

UDOT's Region Four Conflict Warning System Phase 2

Troy C. Torgersen, P.E.

UDOT - Region 4

ITS/Signal Engineer

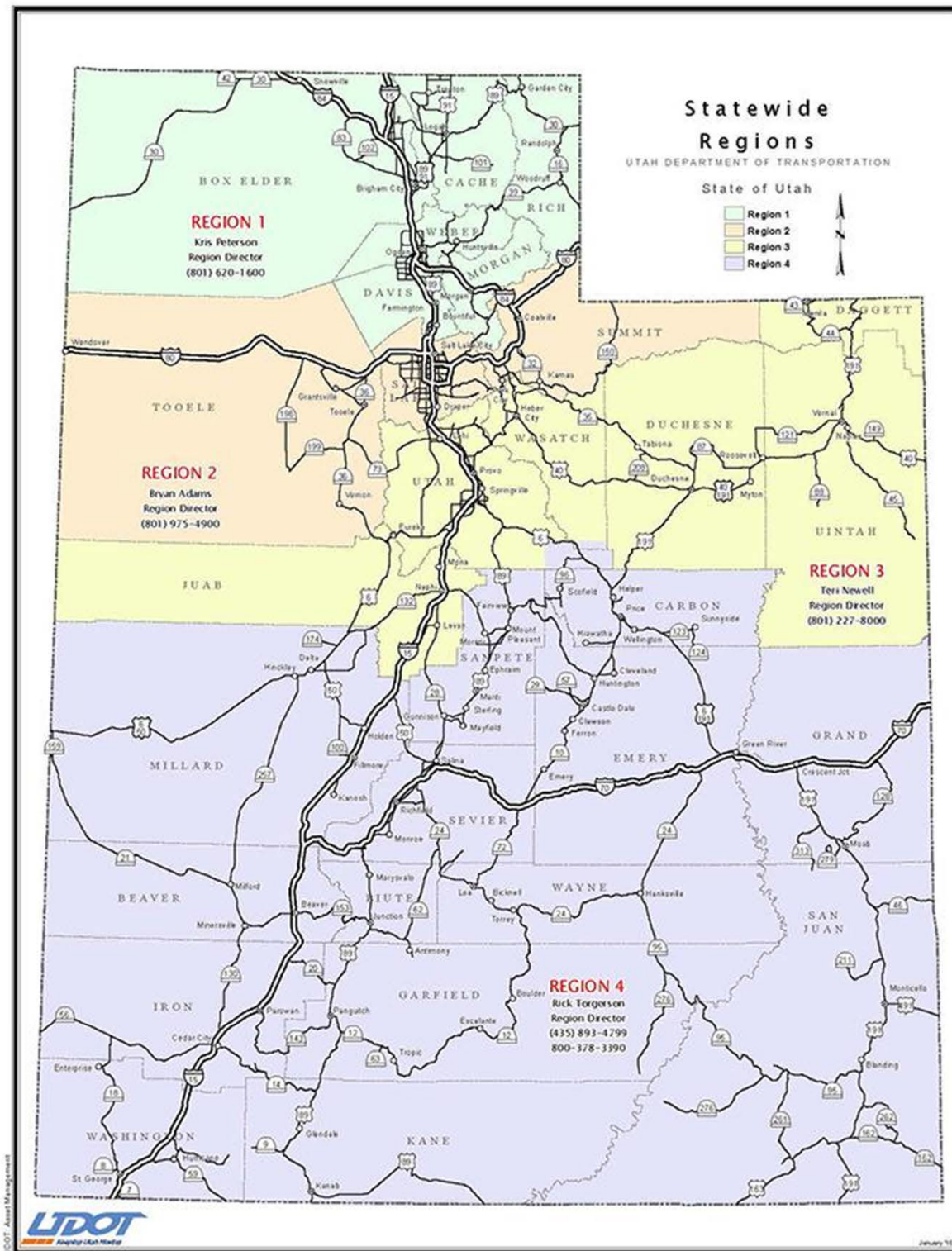
OVERVIEW

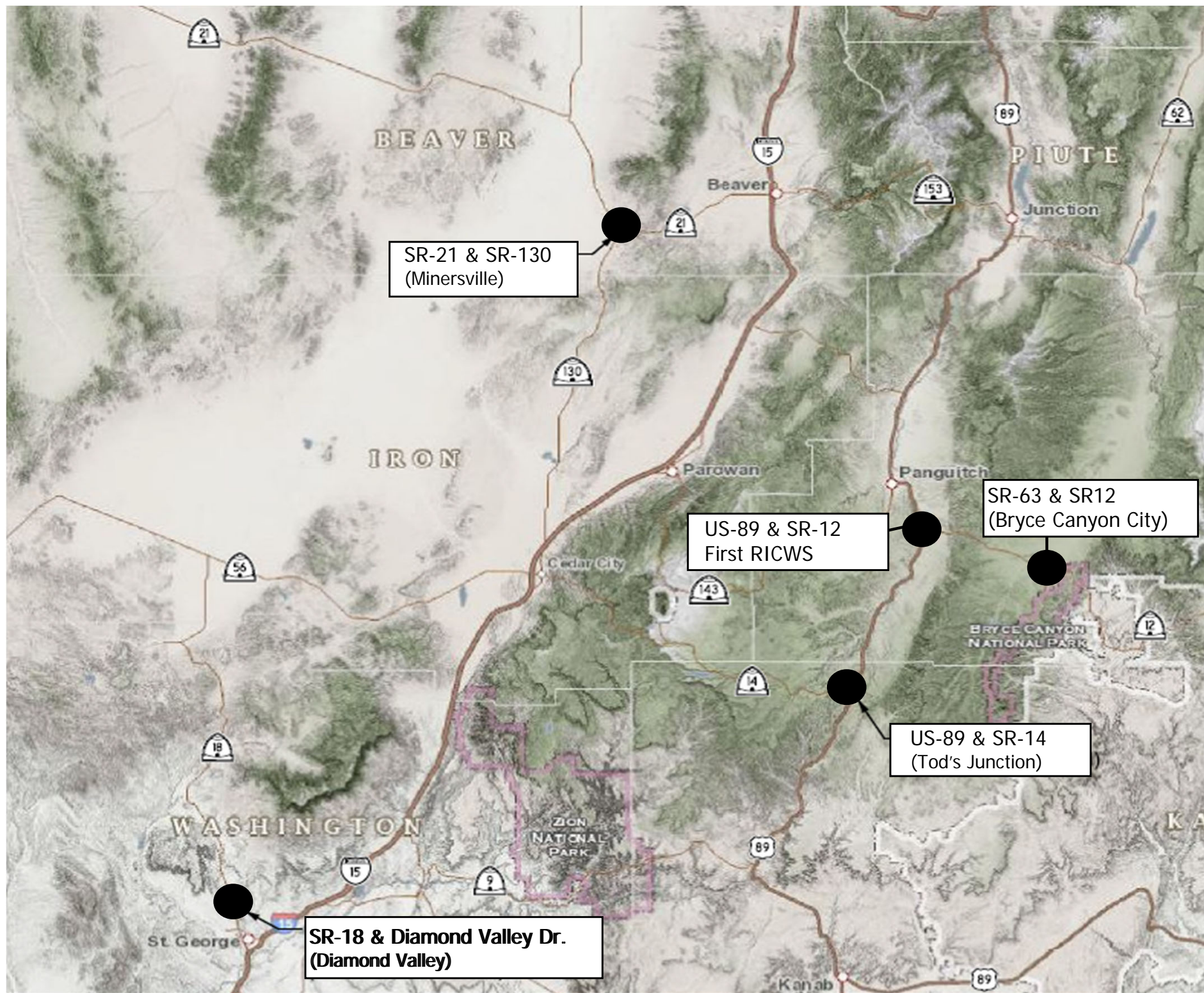
- Phase 1 Project Locations
- Rural Intersection Conflict Warning System Guidelines
- Detection Equipment & Details for Phase 1
- Standard Drawings & Details for Phase 1
- Updated Research

OVERVIEW CON'T

- UDOT Design Example
- Phase 2 Project Locations
- Phase 2 Project Details
- Detection Equipment for Phase 2
- Design Details for Phase 2
- State Furnished Materials List
- Signing Used for Phase 2

Phase 1 Project Locations





Rural Intersection Conflict Warning System Guidelines

RURAL INTERSECTION CONFLICT WARNING SYSTEM GUIDELINES

FINAL REPORT

This report provides conflict warning system selection guidelines for potential conflicts associated with rural high-speed intersections.

2/20/2018

Prepared for:

UDOT REGION 4 TRAFFIC & SAFETY

Prepared by:

CIVIL SCIENCE, INC.



Report contents protected under 23 USC 409

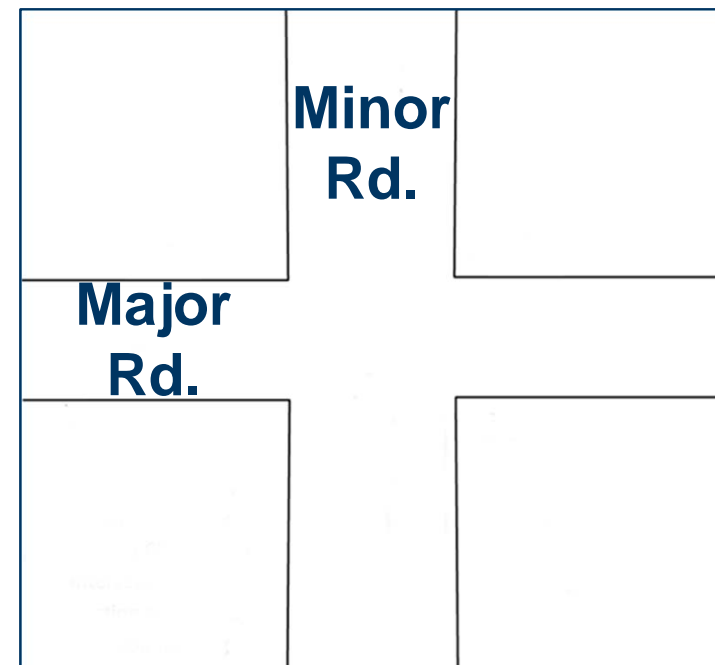
1. Intersection Scenarios

Scenario 1 – Minor Road Alert Only

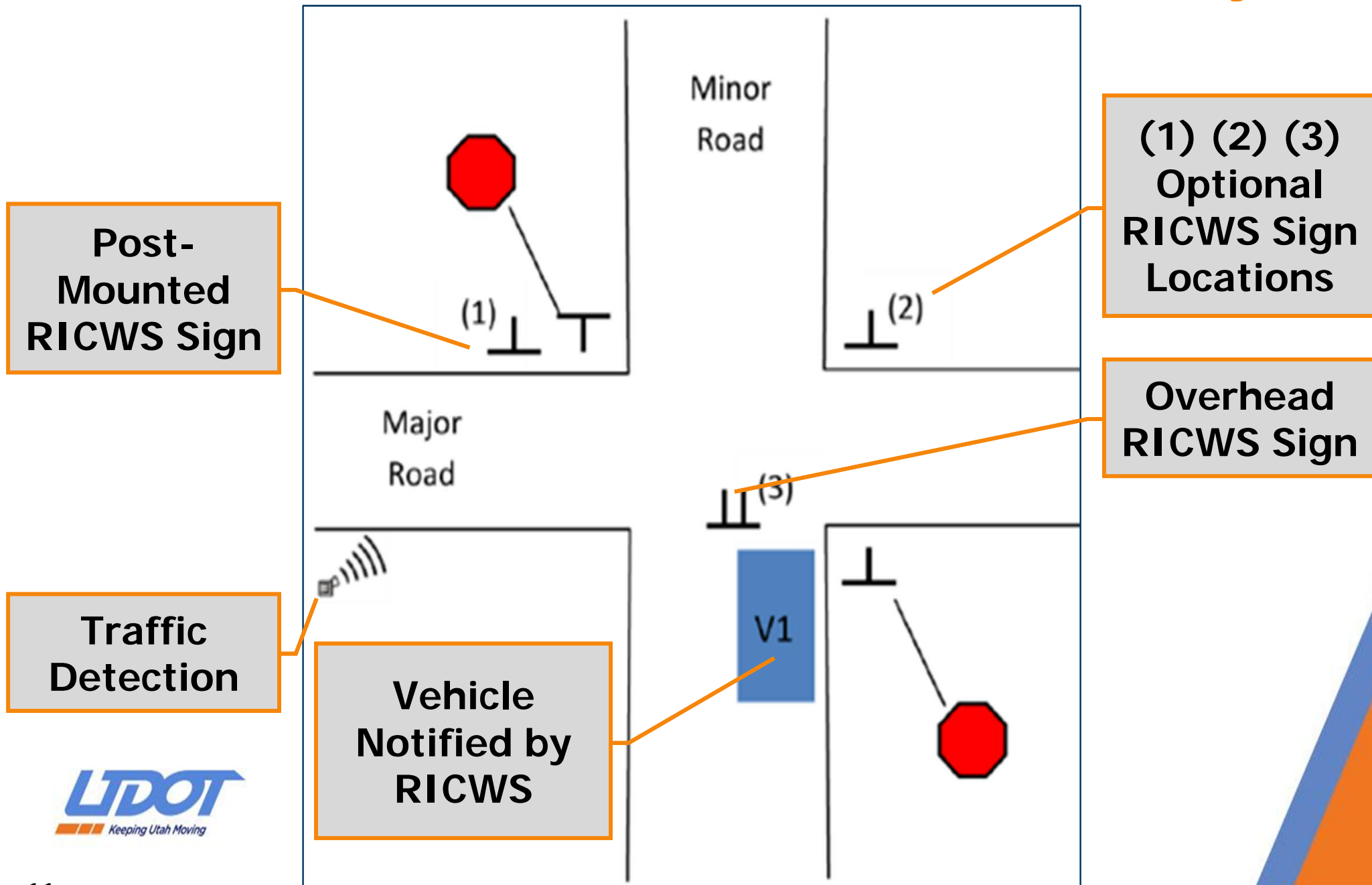
Scenario 2 – Minor Road Alert Only (Divided)

Scenario 3 – Major Road Alert Only

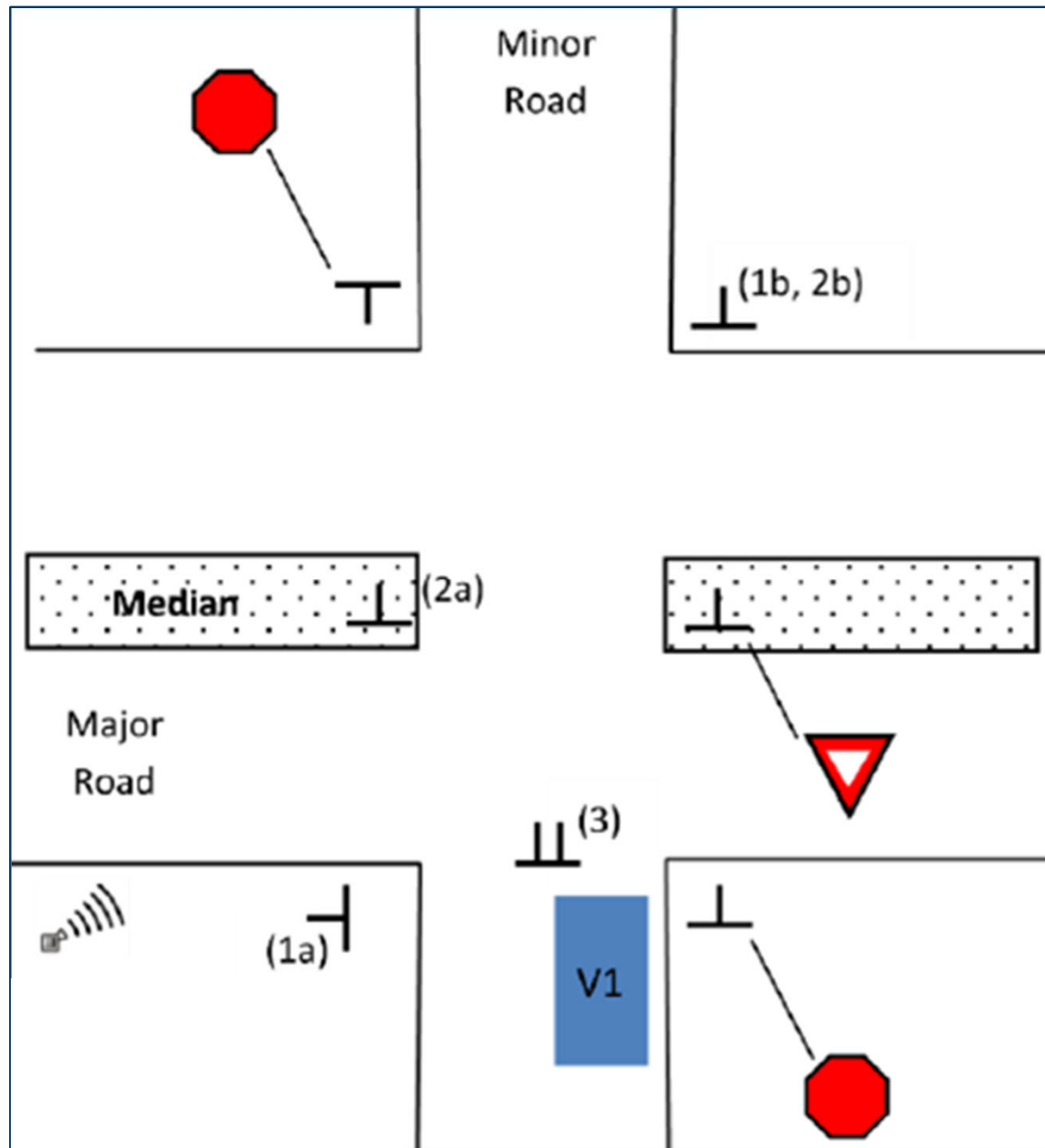
Scenario 4 – Minor and Major Alert



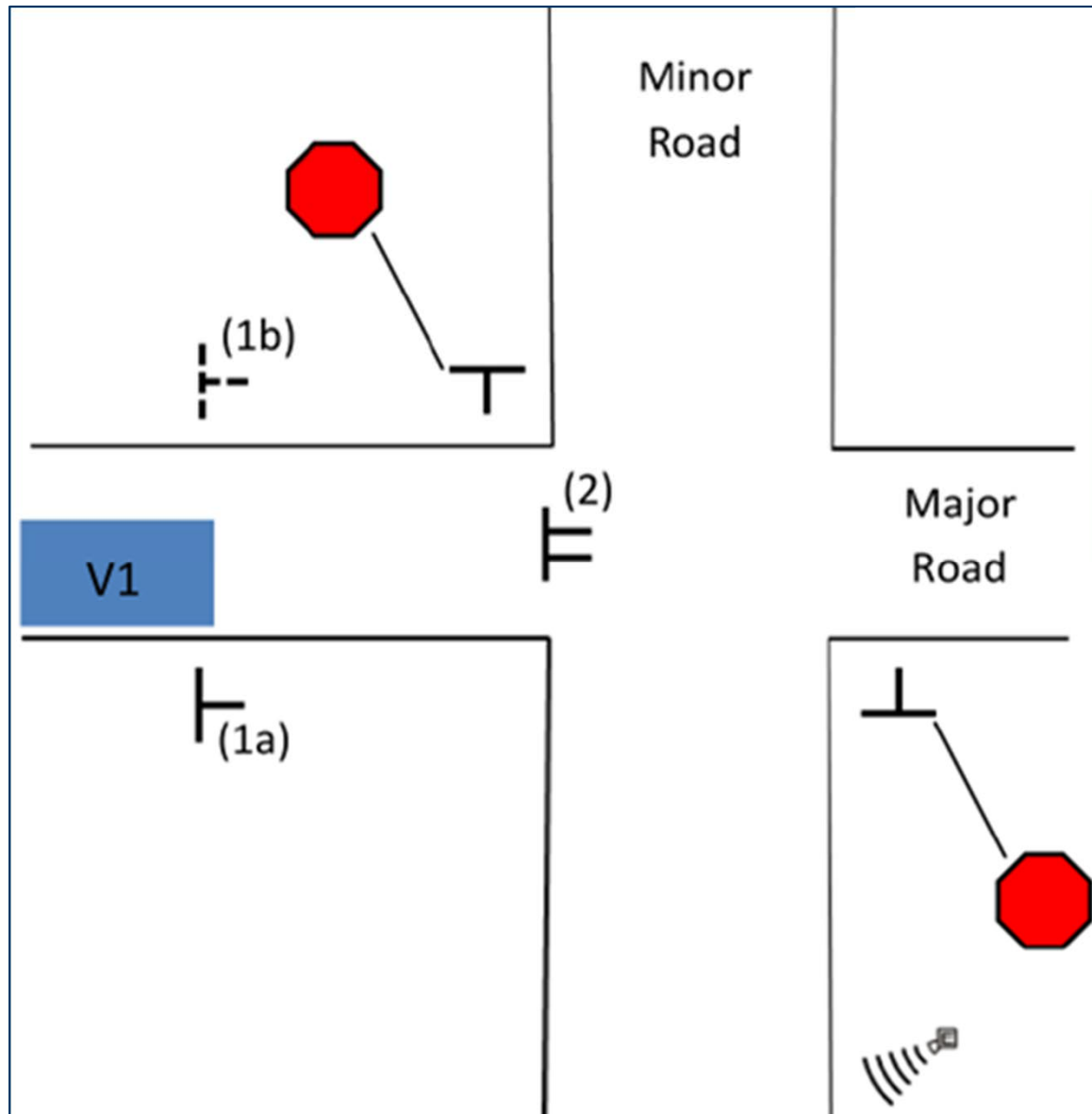
Scenario 1 - Minor Road Only



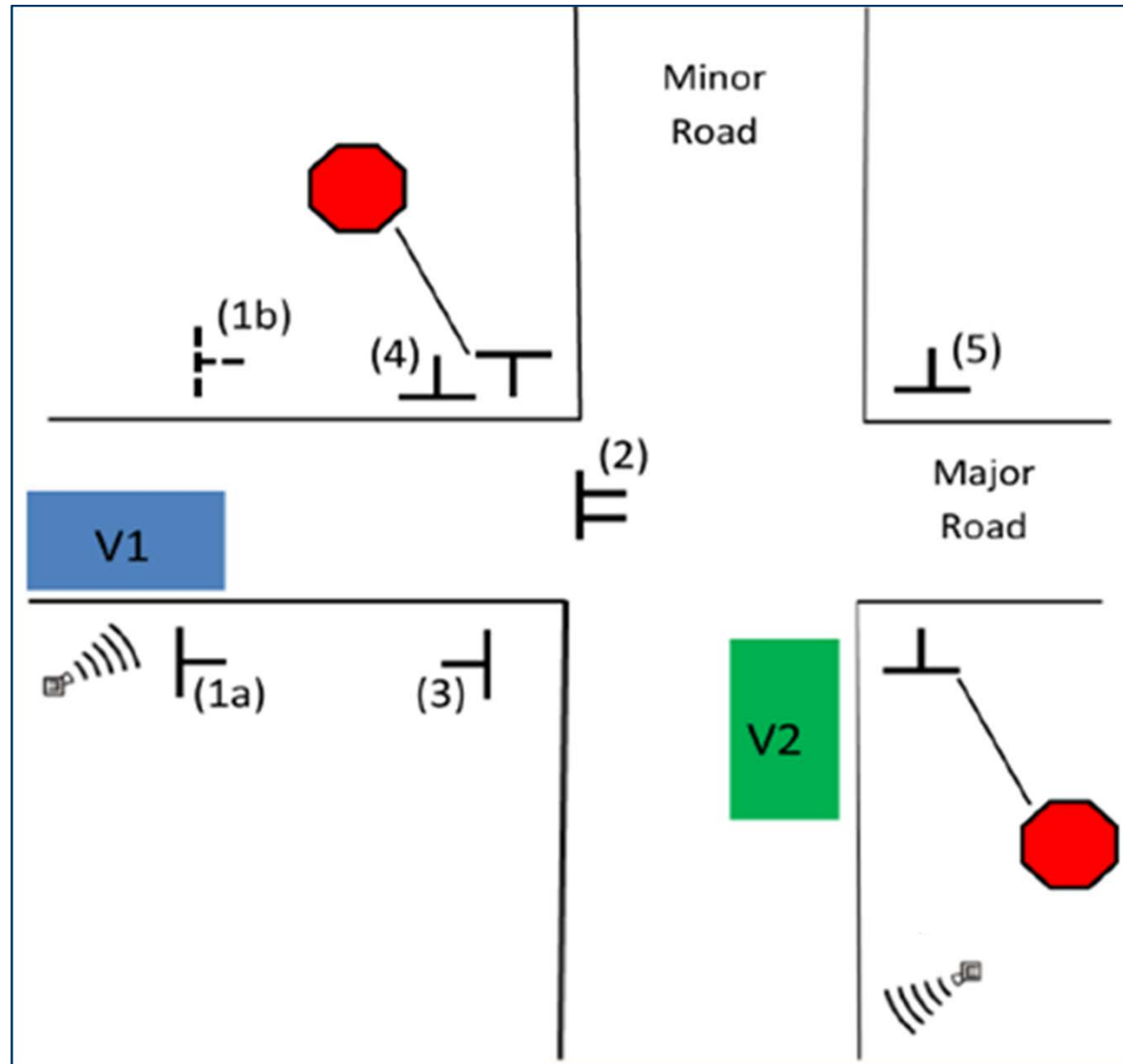
Scenario 2 - Minor Road (Divided)



Scenario 3 - Major Road Only



Scenario 4 – Major & Minor Road



3. Detection Type

Timed Detection

- Single detection component placed at a determined distance away from the intersection
- Does not account for speed changes after initial detection (higher speeds than the posted speed limit), and the system must be replaced when posted speed limits change

Speed & Distance Detection

- Dual detection system placed further back to better detect traffic and to accommodate changes to speed
- Dual functionality allows the system to better track accurate speeds and distance from the intersection

Detection System Options

Type of Detection	Intended Use	Remarks
1. Inductive Loop: 6-ft x 6-ft square or 6-ft diameter loop under the pavement for vehicle detection.	Loops, along with radar, are the most common type of detection system. May be used on either major or minor road.	The most accurate among detection technologies. Requires underground wiring. UDOT recommends installation only in new pavement applications.
2. Wireless Magnetometer (Puck): In-pavement-mounted magnetic sensors to detect vehicles using low-power radio technology.	Use for roads in place of saw cutting. Allows for easy installation and can be used for other types of detection.	Has the same detection characteristics as a 6-ft x 6-ft induction loop. No longer recommended by UDOT for new construction.
3. Wireless Radar: Radar unit is mounted and will detect approaching vehicles on to provide feedback to warning system.	Radar, along with loops, is the most common type of detection system. May be used on either major or minor road.	The location of radar detectors upstream of the intersection and in relation to the stop line on the minor road varies greatly between different example sites. Radar provides for greater system flexibility.

Detection Equipment & Details for Phase 1

Model
225

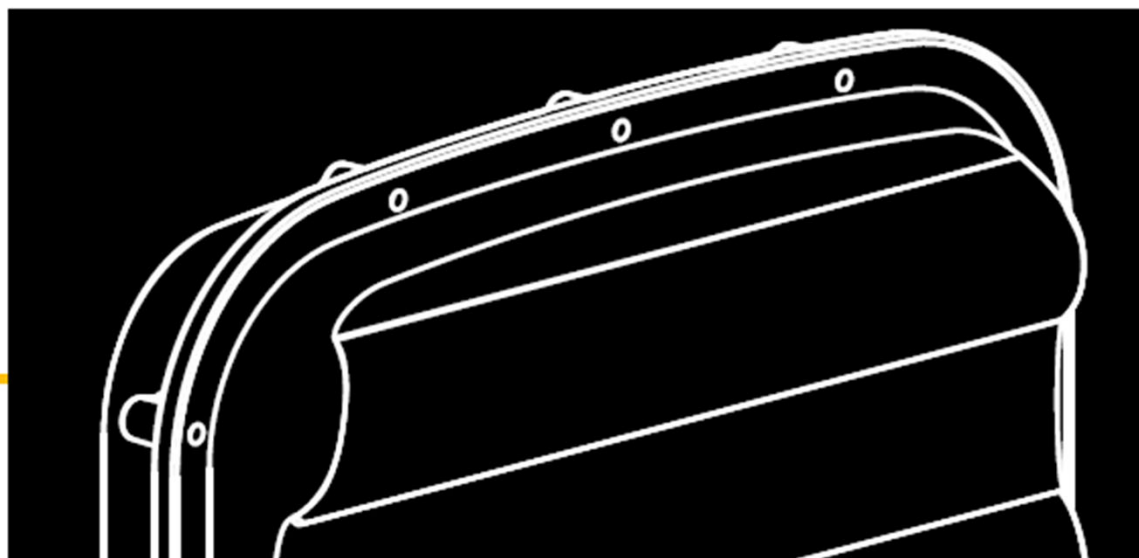
v 0.5

SmartSensor Matrix



SmartSensor Matrix

Model 225



SmartSensor Advance

USER GUIDE

Standard Drawings & Details for Phase 1

LEGEND

- SIGNAL HEAD
- + SIGNAL HEAD
- YELLOW TYPE O SIGNAL HEAD
- MAST ARM SIGNAL POLE
- TT MAST ARM OR SIGNAL POLE MOUNTED SIGN
- △ ADVANCED RADAR DETECTION
- △ STOP LINE RADAR DETECTION
- GROUND MOUNT SIGN

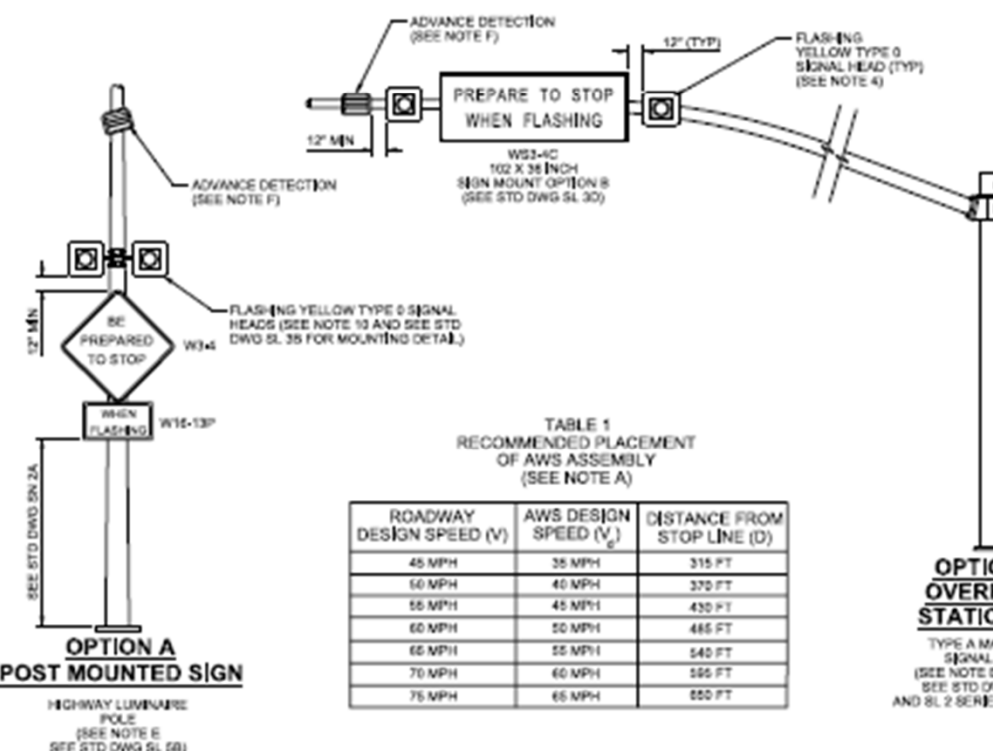
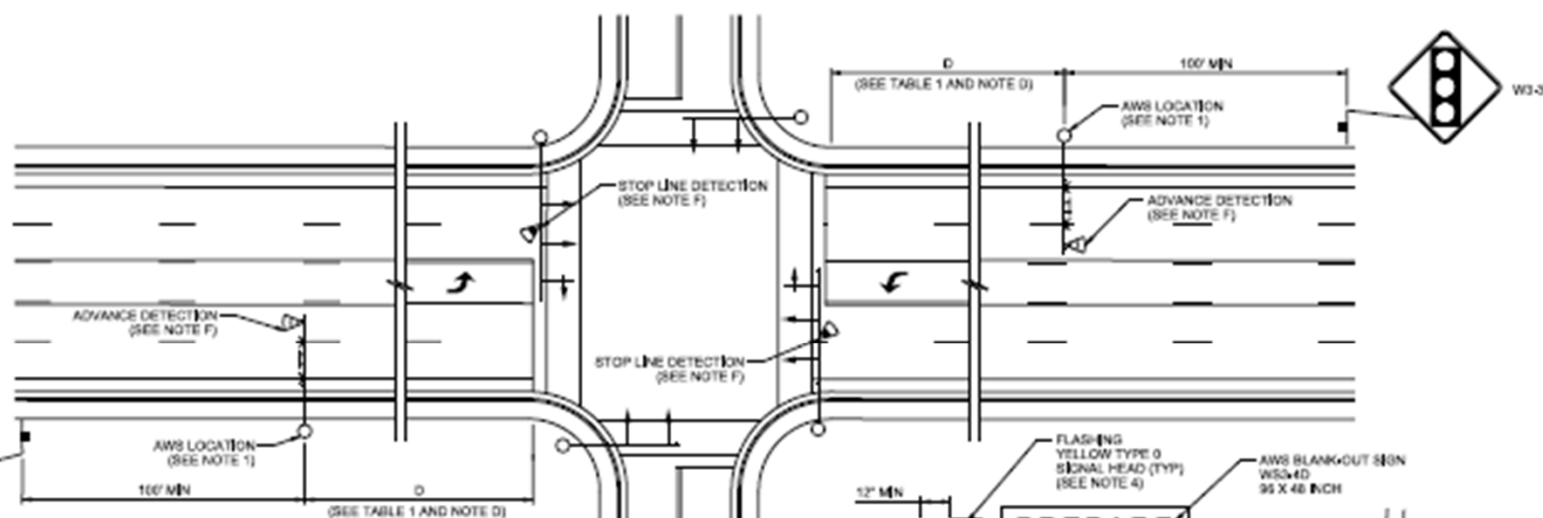


TABLE 1
RECOMMENDED PLACEMENT
OF AWS ASSEMBLY
(SEE NOTE A)

ROADWAY DESIGN SPEED (V)	AWS DESIGN SPEED (V _a)	DISTANCE FROM STOP LINE (D)
45 MPH	35 MPH	315 FT
50 MPH	40 MPH	370 FT
55 MPH	45 MPH	430 FT
60 MPH	50 MPH	485 FT
65 MPH	55 MPH	540 FT
70 MPH	60 MPH	595 FT
75 MPH	65 MPH	650 FT

OPTION B OVERHEAD STATIC SIGN

TYPE A MAST ARM
SIGNAL POLE
(SEE NOTE E, 5, AND G
SEE STD DWG SL 1A
AND SL 2 SERIES STD DWGS)

NOTES:

1. LOCATE RIGHT SIDE MOUNTED OVERHEAD AWS ASSEMBLY SUCH THAT RIGHT BEACON IS LOCATED DIRECTLY OVER RIGHT EDGE LINE. ADJUST THE PLACEMENT OF THE OVERHEAD AWS ASSEMBLY IF AN OBSTRUCTION BLOCKS THE VIEW OF BEACONS. LOCATE LEFT SIDE MOUNTED OVERHEAD AWS ASSEMBLY SUCH THAT LEFT BEACON IS LOCATED DIRECTLY OVER LEFT EDGE LINE.
2. BEACONS FLASH YELLOW ALTERNATELY, LEFT AND RIGHT.
3. USE A TYPE C POLE WITH A COMPATIBLE FOUNDATION WHEN OPTION C OVERHEAD BLANK-OUT SIGN IS INSTALLED. FIELD CUT TYPE C COMPATIBLE MAST ARM TO REQUIRED LENGTH AND CAP END, PROVIDE SUFFICIENT MAST ARM LENGTH FOR AWS ASSEMBLY AND DETECTION EQUIPMENT PLACEMENT, THE MAXIMUM OPTION C MAST ARM LENGTH IS 50 FT.
4. DO NOT PLACE RETROREFLECTIVE TAPE ON FLASHING BEACON BACKPLATES.
5. PROVIDE 18 FT-4 INCH CLEARANCE BETWEEN BOTTOM OF AWS STATIC SIGN OR AWS BLANK-OUT SIGN, INCLUDING BRACKETS, AND HIGHEST POINT OF ROADWAY SURFACE UNDER THE SIGN. PROVIDE 17 FT-4 INCH MINIMUM CLEARANCE WITH APPROVAL FROM THE ENGINEER, PROVIDE 18 FT-4 INCH MINIMUM CLEARANCE ON APPROVED HIGH-LOAD ROUTES, SIGN WS2-4D IS STATE TURNED.

DESIGN ONLY NOTES:

- A. TABLE 1 IS BASED ON A 6-SECOND LEAD FLASH TIME, THE DISTANCE (D) MAY BE ADJUSTED TO PROVIDE A 3-SECOND MINIMUM TO A 6-SECOND MAXIMUM LEAD FLASH TIME USING THE FORMULA: $D = 0.278(V_a^2 - V^2)/G$ WHERE: D = LEAD FLASH TIME (SEC) \times AWS DESIGN SPEED (MPH)

FOR DOWNGRADE APPROACHES OF 2 PERCENT OR GREATER ADD DISTANCE D_g TO D:
 $D_g = \frac{V_a^2}{9.32 \times 300} - \frac{V^2}{9.32}$
WHERE: G = PERCENT GRADE DIVIDED BY 100

- B. AWS DESIGN SPEED (V_a) IS 10 MPH SLOWER THAN ROADWAY DESIGN SPEED.
- C. PLACE AWS TO PROVIDE 2 SECONDS MINIMUM SIGHT DISTANCE ON APPROACH.
- D. INSTALL AWS ASSEMBLY THE SAME DISTANCE FROM THE STOP BAR IN BOTH DIRECTIONS IF AWS WARRANT CRITERIA ARE MET FOR BOTH DIRECTIONS OR AS DIRECTED BY THE REGION TRAFFIC OPERATIONS ENGINEER, PROVIDE DETECTION IN BOTH DIRECTIONS AT A MINIMUM ACCORDING TO NOTE F.
- E. COORDINATE WITH THE REGION TRAFFIC OPERATIONS ENGINEER TO DETERMINE WHICH OPTION TO USE, DO NOT INSTALL POST-MOUNTED AWS ON MULTILANE APPROACH WITHOUT APPROVAL FROM REGION TRAFFIC OPERATIONS ENGINEER.
- F. INSTALL ADVANCE DETECTION THE SAME DISTANCE FROM THE STOP BAR IN BOTH DIRECTIONS, STOP LINE DETECTION REQUIRED AT INTERSECTION IN BOTH DIRECTIONS FOR ALL LANES, PLACE ADVANCE DETECTION AS CLOSE TO CENTER OF THRU LANES AS POSSIBLE WHILE MAINTAINING SPACING AS SHOWN.
- G. PROTECT WITH AN APPROVED BARRIER OR GUARDRAIL SYSTEM WHEN POLE PLACEMENT IS WITHIN ROADSIDE CLEAR ZONE.

OPTION C OVERHEAD BLANK-OUT SIGN

TYPE C MAST ARM
SIGNAL POLE
(SEE NOTE E, 3, 5, AND G
SEE STD DWG SL 1C)

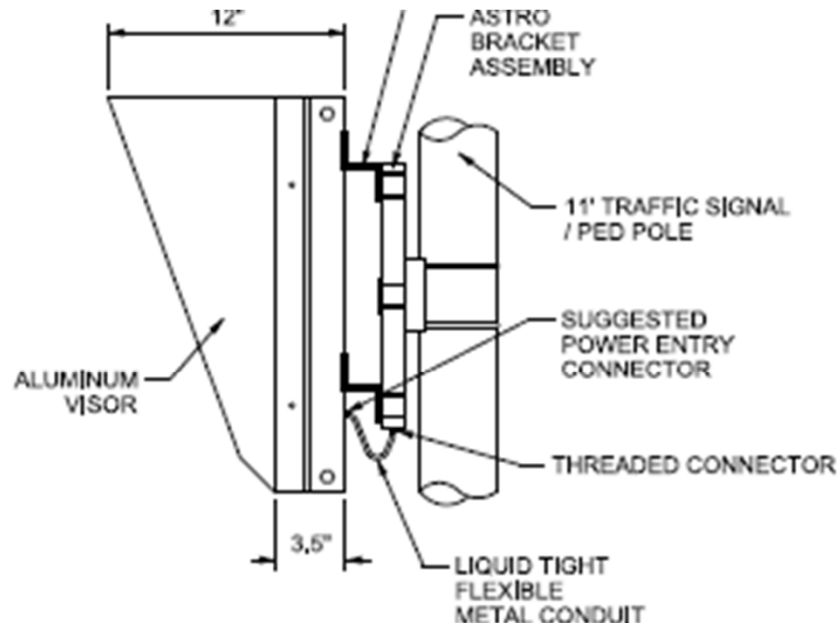
UTAH DEPARTMENT OF TRANSPORTATION
STANDARD DRAWINGS FOR ROAD AND HIGHWAY CONSTRUCTION
SALT LAKE CITY, UTAH

ADVANCE WARNING
SIGNAL (AWS) SYSTEM

STD. DWG. NO.
SL 8



RECTANGULAR BLANKOUT SIGN
FRONT VIEW



RECTANGULAR BLANKOUT SIGN
SIDE VIEW

NOTES:

1. PICK UP THE STATE FURNISHED BLANKOUT SIGN AT THE CEDAR DISTRICT OFFICE AT 1470 NORTH AIRPORT ROAD, CEDAR CITY. CONTACT REGION SIGNAL CREW 10 DAYS PRIOR TO THE DESIRED PICK UP DATE, SEE SG-S01 FOR CONTACT INFORMATION.
2. BLANKOUT SIGN WILL COME WITH STATE FURNISHED Z-BAR MOUNTING TO MOUNT THE SIGN TO THE TRAFFIC SIGNAL / PED POLE. ATTACH Z-BAR TO POLE BY ASTRO BRACKET PER OPTION B FOR LARGE SIGNS ON STANDARD DRAWING SL 3D. INSTALL THREADED CONNECTOR AT BOTTOM OF ASTRO BRACKET TUBE AND USE LIQUID TIGHT FLEXIBLE METAL CONDUIT TO CONNECT FROM THE CONNECTOR TO THE BLANKOUT SIGN POWER ENTRY CONNECTOR.

STATE FURNISHED RECTANGULAR BLANKOUT SIGN DETAIL

STATE FURNISHED ONE SECTION TYPE 0 HEADS,
MOUNT HEADS BY TYPE 0 POST MOUNT - BOLT
BRACKET PER STANDARD DRAWING SL 3B.



**ENTERING TRAFFIC
WHEN FLASHING**

SIGN TYPE A-1, 138 INCH X 42 INCH REQ'D
SEE SHEET DT-06 FOR DETAIL

15' TRAFFIC SIGNAL / PED
POLE AND BASE PER
STANDARD DRAWING SL 1E

2 INCH CONDUIT

TYPE A JUNCTION BOX

TRAFFIC SIGNAL / PED POLE
FOUNDATION - 2'X3' PER
STANDARD DRAWING SL 1E

FRONT ELEVATION

MOUNT SIGN WITH Z-BAR AND U-BOLT,
SEE STANDARD DRAWING SERIES SN9.



Z-BAR PER STANDARD
DRAWING SN 8

7' MIN

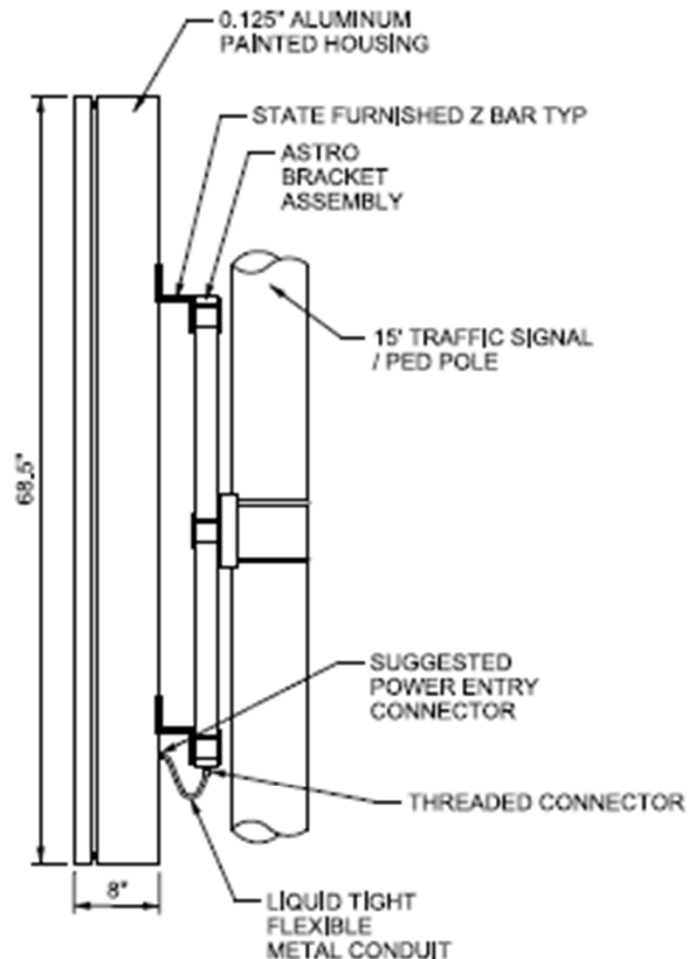
TRAFFIC SIGNAL / PED POLE
FOUNDATION - 2'X3' PER
STANDARD DRAWING SL 1E

2 INCH CONDUIT

TYPE A JUNCTION BOX

BACK ELEVATION

FLASHER SIGN DETAIL



NOTES:

1. PICK UP THE STATE FURNISHED BLANKOUT SIGN AT THE CEDAR DISTRICT OFFICE AT 1470 NORTH AIRPORT RD, CEDAR CITY, CONTACT REGION SIGNAL CREW 10 DAYS PRIOR TO THE DESIRED PICK UP DATE. SEE SG-S01 FOR CONTACT INFORMATION.
2. BLANKOUT SIGN WILL COME WITH STATE FURNISHED Z-BAR MOUNTING TO MOUNT THE SIGN TO THE TRAFFIC SIGNAL / PED POLE, ATTACH Z - BAR TO POLE BY ASTRO BRACKET PER OPTION B ON STANDARD DRAWING SL 3D, INSTALL THREADED CONNECTOR AT BOTTOM OF ASTRO BRACKET TUBE AND USE LIQUID TIGHT FLEXIBLE METAL CONDUIT TO CONNECT FROM THE CONNECTOR TO THE BLANKOUT SIGN POWER ENTRY CONNECTOR.

Updated Research

- Use Technology to reduce or decrease highway crashes on Rural Routes
- Research other States to see how they are addressing Rural Routes
- Look at ways to decrease costs to increase the number of sites
- Internet search to query on Rural Intersection Conflict Warning Systems
- Placed a message on the nation-wide ITE Chat Board to ask for assistance
- Ask our own employees what they would recommend

Responses from other states

- TxDOT
- Ohio DOT
- Washington DOT

TXDOT Layout Example

SS ATKINS

OMNI Theater

289

33.5289695,-101.8158576

84

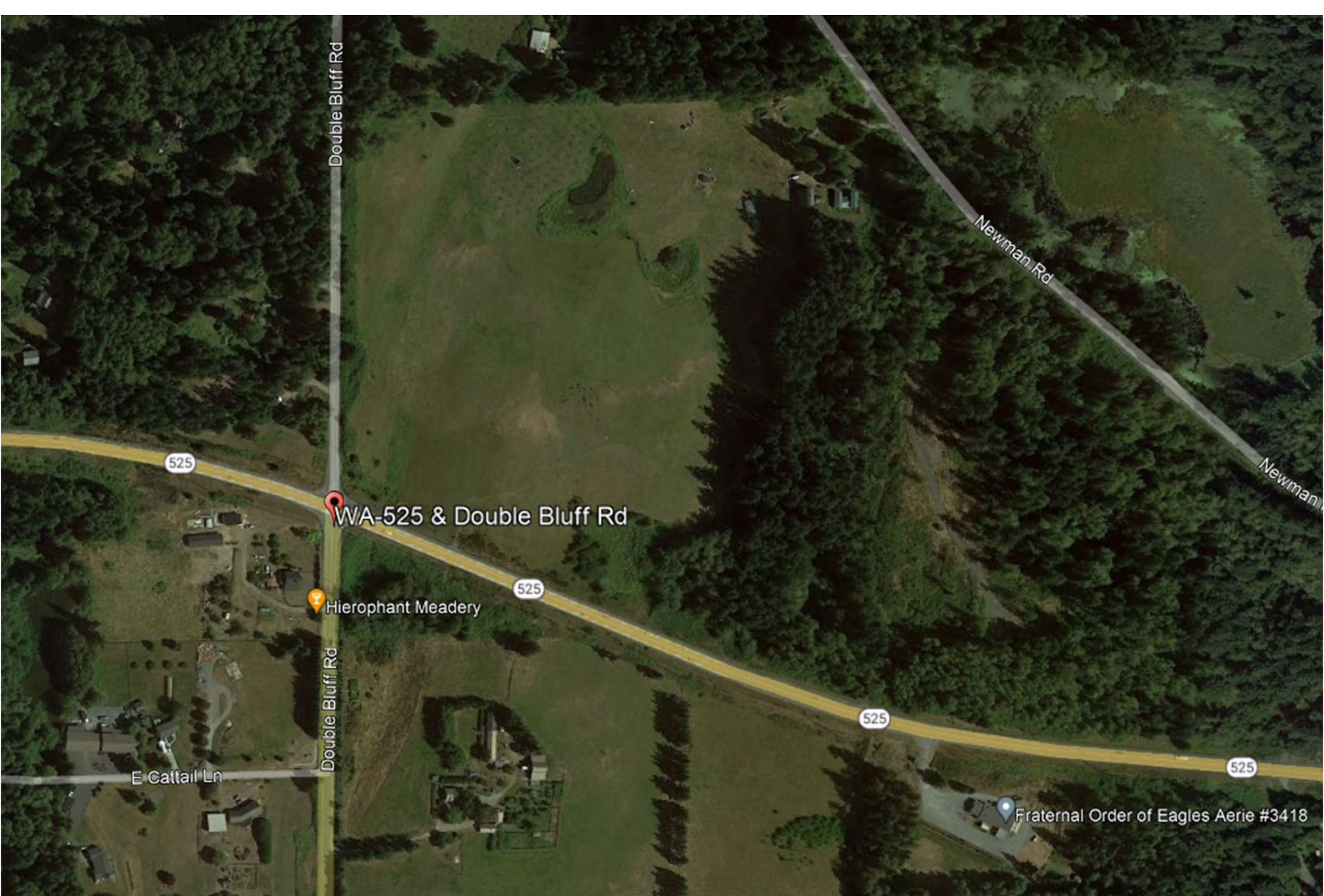
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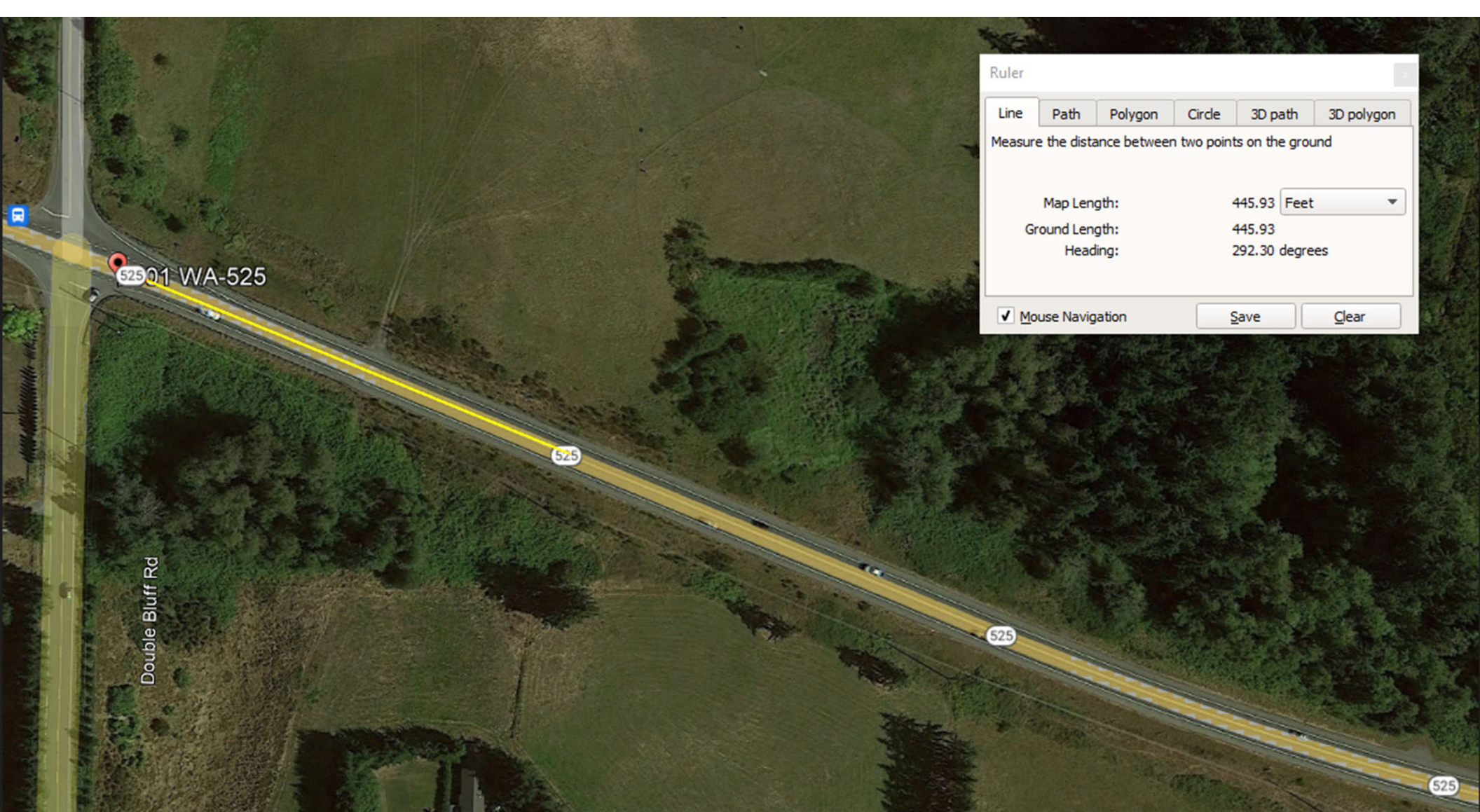
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West Texas Raceway Lubbock, TX



WashDOT Layout Example





Ruler

Line Path Polygon Circle 3D path 3D polygon

Measure the distance between two points on the ground

Map Length: 445.93 Feet

Ground Length: 445.93

Heading: 292.30 degrees

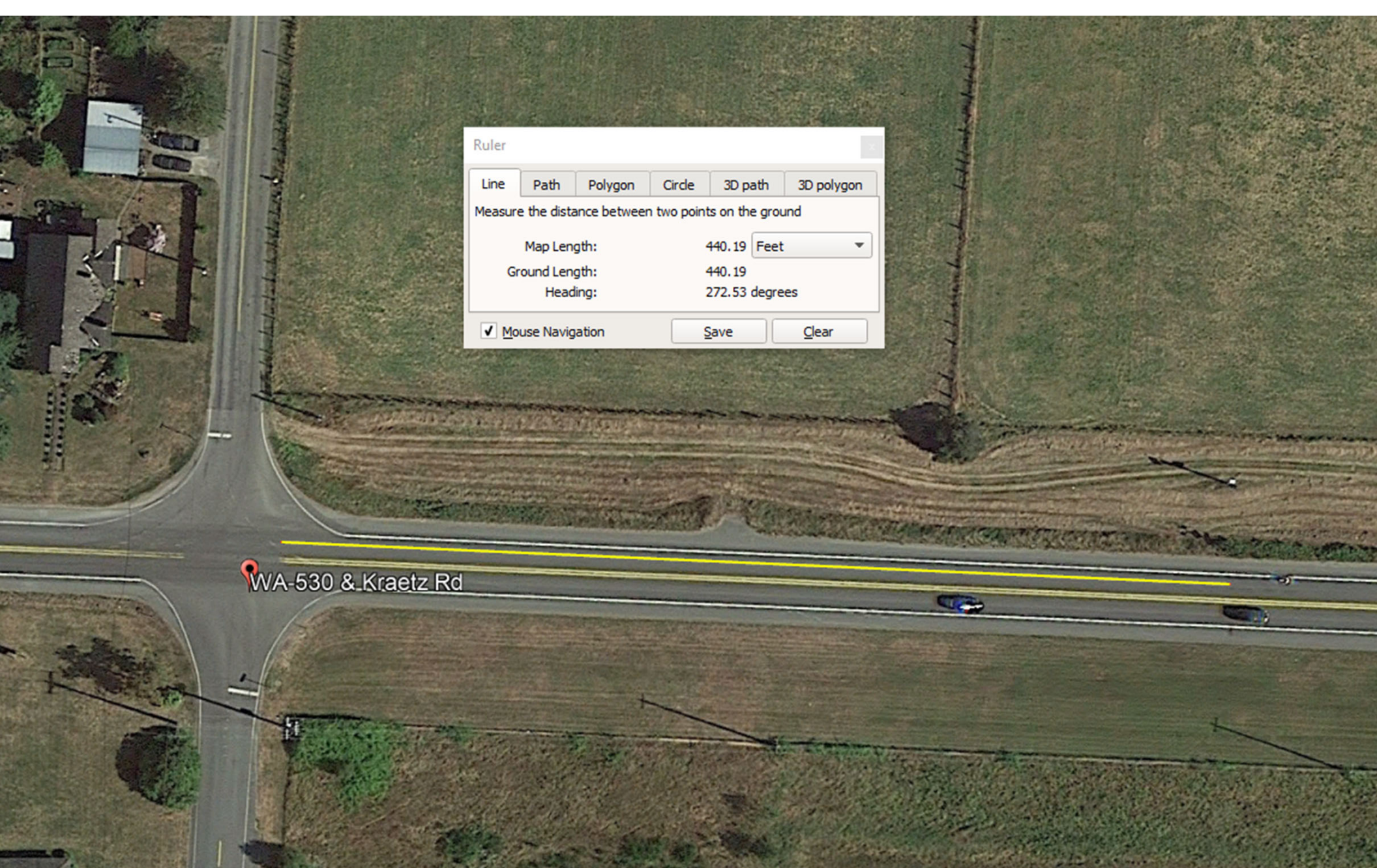
☒ Mouse Navigation

Save Clear









Ruler

Line Path Polygon Circle 3D path 3D polygon

Measure the distance between two points on the ground

Map Length: 440.19 Feet

Ground Length: 440.19

Heading: 272.53 degrees

☒ Mouse Navigation

Save Clear

Ohio State DOT Cabinet





SP 560

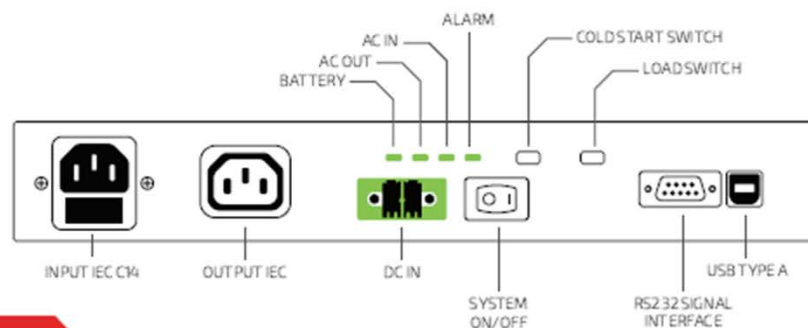
Compact UPS that delivers uncompromising protection



Overview

The compact SP 560 from Clary delivers on-line protection 100% of the time, for reliable, continuous error-free operation, regardless of utility power quality. Occupying only 1U of vertical rack space, it can fit into any cabinet. Clary's SP 560 is a 560 VA / 400 W power source built for electronics equipment in ITS, traffic and security applications, delivering constant, conditioned, regenerated AC power. It protects equipment from being disrupted, degraded or damaged due to harmful power events. Clary power conditioning completely isolates the cabinet from utility power enabling

error-free operation during surges, sags, spikes, and other power anomalies. With an optional battery pack, the SP 560 system operates as an on-line, double-conversion UPS, extending the reliability of the cabinet's electronics during utility power failures (black-outs). The SP 560 is power factor corrected to reduce utility current draw and wiring requirements. Designed for indoor/outdoor use, the Clary SP 560 will operate in temperature extremes from -40°C to +74°C (-40°F to 165°F) and it communicates locally or remotely via serial, USB or an optional web agent.



Features

- Space saving design: 1U vertical rack space
- On-line, conditioned, regenerated power for cabinet equipment protection
- USB connectivity with monitoring center or other equipment
- Power factor corrected for reliable and safe power
- Operates in extreme environments from -40°C to +74°C (-40°F to +165°F)



Specifications

Electrical Input

Voltage	120 VAC (85 VAC to 155 VAC before going to battery, when configured with batteries)
Frequency	40 Hz to 70 Hz

Electrical Output

Voltage	120 VAC $\pm 3\%$
Frequency	Software selectable to sync with input utility or run at crystal controlled 90/60 Hz ± 1 Hz
Current	4.8 A
Rating	560 VA / 400 W
Crest Factor Ratio	<ul style="list-style-type: none"> - 50% load up to 4.8:1 - 75% load up to 3.2:1 - 100% load up to 2.4:1
THD	3.00%
Dynamic Response	$\pm 4\%$ for 100% step load change 0.5 ms recovery time
Overload	<ul style="list-style-type: none"> - 110% for 10 sec - 200% for 50 ms
UPS Protection	<ul style="list-style-type: none"> - Input and output short circuit - Input and output overload - Excessive battery discharge

Environmental

Temperature	-40°C to +74°C (-40°F to +165°F)
Humidity	0% to 95% non-condensing
Altitude	Sea level to 10,000 ft

Mechanical

Input	IEC-320, C14 male connector
Outputs	IEC-320, C13 female receptacles (2)
Dimensions (H x W x D)	1.7" x 11.0" x 8.5" (1U)
Weight	5 lb
Cooling	<ul style="list-style-type: none"> - Low velocity - Forced air

Design

Standard Features	<ul style="list-style-type: none"> - Power factor corrected input - Fully regenerative - True on-line continuous power - Low distortion sine wave output - Designed for non-linear loads - Extended brownout protection
Certifications	<ul style="list-style-type: none"> - FCC Class A - IEEE 587/ANSI C62.4 - IEC 555 @ 120 VA - NEMA
Typical Recharge Time (at 95% Capacity @ 100% Load)	<ul style="list-style-type: none"> - 3 to 5 hrs with SP 48SB battery pack - 48 to 72 hrs with Outpost or Garrison batteries

Control and Indicators

Visual Indicators	<ul style="list-style-type: none"> - Battery status - AC output - AC input - Alarm
Switches / Control Panel	<ul style="list-style-type: none"> - System power - Cold start - Load I
Audible Alarms	<ul style="list-style-type: none"> - Utility interrupt - Inverter failure - Overload - Low battery
Intelligent Computer Interfaces	<ul style="list-style-type: none"> - 1 each DB9-F (RS232 and signal interface pins) - 1 each USB

Options

External Battery Pack	SP 48SB battery pack. Compact design. Ideal for runtime requirements less than an hour.
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SP 48SB BATTERY PACK

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0618

Tel: 800-442-5279 · Fax: 626-305-0254 · www.clary.com

CLARY

UDOT Design Example








336 POLE
MOUNTED
CABINET USED
BY UDOT



BACK SIDE OF
336 POLE
MOUNTED
CABINET

Phase 2 Project Locations

Example of UDOT Plan Set Title Page 11 X 17



UTAH
MAJOR HIGHWAYS

S-R499(409)

UTAH

DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED STATE ROAD

STATE FUNDED PROJECT

S-R499(409) PIN: 19271

R4; RURAL INTERSECTION CONFLICT WARNING SYSTEM

VARIOUS COUNTIES IN REGION 4

SHEET NO.
1


U.S. Standard Units
(Inch-Pound Units)

ALL UNITS IN FEET UNLESS OTHERWISE NOTED

INDEX TO SHEETS		
SHEET NUMBER	NUMBER OF SHEETS	DESCRIPTION
1	1	TITLE SHEET
DT-01 TO DT-03	3	DETAILS
SG-01A TO SG-10	12	SIGNAL
SG-001 TO SG-004	4	SIGNAL SCHEDULE
ITS-001	1	ITS SCHEDULE

LIMITATION OF OPERATIONS:

1. MAINTAIN AT LEAST ONE THROUGH TRAFFIC LANE IN EACH DIRECTION AT ALL TIMES. MAINTAIN ALL LANES UNRESTRICTED DURING NON-WORKING HOURS.
2. MINIMUM LANE WIDTH FOR TRAFFIC CONTROL IS 11 FEET. MINIMUM SHOULDER WIDTH FOR TRAFFIC CONTROL IS 2 FEET.
3. CLEAN UP AND REMOVE WASTE DAILY.
4. IMPLEMENT BEST MANAGEMENT PRACTICES (BMPs) FOR SEDIMENT CONTROL ALONG RIVERS, CREEKS AND IRRIGATION DITCH/CANAL LOCATIONS. AVOID UNNECESSARY EARTH DISTURBANCE. REFER TO STANDARD SPECIFICATION SECTION 910.01 TEMPORARY ENVIRONMENTAL CONTROLS.
5. CONDUIT WASHOUT CONTAINMENT IS REQUIRED. REFER TO STANDARD SPECIFICATION SECTION 913.00 ENVIRONMENTAL COMPLIANCE.
6. FINALIZE THE UDOT PROVIDED DRAFT MSA COMPLIANCE PLAN PRIOR TO STARTING CONSTRUCTION. RETURN A COPY FOR REVIEW AND APPROVAL.
7. NO WORK IS PERMITTED BETWEEN MAY 1 - AUGUST 31 AT SITE 2, US-191 & SAND ISLAND ROAD AND SITE 6, US-89 & LONG CANYON ROAD.
8. WASH ALL EARTH MOVING EQUIPMENT PRIOR TO ARRIVAL AT EACH PROJECT LOCATION.



VERIFIED FOR SUBMISSION FOR ADVERTISEMENT

DESIGN ENGINEER

UTAH DEPARTMENT OF TRANSPORTATION

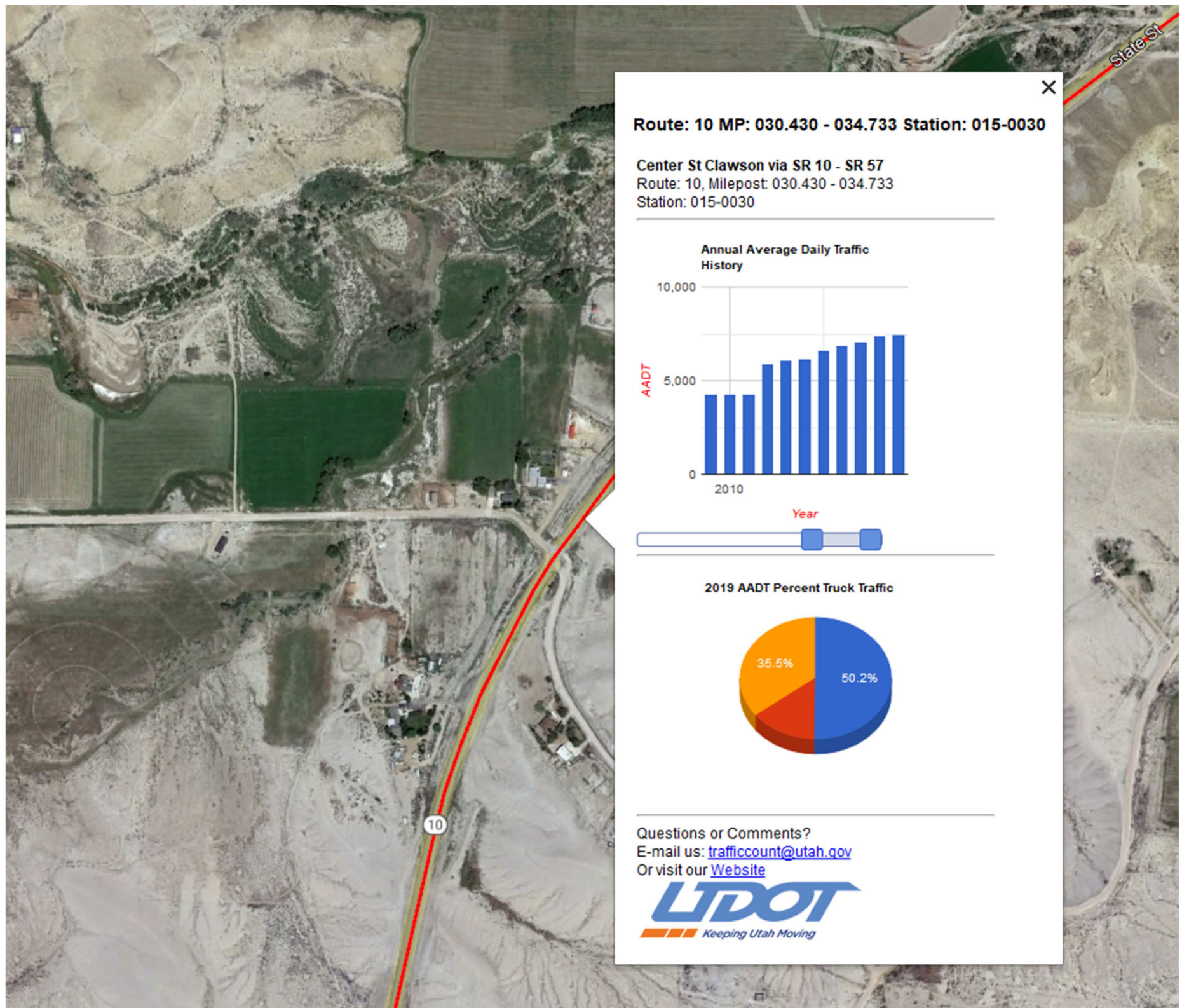
APPROVED FOR USE BY UDOT

REGION FOUR PRECONSTRUCTION ENGINEER





Site Number 1







Looking South Toward Intersection
Speed Limit 65 mph

NOTES:

1. INSTALL 3/4 INCH CONDUIT WITH 3" SWEEPS FROM POWER SOURCE AT BASE OF EXISTING UTILITY POLE TO THE UNDERGROUND SERVICE PEDESTAL PER ROCKY MOUNTAIN POWER REQUIREMENTS. CONTACT (NAME) OF ROCKY MOUNTAIN POWER AT (PHONE) FOR POWER SOURCE / HOOKUP INFORMATION AND TO COORDINATE INSPECTION OF CONDUIT PRIOR TO BACKFILLING TRENCH. UNDERGROUND SERVICE PEDESTAL TO HAVE METERED AND UN-METERED SIDE.
2. INSTALL STATE FURNISHED 40' LUMINAIRE POLE. OFFSET POLE OUTSIDE OF 30' CLEARZONE MEASURED FROM PAINTED EDGE LINE.
3. INSTALL REGION FURNISHED POLE MOUNTED 336 ITS CABINET ON LUMINAIRE POLE.
4. INSTALL WAVETRONIX SMART SENSOR MATRIX RADAR WITH SNOW VISOR PER MANUFACTURER'S STANDARDS. COORDINATE WITH TYSON LARSON AT 801-830-9556 FOR PROPER DETECTION PLACEMENT, WITH TWO WEEKS ADVANCED NOTICE.
5. PROVIDE A FLAT 14' WIDE AND 50' LONG FLAT MAINTENANCE VEHICLE PULL OUT AREA NEAR THE BASE OF LUMINAIRE POLE.
6. UNTREATED BASE COURSE REQ'D.
7. INSTALL STATE FURNISHED 30' LUMINAIRE POLE 650 FEET FROM END OF DOUBLE YELLOW LINE AT INTERSECTION. LOCATE POLE ACCORDING TO STD DWG SN 2A, SEE FLASHER SIGN DETAIL ON SHEET DT-01.
8. INSTALL SIGN ASSEMBLY 1/4 MILE FROM END OF DOUBLE YELLOW LINE AT INTERSECTION. LOCATE SIGN ACCORDING TO STD DWG SN 2A, SEE SIGN DETAIL ON SHEET DT-03.
9. REMOVE SIGN LESS THAN 20 SOFT REQ'D.

NOTES CONTINUED:

10. AUXILIARY SIGN TYPE A REQ'D.
11. SLIPBASE GROUND MOUNTED TUBULAR STEEL SIGN POST REQ'D.
12. STEEL POST SIGN MOUNT, 3' OR WIDER REQ'D.
13. MARK ALL EQUIPMENT LOCATIONS IN THE FIELD PRIOR TO INSTALLATION. OBTAIN WRITTEN APPROVAL OF LOCATIONS FROM THE ENGINEER PRIOR TO INSTALLATION.
14. CONTACT BLUE STAKES TO MARK ALL EXISTING UTILITIES BEFORE WORK BEGINS. UTILITY LOCATIONS SHOWN ARE APPROXIMATE, PROTECT EXISTING UTILITIES IN PLACE.
15. INSTALL CONDUIT AND POLYMER CONCRETE JUNCTION BOXES PER UDOT SPECIFICATIONS. BORE ALL CONDUIT UNDER ROADWAY CROSSINGS, GRADE TO DRAIN WATER AWAY FROM JUNCTION BOXES.
16. COMPLETE THE SIGNAL TURN-ON CHECKLIST PRIOR TO REQUESTING TURN-ON INSPECTION ACCORDING TO NOTES ON SHEET SG-001.

SR-10 & ROCK CANYON RD

SITE 1

SR-10 RP 31.490

BASE BID

SIGNAL CIRCUIT

4-CONDUCTOR NO. 14 AWG. STRANDED CABLE, MSA 20-1 WITH 6 AWG BARE SOLID COPPER GROUND WIRE IN 2-INCH CONDUIT

MATRIX DETECTION CIRCUIT

STATE FURNISHED RADAR CABLE WITH CONNECTOR WITH 12 AWG GROUND WIRE IN 2-INCH CONDUIT

FUTURE USE CONDUITS

ONE 2-INCH CONDUIT WITH DETECTABLE PULL TAPE

POWER CIRCUIT

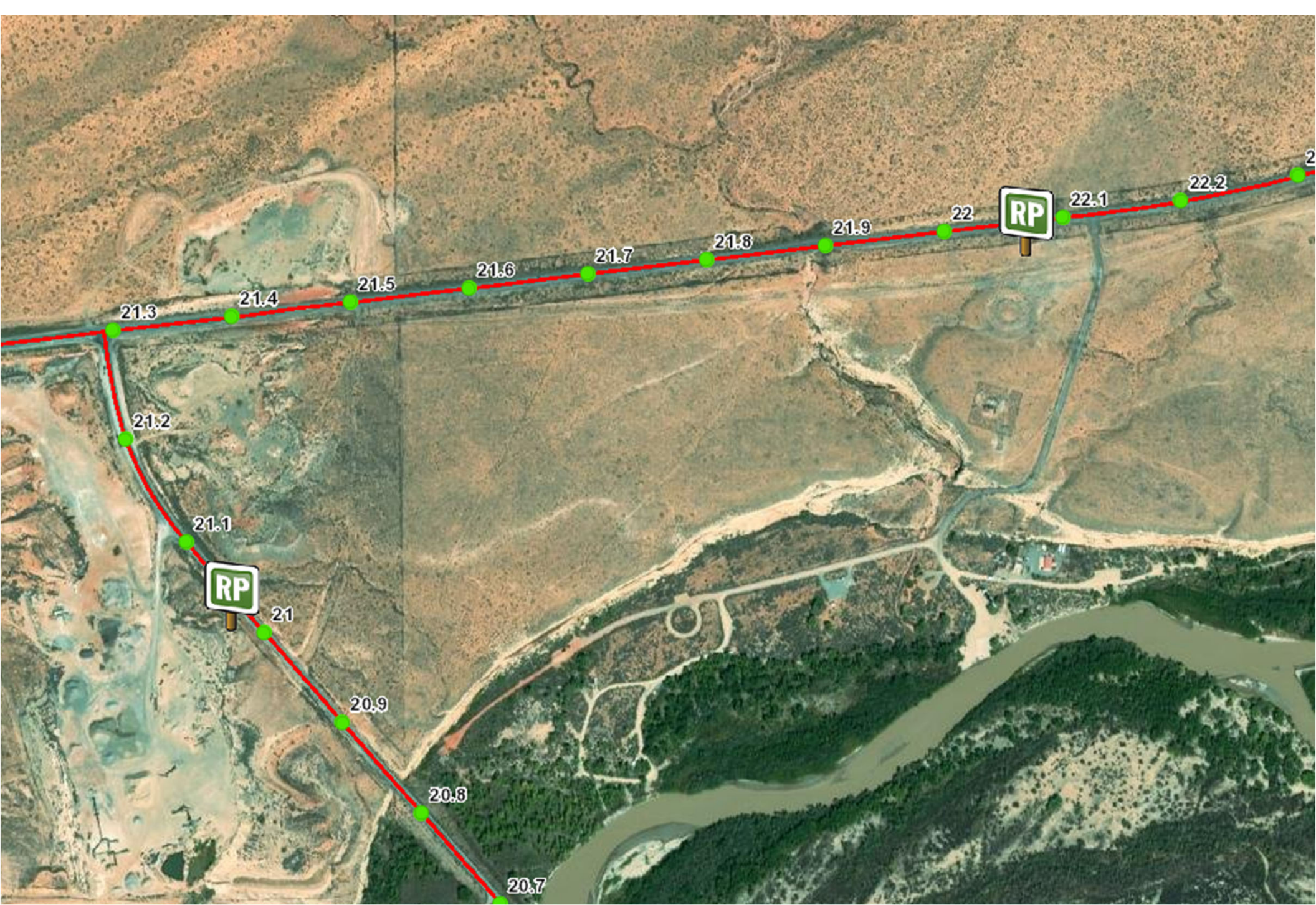
TWO NO. 10 (MINIMUM) SINGLE CONDUCTOR STRANDED COPPER CABLE TYPE RHH-USE 2-RHW2 XLPE OR APPROVED EQUIVALENT WITH 6 AWG BARE SOLID COPPER GROUND WIRE IN 2-INCH CONDUIT

POLE SCHEDULE			
POLE ID	LUMINAIRE		REMARKS
	ARM LENGTH	HEIGHT	
P1		30	LUMINAIRE POLE
P2		40	LUMINAIRE POLE
P3		40	LUMINAIRE POLE

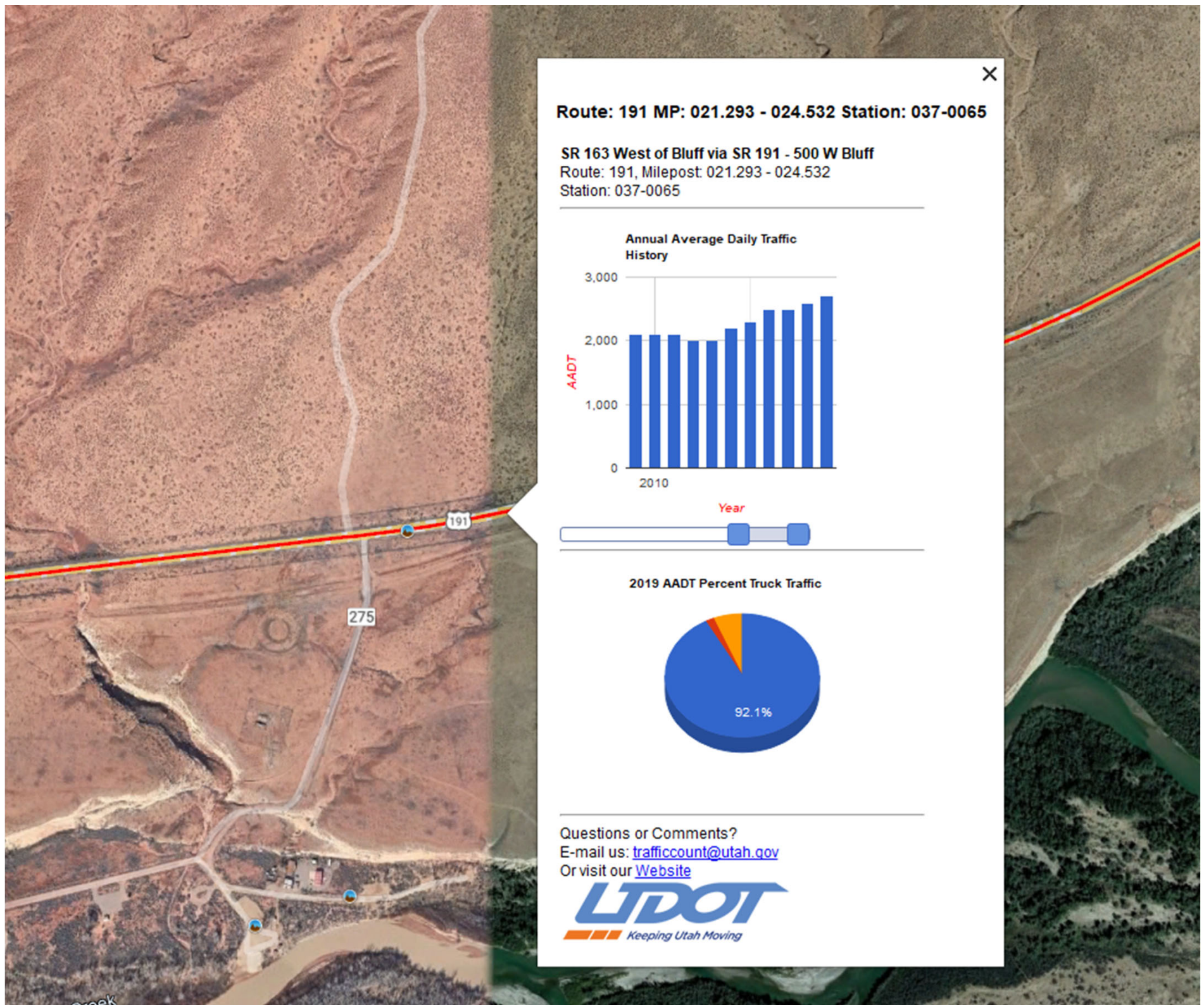
SEE SG-01A
MATCHLINE

SIGN CODE LEGEND:
N - NEW SIGN
R - RELOCATE SIGN
X - REMOVE SIGN

SIGN CODE
SIGN NUMBER
SHEET NUMBER

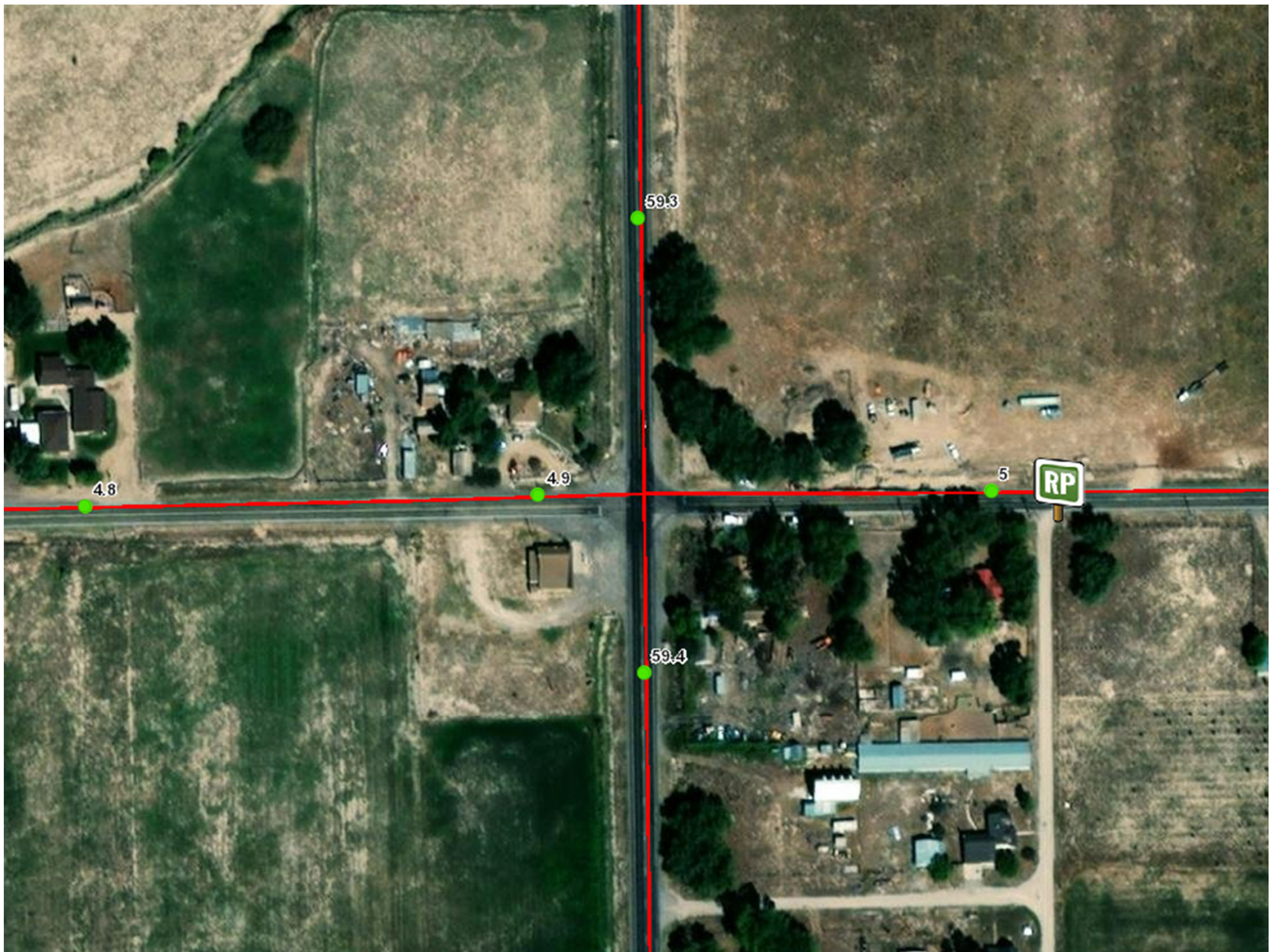


Site Number 2







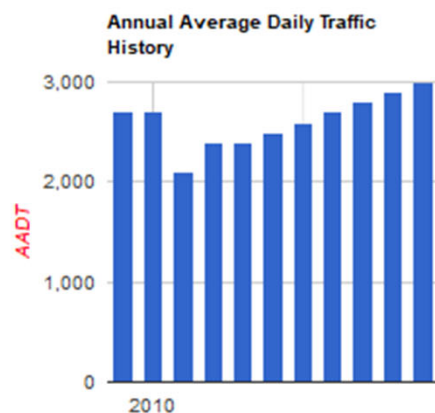


Site Number 3

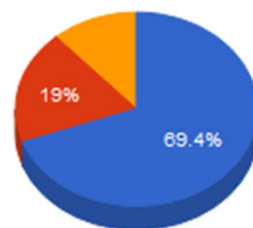
Route: 132 MP: 059.361 - 063.196 Station: 039-0196

SR 117 Chester via SR 132 - SR 89 Pigeon Hollow Jct

Route: 132, Milepost: 059.361 - 063.196
Station: 039-0196



2019 AADT Percent Truck Traffic

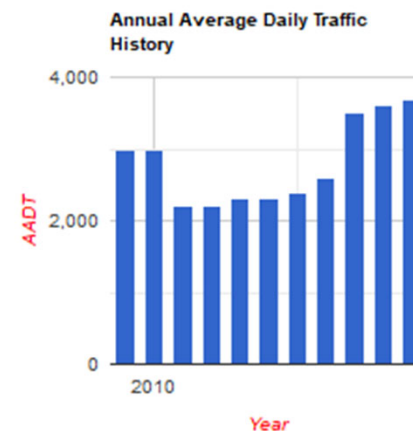


Questions or Comments?
E-mail us: trafficcount@utah.gov
Or visit our [Website](#)

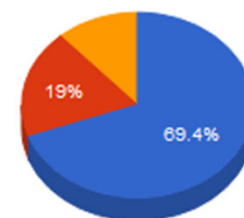
LTDOT

Route: 132 MP: 055.982 - 059.361 Station: 039-0195

100 S via SR 132 (400 E) - SR 117 Chester
Route: 132, Milepost: 055.982 - 059.361
Station: 039-0195



2019 AADT Percent Truck Traffic



Questions or Comments?
E-mail us: trafficcount@utah.gov
Or visit our [Website](#)

LTDOT
Keeping Utah Moving







NOTES:

1. INSTALL 3-INCH CONDUIT WITH 3' SWEEPS FROM POWER SOURCE AT BASE OF EXISTING UTILITY POLE TO THE UNDERGROUND SERVICE PEDESTAL PER ROCKY MOUNTAIN POWER REQUIREMENTS. CONTACT (NAME) OF ROCKY MOUNTAIN POWER AT (PHONE) FOR POWER SOURCE / HOOKUP INFORMATION AND TO COORDINATE INSPECTION OF CONDUIT PRIOR TO BACKFILLING TRENCH. UNDERGROUND SERVICE PEDESTAL TO HAVE METERED AND UNMETERED SIDE.
2. INSTALL STATE FURNISHED 40' LUMINAIRE POLE, OFFSET POLE OUTSIDE OF 16' CLEARZONE MEASURED FROM PAINTED EDGE LINE.
3. INSTALL REGION FURNISHED POLE MOUNTED 336 ITS CABINET ON LUMINAIRE POLE.
4. INSTALL WAVETRONIX SMART SENSOR MATRIX RADAR WITH SNOW VISOR PER MANUFACTURER'S STANDARDS. COORDINATE WITH TYSON LARSON AT 801-830-8556 FOR PROPER DETECTION PLACEMENT. WITH TWO WEEKS ADVANCED NOTICE.
5. PROVIDE A FLAT 14' WIDE AND 50' LONG FLAT MAINTENANCE VEHICLE PULL OUT AREA NEAR THE BASE OF LUMINAIRE POLE.
6. UNTREATED BASE COURSE REQ'D.
7. INSTALL STATE FURNISHED 30' LUMINAIRE POLE 450 FEET FROM END OF DOUBLE YELLOW LINE AT INTERSECTION. LOCATE POLE ACCORDING TO STD DWG SN 2A, SEE FLASHER SIGN DETAIL ON SHEET DT-01.
8. AUXILIARY SIGN TYPE A REQ'D.
9. STEEL POST SIGN MOUNT, 3' OR WIDER REQ'D.

NOTES CONTINUED:

10. MARK ALL EQUIPMENT LOCATIONS IN THE FIELD PRIOR TO INSTALLATION. OBTAIN WRITTEN APPROVAL OF LOCATIONS FROM THE ENGINEER PRIOR TO INSTALLATION.
11. CONTACT BLUE STAKES TO MARK ALL EXISTING UTILITIES BEFORE WORK BEGINS. UTILITY LOCATIONS SHOWN ARE APPROXIMATE. PROTECT EXISTING UTILITIES IN PLACE.
12. INSTALL CONDUIT AND POLYMER CONCRETE JUNCTION BOXES PER UDOT SPECIFICATIONS. BORE CONDUIT UNDER ALL ROADWAY CROSSINGS, GRADE TO DRAIN WATER AWAY FROM JUNCTION BOXES.
13. COMPLETE THE SIGNAL TURN-ON CHECKLIST PRIOR TO REQUESTING TURN-ON INSPECTION ACCORDING TO NOTES ON SHEET SG-S01.

SR-132 & SR-117

SITE 3

SR-132 RP 59,360 & SR-117 RP 4,923

BASE BID

SIGNAL CIRCUIT

4-CONDUCTOR NO. 14 AWG, STRANDED CABLE, IMSA 20-1 WITH 6 AWG BARE SOLID COPPER GROUND WIRE IN 2-INCH CONDUIT

MATRIX DETECTION CIRCUIT

STATE FURNISHED RADAR CABLE WITH CONNECTOR WITH 12 AWG GROUND WIRE IN 2-INCH CONDUIT

FUTURE USE CONDUITS

ONE 2-INCH CONDUIT WITH DETECTABLE PULL TAPE

POWER CIRCUIT

TWO NO. 10 (MINIMUM) SINGLE CONDUCTOR STRANDED COPPER CABLE TYPE RH-HUSE2-RHW2 XLP OR APPROVED EQUIVALENT WITH 6 AWG BARE SOLID COPPER GROUND WIRE IN 2-INCH CONDUIT

POLE SCHEDULE			
POLE ID	LUMINAIRE		REMARKS
	ARM LENGTH	HEIGHT	
P2		40	LUMINAIRE POLE
P3		40	LUMINAIRE POLE
P4		30	LUMINAIRE POLE

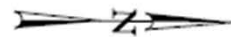
SIGN CODE LEGEND:

N = NEW SIGN
R = RELOCATE SIGN
X = REMOVE SIGN

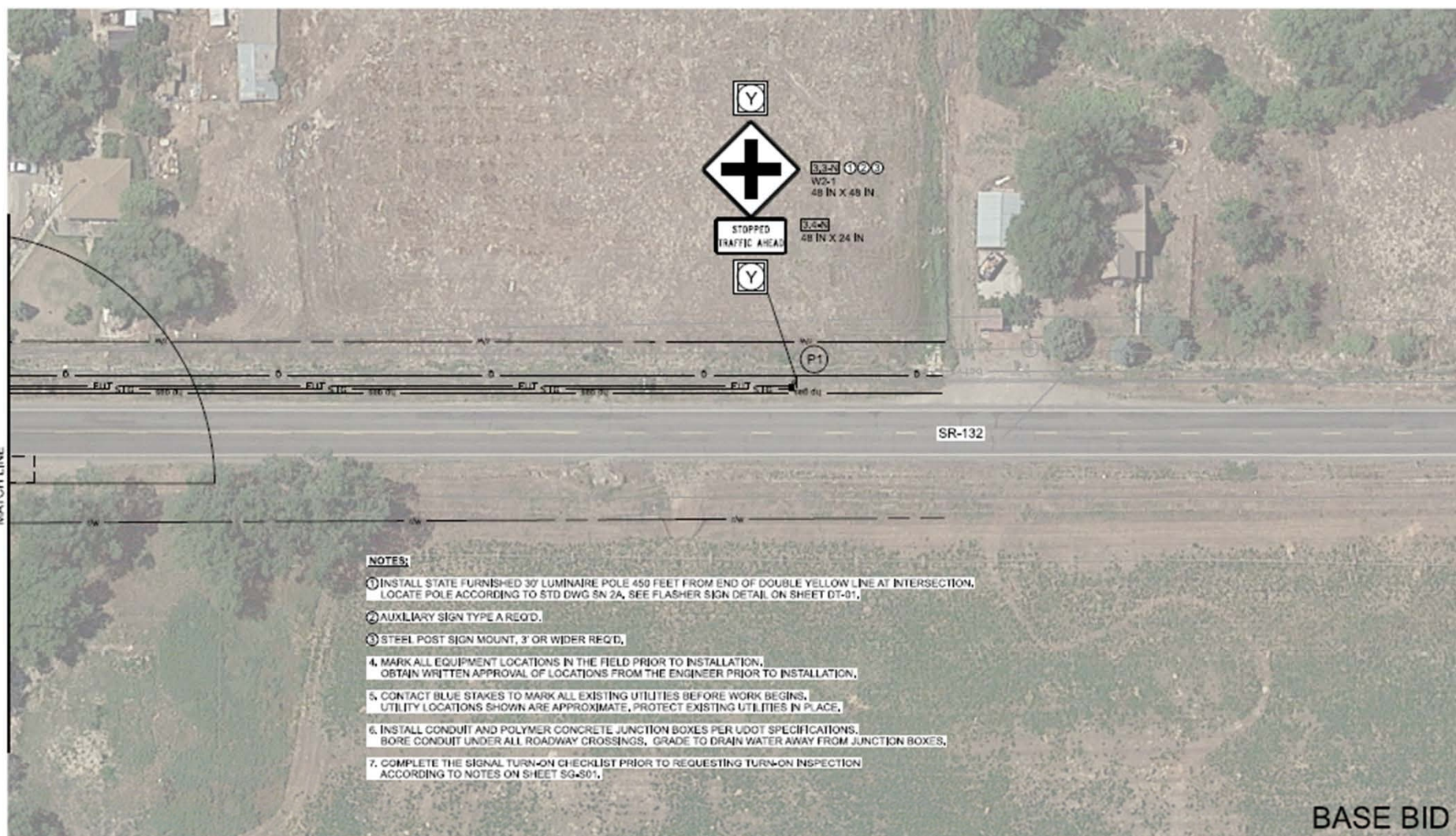
X-X-X

— SIGN CODE
— SIGN NUMBER
— SHEET NUMBER

POLE SCHEDULE			
POLE ID	LUMINAIRE		REMARKS
	ARM LENGTH	HEIGHT	
P1		30	LUMINAIRE POLE



SEE SG-03A
MATCH LINE



NOTES:

1. INSTALL STATE FURNISHED 30' LUMINAIRE POLE 450 FEET FROM END OF DOUBLE YELLOW LINE AT INTERSECTION. LOCATE POLE ACCORDING TO STD DWG SN 2A, SEE FLASHER SIGN DETAIL ON SHEET DT-01.
2. AUXILIARY SIGN TYPE A REQ'D.
3. STEEL POST SIGN MOUNT, 3' OR WIDER REQ'D.
4. MARK ALL EQUIPMENT LOCATIONS IN THE FIELD PRIOR TO INSTALLATION. OBTAIN WRITTEN APPROVAL OF LOCATIONS FROM THE ENGINEER PRIOR TO INSTALLATION.
5. CONTACT BLUE STAKES TO MARK ALL EXISTING UTILITIES BEFORE WORK BEGINS. UTILITY LOCATIONS SHOWN ARE APPROXIMATE, PROTECT EXISTING UTILITIES IN PLACE.
6. INSTALL CONDUIT AND POLYMER CONCRETE JUNCTION BOXES PER UDOT SPECIFICATIONS. BORE CONDUIT UNDER ALL ROADWAY CROSSINGS, GRADE TO DRAIN WATER AWAY FROM JUNCTION BOXES.
7. COMPLETE THE SIGNAL TURN-ON CHECKLIST PRIOR TO REQUESTING TURN-ON INSPECTION ACCORDING TO NOTES ON SHEET SG-S01.

SR-132 & SR-117

SITE 3

SR-132 RP 59,360 & SR-117 RP 4,923

SIGN CODE LEGEND:
N = NEW SIGN
R = RELOCATE SIGN
X = REMOVE SIGN

X-X-X
SIGN CODE
SIGN NUMBER
SHEET NUMBER

SIGNAL CIRCUIT
4-CONDUCTOR NO. 14 AWG, STRANDED CABLE,
IMSA 20-1 WITH 6 AWG BARE SOLID COPPER
GROUND WIRE IN 2-INCH CONDUIT

FUTURE USE CONDUITS
ONE 2-INCH CONDUIT WITH DETECTABLE PULL TAPE

UTAH DEPARTMENT OF TRANSPORTATION

R4: RURAL INTERSECTION CONFLICT
WARNING SYSTEM
S-R499(409)

PROJECT NUMBER

PS&E

DATE

3/28/2022

DATE

3/28/2022

DATE

3/28/2022

DATE

3/28/2022

DATE

3/28/2022

DATE

3/28/2022

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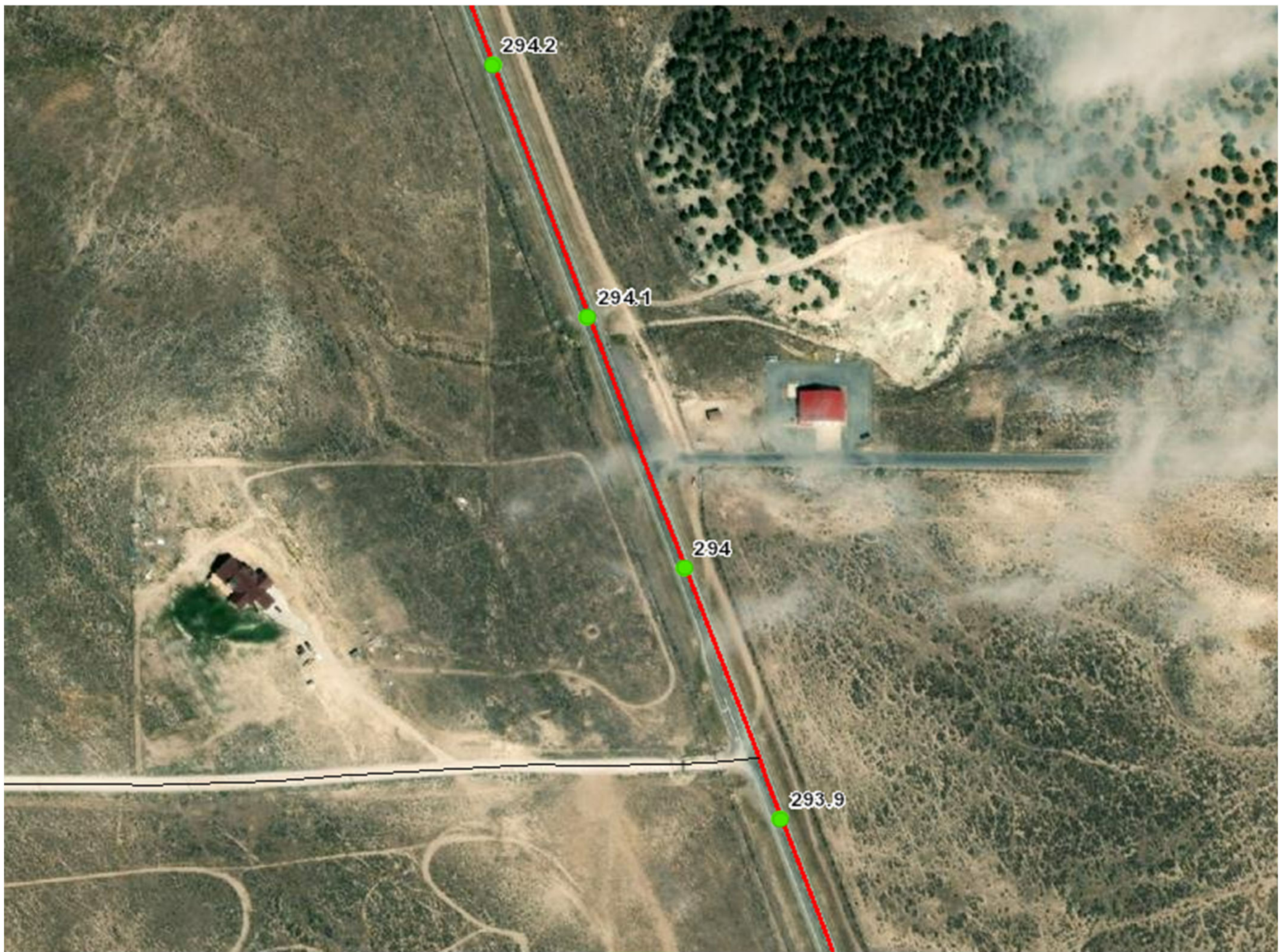
3/28/2022

DATE

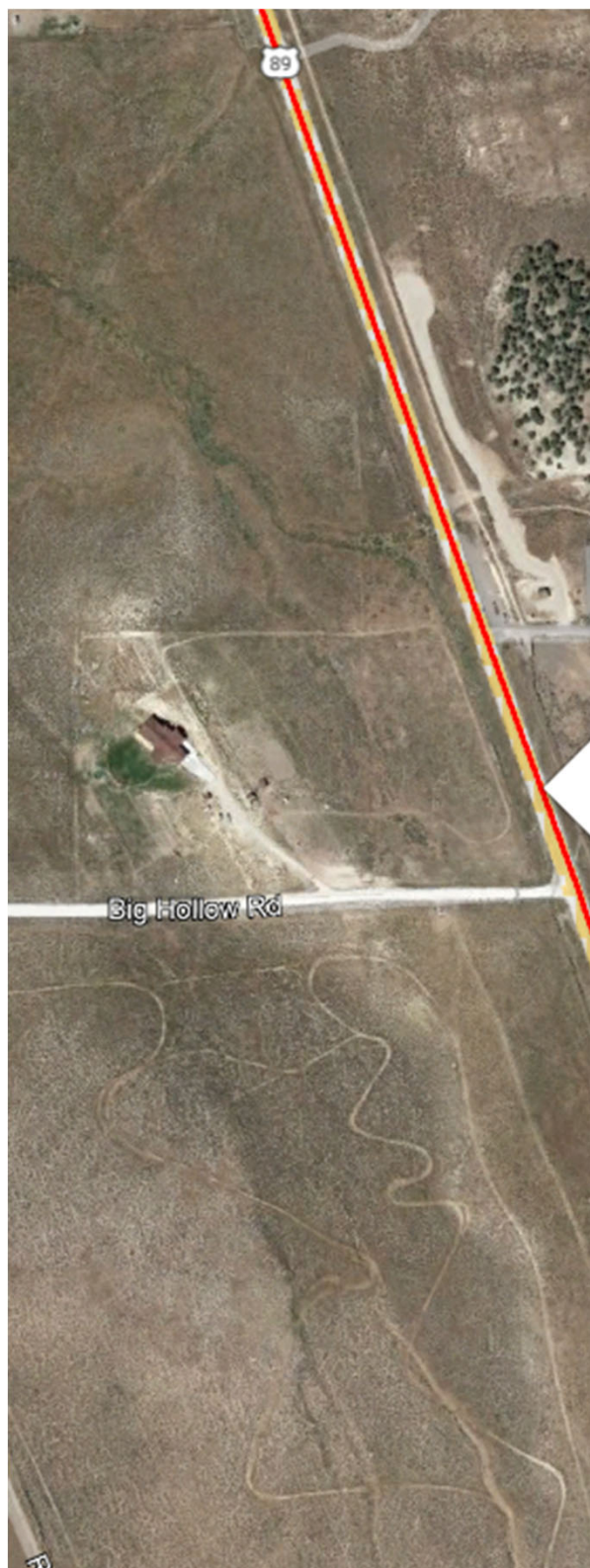
3/28/2022

DATE

3/28/2022



Site Number 4

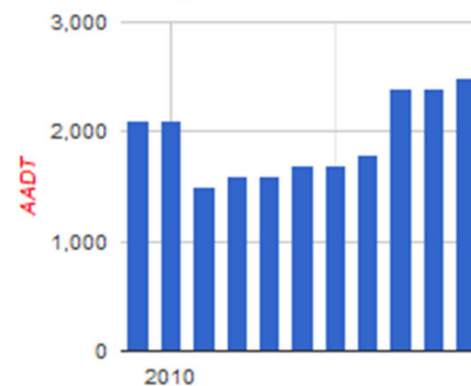


Route: 89 MP: 284.825 - 294.995 Station: 039-0115

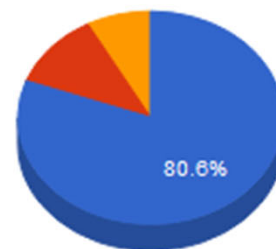
SR 31 (400 N) Fairview via SR 89 - Indianola Rd
(34370 N) Indianola

Route: 89, Milepost: 284.825 - 294.995
Station: 039-0115

Annual Average Daily Traffic
History



2019 AADT Percent Truck Traffic



Questions or Comments?

E-mail us: trafficcount@utah.gov

Or visit our [Website](#)







POLE SCHEDULE			
POLE ID	LUMINAIRE	HEIGHT	REMARKS
P1		30	LUMINAIRE POLE
P2		40	LUMINAIRE POLE



NOTES:

1. INSTALL SOLAR POWER RADAR DETECTION SYSTEM. SEE DETAIL ON SHEET DT-02.
2. INSTALL STATE FURNISHED 40' LUMINAIRE POLE, OFFSET POLE OUTSIDE OF 28' CLEARZONE MEASURED FROM PAINTED EDGE LINE.
3. INSTALL REGION FURNISHED POLE MOUNTED 336 ITS CABINET ON LUMINAIRE POLE.
4. INSTALL WAVETRONIX SMART SENSOR MATRIX RADAR WITH SNOW VISOR PER MANUFACTURER'S STANDARDS. COORDINATE WITH TYSON LARSON AT 801-830-9556 FOR PROPER DETECTION PLACEMENT, WITH TWO WEEKS ADVANCED NOTICE.
5. PROVIDE A FLAT 14' WIDE AND 50' LONG FLAT MAINTENANCE VEHICLE PULL OUT AREA NEAR THE BASE OF LUMINAIRE POLE.
6. UNTREATED BASE COURSE REQ'D.
7. INSTALL STATE FURNISHED 30' LUMINAIRE POLE 650 FEET FROM END OF DOUBLE YELLOW LINE AT INTERSECTION. LOCATE POLE ACCORDING TO STD DWG SN 2A, SEE FLASHER SIGN DETAIL ON SHEET DT-01.
8. AUXILIARY SIGN TYPE A REQ'D.
9. STEEL POST SIGN MOUNT, 3' OR WIDER REQ'D.
10. MARK ALL EQUIPMENT LOCATIONS IN THE FIELD PRIOR TO INSTALLATION. OBTAIN WRITTEN APPROVAL OF LOCATIONS FROM THE ENGINEER PRIOR TO INSTALLATION.
11. CONTACT BLUE STAKES TO MARK ALL EXISTING UTILITIES BEFORE WORK BEGINS. UTILITY LOCATIONS SHOWN ARE APPROXIMATE, PROTECT EXISTING UTILITIES IN PLACE.
12. INSTALL CONDUIT AND POLYMER CONCRETE JUNCTION BOXES PER UDOT SPECIFICATIONS. BORE CONDUIT UNDER ALL ROADWAY CROSSINGS, GRADE TO DRAIN WATER AWAY FROM JUNCTION BOXES.
13. COMPLETE THE SIGNAL TURN-ON CHECKLIST PRIOR TO REQUESTING TURN-ON INSPECTION ACCORDING TO NOTES ON SHEET SG-S01.

BASE BID

SIGNAL CIRCUIT

4-CONDUCTOR NO. 14 AWG, STRANDED CABLE, IMSA 20-1 WITH 6 AWG BARE SOLID COPPER GROUND WIRE IN 2-INCH CONDUIT

MATRIX DETECTION CIRCUIT

STATE FURNISHED RADAR CABLE WITH CONNECTOR WITH 12 AWG GROUND WIRE IN 2-INCH CONDUIT

FUTURE USE CONDUITS

ONE 2-INCH CONDUIT WITH DETECTABLE PULL TAPE

POWER CIRCUIT

TWO NO. 10 (MINIMUM) SINGLE CONDUCTOR STRANDED COPPER CABLE TYPE RHH-USE2-RHW2 XLP OR APPROVED EQUIVALENT WITH 6 AWG BARE SOLID COPPER GROUND WIRE IN 2-INCH CONDUIT

SIGN CODE LEGEND:

N = NEW SIGN
R = RELOCATE SIGN
X = REMOVE SIGN

X-X-X

— SIGN CODE
— SIGN NUMBER
— SHEET NUMBER

US-89 & SNAIL HOLLOW DR

SITE 4

US-89 RP 294,041

UTAH DEPARTMENT OF TRANSPORTATION

R4: RURAL INTERSECTION CONFLICT WARNING SYSTEM

PROJECT

SHEET NO.

PS&E

DESIGNED BY

CHECKED BY

DATE

3/28/2022

DATE

APPROVED

DATE

3/28/2022

DATE

APPROVED

DATE

3/28/2022

DATE

APPROVED

DATE

3/28/2022

DATE

APPROVED

DATE

3/28/2022

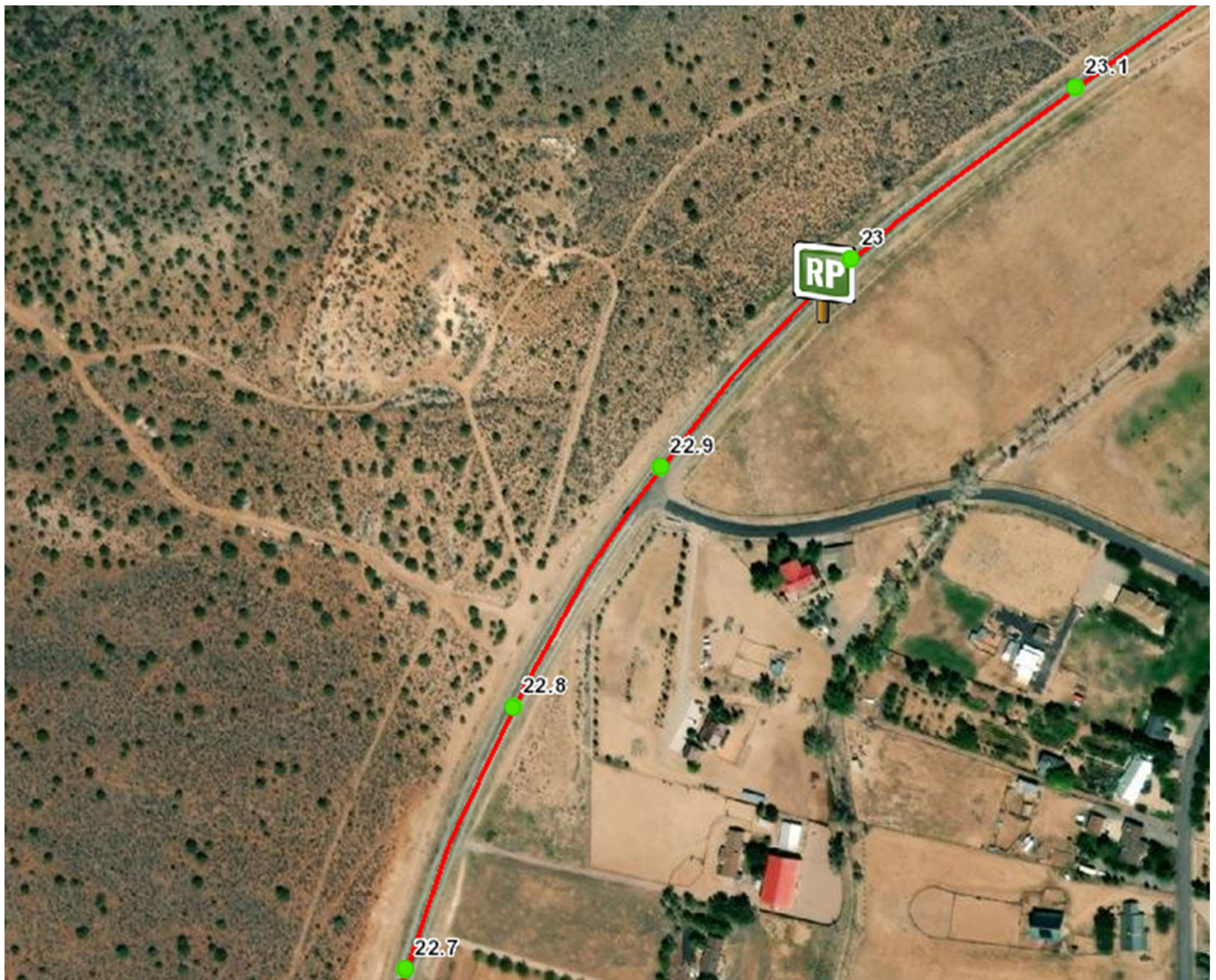
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APPROVED

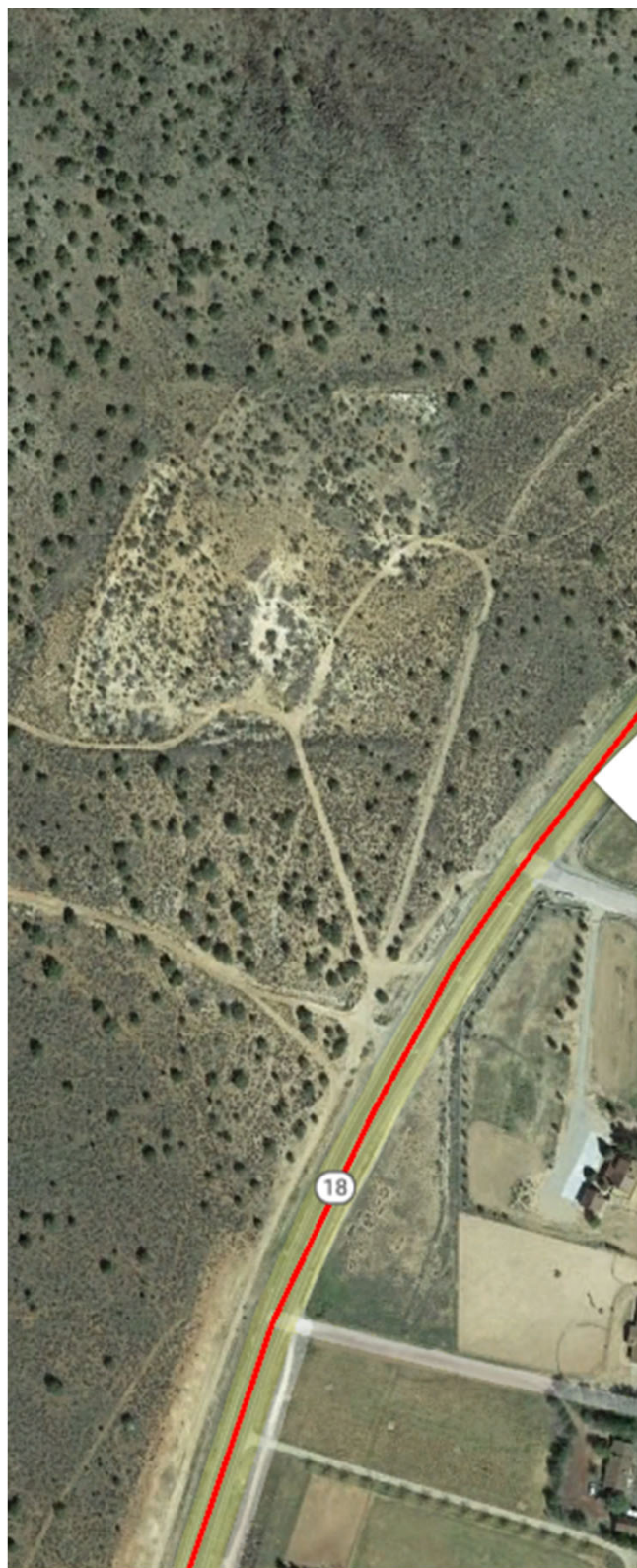
DATE

3/28/2022

DATE



Site Number 5

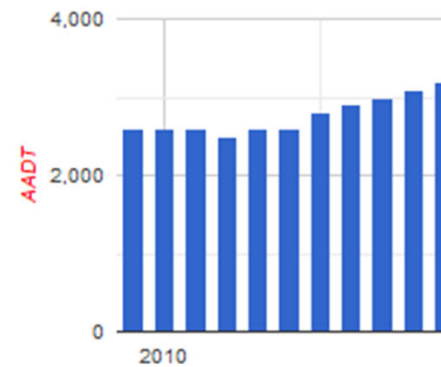


Route: 18 MP: 020.133 - 026.763 Station: 053-0165

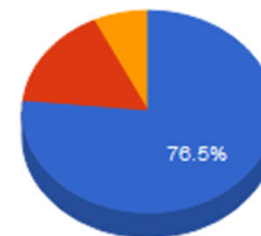
Center St (Veyo) via SR 18 - Pine Valley Hwy (Central)

Route: 18, Milepost: 020.133 - 026.763
Station: 053-0165

Annual Average Daily Traffic History



2019 AADT Percent Truck Traffic



Questions or Comments?

E-mail us: trafficcount@utah.gov

Or visit our [Website](#)







Phase 2 Project Details

1.Speed Reduction or Stopping Design Criteria

a. Stopping Sight Distance (SSD) per AASHTO Green Book

i. Stopping Sight Distance (SSD) is the sum of two distances:

1) The distance traversed by the vehicle from the instant the driver sights an object necessitating a stop to the instant the brakes are applied

2) The distance needed to stop the vehicle from the instant brake application begins.

ii. SSD @ 65 MPH = 645-ft

iii. SSD @ 60 MPH = 570-ft

iv. SSD @ 50 MPH = 425-ft

Table 3-1. Stopping Sight Distance on Level Roadways

U.S. Customary					Metric				
Design Speed (mph)	Brake Reaction Distance (ft)	Braking Distance on Level (ft)	Stopping Sight Distance		Design Speed (km/h)	Brake Reaction Distance (m)	Braking Distance on Level (m)	Stopping Sight Distance	
			Calculated (ft)	Design (ft)				Calculated (m)	Design (m)
15	55.1	21.6	76.7	80	20	13.9	4.6	18.5	20
20	73.5	38.4	111.9	115	30	20.9	10.3	31.2	35
25	91.9	60.0	151.9	155	40	27.8	18.4	46.2	50
30	110.3	86.4	196.7	200	50	34.8	28.7	63.5	65
35	128.6	117.6	246.2	250	60	41.7	41.3	83.0	85
40	147.0	153.6	300.6	305	70	48.7	56.2	104.9	105
45	165.4	194.4	359.8	360	80	55.6	73.4	129.0	130
50	183.8	240.0	423.8	425	90	62.6	92.9	155.5	160
55	202.1	290.3	492.4	495	100	69.5	114.7	184.2	185
60	220.5	345.5	566.0	570	110	76.5	138.8	215.3	220
65	238.9	405.5	644.4	645	120	83.4	165.2	248.6	250
70	257.3	470.3	727.6	730	130	90.4	193.8	284.2	285
75	275.6	539.9	815.5	820	140	97.3	224.8	322.1	325
80	294.0	614.3	908.3	910					
85	313.5	693.5	1007.0	1010					

Note: Brake reaction distance predicated on a time of 2.5 s; deceleration rate of 11.2 ft/s^2 [3.4 m/s^2] used to determine calculated sight distance.

b. Deceleration Distances (per Green Book 9-94)

i. Decelerations Lanes are a sum of three separate distances:

1. Perception-Reaction Distance (d_1) - distance traveled while driver recognized upcoming turn lane and prepares for the left-turn maneuver.
 - a. A value of 4.5 s is often used as the perception-reaction time for suburban, urban, urban core, and rural town context, and 2.5 s is often used for rural context.
2. Lane Change & Deceleration Distance (d_2)
 - a. Deceleration Distances are based on a 6.5 ft./s² deceleration throughout the entire length of deceleration.
3. Storage Distance (d_3) - distance provided for the storage of the queue of stopped vehicles waiting to turn.

- ii. Deceleration distance is the sum of two distances ($d_1 + d_2$):
 - 1. $d_{2(a)}$ = distance traveled while decelerating and changing lanes from the through-lane into the turn lane.
 - 2. $d_{2(b)}$ = distance traveled during deceleration after lane change.
 - 3. Both distances are based on a 6.5 ft./s^2 deceleration throughout the entire length of deceleration.
- iii. Deceleration Distances @ 65 MPH = 700-ft
- iv. Deceleration Distances @ 60 MPH = 600-ft
- v. Deceleration Distances @ 50 MPH = 415-ft

Table 9-20. Desirable Lane Change and Deceleration Distances

U.S. Customary		Metric	
Speed (mph)	Lane Change and Deceleration Distance (ft)	Speed (km/h)	Lane Change and Deceleration Distance (m)
20	70	30	25
25	105	40	35
30	150	50	50
35	205	55	65
40	265	65	85
45	340	70	105
50	415	80	130
55	505	90	155
60	600	95	185
65	700	105	215
70	815	110	250

Notes:

1. The lane change and deceleration lengths are shown as d_2 in Figure 9-32.
2. Deceleration lengths are based on a 6.5 ft/s^2 [2.0 m/s^2] deceleration throughout the entire length. Larger deceleration rates may be used when deceleration lengths based on 6.5 ft/s^2 [2.0 m/s^2] are impractical.
3. Access points should not be located in the deceleration areas.

Table 2C-4. Guidelines for Advance Placement of Warning Signs

Posted or 85th-Percentile Speed	Advance Placement Distance ¹								
	Condition A: Speed reduction and lane changing in heavy traffic ²	Condition B: Deceleration to the listed advisory speed (mph) for the condition							
		0 ³	10 ⁴	20 ⁴	30 ⁴	40 ⁴	50 ⁴	60 ⁴	70 ⁴
20 mph	225 ft	100 ft ⁶	N/A ⁵	—	—	—	—	—	—
25 mph	325 ft	100 ft ⁶	N/A ⁵	N/A ⁵	—	—	—	—	—
30 mph	460 ft	100 ft ⁶	N/A ⁵	N/A ⁵	—	—	—	—	—
35 mph	565 ft	100 ft ⁶	N/A ⁵	N/A ⁵	N/A ⁵	—	—	—	—
40 mph	670 ft	125 ft	100 ft ⁶	100 ft ⁶	N/A ⁵	—	—	—	—
45 mph	775 ft	175 ft	125 ft	100 ft ⁶	100 ft ⁶	N/A ⁵	—	—	—
50 mph	885 ft	250 ft	200 ft	175 ft	125 ft	100 ft ⁶	—	—	—
55 mph	990 ft	325 ft	275 ft	225 ft	200 ft	125 ft	N/A ⁵	—	—
60 mph	1,100 ft	400 ft	350 ft	325 ft	275 ft	200 ft	100 ft ⁶	—	—
65 mph	1,200 ft	475 ft	450 ft	400 ft	350 ft	275 ft	200 ft	100 ft ⁶	—
70 mph	1,250 ft	550 ft	525 ft	500 ft	450 ft	375 ft	275 ft	150 ft	—
75 mph	1,350 ft	650 ft	625 ft	600 ft	550 ft	475 ft	375 ft	250 ft	100 ft ⁶

¹ The distances are adjusted for a sign legibility distance of 180 feet for Condition A. The distances for Condition B have been adjusted for a sign legibility distance of 250 feet, which is appropriate for an alignment warning symbol sign. For Conditions A and B, warning signs with less than 6-inch legend or more than four words, a minimum of 100 feet should be added to the advance placement distance to provide adequate legibility of the warning sign.

² Typical conditions are locations where the road user must use extra time to adjust speed and change lanes in heavy traffic because of a complex driving situation. Typical signs are Merge and Right Lane Ends. The distances are determined by providing the driver a PRT of 14.0 to 14.5 seconds for vehicle maneuvers (2005 AASHTO Policy, Exhibit 3-3, Decision Sight Distance, Avoidance Maneuver E) minus the legibility distance of 180 feet for the appropriate sign.

³ Typical condition is the warning of a potential stop situation. Typical signs are Stop Ahead, Yield Ahead, Signal Ahead, and Intersection Warning signs. The distances are based on the 2005 AASHTO Policy, Exhibit 3-1, Stopping Sight Distance, providing a PRT of 2.5 seconds, a deceleration rate of 11.2 feet/second², minus the sign legibility distance of 180 feet.

⁴ Typical conditions are locations where the road user must decrease speed to maneuver through the warned condition. Typical signs are Turn, Curve, Reverse Turn, or Reverse Curve. The distance is determined by providing a 2.5 second PRT, a vehicle deceleration rate of 10 feet/second², minus the sign legibility distance of 250 feet.

⁵ No suggested distances are provided for these speeds, as the placement location is dependent on site conditions and other signing. An alignment warning sign may be placed anywhere from the point of curvature up to 100 feet in advance of the curve. However, the alignment warning sign should be installed in advance of the curve and at least 100 feet from any other signs.

⁶ The minimum advance placement distance is listed as 100 feet to provide adequate spacing between signs.

2. Rural Intersection Conflict Warning System - Project Design Criteria

a. Advanced Warning on Mainline

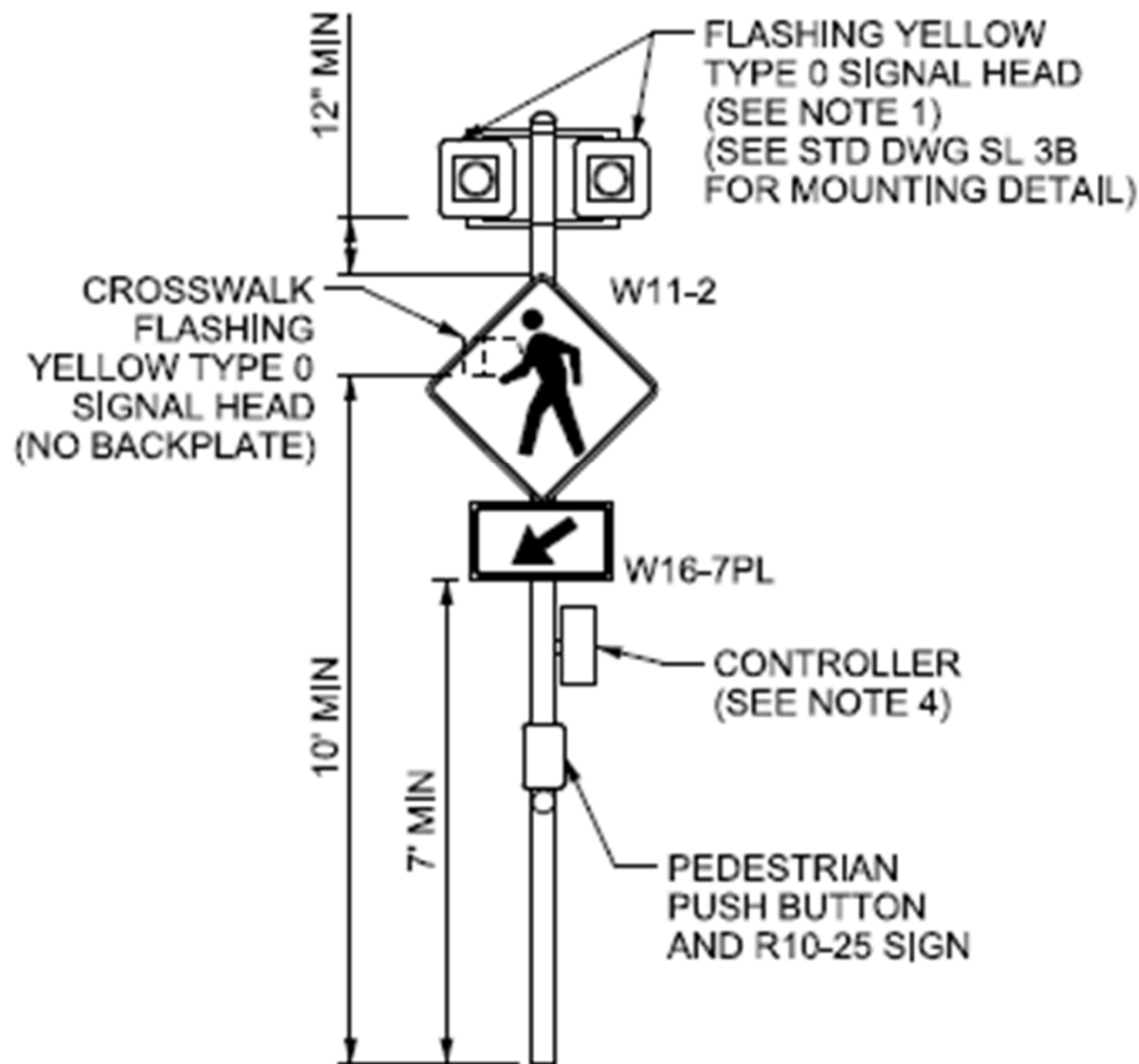
i. Sign & Flashing Yellow Beacon Configuration Requirements:

1. MUTCD Requirements:

a. Requirements According to Roland with FHWA, the MUTCD only has a ***shall*** statement for speed limit signs (including school speed limit signs).

- Utah MUTCD Section 4L.03 does not specify whether a ***warning*** beacon needs to be vertical or horizontal in orientation. It also does not state when one or two beacons should be used.
- Utah MUTCD Section 4L.04 states that when a warning beacon is paired with a speed limit sign, it shall be vertically aligned and flashed alternately, unless the speed limit sign width is greater than the height (not sure when this would occur, but that's what it states).

- Section 7B.15 states that for a school speed limit sign, vertical orientation of warning beacons shall be used and flash alternately.
- UDOT SL series standard drawings show warning beacons being placed in pairs, horizontally oriented above the sign. Std. Dwgs. SL 6E and 6G include the following detail showing the beacons mounted side-by-side above the warning sign...with the beacons 12" above the top point of the sign (as specified in Utah MUTCD Section 4L.01 paragraph 05). The 7 ft. mounting height in the SL 6 series drawings is because the assemblies include ped push buttons and would likely be mounted over pedestrian movements. The signs in our project wouldn't be mounted over ped movements, so the 6 ft. mounting height to the bottom of the supplemental plaque (Std. Dwg SN 2A) would apply.



OPTION A **FLASHING BEACON DETAIL**

15 FT TRAFFIC
SIGNAL POLE / LUMINAIRE POLE
(SEE NOTES A, H AND
STD DWG SL 1E)

***Summary:**

Placement of flashing beacons horizontally above the sign or vertically one above and one below permitted with engineering judgement.

1. Project Specific Sign & Flashing Yellow Beacon Configuration:
 - a. Horizontal Sign & Beacon Mounting Considerations:
 - i. Mount the intersection warning sign and supplemental warning plaque 12-inch below horizontal flashing beacons (side-by-side) on a 15 ft. pedestrian pole is permissible when the correct sign mounting height can be obtained (measured from bottom of sign to top of roadway surface).
 - 1) Installation of State Furnished 15-ft pedestrian pole could only be used in an urban area with side slope of 6:1 for flatter.

2. Vertical Sign & Beacon Mounting Considerations:

a. Mount the flashing beacons vertically (above and below)

intersection warning sign and supplemental warning plaque in the middle of the 12-inch beacons 6-inches above and below the signs.

i. Install State Furnished 30-ft Luminaire Pole with 12-inch flashing solid yellow beacons on top and bottom of W2-1 intersection sign 650-ft from end of double yellow line at intersection.

3. In areas with sharp curves or winding roads, place a "WATCH FOR STOPPED TRAFFIC" warning sign 1/4 mile from end of double yellow line at intersection. Advanced Warning on Side Street (SR-18 Location Only)

a. Installed in accordance with previous manuals of instruction.

Detection Equipment for Phase 2

Model
225

v 0.5

SmartSensor Matrix



SmartSensor Matrix

Model 225

16-beam stop bar sensor

The SmartSensor Matrix is a first-of-its-kind stop bar presence detector designed for use at signalized intersections to detect vehicles with the reliability of radar and with all the advantages of non-intrusive detection.



- Matrix of 16 radars for two-dimensional coverage
- Tracks vehicles through a 90 degree field of view that extends out 140 ft. (42.7 m)
- Includes Radar Vision technology to detect and track in two dimensions
- Reports real-time presence of both moving and stopped vehicles
- Standard detector-rack contact-closure interface
- Easy to install and operate
- Supports curved and angled lanes
- Compatible with Click 65x all-in-one cabinet interface device
- Automated manufacturing process
- Patented auto-configuration process
- Patented Digital Wave Radar II technology
- Remote accessible for traffic monitoring and sensor management
- Flash upgradable
- Robust to changing temperature, light and weather conditions

Description

Commodity Code

Matrix Snow Visor

55082000035



Category

Radar Detection

Model #

101-047

Unit Price

\$72

Compatible with...

• [Matrix Stopbar Sensor](#)

Notes

All matrix stopbar sensors should be equipped with a snow visor.

Lead Time: 8 weeks

Desired Stock: 150

Reorder Threshold: 100

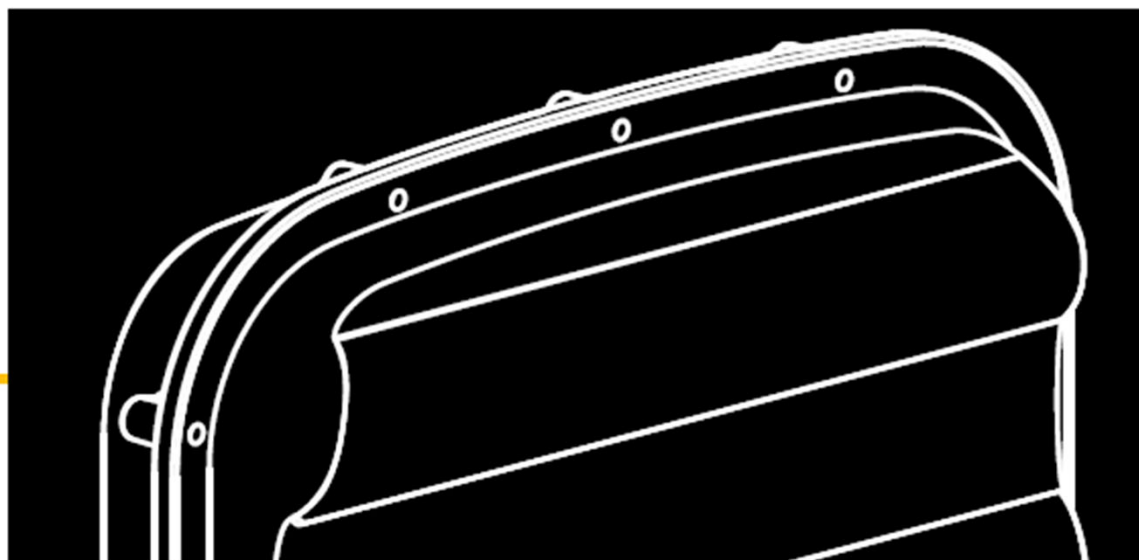
Vendor: Summit

Contract: [PA684](#)

Contract Expiration Date: November 27, 2023







SmartSensor Advance

USER GUIDE

Forward-fire long-distance intersection sensor

SmartSensor Advance Extended Range is the first traffic device to use advance detection to provide enhanced dilemma zone protection for trucks and other high profile vehicles. The sensor boosts detection of these vehicles out to 900 feet, and protects both cars and trucks with innovative SafeArrival technology.



- Dilemma zone protection for high-profile vehicles based on vehicle discovery range
- Advanced techniques boost truck detections out to 900 feet; car detections are boosted out to 600 feet or more
- Patented SafeArrival technology provides protection to individual cars and trucks
- Dynamic ETA Tracking over the entire detection area
- Non-intrusive, above ground position makes the sensor easy to install
- The additional 300-foot range (compared to SmartSensor Advance) makes overhead/straightforward mast arm installation more effective on high-speed approaches
- Easily integrates with SmartSensor Matrix at intersections
- Benefits include reduced risk of hazardous load spills; reduced truck crash and fatalities rates; reduced emissions; fewer truck start-up delays; and improved corridor delivery times

SmartSensor Advance

Intersections



Mounting location, height and offset

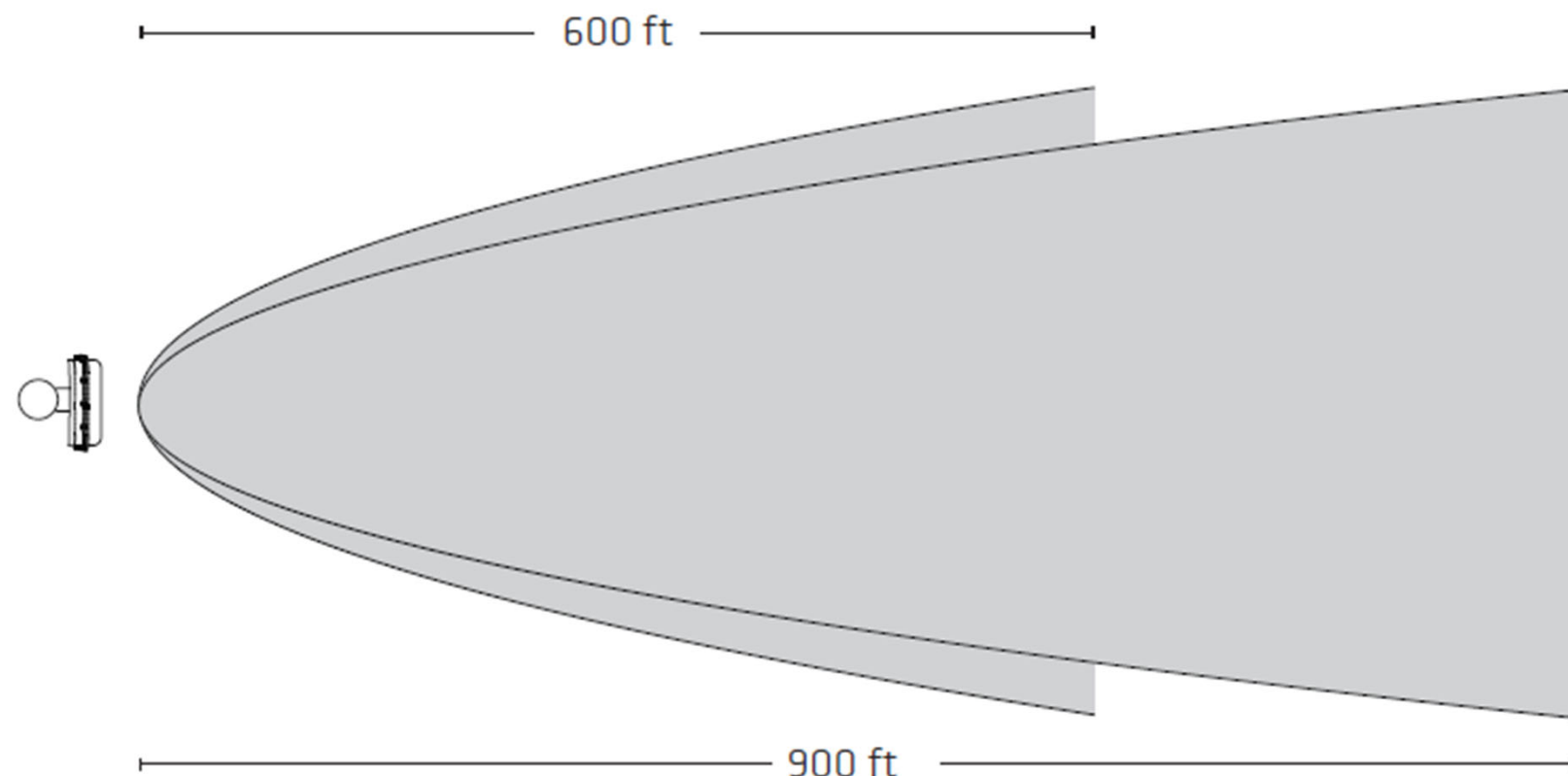


Figure 2. The SmartSensor Advance and Advance Extended Range footprint

- The SmartSensor Advance and SmartSensor Advance Extended Range detect moving traffic out to a maximum range of 600 ft. (182.9 m) and 900 ft. (274.3 m) respectively.
- Make sure the sensor has a clear view of the area you want to detect.

Click 202 Overview

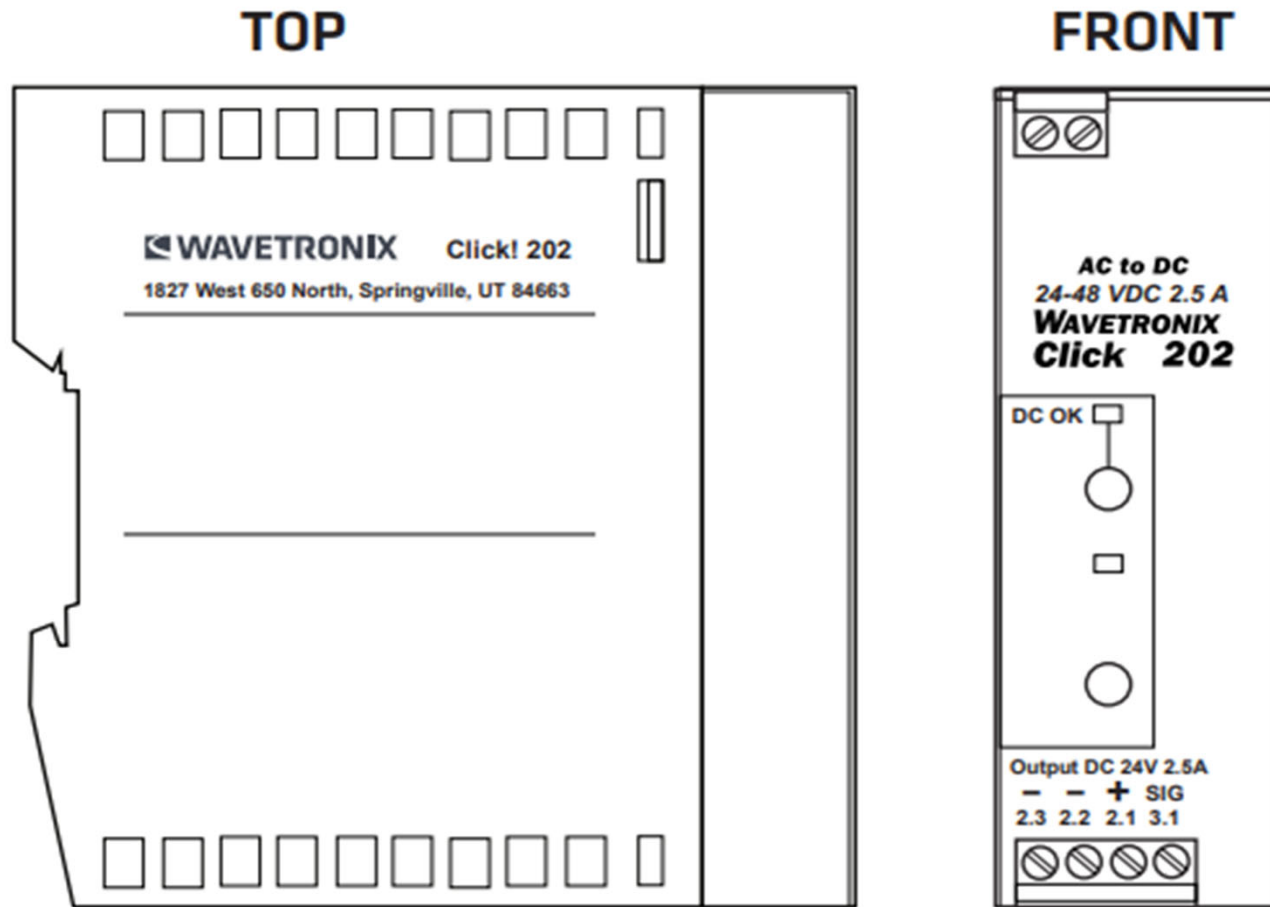
AC to DC power converter

The Click 202 is 100 to 240 VAC to 24 VDC power converters, bringing reliable DC power to your traffic cabinet. With a 100% power reserve, the Click 202 is the most effective remedy for static voltage dips, transient failures of supply voltage, or continuous phase failures.



- Converts 100–240 VAC power to 24 VDC power
- Provides 2 A of current
- Mounts easily onto a DIN rail
- Meets NEMA TS2-2003 environmental specification
- UL listed
- Pluggable screw terminals allow for easier wiring and are red-keyed, allowing connectors to plug into only one specific jack
- Guaranteed mains buffering of more than 20 ms under full load
- DC OK LED indicates when device is working properly
- Features internal surge protection
- Potentiometer allows for adjustable DC voltage output

Click 202 Overview



Click 222 Overview

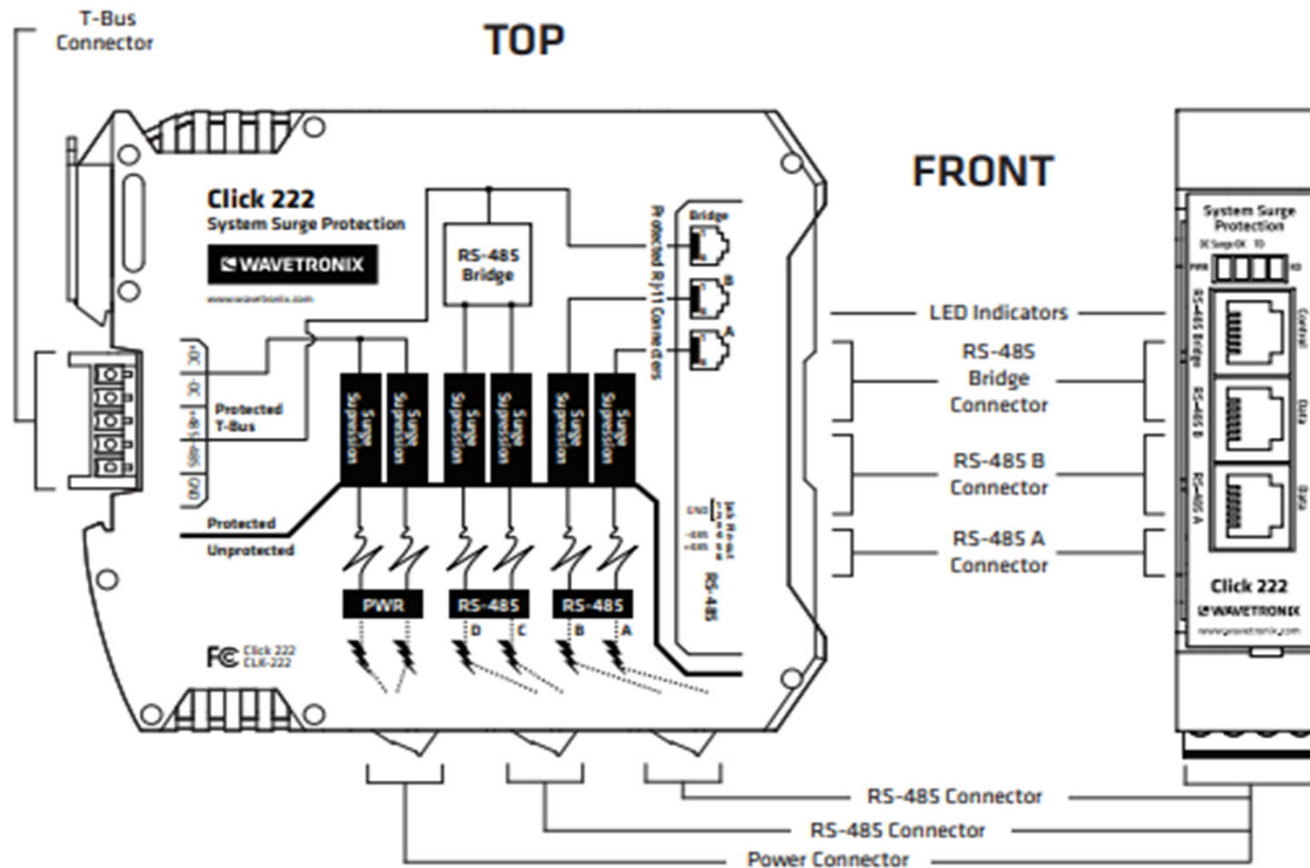
System surge protector

The Click 222 system surge protection device is designed to prevent electrical surges conducted along underground cables from damaging the cabinet equipment. The device features a control bridge that connects independent RS-485 buses, eliminating communication problems caused by star networks.



- Multi-stage surge protection for RS-485 and DC power
- Low capacitance RS-485 protection
- Protects traffic monitoring devices and traffic cabinets
- Designed for use with all Click devices
- DIN rail-mounted for easy installation
- Convenient, hot-swappable power and communication buses
- Features independent RS-485 buses for better communication
- Complies with IEC/EN 61000-4-5 level 4
- Conformal coated
- Pluggable screw terminals minimize problems caused by incorrect wiring
- LEDs indicate power, surge protection status, and data transmission/receipt
- Complies with NEMA TS2-2003 environmental testing

Click 222 Overview

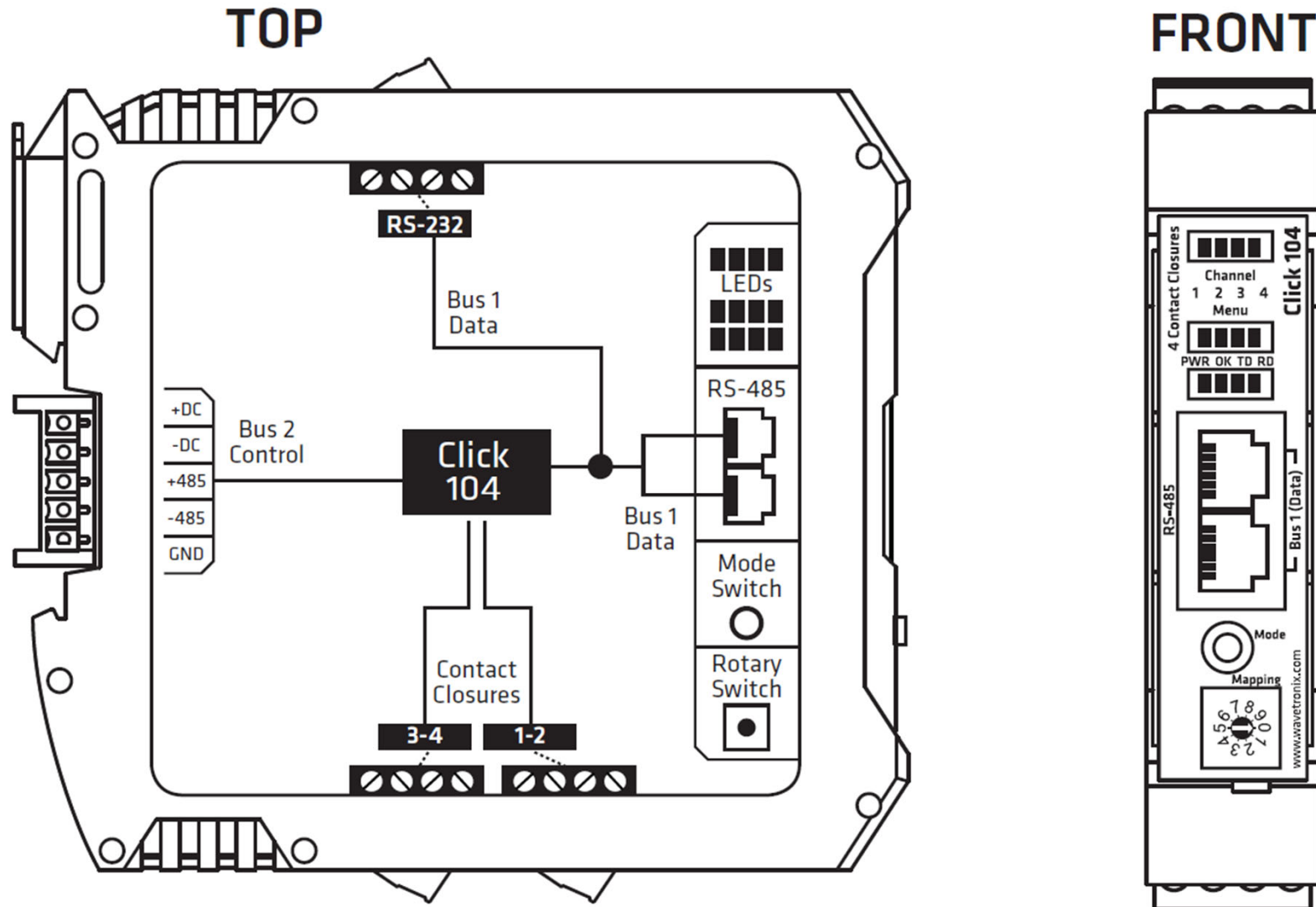


Click 104 Overview



- Compatible with NEMA TS1 and TS2, 170, and 2070 traffic controllers
- Mounts on a DIN rail for easy connection to power and communication bus
- Fail-safe mode in case of interruption of data flow
- Dual communication ports for separate data and configuration communication
- Uses industry-standard RS-485 communication
- Automatically sets baud rate
- Displays detection via LEDs on faceplate
- Solid state outputs
- Configurable via hardware front panel interface or Click Supervisor
- Keyed removable screw terminals for ease of wiring
- Conformal coated

Click 104 Overview



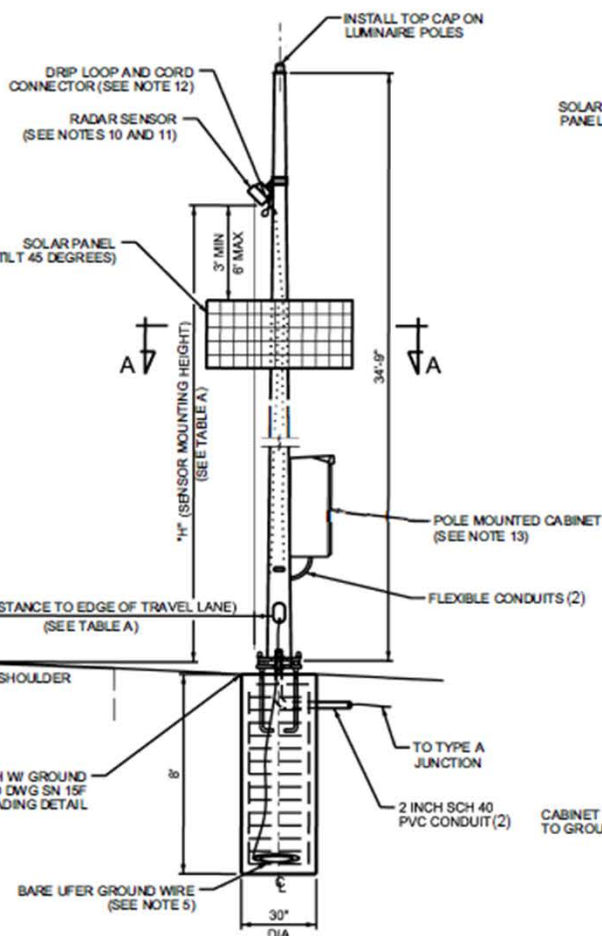
Design Details for Phase 2

Installation Details for Project

- Cabinet Used is a 336 Cabinet
- Cabinet size is larger
- Used existing Standard Drawings for foundation layout
- Junction box layout borrowed from other Standards
- Uses Wavetronix Side fire Radar to detect traffic
- Cabinet Layout

Solar Counting Station Detail AT 14

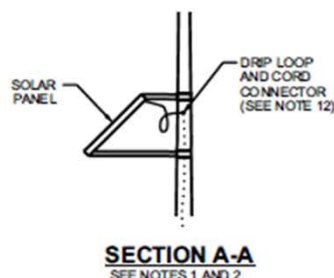
- To keep the project simple, we used existing designs
- AT 14 Design is for a Continuous Counting Station & Traffic Monitoring Station
- Solar Powered Installation
- Uses Wavetronix Side fire Radar to detect traffic
- Cabinet Layout



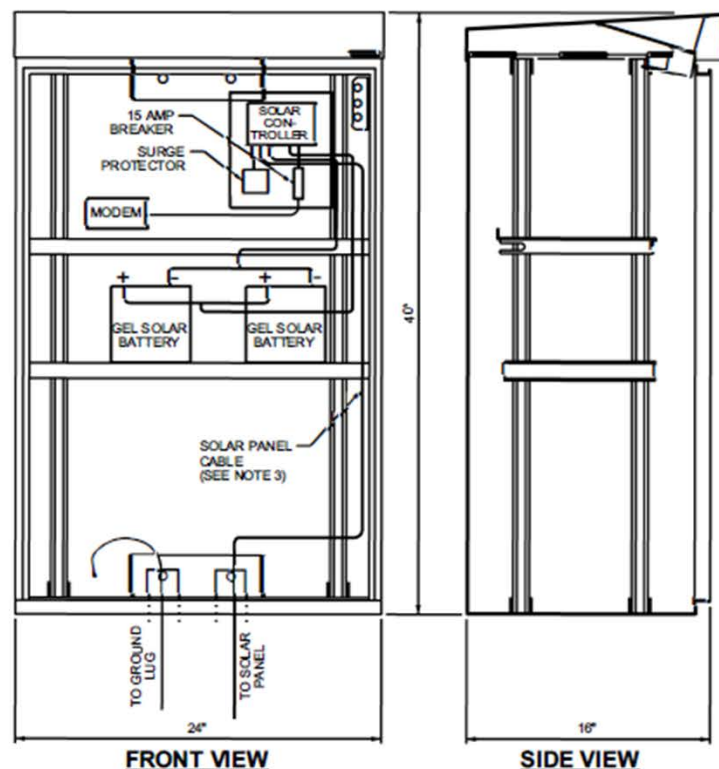
A SOLAR TRAFFIC COUNTING STATION LAYOUT
REFER TO STD DWG SL 5B FOR FOUNDATION DETAILS
REFER TO STD DWG SL 5C FOR SUP BASE DETAILS

OPTIMAL POLE & RADAR SENSOR LOCATION (FT)	
POLE "D"	25 TO 35
SENSOR "H"	26 TO 30

TABLE A
SEE NOTE 7



B TYPICAL - GROUNDING AND COMMUNICATION
REFER TO STD DWG SL 5B FOR ANCHOR BOLT DETAILS
REFER TO STD DWG SL 5C FOR SUP BASE DETAILS



C POLE MOUNTED CABINET DETAIL
REFER TO STD DWG AT-11C FOR MOUNTING DETAILS

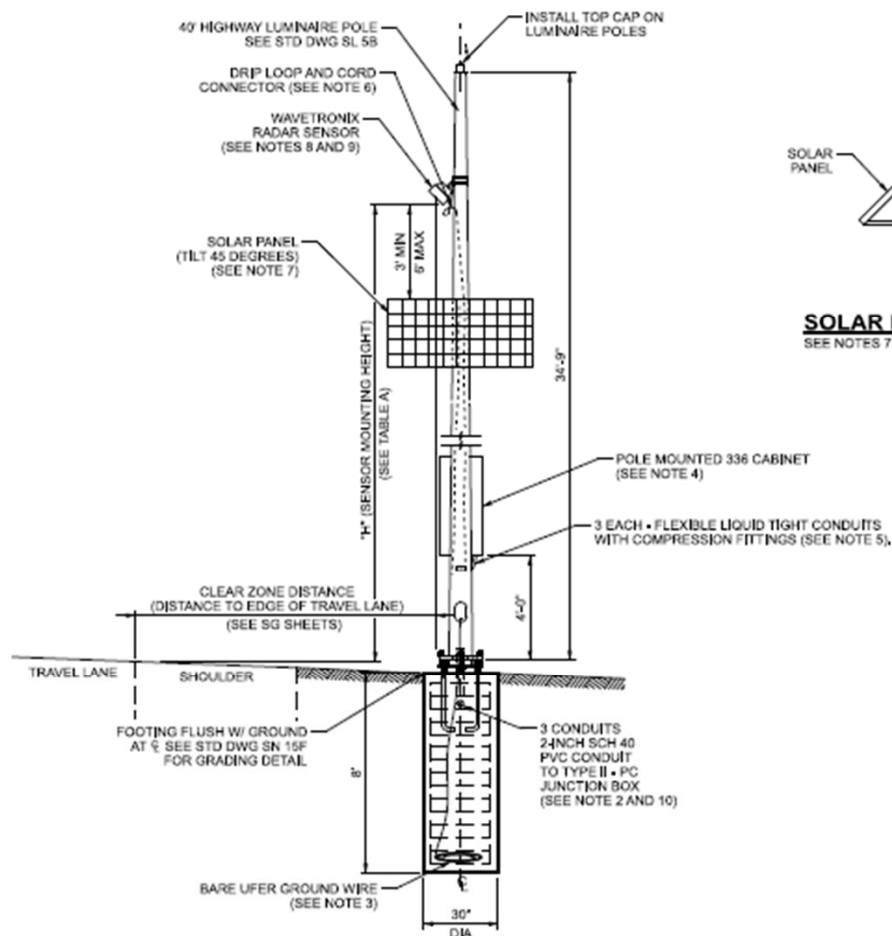
NOTES:

1. ORIENT SOLAR PANEL TO FACE DUE SOUTH.
2. ADJUST SOLAR PANEL MOUNTING HEIGHT FROM SENSOR DETECTION AREA IF RADAR SENSOR IS FACING SOUTH. CONTACT UDOT TRAFFIC COUNTING SHOP THROUGH THE ENGINEER PRIOR TO CONSTRUCTION.
3. USE 12 AWG TYPE TC THIN-WALL-2 CONDUCTORS, 90 C 600V SUN RESISTANT DIRECT BURY SOLAR PANEL CABLE.
4. USE COATED REBAR AND CLASS AA(AE) CONCRETE FOR FOUNDATIONS.
5. USE CONCRETE ENCASED ELECTRODE PER NEC 250 FOR GROUNDING (IFER GROUND).
6. CONTACT UDOT TRAFFIC COUNTING SHOP AT (801) 965-4062 FOR COUNTING MACHINE SPECIFICATIONS.
7. VERIFY POLE AND CONTROLLER CABINET LOCATION AND RADAR SENSOR HEIGHT.
8. PROTECT WITH AN APPROVED STANDARD BARRIER OR GUARDRAIL SYSTEM WHEN POLE PLACEMENT IS WITHIN CLEAR ZONE.
9. STATE FURNISHED ITEMS: SUP BASE POLE, ANCHOR BOLTS, RADAR SENSOR, SOLAR PANEL AND MOUNTING BRACKET, CONTROLLER CABINET AND ALL INTERNAL COMPONENTS EXCLUDING SOLAR PANEL CABLE.
10. AIM RADAR SENSOR DURING FINAL INSPECTION.
11. REFER TO STD DWG AT 11B, DETAIL B FOR MOUNT ASSEMBLY DETAILS.
12. SUPPLY AND INSTALL CORD CONNECTOR. SIZE APPROPRIATELY FOR WIRE.
13. USE CAB17238 G36 PM / EMPTY BATTERY CABINET.

SUPPLEMENTAL DRAWING

UTAH DEPARTMENT OF TRANSPORTATION		STANDARD DRAWING FOR ROAD AND BRIDGE CONSTRUCTION	SALT LAKE CITY, UTAH
RECOMMENDED FOR APPROVAL	DATE	APPROVED	DATE
CHIEF ENGINEER	APRIL 30, 2020	CHIEF ENGINEER	APRIL 30, 2020
DESIGNER	DATE	DESIGNER	DATE
4	4/30/20	4	4/30/20
5	4/30/20	5	4/30/20
6	4/30/20	6	4/30/20
7	4/30/20	7	4/30/20
8	4/30/20	8	4/30/20
9	4/30/20	9	4/30/20
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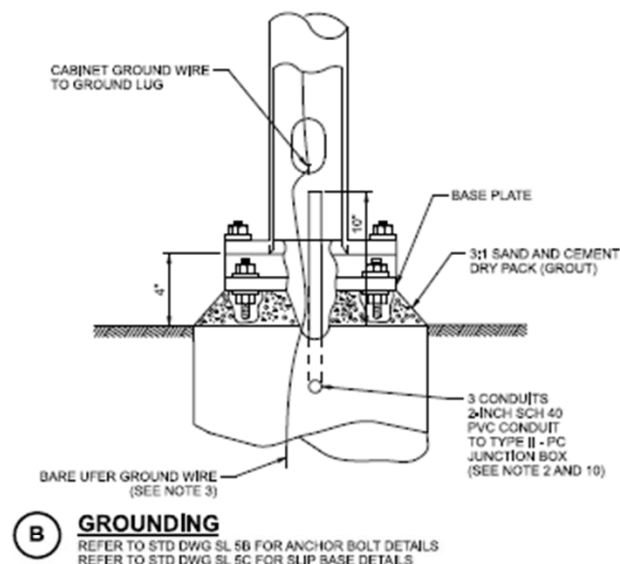
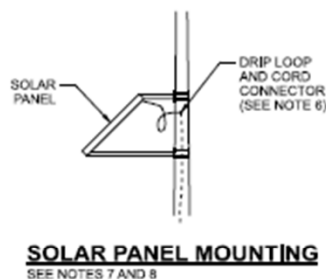
STD. DWG. NO.
AT 14



A SOLAR POWER RADAR DETECTION LAYOUT
REFER TO STD DWG SL 5B FOR FOUNDATION DETAILS
REFER TO STD DWG SL 5C FOR SLIP BASE DETAILS

OPTIMAL POLE & RADAR SENSOR LOCATION (FT)	
SENSOR "H"	25 TO 30

TABLE A



B GROUNDING
REFER TO STD DWG SL 5B FOR ANCHOR BOLT DETAILS
REFER TO STD DWG SL 5C FOR SLIP BASE DETAILS

NOTES:

1. REFER TO STANDARD SPECIFICATION 13558.
2. INSTALL TYPE II PC JUNCTION BOX NEAR POLE BASE IN FRONT OF CABINET. REFER TO STANDARD DRAWING AT11B, INSTALL 2 CONDUITS TO JUNCTION BOX.
3. INSTALL CONCRETE ENCASED ELECTRODE PER NEC ARTICLE 250 FOR GROUNDING (UFER GROUND).
4. INSTALL REGION FURNISHED POLE MOUNTED 336 ITS CABINET.
5. INSTALL FLEXIBLE CONDUITS - DRILL AND ATTACH TO POLE WITH WORKABLE SPACE BETWEEN CONDUITS.
6. SUPPLY AND INSTALL CORD CONNECTOR, SIZE APPROPRIATELY FOR WIRE.
7. ORIENT SOLAR PANEL TO FACE DUE SOUTH.
8. ADJUST SOLAR PANEL MOUNTING HEIGHT TO AVOID CONFLICT WITH WAVETRONIX RADAR SENSOR DETECTION AREA IF WAVETRONIX RADAR SENSOR IS FACING SOUTH.
9. VERIFY WAVETRONIX RADAR SENSOR HEIGHT, AIM RADAR SENSOR DURING FINAL INSPECTION.
10. INSTALL TYPE II PC JUNCTION BOX NEAR POLE BASE OPPOSITE SIDE OF CABINET. REFER TO STANDARD DRAWING AT11B, INSTALL 1 CONDUIT TO JUNCTION BOX.

SOLAR RADAR DETECTION DETAIL

PS&E

UTAH DEPARTMENT OF TRANSPORTATION

R4: RURAL INTERSECTION CONFLICT
WARNING SYSTEM

PROJECT
NUMBER

APPROVED	DATE	3/28/2022
DRAWN BY	DC	CHECKED BY
MPB		
PROFESSIONAL ENGINEER		

SHEET NO. DT-02

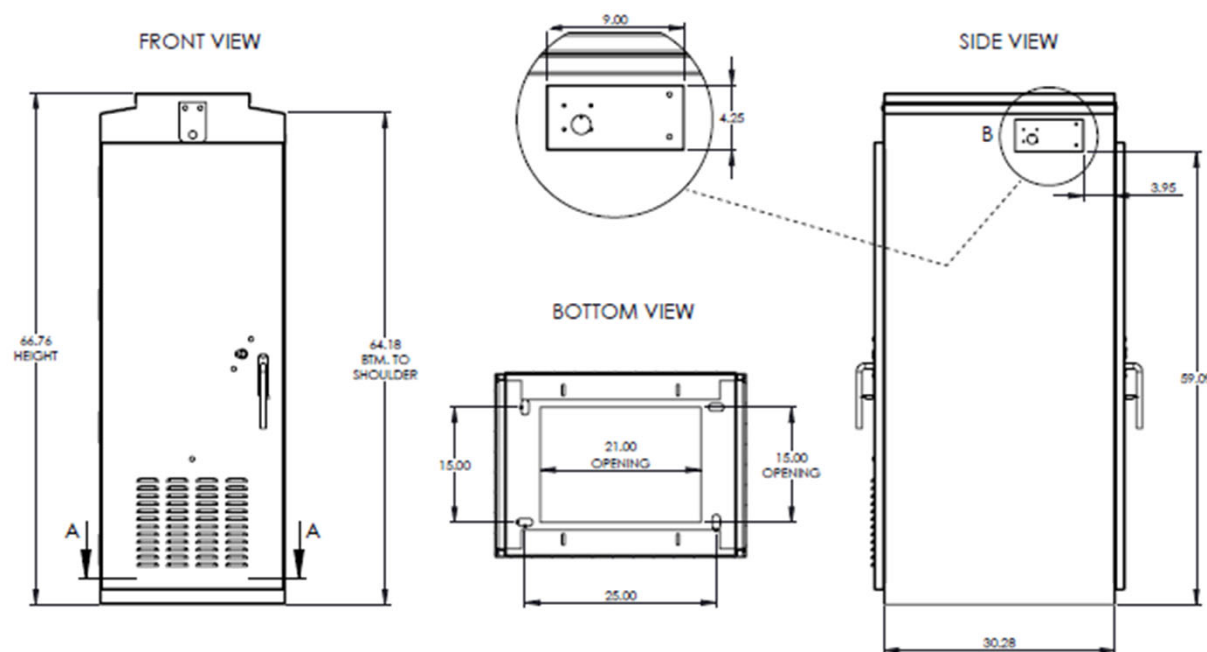


Description

All sub-assemblies are mounted in a removable 19-inch Electronic Industries Alliance (EIA) self-standing rack assembly for ease of maintenance. The power supply and input files are common to the 332, 336, 336S, 333SD, and 332D Cabinets. The standard 334 Cabinet provides the user with 9 AC outputs and up to 28 isolated inputs. Constructed of heavy 0.125-inch aluminum, the 334 provides a durable, weatherproof enclosure designed to the NEMA 3R specification.

Basic Specifications

- **Dimensions**
 - 66 in. H x 24 in. W x 30 in. D
- **Material**
 - Aluminum 0.125 in.
- **Ship Weight**
 - 290 lbs
- **Finish**
 - Anodized, bare, painted, or anti-graffiti
- **UL Label**
 - Cabinet Housing UL 3R listed,
UL File #E256326 (label optional)



State Furnished Material List

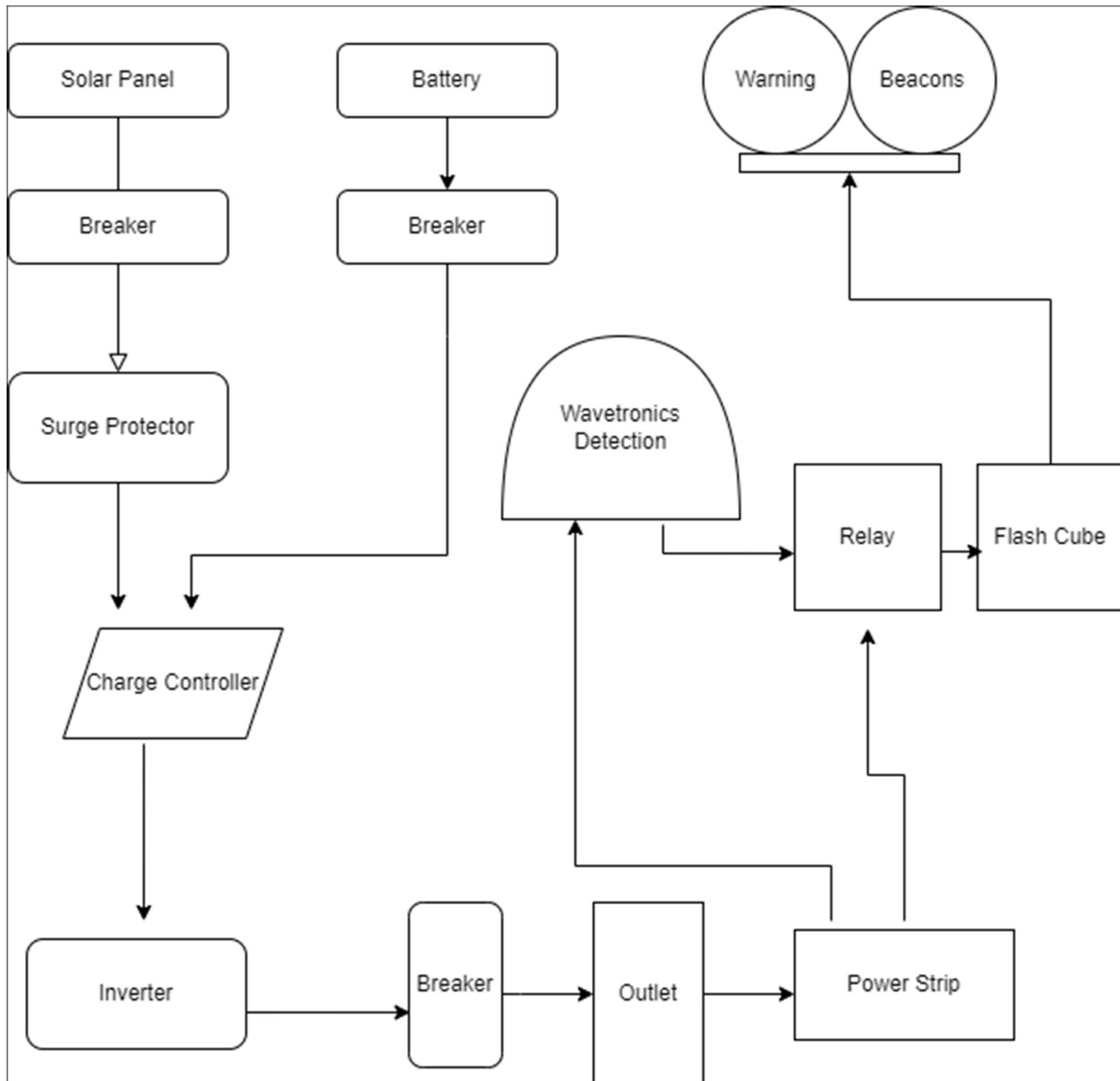
120W Solar Array w/12VDC 200Ah Batteries, Controller, Surge, Breakers, 50' Cable, Pole Mount	Non-Stock	WX-SOL-700-Kit	EA		\$2,775
DIN Rail, 9"	Non-Stock. For Click Cards.	WX-CLX-D001-005	EA		\$2

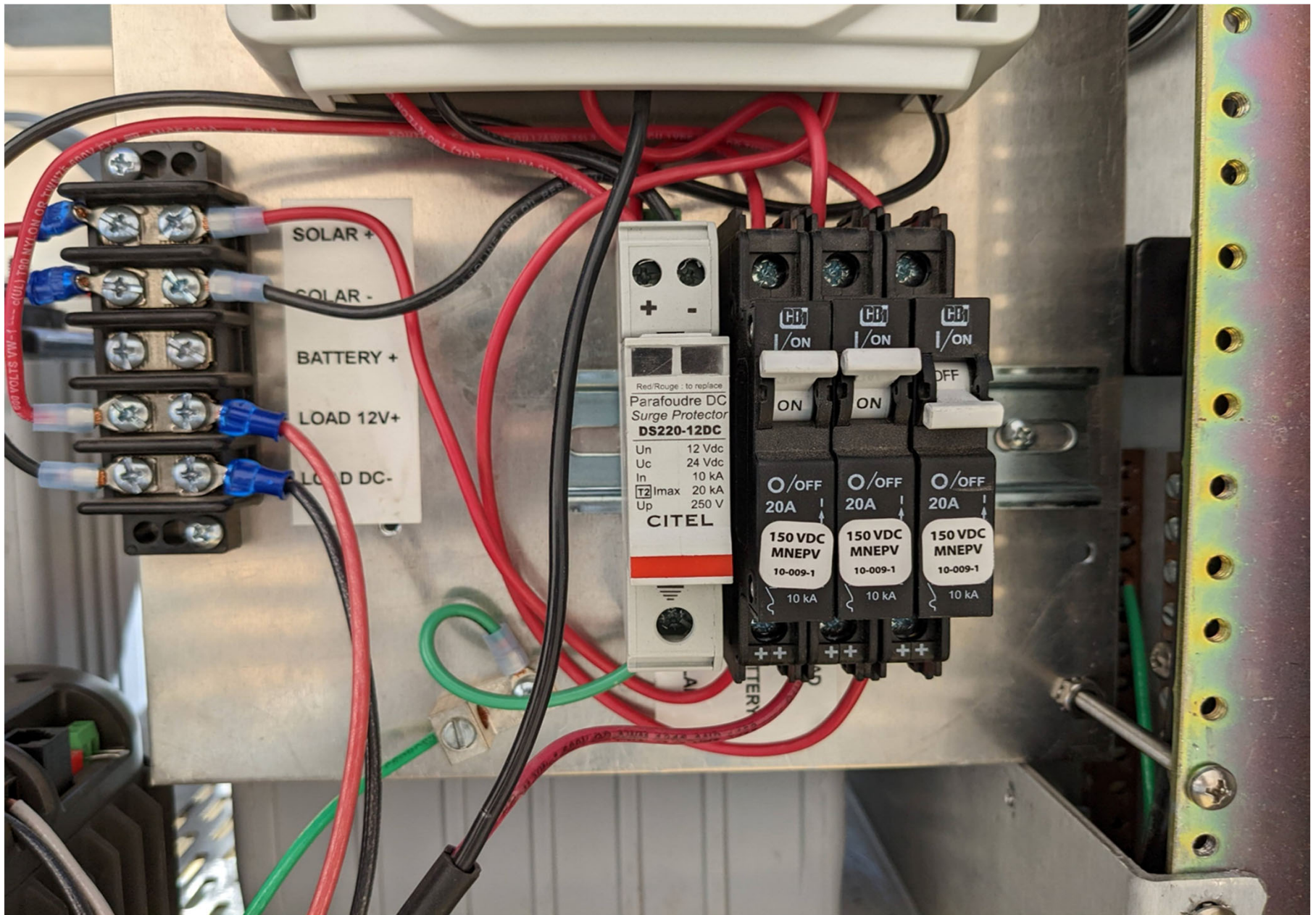
Solar Applications

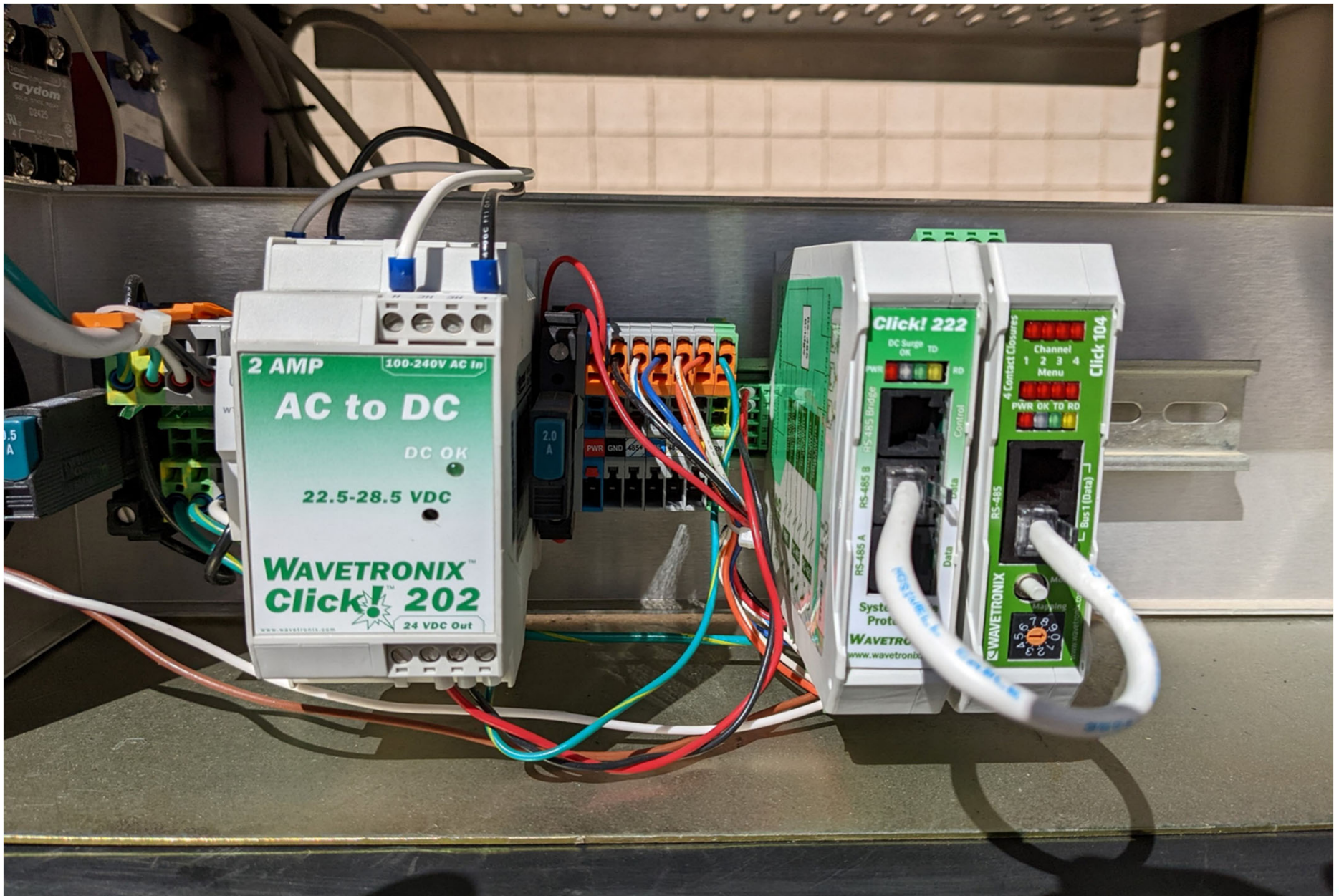
WX-SOL-700-Kit

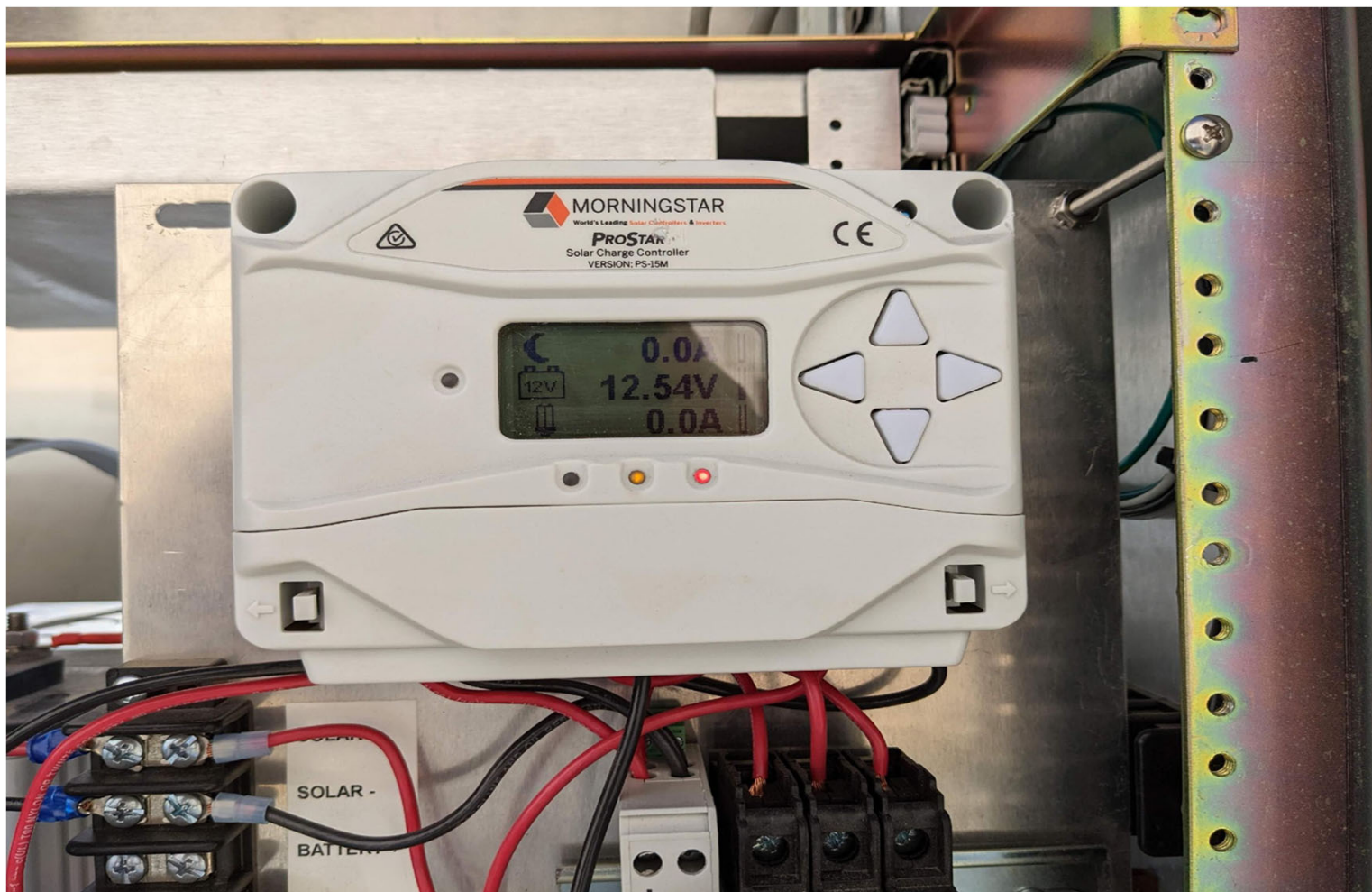
Solar Turnkey kit design (no enclosure): includes adj pole mount
120 Watt Solar array, prewired
12Vdc 200Ah battery bank, charge controller, lightning protection,
circuit breakers and 50 ft

\$2,775.00





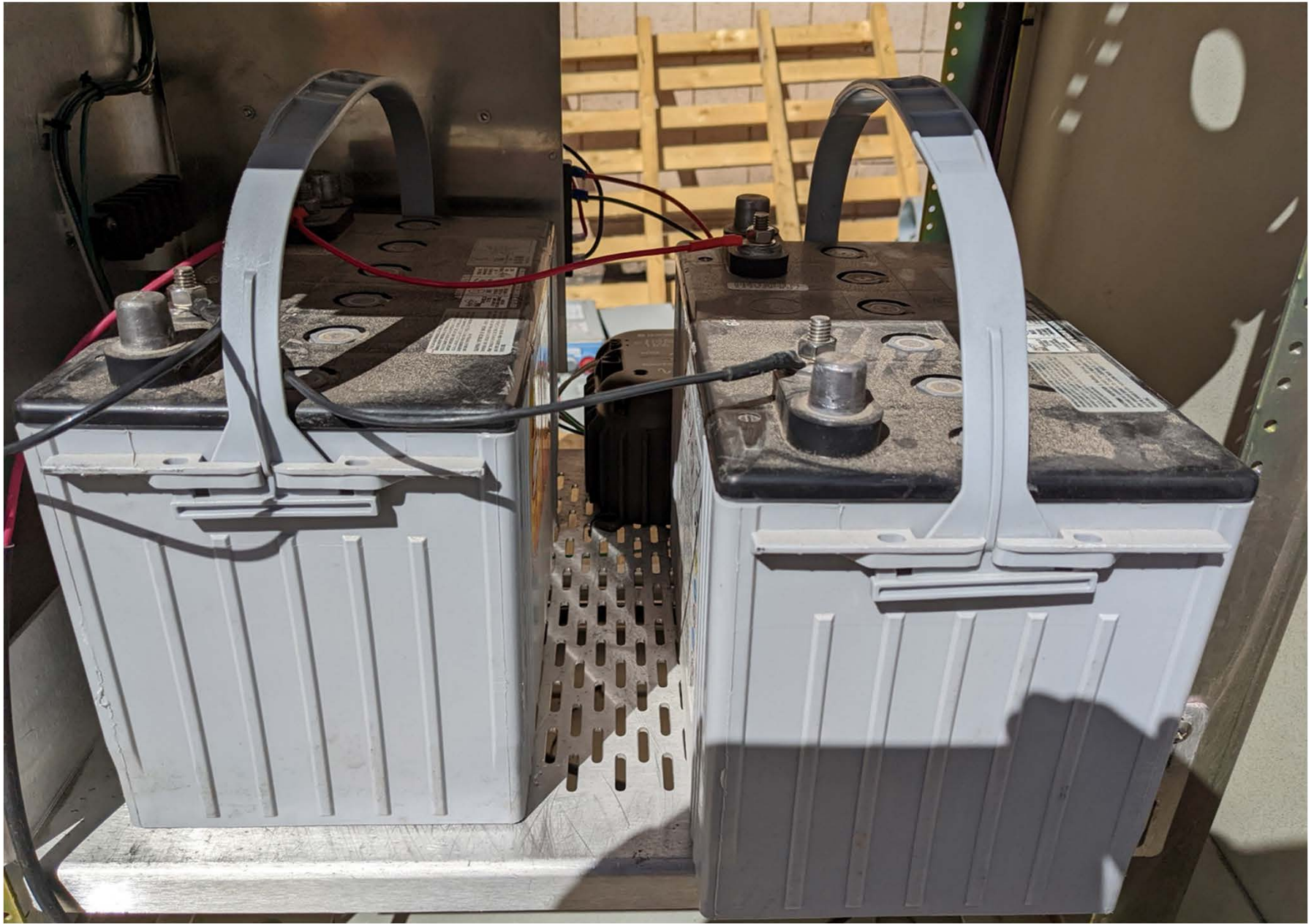




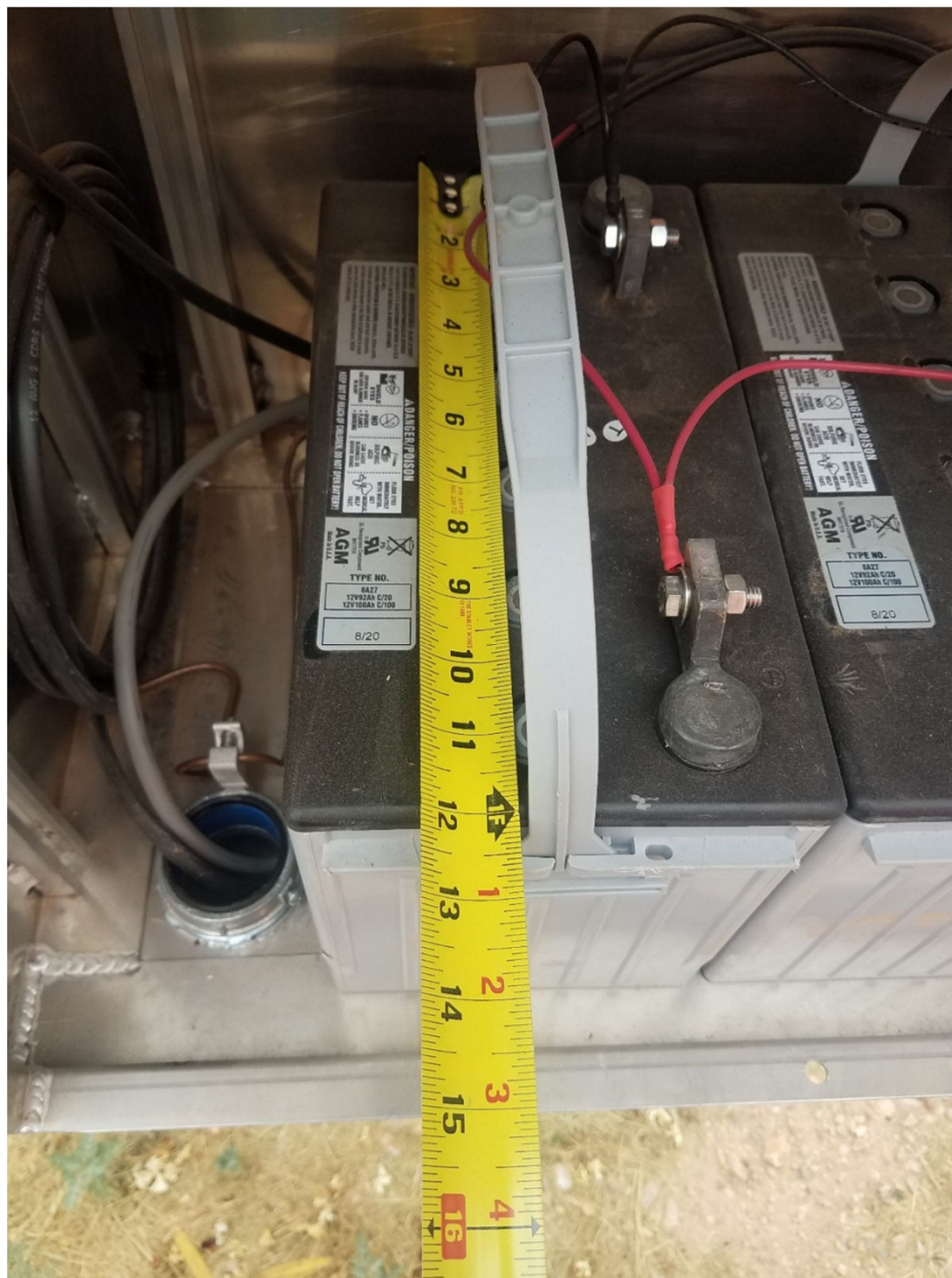
MorningStar ProStar 15 Amp 12/24 Volt PWM Charge Controller

Currently reflecting 12.54V



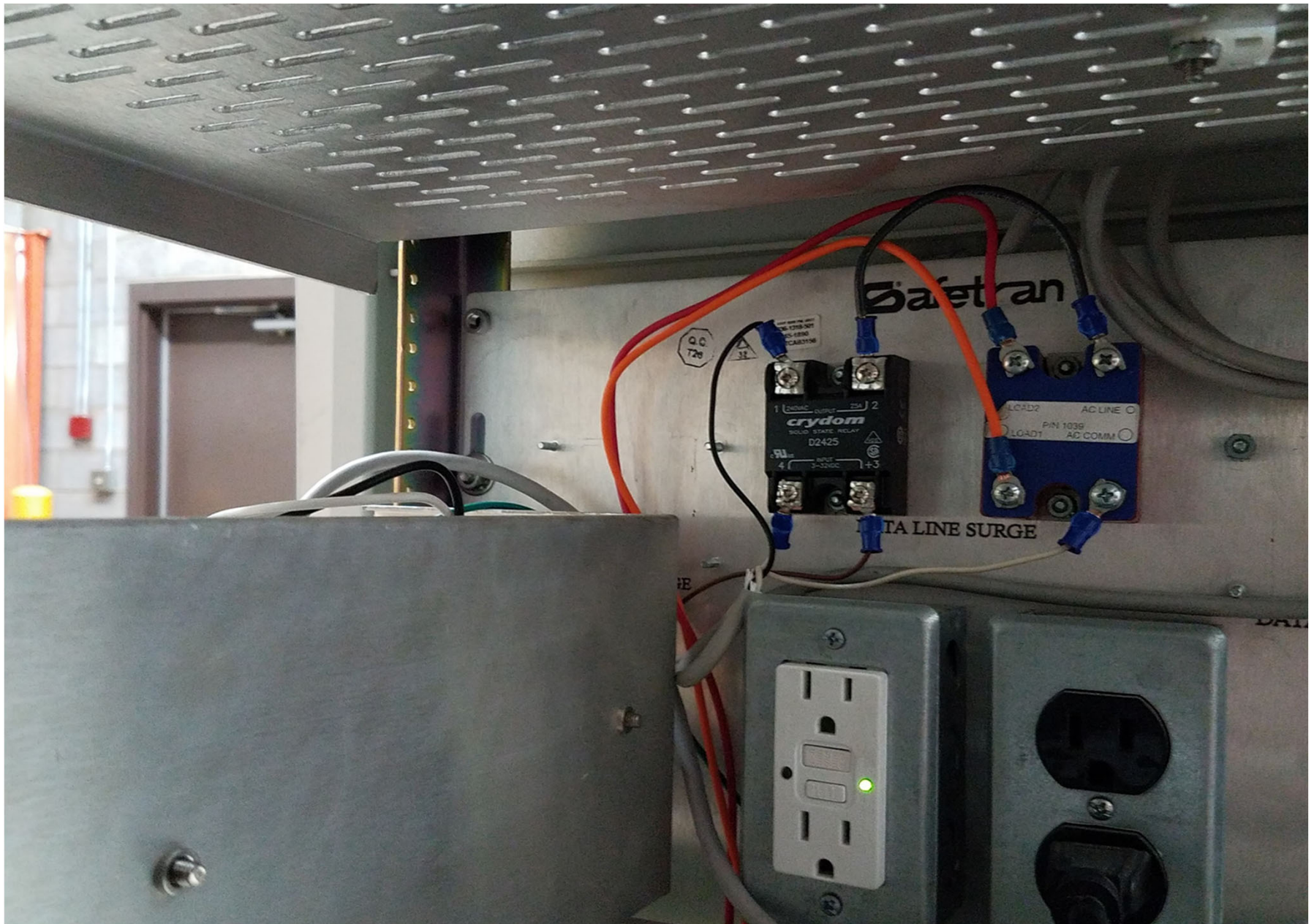


Length of Battery – 12”

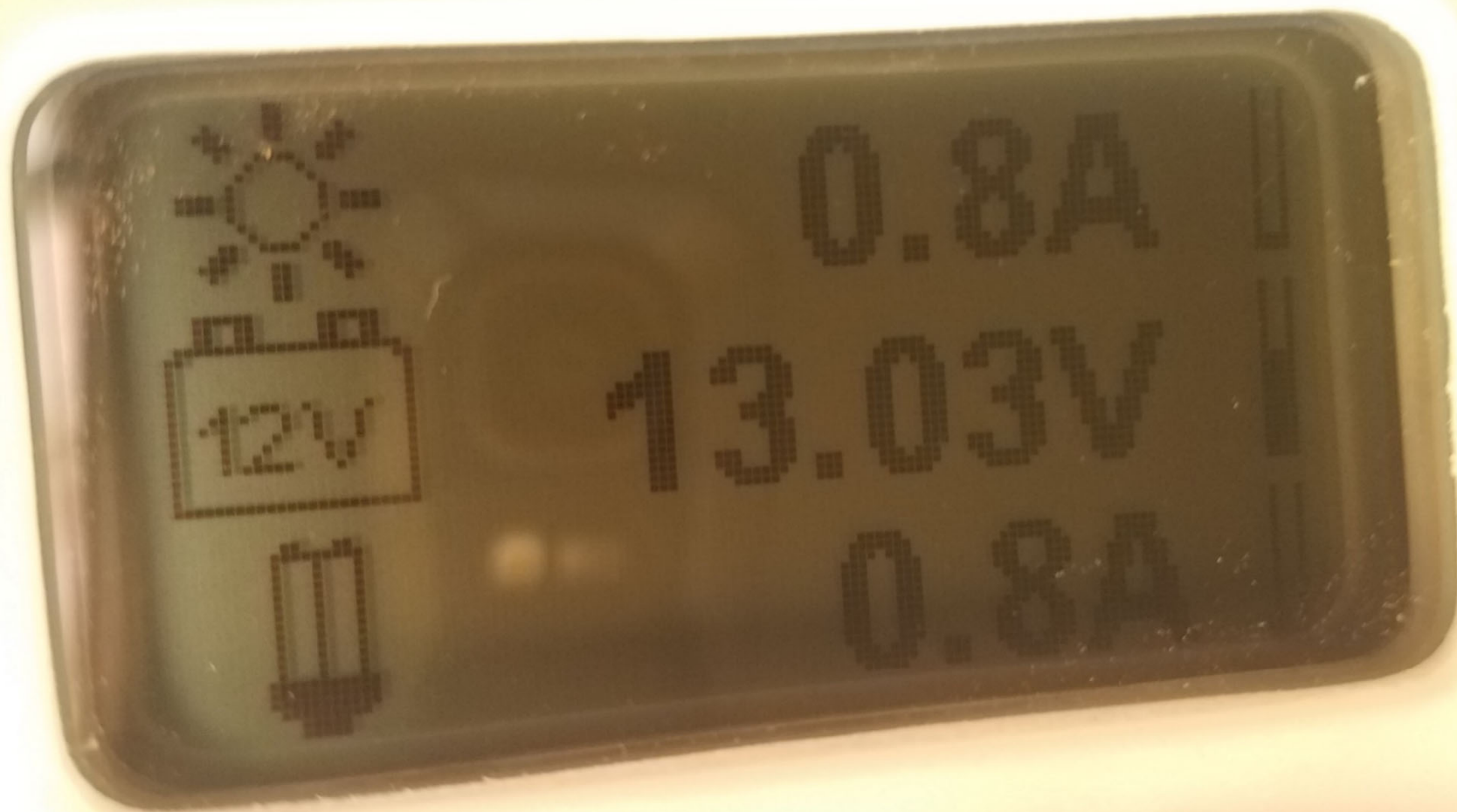


Width of Batteries— 13”

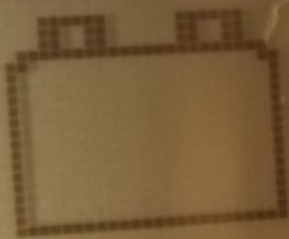




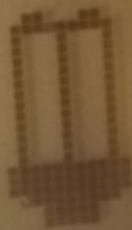
Next Five Slides Are The Morningstar ProStar Displays



Today's Energy



10.3 Ah



13.8 Ah

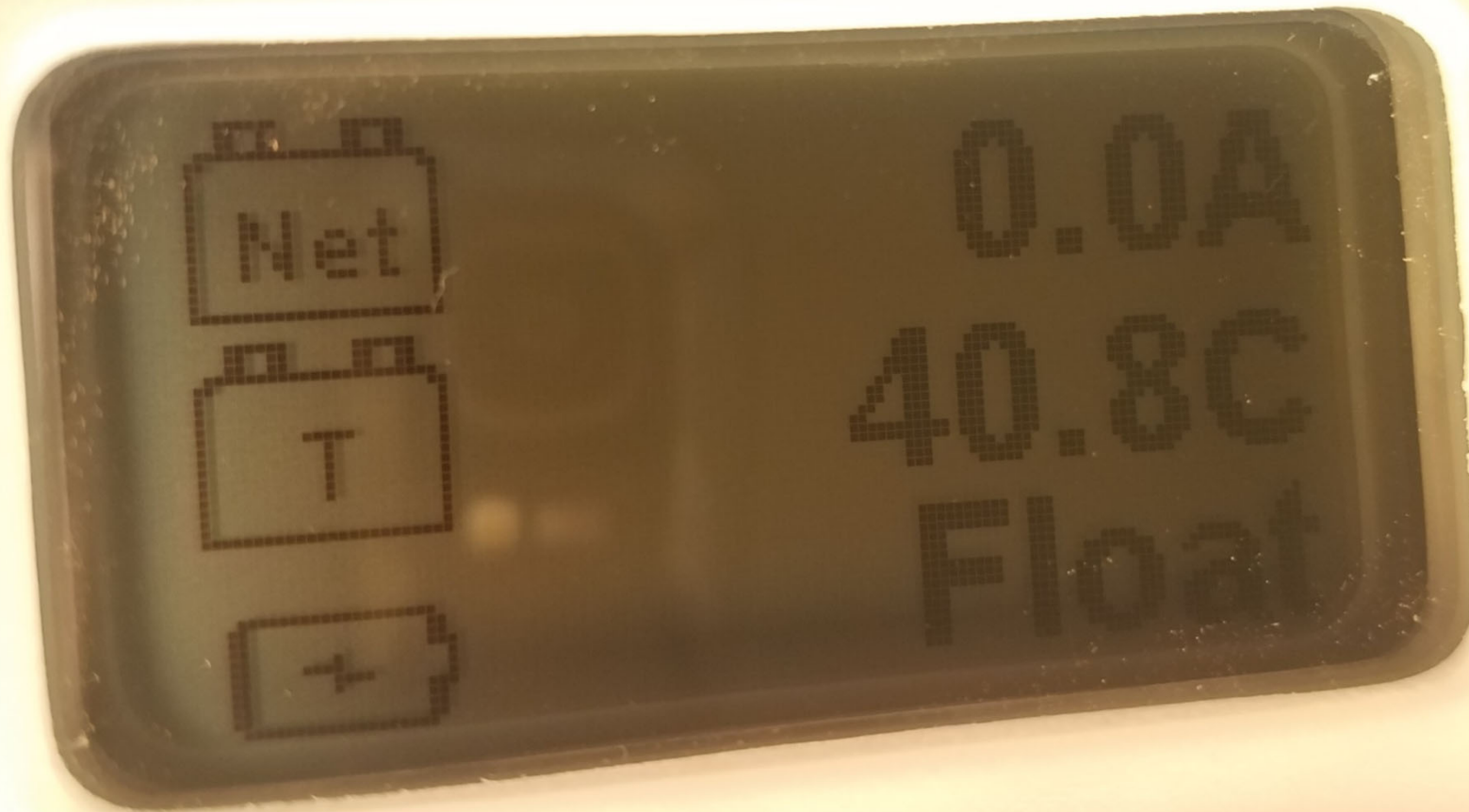
Today's Battery Voltage

Max 13.47 V

Min 12.41 V

Solar Charge Controller

VERSION: PS-15M



VERSION: PS-15M

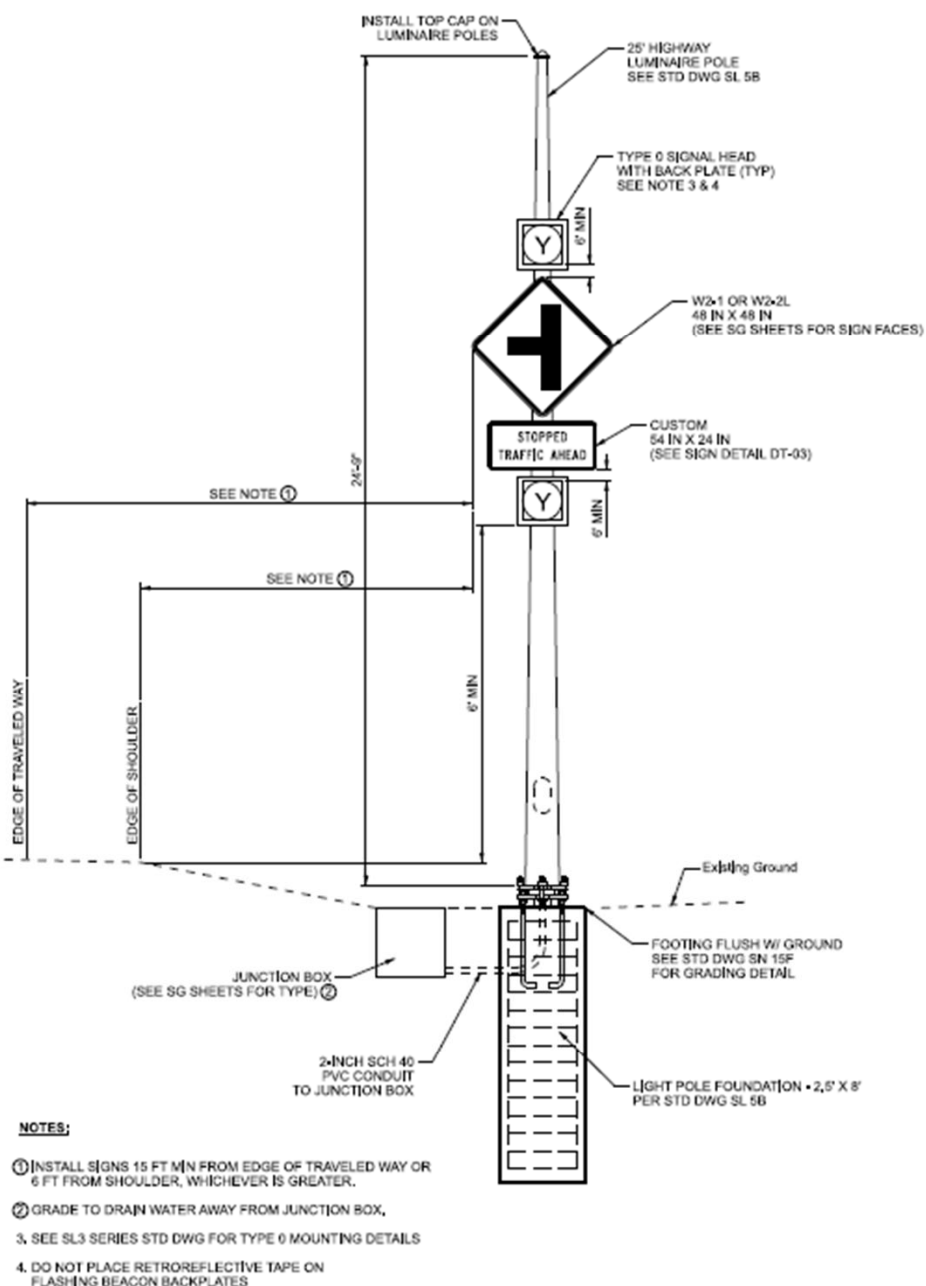
Today's Charge Time

Absorp	Float	EQ
2:59	0:29	0:00

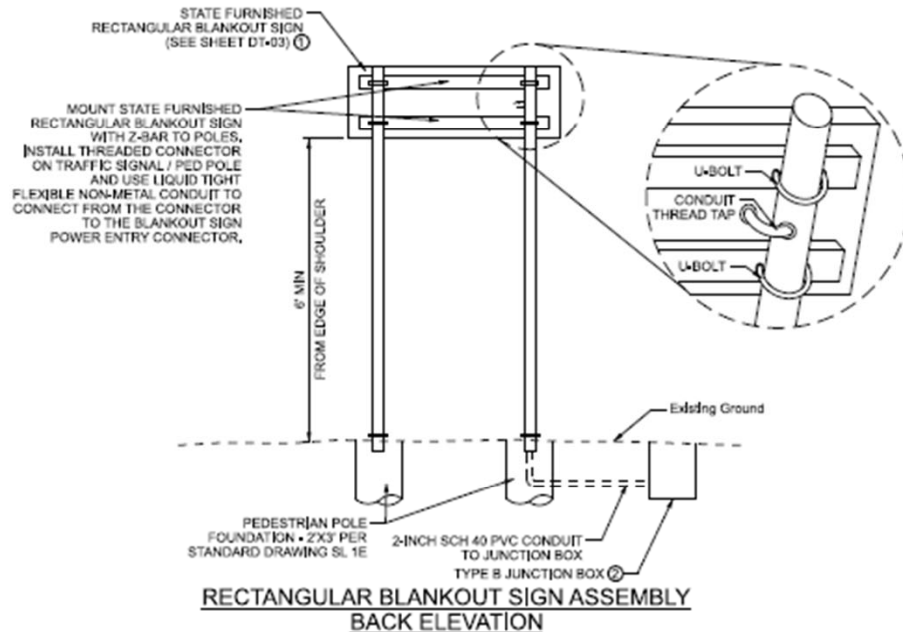
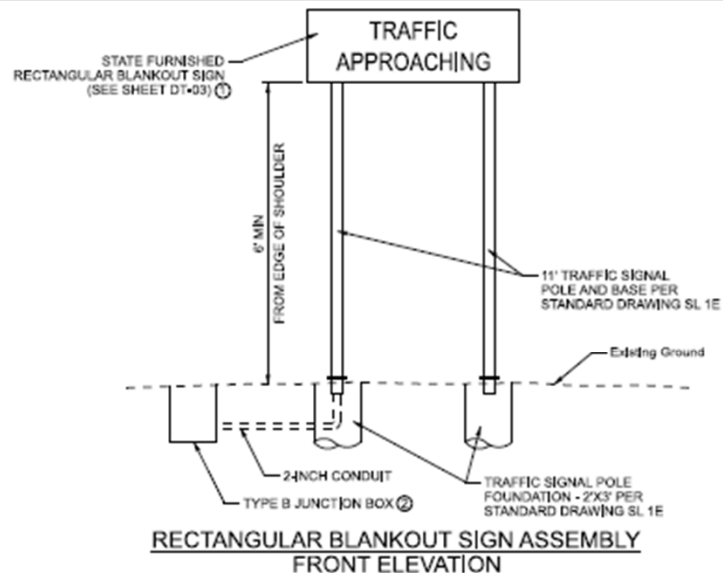


Warning Flasher Sign Details

- Used UDOT Standard Highway Lighting Luminaire Pole
- Chose to use vertical layout for flashing lights vs. Horizontal Layout
 - This required the taller pole (25'-9")
- Used existing Standard Drawing for Highway Luminaire Pole foundation



FLASHER SIGN DETAIL



NOTES:

- ① INSTALL SIGN FACE PARALLEL, 15 FT MIN FROM EDGE OF TRAVELED WAY.
- ② GRADE TO DRAIN WATER AWAY FROM JUNCTION BOX.

STATE FURNISHED RECTANGULAR BLANKOUT SIGN INSTALLATION DETAIL

UTAH DEPARTMENT OF TRANSPORTATION

R4: RURAL INTERSECTION CONFLICT WARNING SYSTEM

PROJECT NUMBER

APPROVED

DATE

PROFESSIONAL ENGINEER

DATE

PROJECT NUMBER

PROJECT NUMBER

PROJECT NUMBER

PROJECT NUMBER

PROJECT NUMBER

PROJECT NUMBER

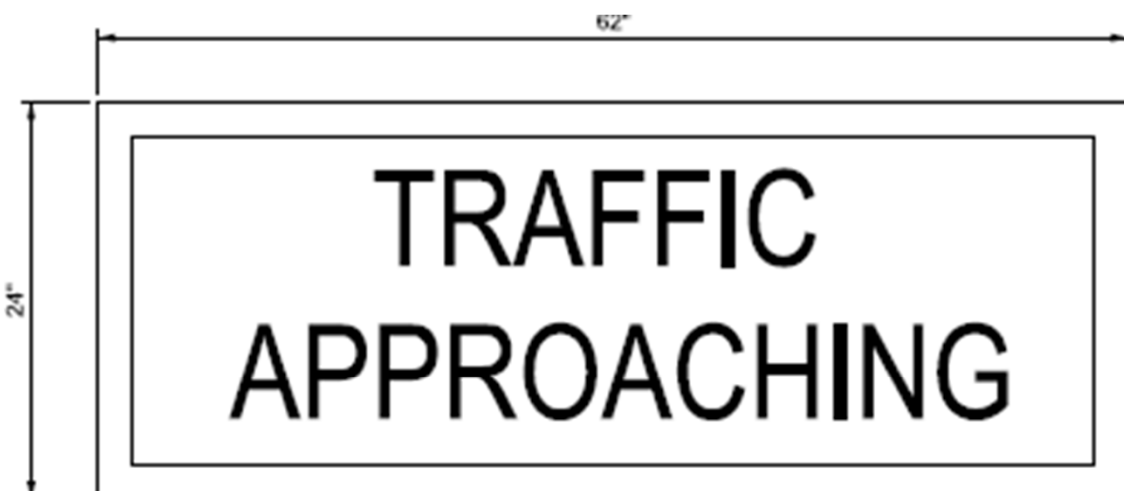
PROJECT NUMBER

PROJECT NUMBER

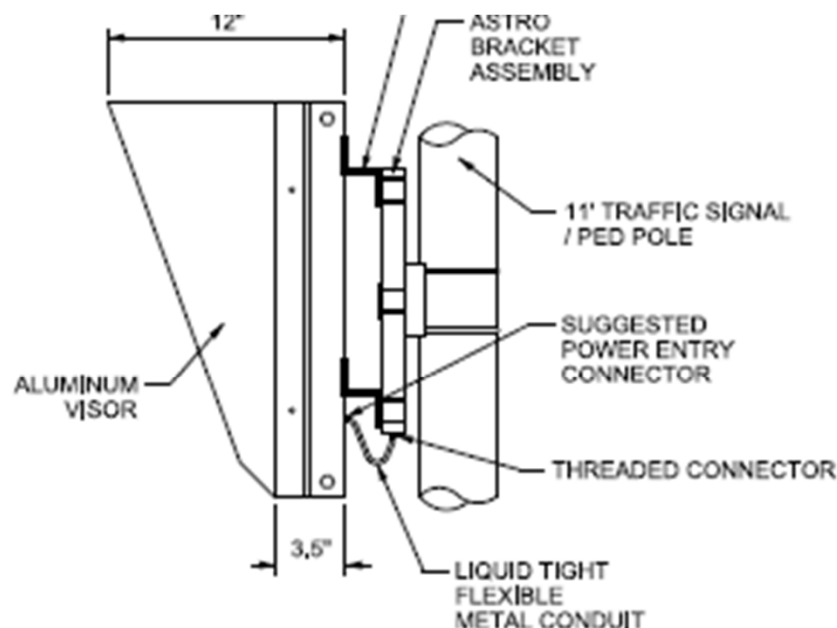
PROJECT NUMBER

Blankout Signing

- Used at only one location
- Used basic layout used on first project
- Modified details slightly for ease of construction
- Chose to use “” LEDs in display



RECTANGULAR BLANKOUT SIGN
FRONT VIEW



RECTANGULAR BLANKOUT SIGN
SIDE VIEW

NOTES:

1. PICK UP THE STATE FURNISHED BLANKOUT SIGN AT THE CEDAR DISTRICT OFFICE AT 1470 NORTH AIRPORT ROAD, CEDAR CITY. CONTACT REGION SIGNAL CREW 10 DAYS PRIOR TO THE DESIRED PICK UP DATE, SEE SG-S01 FOR CONTACT INFORMATION.
2. BLANKOUT SIGN WILL COME WITH STATE FURNISHED Z-BAR MOUNTING TO MOUNT THE SIGN TO THE TRAFFIC SIGNAL / PED POLE. ATTACH Z-BAR TO POLE BY ASTRO BRACKET PER OPTION B FOR LARGE SIGNS ON STANDARD DRAWING SL 3D. INSTALL THREADED CONNECTOR AT BOTTOM OF ASTRO BRACKET TUBE AND USE LIQUID TIGHT FLEXIBLE METAL CONDUIT TO CONNECT FROM THE CONNECTOR TO THE BLANKOUT SIGN POWER ENTRY CONNECTOR.

STATE FURNISHED RECTANGULAR BLANKOUT SIGN DETAIL





Advance Warning Signing Detail

- Used in locations where site distance was an issue
- Supplements downstream signing
- Design specific for Project



Custom_36x36;
36.00" across sides 2.25" Radius, 0.88" Border, 0.63" Indent, Black on, Fluorescent yellow;
"WATCH", C: "FOR STOPPED", C specified length: "TRAFFIC", C:

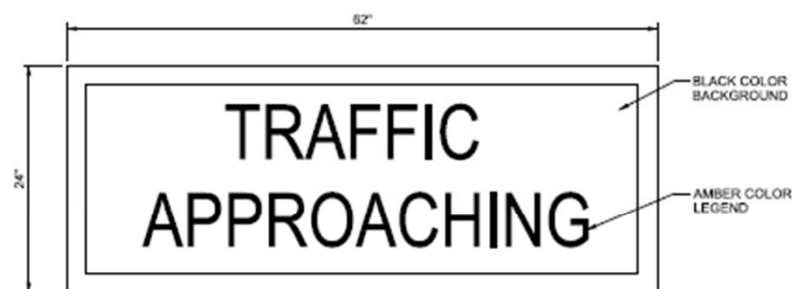


W16-3aP;
1.88" Radius, 0.75" Border, 0.50" Indent, Black on, Fluorescent yellow;
"1/4 MILE", C:

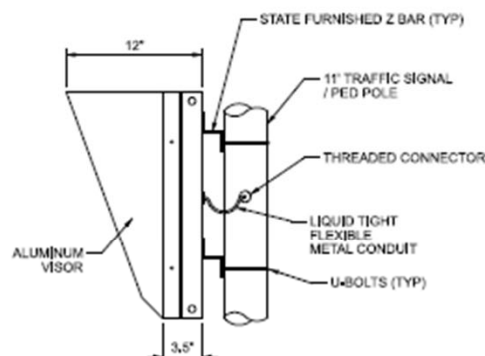


CUSTOM_48x24;
1.88" Radius, 0.75" Border, 0.50" Indent, Black on, Fluorescent yellow;
"STOPPED", C: "TRAFFIC AHEAD", C:

SIGN DETAIL



RECTANGULAR BLANKOUT SIGN
FRONT VIEW



RECTANGULAR BLANKOUT SIGN
SIDE VIEW

NOTES:

- PICK UP THE STATE FURNISHED BLANKOUT SIGN AT THE CEDAR DISTRICT OFFICE AT 1410 NORTH AIRPORT ROAD, CEDAR CITY. CONTACT REGION SIGNAL CREW 10 DAYS PRIOR TO THE DESIRED PICK UP DATE, SEE SG-501 FOR CONTACT INFORMATION.
- BLANKOUT SIGN WILL COME WITH STATE FURNISHED Z-BAR MOUNTING TO MOUNT THE SIGN TO THE TRAFFIC SIGNAL / PED POLE, INSTALL THREADED CONNECTOR ON TRAFFIC SIGNAL / PED POLE AND USE LIQUID TIGHT FLEXIBLE METAL CONDUIT TO CONNECT FROM THE CONNECTOR TO THE BLANKOUT SIGN POWER ENTRY CONNECTOR.

STATE FURNISHED RECTANGULAR BLANKOUT SIGN DETAIL

PS&E

UTAH DEPARTMENT OF TRANSPORTATION

R4: RURAL INTERSECTION CONFLICT
WARNING SYSTEM

PROJECT

APPROVED

DATE

3/28/2022

DATE

3/28/2022

DATE

3/28/2022

DATE

3/28/2022

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3/28/2022

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3/28/2022

DATE

SUMMARY / QUESTIONS

UDOT Region 4

Troy C. Torgersen, PE

435.896.1303

ttorgersen@utah.gov

