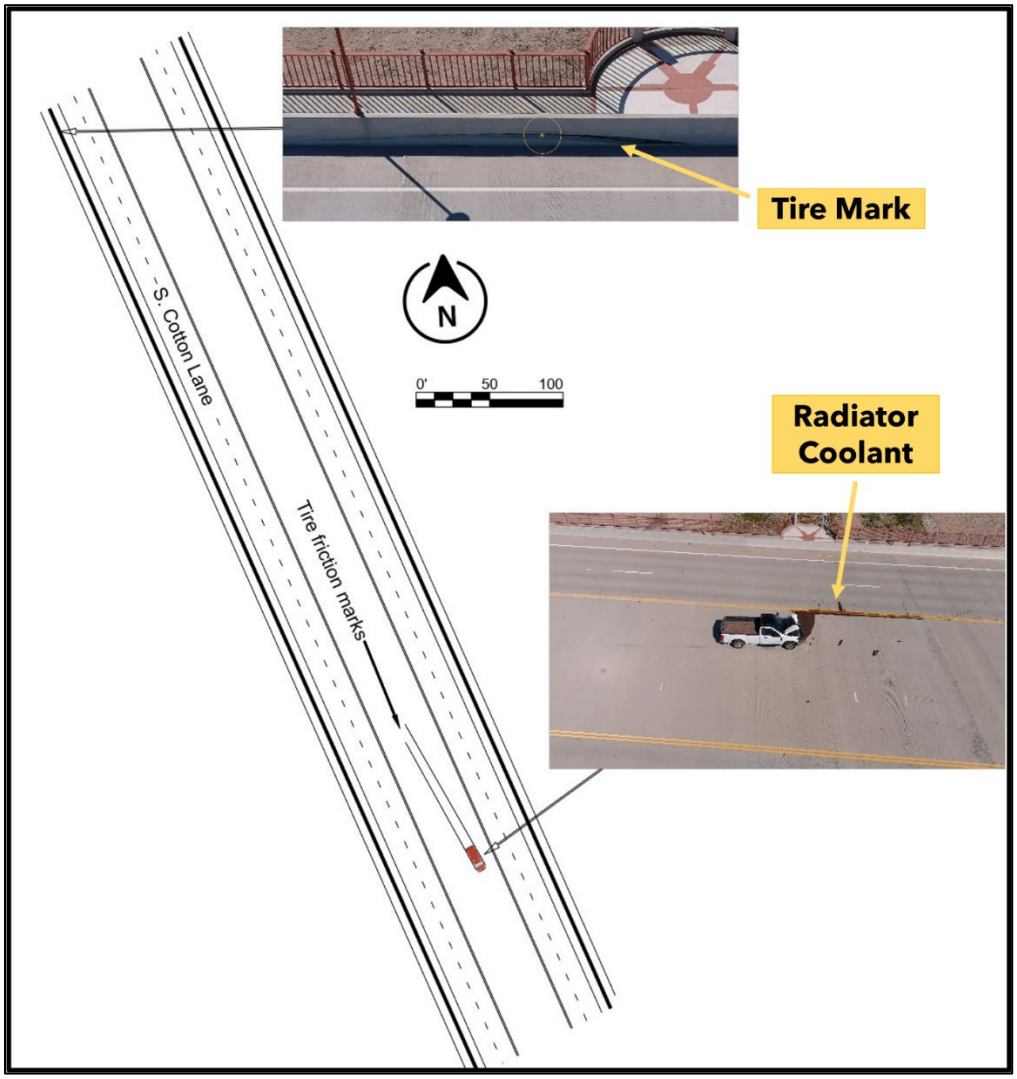

Figure 38: Scaled diagram of crash scene
(source GPD)

4.0 Pickup Driver

Table 23: Pickup occupant information

ID	Sex	Age	Injury Severity
T01	M	26	Not injured

4.1 Medical History

Details are provided in the Medical Factual Report in the docket for this investigation.

4.2 License

In Arizona, there are several Driver's License Classes. Class D is an operator license, which allows a person 18 years and older to drive any vehicle not requiring a motorcycle or commercial license. Class A, B, and C are commercial driver licenses (CDL). Class G is a graduated driver's license for a person who is at least 16 but less than 18 years old and applies only to vehicles permitted by a Class D license.

The driver of the pickup truck was a 26-year-old male. He held a valid Arizona Class D license at the time of the crash. There were no restrictions on his license, which was issued in June of 2021 and is due to expire in February 2062.[39]

In March 2022, he was convicted of speeding in Municipal Court in Mesa, Arizona. In October 2013, he was convicted of exceeding a reasonable and prudent speed, resulting in a traffic crash. Additionally, he was convicted of driving outside of the Class G restrictions he held at the time.

4.3 GPD Crash Investigation Interview

According to the GPD's traffic crash report, the driver was the only occupant in the pickup. He was found outside the front of his pickup and appeared uninjured. During the on-scene interview by GPD, the driver stated that he left his house in Phoenix at 5:30 a.m. and drove to the city of Chandler to pick up concrete forms for work. He left the work yard near the intersection of Cooper and Guadalupe Streets and then headed to the worksite in the Estrella community in Goodyear. He exited I-10 West at SR-303 and headed south. SR-303 becomes South Cotton Lane at the West Van Buren Street stoplight. He continued along South Cotton Lane and stopped at the MC-85 traffic light, where he recalled seeing a group of bicyclists waiting for the light to change. The intersection was approximately one mile before the crash site. He said he had done work in the area and had encountered bicyclists while driving this route. The driver stated that he was in the left lane at the light and did not change lanes after the light turned green, and he continued south to the Cotton Lane Bridge. He was driving on the bridge at 45 mph when the steering wheel "got hard," and the pickup started

[39] According to ARS 28-3171, a driver's license is valid until the applicant's 65th birthday.

drifting off to the right. He had both hands on the steering wheel and couldn't overcome the force to steer it back. The driver compared the vehicle's steering response to a truck he had previously. When the battery died, the steering would "get hard." He then heard scratching noises and let go of the gas pedal, which allowed him to regain control of the vehicle. He said he turned the wheel to the left and stopped the pickup. He denied using his phone while driving and said it was charging and upside down in the vehicle.

When asked about the time he went to bed the previous night, he said he wasn't tired and did not know the exact time, but he didn't remember seeing his clock turn to 11:00 p.m. On the day of the crash, he woke up around 5:15 a.m. and got out of bed 5 minutes later. He left the house around 5:30 a.m. and arrived in Chandler at 6 a.m. to pick up the concrete forms. He left Chandler at 6:46 a.m. and drove towards his work site in Goodyear for about an hour until the crash. After the crash, he called his father on his cellphone and then his wife via Snapchat.

4.4 NTSB Interview

The driver and his lawyer refused all requests for an interview with the NTSB.

4.5 Evaluation for Impairment from Substance Use

Details are provided in the Medical Factual Report in the docket for this investigation.

4.6 Employment

The driver was a self-employed building contractor on his way to work at the time of this crash. The day of the crash was his sixth day in a row at work.

4.7 Sleep History

During the GPD interview on the day of the crash, the driver stated that he wasn't sure when he went to bed the previous night, but it was before 11:00 p.m. He said he woke up without an alarm at approximately 5:15 a.m. and left his house for work at 5:30 a.m. He thought he slept between 6 to 7 hours and did not feel tired. See Section 4.8 for additional details on cellphone activity.

4.8 Cellphone

4.8.1 Carrier Records

The NTSB obtained the 72-hour cellphone records of the pickup driver's cell phone records from T-Mobile Legal and Emergency Response. Using Microsoft Excel, data was received in Coordinated Universal Time (UTC) and converted to Mountain

Standard Time (-7 hours).[40] A summary of the information is given in Table 24. The shaded rows indicate afternoon activity.

Table 24: Summary of pickup driver's cellphone activity

Phase		Date MST	Time MST	Call Type	Duration (sec)
4 Days Before Crash	Afternoon	02/21/2023	05:15:31 p.m.	Outgoing text	
		02/21/2023	05:15:57 p.m.	Incoming call	187
		02/21/2023	05:33:20 p.m.	Incoming text	
		02/21/2023	05:38:52 p.m.	Incoming text	
		02/21/2023	05:38:52 p.m.	Outgoing text	
		02/21/2023	06:03:27 p.m.	Incoming text	
		02/21/2023	06:03:28 p.m.	Outgoing text	
		02/21/2023	06:03:46 p.m.	Incoming call to voicemail	51
		02/21/2023	06:03:56 p.m.		51
		02/21/2023	06:04:49 p.m.	Incoming text	
		02/21/2023	06:22:22 p.m.	Incoming text	
		02/21/2023	06:58:27 p.m.	Incoming text	
		02/21/2023	06:58:27 p.m.	Outgoing text	
		02/21/2023	07:58:00 p.m.	Incoming text	
		02/21/2023	07:58:00 p.m.	Outgoing text	
		02/21/2023	08:30:49 p.m.	Incoming text	
		02/21/2023	08:30:50 p.m.	Outgoing text	
		02/21/2023	09:15:24 p.m.	Incoming call to voicemail	4
		02/21/2023	09:15:55 p.m.		4
		02/21/2023	10:25:57 p.m.	Outgoing call	41
		02/21/2023	11:04:22 p.m.	Incoming text	
		02/21/2023	11:04:22 p.m.	Outgoing text	
3 Days Before Crash	Morning	02/22/2023	05:38:17 a.m.	Outgoing text	
		02/22/2023	05:38:18 a.m.	Incoming text	
		02/22/2023	09:37:40 a.m.	Incoming text	
		02/22/2023	10:36:08 a.m.	Outgoing text	
		02/22/2023	10:36:08 a.m.	Incoming text	
		02/22/2023	11:02:23 a.m.	Outgoing text	
		02/22/2023	11:02:23 a.m.	Incoming text	
	Afternoon	02/22/2023	12:49:35 p.m.	Outgoing text	
		02/22/2023	12:53:45 p.m.	Incoming text	
		02/22/2023	01:33:23 p.m.	Outgoing text	
		02/22/2023	01:47:39 p.m.	Outgoing call	

[40] MST date and time were determined by converting the UTC date and time to a Microsoft Excel date value (DATEVALUE and TIMEVALUE functions, which yield a decimal value indicating the elapsed days from January 1, 1900, 12:00:00 a.m.), subtracting 7 hours (0.291667), and converting the corrected time and date into the appropriate string values.

Phase		Date MST	Time MST	Call Type	Duration (sec)
		02/22/2023	01:53:07 p.m.	Incoming text	
		02/22/2023	02:15:07 p.m.	Outgoing text	
		02/22/2023	02:15:12 p.m.	Outgoing call	
		02/22/2023	02:42:52 p.m.	Incoming text	
		02/22/2023	02:42:53 p.m.	Outgoing text	
		02/22/2023	03:43:06 p.m.	Incoming call to voicemail	44
		02/22/2023	03:43:38 p.m.		44
		02/22/2023	03:44:24 p.m.	Incoming text	
		02/22/2023	03:50:37 p.m.	Incoming text	
		02/22/2023	04:47:24 p.m.	Incoming call to voicemail	18
		02/22/2023	04:47:43 p.m.		18
		02/22/2023	04:48:04 p.m.	Incoming text	
		02/22/2023	05:31:52 p.m.	Incoming text	
		02/22/2023	06:14:09 p.m.	Incoming text	
		02/22/2023	06:14:09 p.m.	Outgoing text	
		02/22/2023	06:48:17 p.m.	Outgoing text	
		02/22/2023	06:48:18 p.m.	Incoming text	
		02/22/2023	06:48:38 p.m.	Incoming text	
		02/22/2023	09:22:22 p.m.	Incoming text	
		02/22/2023	09:22:22 p.m.	Outgoing text	
		02/22/2023	09:30:28 p.m.	Incoming text	
		02/22/2023	09:30:29 p.m.	Outgoing text	
		02/22/2023	09:47:29 p.m.	Incoming text	
		02/22/2023	09:47:29 p.m.	Outgoing text	
		02/22/2023	10:26:51 p.m.	Outgoing call	29
2 Days Before Crash	**Morning**	02/23/2023	02:12:05 a.m.	Outgoing text	
		02/23/2023	02:12:06 a.m.	Incoming text	
		02/23/2023	09:38:02 a.m.	Incoming text	
		02/23/2023	10:04:36 a.m.	Incoming text	
		02/23/2023	10:04:37 a.m.	Outgoing text	
		02/23/2023	10:36:22 a.m.	Incoming text	
		02/23/2023	10:36:23 a.m.	Outgoing text	
		02/23/2023	10:42:48 a.m.	Incoming call	
		02/23/2023	11:01:11 a.m.	Outgoing text	
		02/23/2023	11:01:11 a.m.	Incoming text	
		02/23/2023	11:02:03 a.m.	Incoming text	
		02/23/2023	11:02:04 a.m.	Outgoing text	
		02/23/2023	11:55:48 a.m.	Incoming text	
		02/23/2023	11:56:26 a.m.	Incoming text	
		02/23/2023	11:56:27 a.m.	Incoming text	
		02/23/2023	11:56:52 a.m.	Incoming text	

Phase		Date MST	Time MST	Call Type	Duration (sec)
		02/23/2023	11:59:44 a.m.	Incoming text	
	Afternoon	02/23/2023	12:02:40 p.m.	Incoming text	
		02/23/2023	12:04:12 p.m.	Incoming text	
		02/23/2023	12:06:50 p.m.	Incoming text	
		02/23/2023	12:07:17 p.m.	Incoming text	
		02/23/2023	12:07:35 p.m.	Incoming text	
		02/23/2023	01:43:51 p.m.	Outgoing text	
		02/23/2023	01:43:51 p.m.	Incoming text	
		02/23/2023	02:51:05 p.m.	Incoming text	
		02/23/2023	02:52:19 p.m.	Incoming text	
		02/23/2023	04:19:27 p.m.	Incoming text	
		02/23/2023	04:19:27 p.m.	Outgoing text	
		02/23/2023	06:24:16 p.m.	Outgoing text	
		02/23/2023	06:24:16 p.m.	Incoming text	
		02/23/2023	06:27:49 p.m.	Outgoing text	
		02/23/2023	06:27:49 p.m.	Incoming text	
		02/23/2023	11:25:17 p.m.	Outgoing text	
		02/23/2023	11:25:18 p.m.	Incoming text	
1 Day Before Crash	Morning	02/24/2023	04:50:43 a.m.	Incoming text	
		02/24/2023	04:51:37 a.m.	Incoming text	
		02/24/2023	04:59:40 a.m.	Outgoing text	
		02/24/2023	04:59:41 a.m.	Pager	
		02/24/2023	04:59:41 a.m.	Pager	
		02/24/2023	04:59:42 a.m.	Outgoing text	
		02/24/2023	04:59:42 a.m.	Incoming text	
		02/24/2023	09:01:16 a.m.	Incoming text	
		02/24/2023	09:01:20 a.m.	Incoming text	
		02/24/2023	09:38:58 a.m.	Incoming text	
		02/24/2023	10:26:18 a.m.	Incoming call	
		02/24/2023	10:26:51 a.m.	Outgoing call	
		02/24/2023	10:33:52 a.m.	Incoming text	
		02/24/2023	10:34:55 a.m.	Incoming text	
		02/24/2023	10:35:22 a.m.	Outgoing text	
		02/24/2023	10:35:22 a.m.	Incoming text	
		02/24/2023	10:58:48 a.m.	Incoming call to voicemail	3
		02/24/2023	10:59:20 a.m.		3
		02/24/2023	11:11:19 a.m.	Outgoing call	108
		02/24/2023	11:14:17 a.m.	Outgoing call	40
		02/24/2023	11:27:59 a.m.	Outgoing text	
		02/24/2023	11:27:59 a.m.	Incoming text	
		02/24/2023	11:29:13 a.m.	Outgoing text	

Phase		Date MST	Time MST	Call Type	Duration (sec)
		02/24/2023	11:29:13 a.m.	Incoming text	
		02/24/2023	11:39:56 a.m.	Incoming call	16
		02/24/2023	11:58:11 a.m.	Incoming text	
		02/24/2023	11:58:35 a.m.	Incoming text	
		02/24/2023	11:59:20 a.m.	Incoming text	
		02/24/2023	11:59:31 a.m.	Incoming text	
		02/24/2023	11:59:40 a.m.	Incoming text	
	Afternoon	02/24/2023	12:06:55 p.m.	Incoming call	
		02/24/2023	12:13:09 p.m.	Outgoing call	4
		02/24/2023	12:13:23 p.m.	Outgoing call	26
		02/24/2023	12:23:20 p.m.	Outgoing call	93
		02/24/2023	12:29:14 p.m.	Incoming call	78
		02/24/2023	12:31:00 p.m.	Incoming call	26
		02/24/2023	01:54:45 p.m.	Outgoing text	
		02/24/2023	01:54:45 p.m.	Incoming text	
		02/24/2023	02:05:17 p.m.	Outgoing text	
		02/24/2023	02:05:18 p.m.	Outgoing text	
		02/24/2023	02:05:18 p.m.	Incoming text	
		02/24/2023	02:11:38 p.m.	Incoming call	43
		02/24/2023	03:48:54 p.m.	Incoming call	
		02/24/2023	03:49:27 p.m.	Outgoing call	
		02/24/2023	04:01:09 p.m.	Outgoing call	28
		02/24/2023	04:42:52 p.m.	Outgoing call	68
		02/24/2023	05:38:58 p.m.	Incoming call	3
		02/24/2023	05:39:29 p.m.	Outgoing call	3
		02/24/2023	05:39:39 p.m.	Outgoing call	90
		02/24/2023	05:41:28 p.m.	Outgoing call	
		02/24/2023	05:42:05 p.m.	Incoming call to voicemail	8
		02/24/2023	05:42:36 p.m.		8
		02/24/2023	06:23:20 p.m.	Outgoing call	4
		02/24/2023	06:45:58 p.m.	Outgoing call	21
		02/24/2023	06:47:26 p.m.	Incoming call to voicemail	5
		02/24/2023	06:47:31 p.m.		5
		02/24/2023	06:48:08 p.m.	Outgoing call	18
		02/24/2023	06:48:55 p.m.	Outgoing call	4
		02/24/2023	08:08:24 p.m.	Incoming call	
		02/24/2023	08:11:02 p.m.	Outgoing call	
		02/24/2023	08:16:45 p.m.	Incoming text	
		02/24/2023	08:16:45 p.m.	Outgoing text	
		02/24/2023	08:16:46 p.m.	Outgoing call	31
		02/24/2023	08:17:31 p.m.	Outgoing call	249

Phase		Date MST	Time MST	Call Type	Duration (sec)
		02/24/2023	10:30:12 p.m.	Outgoing text	
		02/24/2023	10:30:12 p.m.	Incoming text	
Day of crash	Morning	02/25/2023	05:45:34 a.m.	Incoming call	50
		02/25/2023	06:38:04 a.m.	Incoming call	
		02/25/2023	06:38:35 a.m.	Outgoing call	
		02/25/2023	06:38:53 a.m.	Outgoing call	17
		02/25/2023	07:56:17 a.m.	Outgoing call	
		02/25/2023	07:56:58 a.m.	Incoming call	39
		02/25/2023	08:00:17 a.m.	Outgoing call	25
		02/25/2023	08:03:13 a.m.	Incoming call to voicemail	3
		02/25/2023	08:03:45 a.m.		3
		02/25/2023	08:04:07 a.m.	Outgoing text	
		02/25/2023	08:04:07 a.m.	Incoming text	
		02/25/2023	08:21:48 a.m.	Incoming call	
		02/25/2023	08:22:21 a.m.	Outgoing call	
		02/25/2023	09:16:59 a.m.	Incoming call	
		02/25/2023	09:17:19 a.m.	Incoming call	
		02/25/2023	10:32:00 a.m.	Outgoing text	
		02/25/2023	10:32:00 a.m.	Incoming text	
		02/25/2023	10:51:17 a.m.	Incoming text	
		02/25/2023	10:51:56 a.m.	Incoming text	
		02/25/2023	11:03:39 a.m.	Incoming text	
	Afternoon	02/25/2023	12:08:31 p.m.	Incoming text	

4.8.2 Digital Data

A forensic examination of the driver's cellphone was performed by GPD using Graykey (version 1.12.4.237 Agent 3.13.0), Cellebrite PA (version 7.60.1.9), and Cellebrite UFED 4PC (version 7.62.0.173). Table 25 summarizes the events obtained from GPD's examination.

Table 25: Summary of digital data from driver's cellphone

Date	Time	Event
2/24/2023	1:40:00 p.m.	The device arrives near The Porch Restaurant.
2/24/2023	1:53:00 p.m.	Video from device showing driver at The Porch Restaurant
2/24/2023	2:37:00 p.m.	Video of several Jeeter XL[41] Infused tubes and a bag of "Mint Cannabis"
2/24/2023	3:14:00 p.m.	The device leaves the area of The Porch Restaurant.
2/24/2023	3:33:00 p.m.	The device arrives around Arizona Mills.
2/24/2023	4:17:00 p.m.	The device leaves the area of Arizona Mills.
2/24/2023	5:19:00 p.m.	The device is around Allure Tempe Apartments.
2/24/2023	5:36:00 p.m.	The device is near a shopping center in Chandler.
2/24/2023	8:57:00 p.m.	The device is around 23rd E. Southern.
2/24/2023	9:29:00 p.m.	The device is around 59th and Glendale Ave.
2/24/2023	9:50:00 p.m.	Video of a waitress bringing shots to the table of the driver
2/24/2023	9:55:00 p.m.	Video on the driver's cellphone of the driver drinking shots
2/24/2023	10:39:00 p.m.	The device leaves the area near 59th and Glendale Ave.
2/24/2023	10:59:00 p.m.	Video on the driver's cellphone shows the driver smoking a cigar consistent with Jeeter XL while operating his vehicle.
2/24/2023	11:14:00 p.m.	Bluetooth disconnected
2/24/2023	11:15:00 p.m.	Last activity sensor data of the day (steps taken)
2/24/2023	11:20:00 p.m.	OfferUP and IDE cookies
2/25/2023	5:11:00 a.m.	First activity sensor data of the day (steps taken)
2/25/2023	5:15:35 a.m.	Leaves the area around East South Mountain Ave
2/25/2023	5:18:00 a.m.	TikTok cookie
2/25/2023	5:26:00 a.m.	Bluetooth connected
2/25/2023	5:45:00 a.m.	First phone call (received) of the day - duration 51 seconds
2/25/2023	6:05:39 a.m.	Arrives at Guadalupe Rd to pick up equipment
2/25/2023	6:36:05 a.m.	Leaves. Guadalupe Rd
2/25/2023	7:44:00 a.m.	Display On (4 seconds)
2/25/2023	7:54:20 a.m.	Phone native location - MC85 and S. Cotton Lane
2/25/2023	7:54:28 a.m.	Display On (8 seconds)
2/25/2023	7:54:36 a.m.	Phone native location - crossing over Buckeye Canal
2/25/2023	7:55:34 a.m.	Phone native location - stopped on Cotton Lane Bridge.
2/25/2023	7:56:50 a.m.	Incoming call - not answered
2/25/2023	7:57:00 a.m.	Incoming call - duration 40 seconds
2/25/2023	7:58:18 a.m.	Outgoing SnapChat call - duration 28 seconds
2/25/2023	7:59:31 a.m.	Video of the driver at the scene
2/25/2023	8:00:00 a.m.	Four SnapChat messages were sent (starting at7:59 a.m.)

[41] Jeeter XL is a hemp blunt wrap that is filled with 2 grams of cannabis flower (Blue Zkittlez). The infused option is coated in distillate oil and rolled in kief (a crystal formation on the tip of the cannabis flower's trichomes' resin gland).

The position of the driver's cell phone (in the cab of the vehicle) on the Cotton Lane Bridge during the time of the crash is shown in Figure 39. The figure is a view of the bridge from the north looking south. The driver's path in the southbound lanes is shown in one-second intervals. As he traveled south across the bridge, he moved from Lane 1 into Lane 2, then across the fog line, and entered the bicycle lane. The cellphone's position then traveled back across Lane 1 and 2 and came to rest in the median.

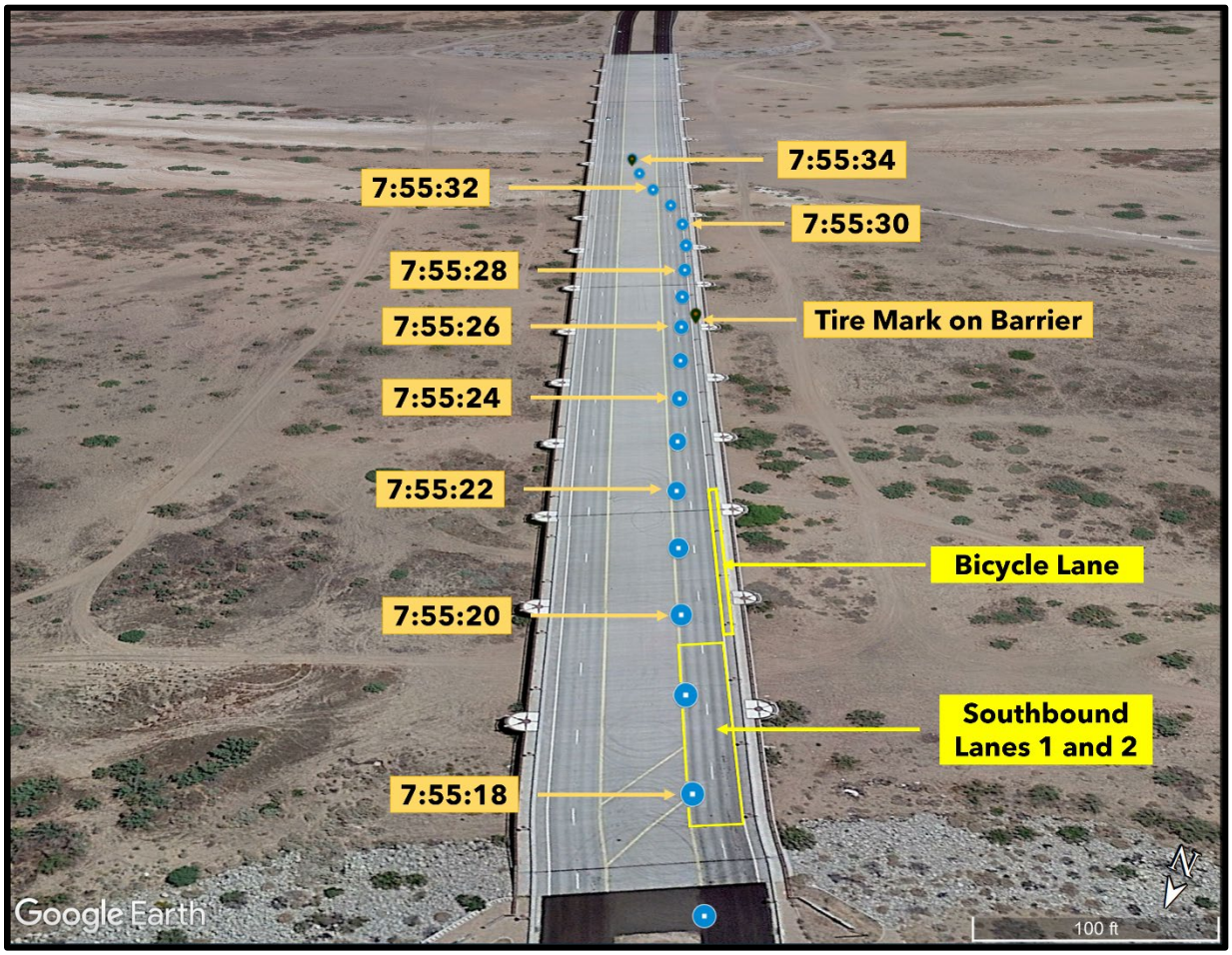

Figure 39: **Position of driver's cellphone during the crash.**
(source modified Google Earth)

The longitude and latitude data were converted to relative displacement using standard formulas.[42] Next, the vehicle's speed was estimated at every one-second interval between MC-85 and South Cotton Lane intersection to the pickup's final location using the displacement data and the timestamp information. Speed was calculated at each time point using the distance covered over the previous three-second interval. Figure 40 shows the time history speed plot aligned with a rotated map to coincide with the vehicle's approximate location.

[42] See Aviation Formulary V1.47 (edwilliams.org) accessed January 17, 2024.

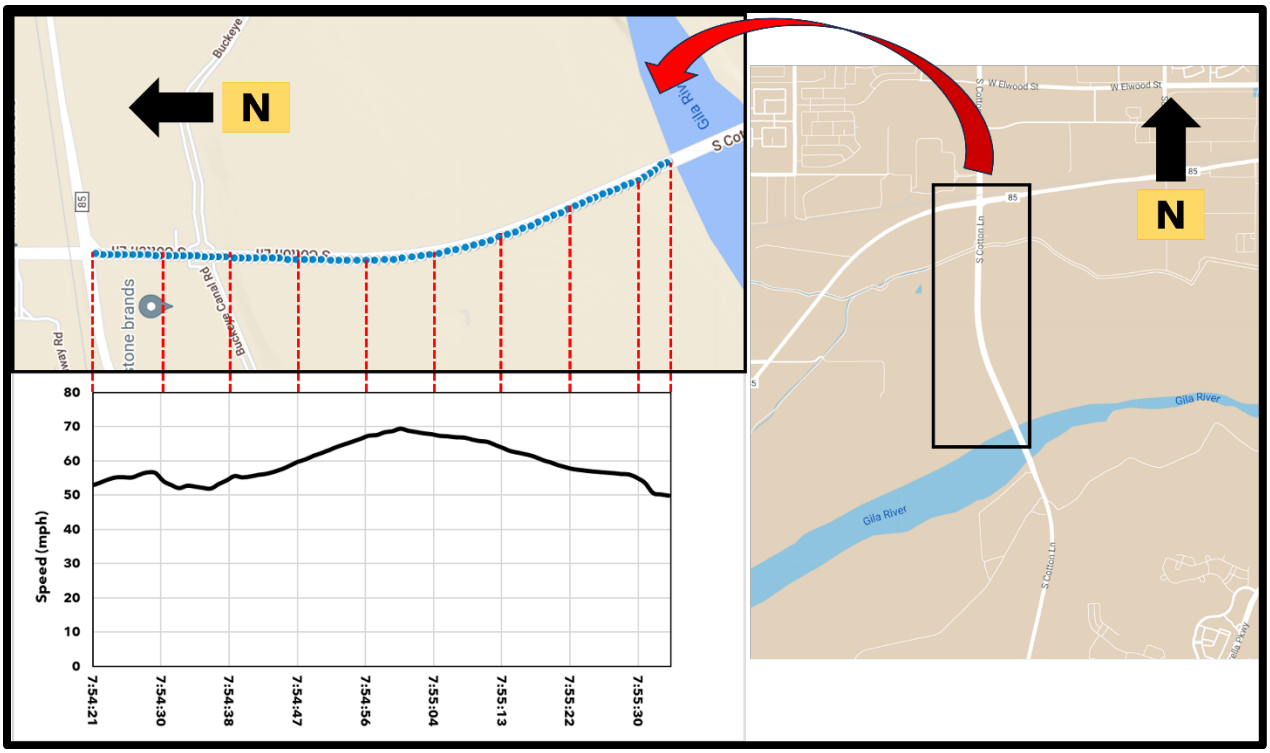

Figure 40: Pickup speed calculated from GPS data.
(source annotated Google Maps).

4.9 Driver Sleep Opportunity

The cellphone carrier and Cellebrite data from Table 24 and Table 25 were combined to estimate the driver's sleep opportunity and are shown in Table 26.

Table 26: Driver sleep opportunity

Date	Time	Activity	Sleep Opportunity (Hours: Minutes)
2/21/2023	11:04 p.m.	Outgoing text	
2/22/2023	5:38 a.m.	Outgoing text	6:34
2/23/2023	2:12 a.m.	Outgoing text	
2/23/2023	10:04 a.m.	Outgoing text	7:52
2/23/2023	11:25 p.m.	Outgoing text	
2/24/2023	5:00 a.m.	Outgoing text	6:25
2/24/2023	11:20 p.m.	The last sensor activity of the day	
2/25/2023	5:11 a.m.	First senor activity of the day	5:55

4.10 Injuries

The driver was not injured in the crash.

5.0 Bicyclists

5.1 Bicycle Occupant Summary

Table 27: Bicycle occupant details

ID	Sex	Age	Injury Severity[43]	Bicycle
B01	F	61	Fatal	Specialized Tarmac Disc Sport
B02	M	65	Fatal	Specialized Tarmac
B03	M	71	Serious	Specialized 2018 S-Works Tarmac
B04	M	59	Serious	Specialized Aethos
B05	M	53	Serious	Litespeed
B06	F	66	Serious	Argon 18 Gallium Pro
B07	M	59	Serious	Tommaso
B08	M	68	Serious	Trek Madone
B09	M	38	Serious	Unknown
B10	M	58	Serious	Cervelo R3
B11	M	65	Serious	Trek Doman SLR7
B12	M	52	Minor	Trek Emonda SLR
B13	F	63	Minor	Trek Emonda
B14	M	60	Minor	Trek Domane SLR
B15	M	54	Minor	Trek 2019 Madone SL 6
B16	M	62	Minor	Cervelo S5
B17	M	63	Not injured	Trek Domane
B18	M	57	Not injured	Scott S50FB

Table 28: Bicycle occupant demographics and injury summary

Demographics	Average age	59.7 ± 7.4 years
	Male occupants	15
	Female occupants	3
Injury Summary	Fatal	2
	Serious	9
	Minor	5
	Not injured	2

[43] The injury levels were evaluated according to 49 Code of Federal Regulations (CFR) 830.2, which defines fatal injury as "any injury which results in death within 30 days of the accident" and serious injury as "any injury which: (1) requires hospitalization for more than 48 hours, commencing within 7 days from the date the injury was received; (2) results in a fracture of any bone (except simple fractures of fingers, toes, or nose); (3) causes severe hemorrhages, nerve, or tendon damage; (4) involves any internal organ; or (5) involves second- or third-degree burns, or any burn affecting more than 5 percent of the body surface."

5.2 West Valley Cycle Club

The riders were part of an informal group ride organized by the West Valley Cycle Club (WVCC). Riders are divided into three groups (A, B, and C) separated by average speed; A group is 24 mph, B 22 mph, and C 16-18 mph. The homepage for the club website[44] is shown in Figure 41.

Figure 41: Homepage for the West Valley Cycle Club

[44] See West Valley Cycle - Home, accessed on February 28, 2023.

5.3 Route Information

The typical size for the Saturday WVCC ride is 75-110 riders. They meet at Santini Bicycle Shop and depart at 7:30 a.m. The entire route[45] is 62.7 miles, as shown in Figure 42. The black arrows indicate the direction of the ride up to the crash.

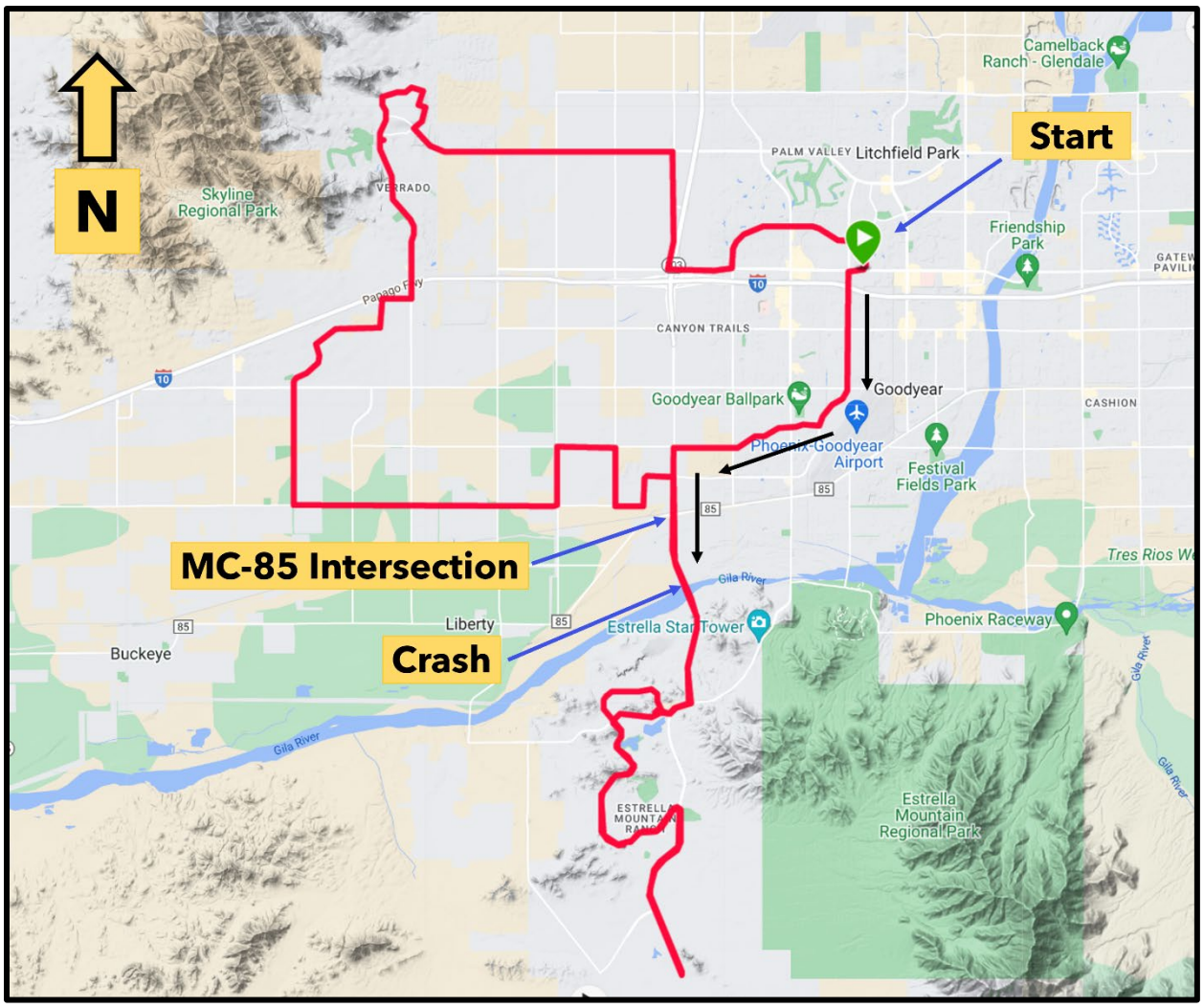

Figure 42: West Valley Cycle Club Saturday ride route.

5.4 Injury Details

Injury details for bicycle occupants are summarized in the following sections. Unless otherwise noted, the injury descriptions were obtained from medical records or autopsy reports obtained by NTSB investigators.

[45] See Garmin Connect, accessed on February 28, 2023.

5.4.1 Occupant B01- Fatal

This 61-year-old female occupant was pronounced dead at the scene, and her final rest was supine in the median, approximately 130 feet north of the pickup truck. The medical examiner's report indicated fractures to multiple ribs (bilaterally) and thoracic spine. The pelvis was fractured in several locations and unstable, along with fractures to the coccyx. She had several lacerations, and the most notable were to the central parietal scalp (with exposure of bone), the left side of the forehead, avulsion to the left buttock (with exposure of soft tissue and bone), right elbow, right forearm (with exposure of underlying soft tissue and bone), left hand, and left femur and tibia. She suffered multiple abrasions covering her entire body. The cause of death was ascribed to blunt head, neck, torso, and extremities injuries.

5.4.2 Occupant B02 - Fatal

This 65-year-old male occupant was transported to Abrazo West Campus Hospital by Maricopa Ambulance M-1815. During treatment at the hospital, he suffered cardiac arrest from trauma and was not revived. He sustained several fractures, which included: a nondisplaced left proximal and distal femur; severely comminuted bilateral sacral alae; sacrum (S3, S4, and S5); left ribs (6, 7, 8, 9, and 11); comminuted L1 vertebrae (20-30% loss of body height) with right spinous process, right facet, and bilateral pedicles; and T8 endplate. He also demonstrated a right retroperitoneal hematoma (9.1 cm A/P by 9.9 cm transverse). The medical examiner listed the cause of death as blunt force injuries of the head, neck, torso, and extremities.

5.4.3 Occupant B03- Serious

This 71-year-old male occupant was transported to Banner University Medical Center, Phoenix Campus, by M-321 with serious injuries. He sustained numerous fractures, which included: the right clavicle at the A/C joint and clavicular head; comminuted left scapula; left ribs at 1 (posterior), 5-9 (posterolateral), and 9-11 (lateral); right ribs at 2-4 (posterior), 4 (anterolateral), 6 (costovertebral junction), and 5-8 (posterolateral); L1 vertebral body; acute L1- L3 transverse process; and acute T7-L1 spinous process. He also suffered a left pneumothorax (~40-50%). These injuries required a hospital stay of more than 48 hours.

5.4.4 Occupant B04- Serious

This 59-year-old male was transported to Banner University Medical Center, Phoenix Campus, by American Medical Response, AMR-193, with serious injuries. He sustained numerous fractures, including the left distal humerus shaft (acute oblique); L2-L5 left transverse process; and left ribs 6-12 (posterolateral). These injuries required a hospital stay of more than 48 hours.

5.4.5 Occupant B05- Serious

This 53-year-old male was transported to Banner University Medical Center, Phoenix Campus, by W-162 with serious injuries. He sustained numerous fractures, that included: the left superior and right inferior sacrum; left superior and inferior pubic rami of the pelvis; head of the left radius (acute); and left fibula (displaced acute oblique). He also had an extraperitoneal bladder rupture. These injuries required a hospital stay of more than 48 hours.

5.4.6 Occupant B06- Serious

This 66-year-old female was transported to Abrazo West Campus Hospital by Phoenix R34 with serious injuries. She sustained numerous fractures, that included: the left ribs at 5, 6 (anterior, nondisplaced), 7 and 9 (posterior and anterolateral, nondisplaced), 9-11 (anterolateral, nondisplaced), and 12 (posterior, nondisplaced); left superior and inferior pubic rami(comminuted); T8 endplate (mild); T9 vertebrae (compression, 20-30% height loss); T11 endplate (mild); L1 burst with mild bony retropulsion[46] into the central canal; right anterior acetabulum; right sacrum (comminuted) with widening at S/I joint; and the right hand at the proximal 4th phalangeal (displaced) and 5th metacarpal base (displaced). She also suffered a laceration to the front of the scalp and bibasilar atelectasis.[47] These injuries required a hospital stay of more than 48 hours.

5.4.7 Occupant B07- Serious

This 59-year-old male was transported to Abrazo West Campus Hospital by Maricopa Ambulance M-182 with serious injuries. He sustained numerous fractures, that included: C5 vertebral body; T11 – comminuted 3-column including the superior endplate, anterior aspect of vertebral body, pedicle (bilateral), and transverse process (bilateral); right clavicle; right ribs at 1 (posterior), 3-9 (posterolateral), 3-6 (anterior and posterior); left rib 12; L2-L4 transverse process; right distal fibular; left ulna (comminuted and displaced). He also suffered a right subdural hematoma (8 mm midline shift), a subarachnoid hemorrhage, right hip dislocation (femoral head posterior and superior relative to the acetabulum), right pneumothorax (trace), contusion to the right pancreatic head, and a right tibiotalar traumatic arthrotomy.[48] These injuries required a hospital stay of more than 48 hours.

[46] A retropulsed fragment is any vertebral fracture fragment that is displaced into the spinal canal.

[47] Atelectasis is the collapse of a lung or part of a lung.

[48] Traumatic arthrotomy is defined as a soft tissue injury over a joint that penetrates the joint space.

5.4.8 Occupant B08- Serious

This 68-year-old male was transported to Abrazo West Campus Hospital by M-183 with serious injuries. He sustained numerous fractures, that included: C6 vertebral body to left transverse foramen; T6-T7 osteophytes (distraction-extension); L1, L3, and L4 left transverse process, L2 3-column burst fracture with disruption of posterior elements (bilateral); L5 bilateral transverse process; bilateral superior aspect of inferior ramus of pelvis; left ilium; S3 and S4; right anteroinferior acetabular wall; left distal clavicle; left ribs 2-12; left ulna (comminuted and displaced); and left scapula (comminuted). The patient suffered a C6-7 epidural hematoma causing cord compression, disruption of the pubic symphysis, dislocation of S/I joint, hematoma surrounding the bladder, hematoma of the left psoas (2.9 x 4.1 X 11.2 cm), and a left hemothorax (moderate) with compressive atelectasis. These injuries required a hospital stay of more than 48 hours.

5.4.9 Occupant B09- Serious

This 38-year-old male was transported to Abrazo West Campus Hospital by Maricopa Ambulance M-181 with serious injuries. He sustained multiple fractures, that included: L3 transverse process (non-displaced); anterior ribs, bilaterally (non-displaced); left lateral tibial plateau avulsion; right fibula avulsion with avulsion of the lateral collateral ligament (LCL) of the knee; and left ankle, bimalleolar (minimally displaced). The patient also suffered tears in the left LCL of the knee, left popliteus muscle, and the lateral meniscus of the right knee. He demonstrated a full-thickness laceration over the left anterior tibia with exposed bone, a laceration to the left anterior scalp, and bibasilar atelectasis. These injuries required a hospital stay of more than 48 hours.

5.4.10 Occupant B10- Serious

This 58-year-old male was transported to Banner Estrella Hospital by Rural Ambulance Service R837 with serious injuries. He sustained a right clavicle comminuted fracture along with a nondisplaced fracture to right rib 1. The patient also had multiple abrasions to his right shoulder, dorsal hands, knees, tibias, and buttocks.

5.4.11 Occupant B11- Serious

This 65-year-old male was transported to Abrazo West Campus Hospital by Buckeye Valley R326 with serious injuries. He sustained numerous fractures, which included: T6 superior endplate compression (acute, 2 mm height loss); T12 vertebral body and anterior pedicles bilaterally and into left lamina (burst w/ 2 mm retropulsion); L1 and L2 left transverse process (nondisplaced); L3 and L4 left transverse process (displaced); L2 superior endplate extending to posterior elements (burst); left ribs 1 and 5-11 (posterior); right superior and inferior pubic rami of the pelvis (displaced); left superior and inferior pubic rami of the pelvis (nondisplaced); right iliac wing of the

pelvis extending into S/I joint; left iliac wing of the pelvis – small avulsion at S/I joint; left sacrum involving S/I joint; left distal fibula. He also sustained a hematoma in the retroperitoneal space and lacerations to the left anterior distal tibia and lateral distal fibula. These injuries required a hospital stay of more than 48 hours.

5.4.12 Occupant B12- Minor

This 52-year-old male was transported to Banner Estrella Hospital by P192 with minor injuries. He sustained a right retroperitoneal hematoma anterior to the right psoas (16 x 5.5 x 8.5 cm). He also had abrasions on his left buttocks, knee, and tibia; right elbow; and hands (bilaterally).

5.4.13 Occupant B13- Minor

This 63-year-old female was transported to Banner University Medical Center, Phoenix Campus, by AMR AP-161 with minor injuries. She suffered a concussion with loss of consciousness and a contusion to her left shoulder.

5.4.14 Occupant B14- Minor

This 60-year-old male was not transported to a hospital. He suffered abrasions to his legs and back.[49]

5.4.15 Occupant B15- Minor

This 54-year-old male was not transported to a hospital. He suffered abrasions on his left arm, hand, hip, and posterior tibia. He went to his primary care physician a couple of days after the accident and was diagnosed with a concussion and a fracture to the rib right 12.[50]

5.4.16 Occupant B16- Minor

This 62-year-old male was not transported to a hospital. He suffered abrasions on his left arm, shoulder, and leg.[51]

5.4.17 Occupant B17- Not injured

This 63-year-old male was not injured.

5.4.18 Occupant B18- Not injured

This 57-year-old male was not injured.

---

[49] Injuries determined from NTSB interview of occupant B14
[50] Injuries determined from NTSB interview of occupant B15
[51] Injuries determined from NTSB interview of occupant B16

5.5 Estimated biking order

The biking order was estimated from NTSB and police interviews and shown in Figure 43. Most subjects with serious injuries do not remember the crash's details. Riders to the front of the formation were focused on the road ahead and were generally unaware of the events and biking order behind. Three of the riders' positions were not estimated. The exact formations (single file or two abreast) are unknown and likely a combination. The figure shows a two-abreast configuration with a slight offset to depict the biking order while maintaining readability and spacing in the document. Additionally, the figure does not account for spacing between the riders. It was likely that the B group had smaller clusters of riders, and this information was not determined or represented in the figure.

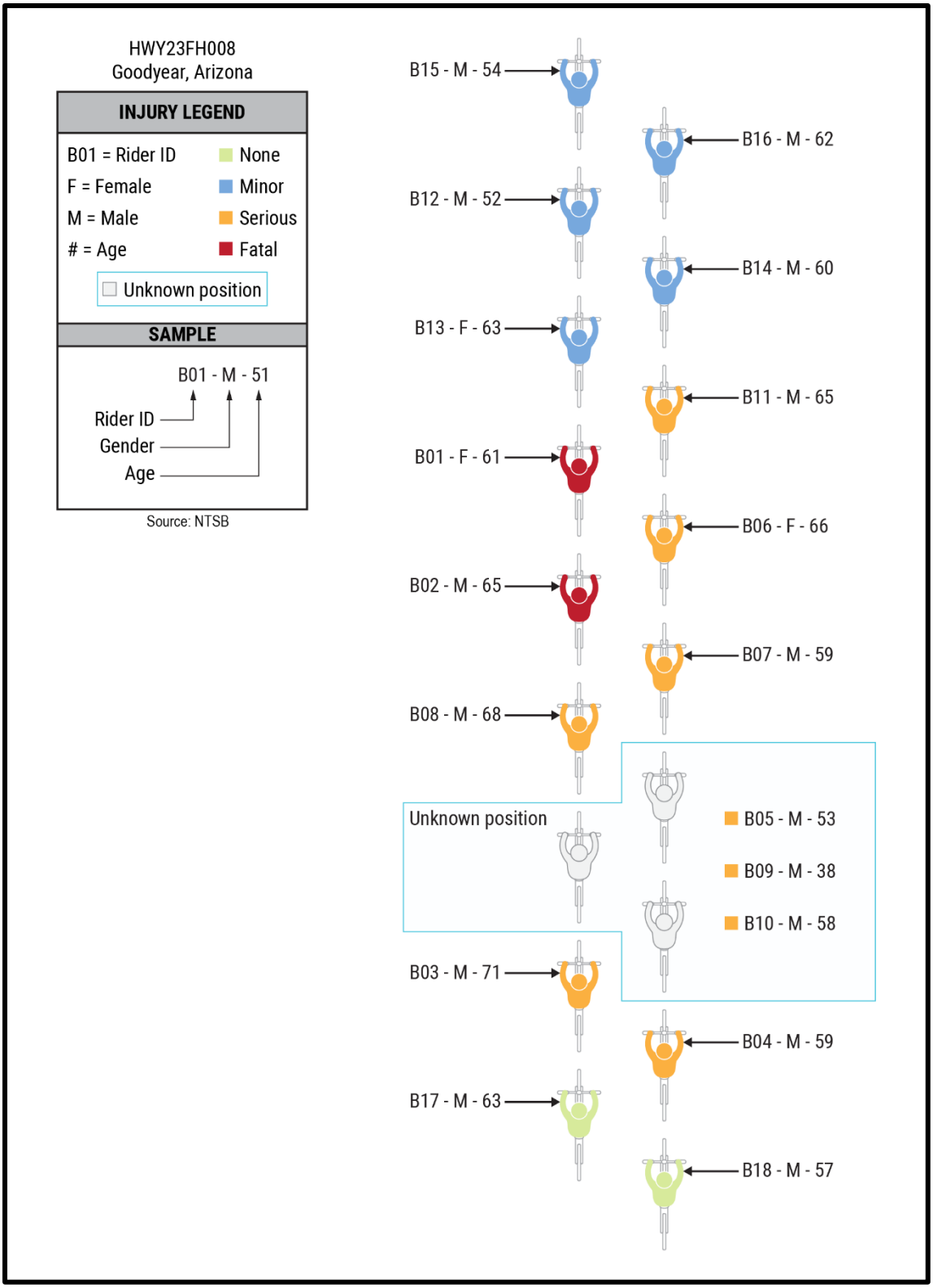

Figure 43: Estimated biking order.

5.6 Interviews

5.6.1 Occupant B03 – NTSB

This occupant did not recall being struck by the pickup. He was fourth from the back of the group while on the bridge and lost consciousness after the impact. His next memory was lying on the ground facing north and suffering much pain. He could not get up after several attempts and had difficulty breathing. Occupant B18 attended to him until EMS arrived. He remembered seeing a red triage tag and talking to the medic in the ambulance about which hospital they were going to. He could not recall who was in front of him just before the accident nor any details about the pickup or the driver.

5.6.2 Occupant B04 – GPD

This occupant did not remember the accident. He was riding in the bike lane and was the first person struck by a pickup, after which he lost consciousness or "blacked out." While on the ground, he was treated by B17 and remembered feeling very cold and thinking he might not survive. He then lost consciousness again. He recalled seeing a white flash of the vehicle that hit him but never heard it approaching.

5.6.3 Occupant B05 – GPD

He remembered leaving the Santini Bike Store in Goodyear and heading south on Bullard, passing through an industrial area and a couple of traffic lights and then to Cotton Lane. He was in the back two-thirds of the group, riding near the road edge, and his bike computer marked a five-mile increment. His account ends with a recollection of lying on the ground on his left side with his back adjacent to the concrete barrier.

5.6.4 Occupant B06 – NTSB

She arrived at the bike shop, met B01 and other riders, and remembered taking photos and setting off on a group ride at 7:30 a.m. The ride started socially, with groups A, B, and C keeping together, warming up and chatting, and continuing to MC-85 and Cotton Lane. They reached the Cotton Lane Bridge, which she described as the safest part of the ride and continued to ride towards Estrella. She did not remember the accident. Her first memory was that she stood up and was in shock. Scattered water bottles and damaged bikes surrounded her. A police officer assisted her and got her to sit down. She remembered being loaded into the ambulance and taken to the hospital.

5.6.5 Occupant B07 – NTSB

This occupant does not remember anything from the day of the crash until the evening when he woke up in the emergency room. He was wearing a helmet equipped with the Mips[52] system.

5.6.6 Occupant B08 – NTSB

This occupant remembered donning a high-visibility long-sleeved jersey at the bike store before departing on the ride. After the group crossed MC-85, he started at the end of the A group but realized he could not maintain their pace and drifted back to the B riders. As the riders approached the base of the hill on the Cotton Lane Bridge, he moved from the front of the B group to the back to conserve energy. The last thing he recalled was falling behind B01. His next memory was waking up in the rehabilitation center approximately five weeks after the crash.

5.6.7 Occupant B09 – GPD

This occupant remembered very little from the accident. He started at the bike shop and recalled the ride up to MC-85 and Cotton Lane. The group was single file, and he was as far to the right as possible. The traffic was light that day. His next memory was waking up in the hospital and getting stitches in his eyebrows.

5.6.8 Occupant B10 – GPD

This occupant was riding southbound on the shoulder of the Cotton Lane Bridge and in the last quarter of the B-group. He was hit from behind, everything went blurry, and he fell into the concrete barrier.

5.6.9 Occupant B11 –NTSB

This occupant recalled stopping to pick up his bike and changing into his gear at the bike store where he worked, about 1.5 miles from the start of the Saturday ride. He wore a helmet with WavelCel[53] technology. He rode his bike to meet the group and departed with everyone from the Santini Bike Store. He characterized the initial part of the ride as a warm-up, but once the group crossed MC-85, the ride officially started, and the pace picked up. He moved into the B group and estimated their speed to be 20-25 mph. As he began the climb up the slight elevation of the bridge, he moved towards the center of the bike lane. He recalled the group was riding in either single or double file. He did not hear anything before he was hit. After impact he was thrown

[52] Mips (multi-directional impact protection system) system consists of a lower friction layer mounted inside the helmet. In a crash, this layer is designed to move slightly inside the helmet with the intent to reduce the risk of brain injury.

[53] WaveCel is a collapsible cellular structure lining the helmet that flexes and crushes with the intent to reduce head angular accelerations during impacts.

forward from his bike and knocked B14 off his bike. B11 then struck the ground and tumbled on the pavement. He may have been run over by the truck, but he was unsure. B15 provided aid and called B11's wife. EMS triaged him with a red tag and transported him to the hospital. He suffered extensive injuries and has spent his time since the crash recovering.

5.6.10 Occupant B12 – NTSB

The ride started normally. They departed on time from the bike shop and eventually made a left onto Cotton Lane. The group went through the MC-85 intersection, and he started up the small rise to the Cotton Lane Bridge. He pulled ahead of B14 and shortly after was hit from behind and sent airborne. He came to rest, sitting on the shoulder, facing west towards the street with his bike five feet behind. He looked to his right and saw a vehicle swerve sharply to the left and stopped close to the median. He was triaged with a green tag and taken to the hospital. He noted that he had distorted time perception (dyschronometria) the rest of the day following the accident.

5.6.11 Occupant B13 – GPD

The group started the ride at 7:30 a.m. She was the fifth rider from the front while going South on the Cotton Lane Bridge. She heard B01 and B06 talking behind her. She did not hear anything from the truck as it approached. She was struck from behind, hit her head on something, and then blacked out. While in the air, she saw a white truck. She woke up lying on the ground and was aided by B14 until an ambulance arrived and transported her to the hospital.

5.6.12 Occupant B14 – NTSB

The ride started at 7:30 a.m. The first four miles were relaxed, neutral miles. They turned south on Cotton Lane about one-half mile north of MC-85. At this point, the ride changed from a warm-up to a tempo pace, and the bicyclists were divided into groups based on speed. B14 was in the slower part of the B-group, which consisted of 18-20 riders. He began the climb up the bridge and was fourth from the front, right behind B12. He heard a loud popping noise, similar to a firecracker, and then either B06 or B13 yelled, "What's going on?". He was knocked off his bike just as the pickup passed him. On his way down, he saw the truck go by and estimated the speed at 50-60 mph. He rolled onto his back, stayed down for about a minute, and assessed his injuries. He then stood up and saw riders piled up around him and broken bikes. He checked on the people around him and then aided B13. He estimated the first impact between the bicyclists and the pickup at the first expansion joint (one-third of the way across the bridge), and the pickup stopped at approximately the second expansion bridge (two-thirds). He did not hear or observe any indication of the braking by the pickup.

5.6.13 Occupant B15 – NTSB

About 20 minutes into the ride, the group turned left onto Cotton Lane towards the Estrella community. After the turn, the riders split into several groups, and he was in the main B-group. Once on the Cotton Lane Bridge, he was the lead cyclist of the B group, and they were in a two abreast formation in the bicycle lane extending partly in the right traffic lane (Lane 2). As he was about one-third of the way across the bridge, he heard a large boom followed by crunching noises and tires popping. Following this, he was pushed forward by the riders behind, and he crashed on his left side and hit his head hard on the ground. He remained conscious but had concussion symptoms. He stood up and saw the pickup stopped approximately 200 meters ahead with broken bikes and 12-15 bicyclists on the ground in between. He observed the pickup driver briefly approach the scene before returning to the vehicle. B15 took a picture of the license plate and the vehicle. He began checking on the injured, finding many seriously hurt, and called 911, requesting every available emergency vehicle. He aided B06, B08, B09, and B13, all in the same area. He was eventually taken into an ambulance and interviewed by police.

5.6.14 Occupant B16 – NTSB

The ride started at 7:30 a.m. It was an overcast, cool morning in the 40s. They took Bullard Lane to Cotton Lane and turned south towards the Estrella community. As they approached the Cotton Lane Bridge, the bicyclists were to the right on the shoulder and riding side-by-side (two abreast). He was second or third from the front of the B-group when he heard a carbon fiber breaking and snapping. The noises got louder and louder, and then debris and bodies from behind and the side pushed him to the ground. He did not observe any signs of braking by the pickup. He landed on his left side, got up, and was the first to call 911. He checked on the nearby victims and called his wife, who drove to the scene with blankets.

5.6.15 Occupant B17 – NTSB

This occupant traveled to Arizona to train in the winter and watch some spring training baseball games. He found the West Valley Cycle Club and tried the Saturday ride. He did not know anyone else and arrived early at the starting point to meet the group and find out more information. He rode with the group, and they went through some side streets and passed the baseball park. At some point, the riders spread out and arrived at a large bridge in a rural area. He was second to last in the B-group. He next noticed that a pickup truck passed “really, really close” to him on his left. The pickup moved from left to right, struck the next bicyclist (B04), and continued hitting other riders in the shoulder lane. The vehicle eventually struck the concrete barrier. B17 was not hit by the truck, so he got off his bike and tended to B04.

5.6.16 Occupant B18 – NTSB

This occupant was visiting Arizona with B02 and met the bicycle club riders at the bike shop. He didn't know the area, and when they got to the bridge, the riders began splitting up into different groups. He wasn't comfortable drafting close to the wheel of the next rider, so he was several lengths behind the last rider of the B-group (B17). He was riding inside the shoulder when a white truck passed within three or four feet (arm's length). The truck drifted to the right and struck one of the riders (B04). B18 noted that the passenger side tires of the truck stayed one or two feet inside the white line of the shoulder and advanced through the main cluster of bicyclists. He did not observe brake lights on the truck as it struck the riders during the event. B18 unclipped from his bike and attempted to find B02, who was further forward in the formation. While on his way, he stopped to aid B03 until EMS arrived. Subsequently, B18 made his way up the bridge and found B02, who was on the ground and was being administered aid by paramedics. B18 stayed with B02 and talked to him until he was loaded into the ambulance. B18 remained on the scene until the police interviewed him. Shortly after, he received word that B02 had died in the hospital.

6.0 First Responders

6.1 911 Notification

Four 911 audio records were obtained from the GPD. A summary of each call is given in the following sections.

6.1.1 Caller 1

This caller was bicyclist B16. He informed the operator that 20 bicyclists were struck by a pickup truck and gave the location as the South Cotton Lane Bridge between MC-85 and Estrella Parkway.

6.1.2 Caller 2

This caller was bicyclist B17. He informed the operator that a dozen injured bicyclists were hit by a truck. He was not from the area and did not know where he was. He gave the location as Cotton Lane Bridge.

6.1.3 Caller 3

This caller was bicyclist B15. He informed the operator that 15 bicyclists were hit by a car. He identified that one woman was severely injured. He gave the location as Cotton Lane, north of MC-85.

6.1.4 Caller 4

This caller was a bystander and informed the operator of a major accident on the Cotton Lane bridge south of MC-85. The operator did not ask for more information as fire rescue was already on the way.

6.2 Police

GPD was the only responding police agency. A summary of the units that responded to the crash scene and their activities is given in Table 29.

Table 29: Summary of GPD scene response

Unit	Time In	Time Out	Activity	Details
1351	8:03 a.m.	1:40 p.m.	Initial Response	Traffic Control. Collected victim information at the hospital.
1209	8:03 a.m.	10:24 a.m.	Initial Response	Assessed casualties. Identified victims
1398	8:05 a.m.	5:38 p.m.	Initial Response	Gathered statements from bicyclists
1147	8:05 a.m.	1:23 p.m.	Initial Response	CPR to B01. Applied dressings to B06. Interviewed victims at the hospital
1308	8:05 a.m.	5:38 p.m.	Initial Response	Identified subjects. Preliminary scene photos. Set up media/family staging area.
1363	8:06 a.m.	1:57 p.m.	Initial Response	Gathered statements from witnesses
1243	8:07 a.m.	3:20 p.m.	Initial Response	Traffic control.
1360	8:07 a.m.	5:38 p.m.	Initial Response	CPR to B01. Interviewed bicyclists.
1348	8:10 a.m.	5:00 p.m.	Initial Response	CPR to B01. Assisted with scene management
1185	8:10 a.m.	1:39 p.m.	Initial Response	Initial IC
1144	8:48 a.m.	6:30 p.m.	Investigation	Lead investigator. Documented scene and vehicle
1326	8:49 a.m.	6:30 p.m.	Investigation	Interviewed bicyclists. Assisted with scene diagram. Secured bicycles. Cleanup
1256	8:56 a.m.	12:14 p.m.	Initial Response	Response
1295	9:02 a.m.	7:00 p.m.	IC/Traffic Investigation	IC. Directed investigation.
1228	9:14 a.m.	5:00 p.m.	Investigation	Administer DRE/Interviewed driver/blood draw
942	9:15 a.m.	5:00 p.m.	Investigation	Interviewed victims at Banner Estrella Hospital.
1166	9:15 a.m.	6:00 p.m.	Command	Supervision
1275	9:16 a.m.	5:03 p.m.	Investigation	Document scene

Unit	Time In	Time Out	Activity	Details
1335	9:40 a.m.	1:52 p.m.	Deputy Chief	Supervision
1101	9:54 a.m.	1:35 p.m.	Chief	Supervision
1320	10:05 a.m.	5:00 p.m.	CSI	Document scene
1384	10:06 a.m.	5:00 p.m.	CSI	Document vehicle

The first GPD units responded to the scene approximately eight minutes after the crash. Three officers administered cardiopulmonary resuscitation (CPR) to bicyclist B01 until EMS arrived. GPD also administered first aid to the head and legs of bicyclist B13. Officers controlled traffic and worked with fire rescue services to establish staging areas. The pickup driver was interviewed, drug and sobriety assessments were performed, and he was arrested. Once the victims cleared the scene, GPD documented the scene using a global navigation satellite system (GNSS) antenna (Leica GS14) and drone and ground-based photographs. The pickup's ACM was downloaded. The interior and exterior of the vehicle were photographed, and the vehicle was taken to the police impound lot. All involved bicycles were collected, photographed, and brought to the police storage unit. Victims and witnesses were interviewed at the scene or the hospital.

6.3 Fire Rescue and Emergency Medical Services

6.3.1 Phoenix Fire Department Regional Dispatch Center

The Phoenix Fire Department Regional Dispatch Center (RDC) dispatches fire and medical operations in Phoenix and the surrounding area (Figure 44). The black star indicates the approximate location of the crash. The center covers twenty-six jurisdictions directly and three entities indirectly, encompassing over 2000 square miles. All departments that use the RDC participate in an automatic aid agreement whereby fire, medical, and rescue units are shared regardless of local boundaries. Each resource within the network is tagged and tracked using a Global Positioning System (GPS) to determine its location. Aid is dispatched based on the resources needed and proximity to the event. The RDC functions as a secondary answering point, meaning that 911 calls are first directed to the local law enforcement agency, which determines if the emergency requires fire and medical services. If so, the call is transferred to the RDC, which allocates the necessary resources and tactical radio channels.

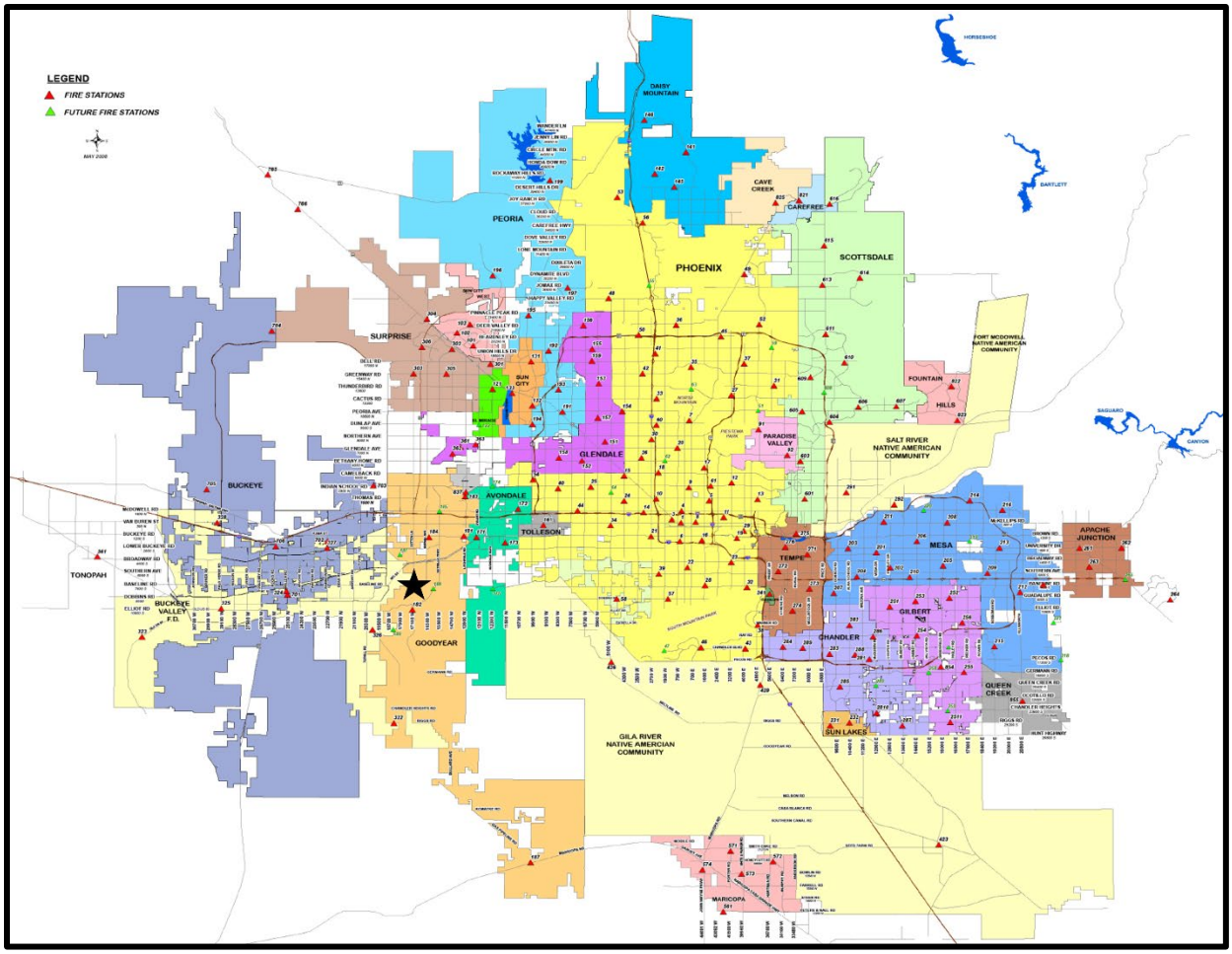

Figure 44: Automatic aid map of Phoenix RDC.

6.3.2 Computer Aided Dispatch Log

A summary of the responding Fire Rescue and Emergency Medical Service (EMS) units is given in Table 30.

Table 30: Summary of fire rescue and EMS response

Unit	Agency	Dispatched	Enroute	On Scene	Available
LT184	Goodyear	7:58:49 a.m.	7:59:23 a.m.	8:07:10 a.m.	10:16:06 a.m.
M-182	Goodyear	7:58:49 a.m.	7:59:23 a.m.	8:04:07 a.m.	9:43:24 a.m.
BC181	Goodyear	8:01:13 a.m.	8:02:15 a.m.	8:09:01 a.m.	10:11:24 a.m.
E182	Goodyear	8:01:13 a.m.	8:02:35 a.m.	8:06:17 a.m.	9:05:34 a.m.
E171	Avondale	8:01:13 a.m.	8:01:39 a.m.	8:10:36 a.m.	9:32:14 a.m.
E181	Goodyear	8:01:13 a.m.	8:02:28 a.m.	8:10:56 a.m.	9:30:02 a.m.
M-183	Goodyear	8:02:39 a.m.	8:02:42 a.m.	8:10:46 a.m.	9:34:44 a.m.
M-1815	Goodyear	8:03:55 a.m.	8:03:41 a.m.	8:16:24 a.m.	9:42:54 a.m.
E185	Goodyear	8:05:29 a.m.	8:05:59 a.m.	8:17:44 a.m.	9:34:19 a.m.
BC171	Avondale	8:05:29 a.m.	8:06:23 a.m.	8:15:03 a.m.	9:02:47 a.m.

Unit	Agency	Dispatched	Enroute	On Scene	Available
L703	Buckeye	8:05:29 a.m.	8:06:05 a.m.	8:19:42 a.m.	9:00:10 a.m.
BC701	Buckeye	8:05:29 a.m.	8:05:55 a.m.	8:15:28 a.m.	9:08:38 a.m.
U324	Buckeye Valley	8:05:29 a.m.	8:07:38 a.m.	8:22:41 a.m.	9:15:05 a.m.
BC321	Buckeye Valley	8:05:29 a.m.	8:06:54 a.m.	8:21:01 a.m.	9:11:30 a.m.
WDC	Glendale	8:05:29 a.m.	8:06:41 a.m.	8:27:40 a.m.	9:16:44 a.m.
NDC	Phoenix	8:05:29 a.m.	8:06:34 a.m.	8:33:29 a.m.	9:23:59 a.m.
E175	Avondale	8:06:50 a.m.	8:07:05 a.m.	8:19:37 a.m.	9:12:31 a.m.
E173	Avondale	8:06:50 a.m.	8:07:27 a.m.	8:20:32 a.m.	9:04:10 a.m.
E183	Goodyear	8:06:50 a.m.	8:08:47 a.m.	8:19:51 a.m.	8:44:20 a.m.
E321	Buckeye Valley	8:06:50 a.m.	8:08:26 a.m.	8:22:27 a.m.	8:47:53 a.m.
LT161	Tolleson	8:06:50 a.m.	8:07:31 a.m.	8:24:44 a.m.	8:43:49 a.m.
BC161	Tolleson	8:06:50 a.m.	8:08:06 a.m.	8:25:01 a.m.	9:07:23 a.m.
BC3	Phoenix	8:06:50 a.m.	8:09:04 a.m.	8:31:01 a.m.	8:46:49 a.m.
U308	Surprise	8:06:50 a.m.	8:07:46 a.m.	8:28:21 a.m.	8:43:05 a.m.
SQ44	Phoenix	8:07:43 a.m.	8:07:43 a.m.	8:27:53 a.m.	8:43:28 a.m.
SQ173	Avondale	8:08:31 a.m.	8:08:31 a.m.	8:20:29 a.m.	8:43:35 a.m.
M-181	Goodyear	8:09:01 a.m.	8:09:01 a.m.	8:14:54 a.m.	9:02:34 a.m.
SDC	Phoenix	8:09:18 a.m.	8:09:18 a.m.	8:37:04 a.m.	9:13:19 a.m.
E150	Glendale	8:10:22 a.m.	8:10:25 a.m.	8:24:31 a.m.	8:58:58 a.m.
R326	Buckeye Valley	8:11:00 a.m.	8:11:22 a.m.	8:23:42 a.m.	9:09:03 a.m.
M321	Buckeye Valley	8:11:00 a.m.	8:12:17 a.m.	8:25:24 a.m.	9:41:30 a.m.
W-162	Tolleson	8:11:34 a.m.	8:11:34 a.m.	8:32:35 a.m.	10:39:45 a.m.
W-161	Tolleson	8:11:34 a.m.	8:11:34 a.m.	8:28:15 a.m.	10:28:33 a.m.
P-192	Peoria	8:11:34 a.m.	8:11:34 a.m.	8:36:13 a.m.	10:08:15 a.m.
P-193	Peoria	8:11:34 a.m.	8:11:34 a.m.	8:40:20 a.m.	10:09:17 a.m.
R34	Phoenix	8:13:12 a.m.	8:14:37 a.m.	8:35:08 a.m.	9:45:37 a.m.
R837	Rural	8:14:57 a.m.	8:14:57 a.m.	8:34:25 a.m.	10:04:53 a.m.
E172	Avondale	8:15:13 a.m.	NR[54]	8:25:45 a.m.	8:57:40 a.m.
M-SUP3	Maricopa County	8:15:18 a.m.	8:15:18 a.m.	8:43:37 a.m.	8:49:49 a.m.
E701	Buckeye	8:16:40 a.m.	8:16:40 a.m.	8:28:39 a.m.	8:47:05 a.m.
E326	Buckeye Valley	8:19:53 a.m.	8:19:53 a.m.	8:32:14 a.m.	8:41:11 a.m.
AM-100		8:25:44 a.m.	8:25:44 a.m.	8:46:55 a.m.	11:10:35 a.m.
AM-400		8:29:32 a.m.	8:29:32 a.m.	9:03:00 a.m.	11:10:46 a.m.
M324	Buckeye Valley	8:30:39 a.m.	8:30:39 a.m.	8:44:10 a.m.	10:27:12 a.m.
BC231	Sun Lakes	9:00:47 a.m.	9:01:20 a.m.	9:45:33 a.m.	10:50:46 a.m.
RH231	Sun Lakes	9:00:47 a.m.	9:02:09 a.m.	10:03:38 a.m.	10:41:55 a.m.
CR181	Goodyear	9:17:16 a.m.	9:17:16 a.m.	9:58:51 a.m.	12:26:15 p.m.
CV171	Avondale	9:37:51 a.m.	9:37:51 a.m.	10:29:43 a.m.	7:27:18 p.m.
E174	Avondale	9:43:52 a.m.	9:43:59 a.m.	10:21:17 a.m.	11:28:44 a.m.

[54] Time not recorded.

6.3.3 Patient Transport

Patient transport information to the area hospitals is given in Table 31.

Table 31: Patient transport summary[55]

Unit	Leave Scene	At Hospital	Hospital	Victim
M-182	8:16:00 a.m.	8:28:00 a.m.	Abrazo West	B07
M-183	8:18:22 a.m.	8:34:48 a.m.	Abrazo West	B08
R326	8:31:32 a.m.	8:46:18 a.m.	Abrazo West	B11
M321	8:34:23 a.m.	9:00:33 a.m.	Banner University Medical Center - Phoenix Campus	B03
M-1815	8:34:32 a.m.	8:43:11 a.m.	Abrazo West	B02
M-181	8:34:40 a.m.	8:41:11 a.m.	Abrazo West	B09
R837	8:43:00 a.m.	9:01:00 a.m.	Banner Estrella	B10
AP162	8:43:50 a.m.	9:08:11 a.m.	Banner University Medical Center - Phoenix Campus	B05
R34	8:44:29 a.m.	9:00:34 a.m.	Abrazo West	B06
P193	8:48:30 a.m.	9:16:38 a.m.	Banner University Medical Center - Phoenix Campus	B04
P192	8:48:08 a.m.	9:10:06 a.m.	Banner Estrella	B12
AP161	8:45:09 a.m.	9:14:06 a.m.	Banner University Medical Center - Phoenix Campus	B13

6.3.4 Response Summary

The first EMS unit arrived on the scene at 8:04 a.m. and was a Maricopa Ambulance, unit M-182. Engine 182 from Goodyear arrived two minutes later and estimated 20 casualties, which was updated to 15, with eight needing immediate treatment and seven requiring delayed treatment. Upon arrival, at 8:09 a.m., the Goodyear Battalion Chief assumed command and assigned E182 and LT184 to the treatment sector to begin administering aid to the most critical patients. The IC ran the command from his truck parked north of the incident on the Cotton Lane Bridge. Each immediate patient was assigned an Advanced Life Support (ALS) company, which escalated to a second alarm medical response due to the number of victims requiring aid.

The next battalion chief (BC) to arrive was B171 from Avondale, and he was assigned control of the treatment sector. The following BC was B701 from the City of Buckeye and established the transportation sector. The third BC (BC321 from Buckeye Valley) was assigned to the staging sector North of the bridge. With this structure, as additional units arrived on the scene, they would first go to the staging area and assigned tasks as needed.

Patient triage subsequently updated the status to nine requiring immediate transport, three delayed, and one fatal. Private ambulance companies supplied the

[55] All times a.m.

primary medical transport service in the Valley area, and the initial request for ten ambulances exceeded their capacity. Within a short period, the IC coordinated a landing zone sector for air assets to accommodate victim evacuation. Shortly after this was set up, the ambulance request was filled, eliminating the need for air evacuations and a landing zone section.

The first immediate transport victim left the scene at 8:16 a.m. and the last by 8:47 a.m. The last delayed transport left by 8:48 a.m. The incident began to deescalate after these patients were transported to the hospital. The focus shifted towards aiding the non-injured individuals involved in the incident.

6.3.5 Mass Casualty Incident Plan

All fire districts participating in the Phoenix RDC automatic aid agreement use the Phoenix Regional Standard Operating Procedures for EMS Responsibilities.[56] The general tactical objects outlined in this guideline are:

1. Remove endangered occupants and treat the injured.
2. Stabilize the incident and provide for life safety.
3. Ensure the triage, extrication, and treatment and transportation functions are established as needed and performed appropriately.
4. Provide for rescue personnel and victims' safety, accountability, and welfare.
5. Conserve property.

The plan defines a multi-patient incident as fewer than 25 patients; mass casualty is between 25 to 100, and disaster is over 100. Responders follow the Arizona Triage System,[57] which is based on the Simple Triage and Rapid Treatment (START) method,[58] where the victims were grouped into one of four categories- black (deceased), red (immediate), yellow (delayed), or green (walking wounded). Triage tags are to be used whenever there are three or more immediate patients or more than ten patients.

Other areas covered in the plan are command responsibilities, basic sectors, additional sectors, branches, and resource commitment and flow.

7.0 Hospitals

The three hospitals that treated the injured bicyclists were Abrazo West Campus (Level 1 Trauma Center), Banner Estrella Medical Center (Level 4), and Banner – University Medical Center Phoenix (Level 1). Figure 45 shows the hospitals' location, distance from the accident, and the victims' number and injury severity.

[56] See EMS Responsibilities MP203.01 accessed August 30, 2023.
[57] See Fire Triage Training (phoenix.gov) accessed August 30, 2023.
[58] See START Information accessed August 29, 2023.

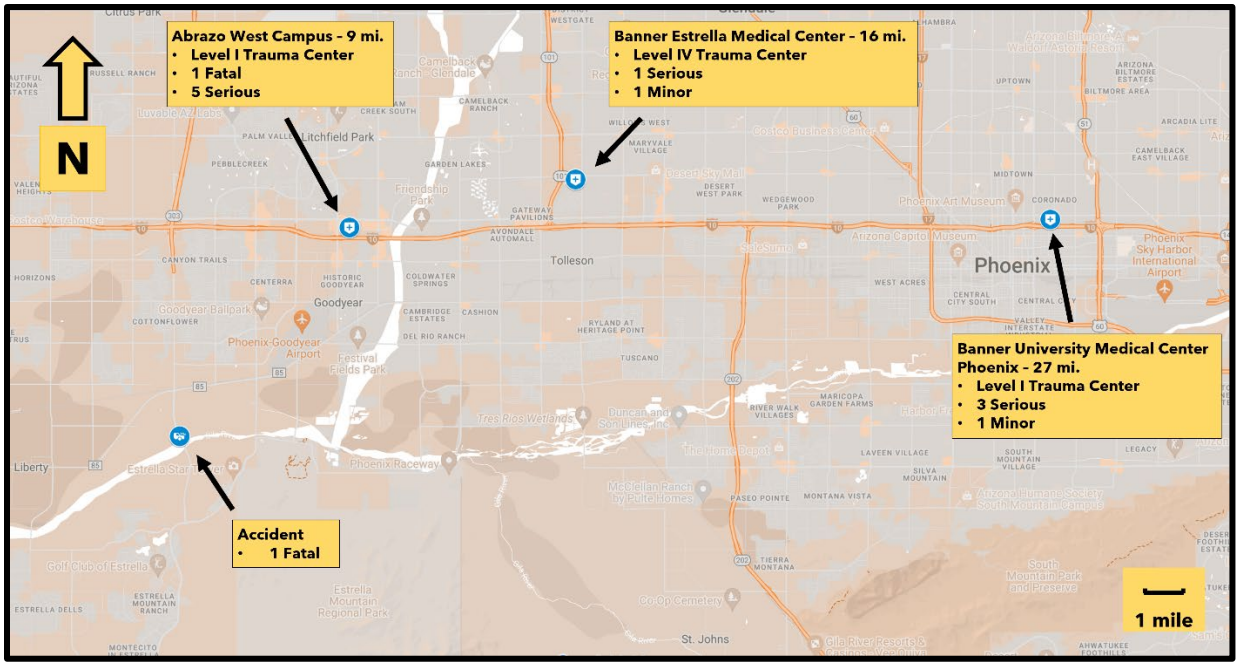

Figure 45: Hospitals and crash scene locations.
(source annotated Google Maps)

E. LIST OF ATTACHMENTS

- City of Goodyear AZ Engineering Design Standards and Policies Manual Chapter 4
- Arizona Bicycle Facilities Planning and Design Guidelines
- Should State DOTs prefer bicycle lanes or wide curb lanes?
- 2022 Arizona Bikeways Map
- ADOT Statewide Bicycle and Pedestrian Plan Update – Final Report
- 2019 Ford F250 EDR Report
- List of NHTSA complaints on Ford F-Series MY17-22 2 WD pickups.
- Transcript of NTSB Interviews with bicyclists
- Transcript of NTSB Interviews with first responders

Submitted by:

Brian Bragonier, IIC
John Humm, Survival Factors
Eric Gregson, Technical Reconstruction