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Valley Metro®

Track Access Guide (TAG)



VALLEY METRO

APPROVAL AND AUTHORIZATION

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1.0 INTRODUCTION AND PURPOSE

1.1 PURPOSE

This Track Access Guide establishes the standardized procedures, communication protocols, and safety requirements for roadway workers accessing track areas under the Federal Transit Administration (FTA) Roadway Worker Protection (RWP) Program. It defines responsibilities, radio communication format, and required personal protective equipment (PPE) to ensure safe and coordinated operations between field personnel and the Operations Control Center (OCC).

1.2 SCOPE AND APPLICABILITY

This guide applies to all Valley Metro employees, contractors, and authorized personnel who perform inspection, maintenance, construction, or operational support activities within the light rail or streetcar alignment. It encompasses all mainline, yard, and streetcar segments designated as controlled track under OCC jurisdiction.

The procedures outlined herein are applicable to:

- Track and infrastructure maintenance (Track, Signal, Traction Power, and Facilities departments)
- Vehicle operations and training activities requiring access to the guideway
- Emergency response and recovery operations coordinated with OCC
- Third-party or contractor work authorized through the RWP permit and access control process

This guide is intended to ensure full compliance with FTA 49 CFR Part 674, FRA 49 CFR 214 Subpart C (as harmonized), and Valley Metro's System Safety Program Plan (SSPP). All personnel accessing the right-of-way must comply with the procedures contained herein to maintain the safety of workers, train operators, and the traveling public.

1.3 REGULATORY FRAMEWORK

This Track Access Guide is developed in alignment with federal, state, and local regulatory requirements governing roadway worker safety within rail transit environments. The following frameworks and standards establish the foundation for Valley Metro's Roadway Worker Protection (RWP) Program:

1. **Federal Transit Administration (FTA)** – 49 CFR Part 674, State Safety Oversight (SSO)
    a. Requires each rail transit agency to implement a Safety Management System (SMS) and ensure worker protection under the agency's System Safety Program Plan (SSPP).
    b. Establishes oversight responsibilities for the State Safety Oversight Agency (ADOT SSO).

2. **Federal Railroad Administration (FRA)** – 49 CFR Part 214, Subpart C – Roadway Worker Protection
    a. Provides harmonized guidance for roadway worker safety applicable to light rail systems operating under FTA jurisdiction. (1st Ave & Ash Crossing)
    b. Defines requirements for on-track safety, worker qualification, and communication with the control center.

3. **Occupational Safety and Health Administration (OSHA)** – 29 CFR Part 1910 and 1926
    a. Establishes baseline safety and health requirements for construction, maintenance, and general industry activities performed within or adjacent to the rail right-of-way.

4. **Arizona Department of Transportation (ADOT) State Safety Oversight (SSO)**
    a. Serves as the designated oversight authority for Valley Metro Rail.
    b. Reviews and approvals all updates to the RWP Program, Track Access Guide, and associated procedures to ensure compliance with FTA Part 674 requirements.

5. **Valley Metro Internal Standards and Procedures**
    a. Agency Safety Plan (ASP)
    b. Standard Operating Procedures (SOP 100–2300 Series)
    c. Safety Event Investigation and Corrective Action Program (CAP)
    d. Real Time Risk Solutions (RTRS) Job Briefing and Access Authorization System

Together, these regulations and standards ensure that all roadway worker activities conducted within the Valley Metro system are performed safely, systematically, and in compliance with federal and state oversight expectations.

1.4 PROGRAM OBJECTIVES

The Valley Metro Roadway Worker Protection (RWP) Program and this Track Access Guide are designed to establish a comprehensive, systemwide approach to worker safety within all rail and streetcar alignments. The objectives of this program are to:

1. Protect Roadway Workers and Rail Operations
    a. Prevent employee injury, equipment damage, and unsafe conditions by ensuring that no worker, vehicle, or equipment is exposed to uncontrolled train movements.

2. Standardize Safe Access Procedures
    a. Provide uniform processes for requesting, receiving, and releasing track access authority through the Operations Control Center (OCC).
    b. Ensure consistent communication and coordination between field personnel and OCC during all maintenance, inspection, and construction activities.

3. Maintain Compliance with Federal and State Regulations
    a. Fulfill the requirements of FTA 49 CFR Part 674 and FRA 49 CFR 214 Subpart C by establishing clear on-track safety procedures, worker qualification requirements, and defined lines of authority.

4. Promote a Safety Management System (SMS) Culture
    a. Reinforce proactive hazard identification, risk assessment, and mitigation practices throughout all phases of track and systems maintenance.
    b. Encourage employee participation, hazard reporting, and continuous improvement in accordance with the agency's System Safety Program Plan (SSPP).

5. Enhance Interdepartmental Coordination
    a. Facilitate safe interaction among Valley Metro departments—including Track, Signal, Traction Power, Facilities, Operations, and Security—when working within or adjacent to the guideway.
    b. Ensure that all work activities are compatible with train operations and OCC control requirements.

6. Ensure Contractor and Third-Party Compliance
    a. Require all contracted personnel and third-party entities perform work within Valley Metro right-of-way to meet the same safety, training, and procedural standards as Valley Metro employees.

7. Support Emergency and Recovery Operations
    a. Define safe access and communication protocols during incidents, emergencies, or system disruptions to support timely and coordinated recovery efforts.

■ ■ ■

2.0 ROLES, RESPONSIBILITIES, AND DEFINITIONS

This section defines the personnel roles, authorities, and responsibilities essential to safe roadway worker operations under Valley Metro's Roadway Worker Protection (RWP) Program. Understanding each role ensures consistent communication, proper protection, and compliance with FTA 49 CFR Part 674, FRA 49 CFR Part 214, and Valley Metro's System Safety Program Plan (SSPP).

2.1 OPERATIONS CONTROL CENTER (OCC)

The OCC is the centralized authority for controlling all train movements, track access, and protection across Valley Metro's light-rail and streetcar systems.

Responsibilities include:

- Issuing, recording, and releasing all track-access authorities.
- Coordinating train movements and communicating protection limits to operators.
- Maintaining continuous radio contact with field personnel during protection.
- Ensuring no train movement enters an active work zone without confirmed clearance.
- Logging all work-zone activities and reporting any deviation from authorized limits.

2.2 ROADWAY WORKER-IN-CHARGE (RWIC)

The RWIC is the qualified individual designated to establish, maintain, and release on-track safety for each work group.

Responsibilities include:

- Acting as the single point of contact with OCC.
- Requesting, verifying, and releasing protection limits.
- Conducting pre-work job briefings and ensuring signatures in Real Time Risk Solutions (RTRS).
- Ensuring all workers understand limits, hazards, and communication protocols.
- Maintaining visual control of the work zone and personnel.
- Releasing protection only after verifying all workers and equipment are clear.

2.3 ROADWAY WORKERS

A Roadway Worker is any employee or contractor whose duties place them on, under, or adjacent to track areas where there is potential exposure to train or electrical hazards.

Responsibilities include:

- Completing required RWP training and annual recertification.
- Communicating work location, limits, and duration to the RWIC and OCC.
- Remaining within designated safe zones of refuge and using required PPE.
- Maintaining constant situational awareness.
- Reporting hazards, near misses, or protection concerns immediately to OCC and supervision.

2.4 MAINTENANCE OF EQUIPMENT (MOE)

MOE personnel perform inspection, servicing, testing, and repair of light-rail vehicles, support vehicles, and shop systems that interface with the mainline or yard tracks.

Responsibilities include:

- Coordinating with OCC before moving any vehicle or test train beyond yard limits.
- Maintaining radio communication during any movement on controlled track.
- Verifying that all energized systems are isolated before maintenance.
- Performing inspections, troubleshooting, or propulsion/brake tests only under verified OCC clearance.
- Using chocks, wheel restraints, and proper PPE when working under or around vehicles.

Notes:
MOE staff must hold current RWP certification when entering controlled track.
Test-track and mainline work may require RWIC oversight.

2.5 MAINTENANCE MACHINE OPERATORS (MMO)

MMOs operate on-track roadway maintenance machines, hi-rail vehicles, and mechanized tools used for track, signal, or power maintenance.

Responsibilities include:

- Completing RWP and equipment-specific certification under FRA 214 Subpart D standards.
- Inspecting machines daily for breaking, lighting, and warning-device functionality.
- Obtaining OCC authorization prior to fouling any track.
- Maintaining continuous communication with OCC and RWIC.
- Operating within authorized limits and at speeds that allow stopping within half the range of vision.
- Using ground guides or flaggers when visibility is obstructed.
- Securing equipment (brakes applied, keys removed) when unattended.

2.6 WATCHPERSONS / LOOKOUTS

A Watchperson/Lookout is a trained roadway worker whose sole duty is to warn workers of approaching trains or equipment when OCC-controlled protection is not in effect or when supplemental protection is required.

Responsibilities include:

- Maintaining an unobstructed view of train approaches.
- Issuing clear, distinctive audible or visual warnings providing sufficient time to reach safety.
- Remaining free from any distracting duty.
- Keeping radio contact with the RWIC or OCC when part of coordinated work.

Notes:

- Lookout protection may be used only where sight distance and conditions ensure adequate warning time.
- It cannot replace OCC protection in interlockings or limited-visibility areas.

2.7 FLAGGERS

Flaggers control vehicles, pedestrian, or train movement through work zones, intersections, or crossings where automatic warning systems or OCC control alone cannot ensure safety.

Responsibilities include:

- Using approved hand signals, red flags, lanterns, or STOP/SLOW paddles.
- Coordinating with the RWIC and OCC to establish or release flag protection.
- Remaining in clear view of both the work area and approaching movements.
- Stopping all movements until safe passage is confirmed.

Notes:

- Flaggers are required during grade-crossing malfunctions, roadway detours, or when sightlines are obstructed.
- They may perform no other duties while flagging is active.

2.8 LONE WORKERS

A Lone Worker is a qualified roadway worker performing duties independently without immediate assistance.

Responsibilities include:

- Contacting OCC before entering the alignment and providing exact location, limits, and duration.
- Maintaining continuous radio communication with OCC.
- Remaining within defined safe zones and clearing the track if communication is lost or a train is observed.
- Completing and recording a Lone-Worker Job Briefing in RTRS.

Notes:

- Lone-worker protection is allowed only where OCC can maintain direct communication and visibility is sufficient for safety.

2.9 SUPERVISORS AND MANAGERS

Supervisors and managers ensure employee qualification, safe work planning, and compliance with all RWP requirements.

Responsibilities include:

- Confirming valid RWP certifications before field assignment.
- Reviewing and approving job briefings and access requests.
- Conducting field safety observations and audits.
- Initiating corrective actions and follow-up reviews after incidents.

2.10 CONTRACTORS AND THIRD-PARTY PERSONNEL

External entities performing work on or near the alignment must comply fully with Valley Metro's RWP Program.

Responsibilities include:

- Designing a qualified RWIC for all on-track activities.
- Ensuring personnel possess RWP certification and required PPE.
- Coordinating work access through Valley Metro's authorized representative and OCC.

2.11 TRAIN OPERATORS

Train Operators maintain vigilance for workers, work-zone signage, and signal indications while following all OCC directives.

Responsibilities include:

- Operating at restricted speed through active work zones.
- Communicating with OCC regarding any observed personnel or obstructions.
- Reporting unusual or unsafe conditions immediately.

2.12 DEFINITIONS

- **Controlled Track**: Any mainline, yard, or streetcar track under OCC jurisdiction.
- **Protection Limits**: Authorized boundaries where on-track safety is established.
- **Restricted Speed**: A speed allowing a train or machine to stop within half the range of vision.
- **Safe Zone of Refuge**: A designated area clear of the dynamic envelope of train or machine movement.
- **Job Briefing**: A pre-work discussion covering scope, hazards, protection type, and emergency actions.
- **Lone Worker**: A qualified roadway worker performing duties independently under OCC oversight.
- **Maintenance of Equipment (MOE)**: Personnel responsible for vehicle or equipment servicing within controlled areas.
- **Maintenance Machine Operator (MMO)**: A qualified employee operating or maintaining on-track machines or hi-rail vehicles under authorized protection.

■ ■ ■

3.0 COMMUNICATION AND COORDINATION REQUIREMENTS

Effective communication and coordination between field personnel and the Operations Control Center (OCC) are essential to ensuring roadway worker safety and maintaining uninterrupted train operations. This section defines the standard communication procedures required under Valley Metro's Roadway Worker Protection (RWP) Program.

3.1 GENERAL COMMUNICATION PRINCIPLES

- All communications concerning track access, protection, and movement authority shall be conducted using clear, concise, and standardized radio terminology.
- Every worker communicating with OCC must identify:
  - Unit call number
  - Track number
  - Type of work (inspection, maintenance)
  - Requested limits of authority (station-to-station, interlock-to-platform, etc.)
- All radio communication must be acknowledged by both parties. No instruction or protection is considered active until confirmation is received and repeated back verbatim.
- Only authorized personnel holding valid RWP training and current radio privileges may communicate with OCC for track access.

3.2 OCC CALLOUT PROCEDURE

All roadway workers, contractors, and maintenance personnel must contact the Operations Control Center (OCC) prior to entering, occupying, or clearing the alignment.

The following standardized radio procedure ensures clear communication, route protection, and safety compliance.

- Step 1 – Initiate Call "[Unit call number] to OCC."
- Initiate contact using your assigned unit call number. Wait for acknowledgment before transmitting additional information.
- Step 2 – OCC Response "OCC to [Unit call number]."
- OCC will respond to confirm communication is established.
- Step 3 – Request Track Access "OCC, this is [Unit call number]. Requesting permission to perform [scope of work] on Track [#], [location (if single) or must include starting and ending points if necessary]."

- Clearly state your intended work activity, the track number, and precise start and end limits (using crossovers, stations, or interlockings as reference points).
- Step 4 – OCC Authorization OCC will confirm route securing, apply exit inhibits (if applicable), and issue permission to occupy the alignment. Do not enter the trackway until verbal authorization is received.
- Step 5 – Work Completion Upon completion, notify OCC:
- “OCC, this is [Unit call number]. Work complete, clear of track [#] between [start] and [end].” OCC will acknowledge clearance and release any route protection.

3.3 UNIT CALL NUMBERS

Unit #	Department	Description
300	Track Maintenance	Track Maintainers
400	Traction Power	Traction Power Technicians
500	Signal Maintenance	Signal Technicians
600	Operations	Train Operations
700	Security	Security Personnel
800	Facilities	Facilities Maintenance / Cleaners

3.4 LINE SECTIONS

3.4.1 BLUE LINE (A LINE) – TRACK 1 EAST / TRACK 2 WEST

- BL-A-1: Gilbert Tail Track – Edgemont
- BL-A-2: Edgemont – Dobson
- BL-A-3: Dobson – Tempe Bridge
- BL-A-4: Tempe Bridge – 27th Street
- BL-A-5: 27th Street – 3rd Avenue

3.4.2 ORANGE LINE (B LINE) – TRACK 1 SOUTH / TRACK 2 NORTH

- OL-B-1: Baseline Tail Track – Sherman
- OL-B-2: Sherman – McDowell
- OL-B-3: McDowell – Montebello
- OL-B-4: Montebello – Metro Tail Track

3.4.3 TEMPE STREETCAR TRACK - HAYDEN FERRY – DORSEY

3.5 RADIO CHANNEL ASSIGNMENTS

System	Radio Channel	Notes
A Line	Channel 1	Primary communication for Blue Line operations
B Line	Channel 2	Primary communication for Orange Line operations
Yard / Streetcar	Channel 3	Designated channel for Yard and Streetcar operations
Unused Operations	Channel 4	
LRV Maintenance	Channel 5	Dedicated channel for Track, Traction Power, and Signal Maintenance crews
Maintenance of Way (MOW)	Channel 6	
Security (primary)	Channel 7	Security and law enforcement coordination channel
Security (secondary/backup)	Channel 8	
Emergency ONLY	Channel 9	
Bus Operations	Channel 10	

3.6 CROSSOVER CALL CHECKPOINTS

Blue Line (A Line) – Track 2 (Westbound Sections 1–5) / (Eastbound 5–1)

- BL-A-1: Guthrie, Edgemont
- BL-A-2: Edgemont, Hibbert, Date, Longmore, Dobson
- BL-A-3: Dobson, River, Dorsey, Mill Pocket,
- BL-A-4: Yard Entrance, 27th Street
- BL-A-5: 27th Street, 11th Street, 5th Street, 3rd Avenue Platform

Orange Line (B Line) – Track 2 (Northbound 1–4) / (Southbound 4–1)

- OL-B-1: Cocopah, Hidalgo, Raymond, Sherman
- OL-B-2: Sherman, Jackson
- OL-B-3: Culver, Earll, Pierson, Montebello
- OL-B-4: Montebello, Tuckey, Morten, Dunlap, Mountain Point,

Tempe Streetcar - spring switch to spring switch

- Hayden Ferry Switch 1, 3, 5
- Marina Heights Switch 7, 9
- 9th & Mill Switch 1, 3
- Dorsey Switch 7

Call Checkpoint Step – Defining Work Limits

- Personnel may identify work limits using interlockings, streets, or stations as reference points when communicating with OCC.

This provides flexibility for defining work zones while maintaining OCC clarity and control. (see Appendix P)

3.7 CONTRACTOR PROTOCOL

Contractors must contact OCC using their assigned permit number and provide the following:

- Company name and permit ID
- Work scope and location limits
- Start and estimated end time
- Responsible person on-site

OCC will verify authorization before granting access.

3.8 DOWNTOWN HUB COORDINATION

Line	Radio Channel	Location	Switch ID
A	1	Washington	3A
A	1	Jefferson	1B
B	2	Central	3B
B	2	1st Avenue	1A

Notes: Field crews must communicate on the assigned channel for their line and monitor the alternate line channel to ensure safe coordination across interlockings.

3.9 CROSS-LINE COORDINATION

All cross-line or interlocking movements (e.g., transitions between the A Line and B Line, or between revenue and non-revenue tracks) must be coordinated exclusively through OCC Line Controllers.

Personnel shall not assume route protection or clearance without explicit OCC confirmation.

4.0 TRACK PROTECTION AND MOVEMENT

4.1 PURPOSE

This section establishes the safeguards, communication procedures, and operational restrictions required to protect roadway workers and control train movements during maintenance or inspection activities. Track protection and movement control ensure that all on-track work is coordinated through the Operations Control Center (OCC) in accordance with Federal Transit Administration (FTA) Roadway Worker Protection (RWP) standards. All roadway workers, operators, and OCC personnel must adhere to these protocols to prevent conflicting movements and ensure safe separation between workers and trains.

4.2 TYPES OF TRACK PROTECTION

Type	Description	Established By	Typical Use
Exclusive Track Occupancy (ETO)	A defined track segment is removed from train service and occupied exclusively by roadway workers. No train movement is permitted within the established limits	OCC	Major maintenance, signal or track repairs, or multiple-crew work zones
Train Approach Warning (TAW)	A qualified lookout or watchperson provides continuous warning of approaching trains, allowing workers to clear the track prior to train arrival	Watchperson / Lookout	Short-duration or mobile work where ETO is not practical
Working Limits by Verbal Authority	OCC grants verbal authorization to occupy track between defined reference points (interlockings, crossovers, or stations)	OCC	Troubleshooting or short-term inspection requires controlled movement
Station-to-Station Protection	Work activities are confined between two passenger stations under OCC coordination and control	OCC	Rapid response, department-specific activities, or minor maintenance

4.3 RADIO COMMUNICATION FORMAT – SWITCH OPERATION REQUESTS

Signal Technician or Field Crew Request:

> "OCC, this is [Unit Call Number] at [Location]. Requesting Switch [Switch ID] to [Normal/Reverse]."

OCC Response:

> "Stand clear. Switch [Switch ID] at [Location] going to [Normal/Reverse]."
> "Switch [Switch ID] is passing [Normal/Reverse]" or "Switch [Switch ID] is failing [Normal/Reverse]."

Critical Note:
The terms "in correspondence" or "out of correspondence" shall not be used over the radio due to potential misinterpretation. Always use "switch is in Normal" or "switch is in Reverse".

4.4 ROUTE SECURING AND CONFIRMATION REQUIREMENTS

Before granting or releasing track access, OCC must ensure all switches, routes, and signals within the defined work limits are secured and remain locked against conflicting train movement.

Procedures:

1. OCC verifies no active train movements exist within the requested limits.
2. OCC secures all switches within and adjacent to the work limits.
3. OCC confirms route locking status verbally with the field supervisor or qualified employee-in-charge (EIC).
4. The EIC must repeat back the protected limits verbatim (e.g., "from Edgemont to Hibbert on Track 1") before work may begin.
5. OCC records the protection in the Track Access Log, including time, limits, protection type, and responsible personnel.

4.5 TRAIN NOTIFICATION AND MOVEMENT CONTROL

To ensure train operators are aware of active roadway worker protection:

- Prior to establishing protection, OCC shall notify all trains operating in the affected limits of the upcoming work zone.
- Upon confirmation of ETO or verbal authority, OCC shall issue an “all-call” to train operators:
    - “Attention all trains, track protection in effect between [Point A] and [Point B] on [Track #]. Maintain vigilance and await further instruction before entering the limits.”
- If train movement is required through or adjacent to the protected limits, OCC must coordinate directly with the EIC to confirm safe passage or clearance of workers.
- Upon clearance, OCC shall issue a closing “all-call” indicating protection has been released and normal operations may resume.

4.6 MAINTENANCE AND OPERATIONS RESPONSE PROCEDURES (UNDER RWP CONDITIONS)

During track protection periods, maintenance and operations personnel must adhere to the following requirements:

1. Access Authorization:
    a. No employee may enter the alignment without direct OCC authorization under active protection.
    b. The EIC is responsible for ensuring all workers understand the established limits and method of protection.
2. Switch Operation:
    a. No manual switch operation shall occur without prior OCC approval.
    b. The employee requested must receive verbal confirmation that the switch is clear of train movement and safe to operate.
3. Equipment Movement:
    a. Maintenance machines, hi-rail vehicles, or other equipment may only move within defined working limits.
    b. The operator must confirm direction of travel and end-of-limits clearance with OCC.
4. Coordination Between Departments:
    a. When multiple departments (e.g. Track, Signal, MOE) are working within the same limits, a single EIC shall coordinate all movements under OCC oversight.

b. Department leaders shall communicate intended activities and clearance times to OCC.

5. Emergency Withdrawal:
   a. If train movement is inadvertently routed into protected limits, the EIC must immediately withdraw personnel to a designated Safe Zone and notify OCC.
   b. OCC shall issue an immediate “stop all trains” order until protection is verified.

4.7 OPERATIONS CONTROL CENTER (OCC) RESPONSIBILITIES

OCC plays a critical role in maintaining safe separation between roadway workers and train movements.

OCC Duties Include:

- Establishing, recording, and releasing all forms of track protection.
- Verifying the physical security of routes and switch positions.
- Maintaining real-time communication with the EIC and operators.
- Issuing all-call notifications and train movement advisories.
- Logging protection starts and end times, type of protection, and personnel involved.
- Coordinating with supervision and safety staff for incident or near-miss reporting under RWP coverage.

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5.0 SPECIFIC RWP PROCEDURES AND PROTOCOLS

This section establishes the standardized procedures and operational protocols required to ensure roadway worker protection (RWP) during all maintenance, inspection, or troubleshooting activities conducted within the alignment. These procedures are based on the Federal Transit Administration (FTA) Roadway Worker Protection Rule and incorporate Valley Metro's specific operating conditions, OCC coordination practices, and departmental responsibilities.

Each subsection defines the step-by-step expectations for establishing track protection, obtaining OCC authorization, maintaining situational awareness, and clearing work limits prior to train movement.

5.1 PRE-WORK PREPARATION

- Conduct a job briefing using approved Job Safety Briefing form.
- Identify work location, limits, and type of protection required (e.g., ETO, TAW, verbal authority).
- Verify radio functionality and ensure all personnel are equipped with required PPE and safety devices.
- Confirm understanding of safe zones and nearest access/egress points.

5.2 OCC COMMUNICATION PROTOCOL

- Contact OCC before occupying track; identify unit call number, location, and work limits.
- Repeat and confirm limits as stated by OCC.
- Maintain open communication throughout the duration of the work.
- Notify OCC immediately upon clearing the track and releasing protection.

5.3 ESTABLISHING TRACK PROTECTION

OCC may authorize one of the following:

- Exclusive Track Occupancy (ETO) – Full removal of track from service for exclusive worker use.
- Train Approach Warning (TAW) – Designated watchperson provides continuous warning.

- Working Limits by Verbal Authority – Controlled access between defined reference points.

Confirm limits using physical landmarks (stations, interlockings, or cross streets).

5.4 LONE WORKER PROCEDURES

- Lone workers must operate under enhanced communication protocols.
- Must establish a defined protection method (TAW not permitted unless second qualified lookout available).
- OCC check-ins at predetermined intervals are mandatory.

5.5 WORK ZONE SAFETY PRACTICES

- Maintain a minimum 10-foot clearance from any energized OCS component unless qualified MOW employee.
- Utilize safe zones of refuge when trains approach.
- Keep tools and equipment clear of the dynamic envelope.
- Report any unsafe condition or near miss immediately to OCC and supervisor.

5.6 POST-WORK REPORTING

- Close out job briefing form with signatures of all participants.
- Release track protection limits to OCC.
- Submit any hazard observations or safety concerns through the Safety Reporting System or RTRS.

5.7 SWITCH OUT OF CORRESPONDENCE PROTOCOL

This section establishes the standardized procedure to be followed when a track switch is out of correspondence, ensuring the safety of all roadway workers, Operations Control Center (OCC) personnel, and operators while maintaining route integrity and compliance with the Federal Transit Administration (FTA) Roadway Worker Protection (RWP) Program).

Procedure:

- Identification: When a switch fails to display proper correspondence, the OCC shall immediately notify field personnel and affected operators.

- Verification: Operators must not attempt to verify switch position from the cab when correspondence is lost.
- Manual Operation: The switch must be manually thrown by qualified personnel under the direction of OCC.
- Switch Cycling: The switch shall be hand-thrown and cycled twice to confirm full mechanical and electrical function before being considered safe for movement.
- OCC Authorization: No train or equipment may pass over the affected switch without direct OCC authorization following verification and confirmation of route integrity.
- Documentation: OCC must record the event in the Switch Out of Correspondence Log, including time, location, personnel involved, and corrective actions taken.

5.8 BROKEN GRADE CROSSING PROTECTION PROCEDURE

This section defines the standardized procedure to be followed when an active grade crossing warning system (bells, lights, or gates) is malfunctioning, ensuring the protection of roadway workers, train operators, and the public while maintaining compliance with the Federal Transit Administration (FTA) Roadway Worker Protection (RWP) Program) and internal OCC operating procedures.

Procedure:

1. Identification
    a. When a grade crossing gate, bell, or light fails to operate as intended, the OCC shall immediately notify affected operators and field personnel, identifying the crossing location, nature of the malfunction, and any active protection failures.
2. Field Assessment
    a. Qualified signal or maintenance personnel shall be dispatched to the affected crossing to assess functionality, verify power and signal status, and determine if the failure is mechanical, electrical, or communication-related.
3. Crossing Protection Activation
    If automatic protection is unavailable or unreliable:
    a. A flagger or watchperson shall be positioned at the crossing prior to any train movement.
    b. The flagger may be equipped with an illuminated red flag (daytime) or red lantern (nighttime), may use hand signals when no flag or lantern available and maintain clear line of sight in both directions.
    c. Train operators must receive confirmation from OCC that flagging protection is in place before proceeding.
4. Train Operation Over Crossing

a. Trains shall approach the affected crossing at restricted speed (not exceeding 10 mph) and be prepared to stop short of the crossing if protection is not confirmed.
b. Operators must sound the horn continuously until the entire train has cleared the crossing.
c. Movement may only proceed upon OCC authorization and confirmation that roadway traffic has been stopped by the flagger or field personnel.

5. Repairs and Verification
    a. Signal technicians shall perform repairs under OCC coordination.
    b. Once the crossing warning devices are restored to full operation, OCC shall verify functionality via field confirmation (visual or relay check) before normal train movement resumes.
6. Documentation
    OCC must document all events in the Grade Crossing Failure Log, noting:
    a. Date, time, and crossing location
    b. Nature of failure (gate stuck, light inoperative, bell failure, etc.)
    c. Personnel assigned and response times
    d. Time protection was established and restored
    e. Final verification and clearance for normal operations
7. Incident Reporting
    If the malfunction results in any safety event, near miss, or public exposure, OCC must initiate a Safety Event Notification and forward details to Signal Maintenance, Safety Department, and FTA SSO per reporting timelines.

5.9 OVERHEAD CONTACT SYSTEM (OCS) – DEBRIS ON CONTACT WIRE PROCEDURE

This section establishes the standardized procedure to be followed when debris, foreign material, or obstruction is observed on or near the Overhead Contact System (OCS) contact wire, messenger, or hardware. The purpose is to prevent arcing, damage to traction power components, or hazard to personnel and equipment while maintaining compliance with FTA Roadway Worker Protection (RWP) requirements and Valley Metro Traction Power Safety Protocols.

1. Identification and Initial Notification
    a. Upon observation of debris (e.g., tree branches, plastic, metallic objects, or foreign materials) on or near the contact wire, the train operator or field personnel shall immediately notify the Operations Control Center (OCC).
    b. Provide clear details: exact location (by pole number or nearest intersection), direction of travel, and description of debris type and size.
    c. OCC will log on to the report and notify Traction Power and Signal Maintenance.

2. OCC Action
    a. OCC shall assess operational risk and, if necessary, de-energize the affected OCS section using the nearest Traction Power Substation (TPSS) disconnects.
    b. OCC must halt train movements through the affected zone until the hazard is cleared or isolated.
    c. The affected track and span limits are to be defined and protected through route inhibiting or “no-movement” restriction in the control system.

3. Field Response and Assessment
    a. Traction Power Technicians (qualified employees) shall respond to the site with proper PPE, hot-stick tools, and grounding equipment.
    b. Upon arrival, technicians must conduct a visual assessment from a safe distance to determine if the debris is in contact with energized components.
    c. If arcing, burning, or smoke is observed, maintain a minimum 15-foot approach distance and confirm with OCC that the circuit is de-energized and grounded before approaching.

4. Debris Removal
    a. Only qualified traction power or OCS maintenance personnel may remove debris from the wire.
    b. Use insulated tools or hot-stick equipment; never contact the wire directly, even if de-energized, until grounding is visually verified.
    c. After removal, visually inspect the contact wire and messenger for damage (flattened wire, burn marks, broken droppers, or damaged insulators).

5. System Restoration
    a. Once the area is confirmed clear and inspected, the technician shall notify OCC that the span is ready for re-energization.
    b. OCC will re-energize the OCS section, perform voltage verification, and confirm restoration.
    c. No train or maintenance vehicle shall operate through the area until OCC provides verbal clearance.

6. Documentation
    OCC must record the incident in the OCS Incident Log, noting:
    a. Date, time, and exact location (by TPSS and pole number)
    b. Reporting employee / operator ID
    c. Description of debris type and cause (e.g., weather, vandalism, vehicle contact)
    d. Actions taken, time de-energized, and restoration time

e. Personnel involved and final clearance authorization

7. Incident Reporting
    a. If damage to the OCS or loss of service occurs, OCC shall initiate a Safety Event Notification and notify Traction Power, Safety, and Maintenance Management.
    b. FTA SSO reporting timelines apply for any event involving energized contact wire damage or public exposure.

5.10 LIGHT RAIL VEHICLE (LRV) – DISABLED VEHICLE ON ALIGNMENT PROCEDURE

This section defines the standardized procedure to be followed when a Light Rail Vehicle (LRV) becomes disabled or experiences equipment failure while occupying the mainline alignment. The purpose is to ensure personnel safety, maintain train control integrity, and comply with Federal Transit Administration (FTA) Roadway Worker Protection (RWP) requirements and Operations Control Center (OCC) coordination protocols.

Procedure

1) Initial Reporting
    a) The train operator shall immediately notify the Operations Control Center (OCC) when a failure prevents movement, propulsion, or safe operation.
    b) The operator must provide: train number, direction of travel, track number, exact location (nearest station or interlocking), and a brief description of the issue (e.g., propulsion fault, brake fault, pantograph down, loss of control).
    c) OCC will immediately notify Maintenance of Equipment (MOE), Traction Power (if electrical isolation is required), and Line Controllers.
2) Securing the Vehicle and Alignment
    a) The operator must apply handbrakes, place the master controller in neutral, and engage the parking brake if available.
    b) The operator shall ensure the doors remain closed unless evacuation is required.
    c) OCC shall apply exit inhibits, cancel all active routes through the affected section, and notify approaching trains to proceed at restricted speed or hold clear of the disabled train.
3) MOE Field Response
    a) MOE personnel shall respond with the appropriate service vehicle and diagnostic tools.
    b) Upon arrival, MOE shall contact OCC and request RWP access protection for the alignment prior to approaching or working near the disabled LRV.
    c) If the failure involves a pantograph, arcing, or OCS contact, MOE must confirm with OCC that the section is de-energized and grounded before accessing the roofline area.

4) Vehicle Stabilization and Assessment
   a) Confirm that the train is properly secured and not under tension or power.
   b) Conduct a diagnostic assessment to determine cause (e.g., propulsion loss, circuit breaker trip, brake fault, communication failure).
   c) Coordinate with OCC to isolate auxiliary circuits or reset breakers as needed under control supervision.
5) Towing or Coupling Operations
   a) If the LRV cannot be repaired on site, OCC shall dispatch a recovery LRV or service vehicle.
   b) Only qualified MOE personnel may perform coupling, towing, or mechanical uncoupling.
   c) Verify brake continuity, communication cable connection, and ensure both vehicles are in the proper mode (one in “lead,” one in “trail”).
   d) Movement shall occur at restricted speed not exceeding 5 mph to the nearest crossover, pocket track, or yard, under OCC authority.
6) System Restoration and Clearance
   a) Once the disabled LRV is cleared from the mainline, OCC will perform system verification ensuring route integrity and power restoration.
   b) MOE must confirm safe condition of all components before releasing the vehicle for further service or towing to the maintenance facility.
   c) OCC shall lift route inhibits and restore automatic control once the alignment is confirmed clear.
7) Documentation and Reporting
8) OCC must document:
   a) Date, time, train number, and location of incident
   b) Nature of equipment failure and actions taken
   c) MOE personnel dispatched and response times
   d) Time protection established and released
   e) Any coordination with Traction Power or other departments
   f) Maintain continuous two-way communication with OCC during all alignment activities.
   g) Never access the roof or OCS area until confirmation of de-energization and grounding is received from OCC.
   h) All recovery movements must be authorized and directed by OCC.
   i) Operators and MOE personnel must remain clear of coupler and brake line areas during alignment operations.

Key Safety Reminders

- Treat all OCS components as energized until verified de-energized, grounded, and tested.
- Only qualified traction power technicians may remove debris or contact OCS hardware.

- Always Maintain radio contact with OCC; confirm “de-energized, grounded, and safe to proceed” before work begins.
- Operators must never attempt to dislodge debris from the cab or use on-board equipment.

5.11 DERAILMENT PROCEDURE

This procedure establishes standardized actions to be followed when a Light Rail Vehicle (LRV) becomes derailed on the mainline alignment, yard, or within an interlocking. The purpose is to ensure the protection of personnel, preservation of equipment, and rapid coordination of recovery activities under Federal Transit Administration (FTA) Roadway Worker Protection (RWP) requirements.

1) Initial Reporting
   a) The Train Operator shall immediately notify the Operations Control Center (OCC) upon detecting or suspecting a derailment.
   b) The operator must state train number, direction of travel, track number, location (nearest station or interlock), and whether passengers are onboard.
   c) OCC shall initiate an emergency response, suspend train movements within the affected limits, and notify Maintenance of Equipment (MOE), Track, Signal, and Traction Power departments as required.

2) Securing the Area
   a) OCC must establish track protection and issue a system-wide or area-specific All-Call to hold trains clear of the affected zone.
   b) Operators must not attempt to re-rail or move the train until authorization is given by OCC and recovery personnel are present.
   c) The area shall be treated as a restricted RWP zone, requiring authorization prior to any entry.

3) Field Response and Assessment
   a) The MOE Supervisor will serve as the Recovery Lead, coordinating all re-railing and mechanical assessments.
   b) The Roadway Worker in Charge (RWIC) shall establish RWP limits, verify communication with OCC, and ensure all responders are briefed prior to entry.
   c) Track and Signal personnel shall inspect for infrastructure damage, including rail integrity, switches, or signal components.

4) Recovery and Rerailing
   a) All rerailing efforts must be directed by the MOE Recovery Lead under OCC coordination.
   b) Power must be de-energized and grounded when work occurs near the Overhead Contact System (OCS).

c) OCC shall maintain a record of route protection, personnel on-site, and time of clearance.

5) Post-Incident Requirements
   OCC must document:
   a) Incident time and location
   b) Departments involved and response times
   c) Protection established and released
   d) Cause determination and corrective actions
   e) A Safety Event Report shall be submitted in accordance with ADOT SSO Program Standard §7.3 and Valley Metro SOP 500.3.

Key Safety Reminders

- Treat all derailments as RWP-protected zones.
- Maintain continuous two-way radio communication with OCC.
- Do not energize, rerail, or tow until the Incident Commander and OCC authorize movement.
- Verify Safe Zones and maintain watchperson coverage during all recovery operations.

5.12 BROKEN RAIL PROCEDURE

This procedure establishes the standardized response when a broken, cracked, or separated rail is detected on the alignment. It ensures protection of roadway workers, train operators, and the public under Federal Transit Administration (FTA) Roadway Worker Protection (RWP) requirements and Valley Metro Track Maintenance protocols.

1) Initial Identification and Reporting
   a) Any operator, inspector, or field personnel observing a suspected or confirmed rail break must immediately notify the Operations Control Center (OCC) and provide:
      i) Exact location (nearest station, crossover, or street)
      ii) Direction of travel and track number
      iii) Visible extent of damage (fracture, split head, joint separation, etc.)
2) OCC shall immediately suspend train movements within the affected limits and issue an All-Call for operators to hold at the nearest station.

3) OCC Actions
   a) Apply route inhibits and protects both tracks through the affected area.
   b) Notify Track Maintenance, Signal, and Traction Power departments.
   c) If the break is within an interlocking or grade crossing, Signal Maintenance shall verify correspondence integrity and crossing protection status.
   d) Document event time, location, and personnel dispatched in the OCC Incident Log.

4) Field Response and Assessment
   a) The MOW Supervisor shall serve as the Roadway Worker in Charge (RWIC) and establish formal RWP protection limits before entering the alignment.
   b) Upon arrival, field crews shall:
      i) Verify the break and inspect adjacent rail ends for gaps, alignment shift, or loose fasteners.
      ii) Determine whether the break is clean (brittle fracture) or progressive (fatigue crack).
      iii) Confirm that no train is fouling the track and that all personnel remain in Safe Zones during inspection.

When necessary, request de-energization of nearby OCS if cutting, welding, or grinding is required near live equipment.

5) Temporary Repair and Protection

   a) Install joint bars and clamps or temporary shunts if immediate restoration of circuit continuity is required.
   b) Track Maintainers shall tag and mark the defect area, and OCC must issue a speed restriction or “stop and proceed” order for train movement if temporary repairs are in place.
   c) No movement shall occur until:
      i) The RWIC confirms track alignment and secure joint condition.
      ii) OCC authorizes controlled passage under restricted speed.

6) Permanent Repair

   a) A qualified rail welding crew shall replace or thermite-weld the broken section as soon as practicable.
   b) All replacement activities must remain under full RWP protection, with OCC tracking start and completion times.
   c) After completion, perform:
      i) Ultrasonic inspection (UT) or visual verification per maintenance standards.
      ii) Documentation of rail size, type, and length replaced.

7) Post-Incident Documentation

   OCC shall record:
   a) Incident time, location, and affected track
   b) Cause (thermal stress, defect propagation, wheel impact, etc.)
   c) Protection established and released
   d) Personnel involved and response duration

Track Maintenance must submit a Corrective Action Report summarizing:

e) Root cause and inspection findings
f) Corrective and preventive measures
g) Follow-up inspection schedule

8) Key Safety Reminders
   - Treat all broken rail reports as critical safety events until verified safe.
   - Do not allow train movement over a broken or cracked rail without OCC authorization and confirmed field assessment.
   - Maintain continuous OCC communication throughout all phases.
   - Use watchperson coverage when working within active track zones.
   - Document all findings in the Track Defect Log and RWP activity record.

5.13 SPECIAL HAZARD AREAS

Certain locations along the Valley Metro Light Rail and Streetcar alignments present unique operational hazards requiring heightened situational awareness, additional protective measures, and strict adherence to Roadway Worker Protection (RWP) procedures. These areas are characterized by limited visibility, complex track geometry, and increased potential for train–worker conflicts.

5.13.1 TRACK SPLITS AND SLIP RAMPS

Track splits and slip-ramp sections introduce merging and diverging train movements that can occur with limited warning.

Required controls:

- Maintain continuous radio communication with the OCC.
- Remain within designated safe zones at all times.
- Confirm switch position and signal aspect before entering the area.
- Assign a qualified lookout when visibility is restricted or when trains operate bi-directionally.

5.13.2 DECK PARK TUNNEL BRIDGE AND CULVER CROSSOVER

This corridor includes vertical and horizontal curvature that limits line-of-sight between approaching trains and roadway workers, as well as a grade transition that obscures visibility near the Culver Crossover.

Mitigation measures:

- Mandatory lookout protection whenever work is performed on or near the bridge span.
- Position personnel on the high-visibility side of the alignment and maintain a clear escape path.
- Use audible warning devices and maintain continuous OCC monitoring.
- Verify track-circuit occupancy prior to entering the Culver Crossover area.

Lone Worker Foul Time Provision

In the event a lone worker must foul the track to perform work, OCC shall not allow any rail transit vehicle to enter the protected area without explicit authorization from the lone worker. The lone worker must request foul time from OCC prior to fouling the track, verify that the limits are secured, and maintain continuous communication. Foul time remains in effect until the lone worker releases it back to OCC. No train movement, including yard movements or single-car repositioning, may occur within the established limits unless the lone worker confirms that the track is clear and authorizes movement.

1. Requesting Foul Time
    1. The lone worker shall contact OCC and request foul time, stating:
        a. Call Number and RWP level
        b. Exact track, limits, and nature of work
        c. Estimated duration
    2. OCC shall repeat the limits back to the lone worker to confirm accuracy.
    3. OCC shall communicate to all affected trains and personnel that the track or limits are protected and unavailable for movement.

2. Establishing Protection

1. Foul time is considered active only after OCC confirms the track is secured and no movements are authorized within the limits.
2. The lone worker shall not foul the track until OCC provides a clear confirmation such as:“Foul time granted for Track __ between __ and __. No train movements authorized.”
3. Continuous radio communication between the lone worker and OCC must be always maintained while foul time is active.

3. Protection Requirements

- OCC shall not allow any rail transit vehicle to enter, move through, or approach the protected limits without authorization from the lone worker.
- No switching, yard moves, single-car testing, or reverse moves are permitted within the foul time limits unless cleared by the lone worker.
- Foul time must remain in place until the lone worker reports clear.

4. Releasing Foul Time

1. Before clearing foul time, the lone worker shall:
    a. Physically exit the track and ensure all tools/equipment are removed
    b. Verify track is clear and safe for movement
2. The lone worker notifies OCC: “[Name], clear of the track. Release foul time for Track __ between __ and __.”
3. OCC shall repeat the release back to the worker and confirm foul time has been removed.

5. Loss of Communication

- If communication is lost, the lone worker must immediately clear the track until communication with OCC is restored.
- OCC must treat loss of communication as a safety-critical condition, maintaining blocked movement until positive contact is re-established.

5.13.3 QUIET ZONES (3RD STREET / MILL AVENUE)

Within designated quiet zones, train operators are restricted from routine horn use, reducing audible warning for workers and the public.

Protective measures:

- Mandatory lookout or Train Approach Warning (TAW) coverage for all track work.
- Use of high-visibility apparel and supplemental audible devices (e.g., hand-held horns).
- Continuous radio coordination with OCC to confirm train movements.

5.13.4 DIAMOND CROSSINGS

Diamond crossings—where two tracks intersect—create complex rail interfaces and increase risk of tripping, equipment entanglement, and wheel-flange pinch points.

Diamond-crossing locations include:

- Central Avenue / Jefferson Street
- Central Avenue / Washington Street
- 1st Avenue / Jefferson Street
- 1st Avenue / Washington Street
- 3rd Avenue / Ash Avenue (Tempe Streetcar interface)
- Mill Avenue / 3rd Street (Tempe Streetcar Diamond)

Mitigation requirements:

- Enter only under established Exclusive Track Occupancy (ETO) or OCC-authorized Working Limits.
- Do not stand or place equipment within the diamond area during any train movement.
- Conduct frequent inspections for loose fasteners, flangeway debris, or surface irregularities.
- Exercise extreme caution during wet or low-light conditions where rail surfaces may be slippery.

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6.0 SAFE WORK PRACTICES AND PERSONAL PROTECTIVE EQUIPMENT (PPE)

6.1 PURPOSE

This section establishes the minimum safe work practices and required personal protective equipment (PPE) for all roadway workers performing inspection, maintenance, or construction activities within the light rail alignment. These requirements ensure the protection of workers from electrical, mechanical, and environmental hazards while maintaining compliance with FTA and OSHA standards.

6.2 GENERAL SAFE WORK PRACTICES

- All personnel shall receive Roadway Worker Protection (RWP) training and be qualified prior to entering the alignment.
- Workers must always maintain situational awareness and be alerted to approaching trains, service vehicles, or maintenance equipment.
- A clear and continuous line of communication with the Operations Control Center (OCC) must be maintained while on or near the track.
- Work limits shall be established and confirmed with OCC before entering the right-of-way (ROW).
- Personnel shall utilize designated **Safe Zones** for refuge whenever trains are present or when directed by the lookout or OCC.
- No work shall be performed during adverse weather, limited visibility, or lightning conditions unless authorized by OCC and deemed safe.
- Loose tools, materials, or equipment must be secured to prevent fouling of the track or overhead contact system (OCS).
- All workers must follow the "**3-Point Contact Rule**" when climbing ladders, accessing vehicles, or working on elevated surfaces.
- Smoking and vaping are prohibited within the ROW or near traction power equipment.

6.3 PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIREMENTS

All roadway workers must wear the following PPE while on or near the track alignment:

PPE Item	Requirement / Description	Standard / Reference
High Visibility Apparel	Class 3 high-visibility vest or outerwear (ANSI/ISEA 107)	OSHA 29 CFR 1910.132
*Hard Hat**	Type I, Class E electrical-rated helmet	ANSI Z89.1
Safety Footwear	Steel/composite toe with electrical hazard protection	ASTM F2413
*Safety Glasses**	Clear lenses with side shields	ANSI Z87.1
*Work Gloves**	Cut-resistant and suitable for task (mechanical, electrical, etc.)	OSHA 1910.138
Hearing Protection	Required when noise exceeds 85 dBA	OSHA 1910.95
Fall Protection	Required when working above 6 ft or on aerial lifts	OSHA 1926 Subpart M
Arc Flash / Electrical PPE	For traction power per NFPA 70E	NFPA 70E

**if work requires the use of these items, identified in the Job Safety Briefing*

6.4 SPECIALIZED EQUIPMENT

- Respiratory Protection: Required when working in confined spaces, dusty areas, or around chemical hazards; must be approved and fit-tested per OSHA 1910.134.
- Headlamps or Flashlights: Must be intrinsically safe when used near energized OCS or signal cabinets.
- Cold or Heat Stress Gear: Provided as needed during extreme temperature conditions per Valley Metro Safety Policy.

6.5 PPE INSPECTION AND MAINTENANCE

- PPE must be inspected before each use for wear, damage, or contamination.
- Damaged or expired PPE shall be replaced immediately and reported to the supervisor.
- Shared PPE (such as arc flash suits or harnesses) shall be cleaned and stored according to manufacturer recommendations.

6.6 PROHIBITED PRACTICES

- Entering the trackway without authorization or proper PPE.
- Working under the influence of alcohol, drugs, or impairing medication.
- Crossing tracks without ensuring both directions are clear and OCC has granted clearance.
- Standing or placing materials between running rails, within 4 feet of the nearest rail, or inside gauge during active service.

6.7 LONE WORKER RESTRICTIONS

To ensure personnel safety and regulatory compliance, lone worker activities within the light rail alignment are strictly controlled and permitted only under specific conditions as defined by Valley Metro's Roadway Worker Protection (RWP) Program and OSHA 29 CFR 1910.147 / 1926 Subpart C.

6.7.1 DEFINITION

A lone worker is defined as any qualified employee performing duties on or near the track without the continuous physical presence of another qualified worker. This includes inspections, testing, or troubleshooting tasks conducted outside of team-based work zones.

6.7.2 GENERAL RESTRICTIONS

- Lone Worker Limitation: Roadway workers shall not perform duties as lone workers within active mainline track segments unless expressly authorized by the Operations Control Center (OCC) under defined safety conditions.
- Track Protection Requirement: Exclusive Track Occupancy (ETO) or Work Limits established by Verbal Authority must be in place before any personnel enter or occupy the track alignment.
- Prohibited Activities: Lone workers are not authorized to conduct tasks involving lifting, track component replacement, or hazardous energy control procedures unless additional qualified personnel are present on site.
- Power Tool Restriction: The operation or use of any power tool, including battery-powered equipment, is strictly prohibited while working alone. Power tool use requires the presence of another qualified employee and must occur only under approved Roadway Worker Protection (RWP) safety protocols.

6.7.3 COMMUNICATION REQUIREMENTS

- Continuous two-way radio communication with OCC must be maintained throughout the entire duration of work.
- The lone worker must check in with OCC every 15 minutes or at intervals designated by OCC, depending on the location and activity risk.
- If communication is lost, the lone worker must immediately clear the alignment and re-establish contact before resuming work.

6.7.4 SAFETY EQUIPMENT REQUIREMENTS

- Lone workers must carry an operable handheld radio on the assigned channel for the line (A Line – Channel 1, B Line – Channel 2, Yard/Streetcar – Channel 3).
- A personal alert safety device (PASD) or Real Time Risk Solutions (RTRS) mobile check-in system must be active during all lone work.
- High-visibility PPE and headlamps must always remain in use, including during low-light conditions.

6.7.5 AUTHORIZATION

- Authorization for lone worker activity must be obtained from the OCC Supervisor or Maintenance-of-Way Supervisor prior to access.
- A job briefing must be completed before the worker enters the alignment.
- Lone worker authorization will not exceed one continuous work period and must be revalidated for each new entry or task

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7.0 WORKING IN EXCESSIVE HEAT CONDITIONS

7.1 PURPOSE

To establish protective measures for roadway workers exposed to high-temperature environments during maintenance, inspection, or construction activities along the Valley Metro system.

7.2. HAZARD OVERVIEW

Excessive heat exposure can cause dehydration, heat cramps, heat exhaustion, or heat stroke. These risks increase when employees perform strenuous physical labor, wear protective clothing, or work near reflective surfaces such as rail or concrete during extreme temperatures.

7.3 PREVENTIVE MEASURES

- **Work Scheduling**: When possible, schedule outdoor tasks during cooler hours (early morning or evening). Avoid peak heat periods between 12:00 PM and 4:00 PM.
- **Hydration**: Employees must drink water frequently (one cup every 15–20 minutes). Avoid caffeinated or sugary beverages.
- **Rest Breaks**: Establish shaded or air-conditioned rest areas and encourage regular breaks during extreme heat.
- **Acclimatization**: New or returning workers should gradually increase heat exposure over a 7–14 day period to build tolerance.
- **Buddy System**: Lone work is discouraged during excessive heat warnings. Workers must monitor each other for signs of heat-related illness.
- **Protective Clothing**: Lightweight, breathable, high-visibility garments with moisture-wicking properties are required. Hard hats should include neck shades when available.

7.4 HEAT ILLNESS RECOGNITION

Condition	Symptoms	Immediate Action
Heat Cramps	Muscle spasms, sweating, fatigue	Move to a cool area, hydrate with water or electrolyte fluids.
Heat Exhaustion	Heavy sweating, dizziness, nausea, rapid pulse	Stop work, cool the body with water or shade, notify OCC or supervisor.
Heat Stroke	Confusion, hot dry skin, loss of consciousness	**Medical emergency.** Call 911, provide cooling, notify OCC immediately.

7.5. COMMUNICATION AND REPORTING

- The Operations Control Center (OCC) shall issue Heat Safety Alerts when the National Weather Service (NWS) reports excessive heat warnings for the Phoenix–Tempe–Mesa region.
- Supervisors must document any heat-related illness or near-miss event in the Real Time Risk Solutions (RTRS) system and initiate corrective actions.

7.6 REFERENCES

- OSHA 29 CFR 1926.21(b)(2) – Safety Training and Education
- NIOSH Publication No. 2016-106 – Criteria for a Recommended Standard: Occupational Exposure to Heat and Hot Environments
- Valley Metro SOP 400.7 – Adverse Weather Response

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8.0 SAFE ZONE DEFINITIONS AND REQUIREMENTS

8.1 PURPOSE

Safe Zones provide designated refuge areas that protect roadway workers from approaching trains, on-track equipment, and other moving hazards. Establishing Safe Zones is essential to meet Federal Transit Administration (FTA) Roadway Worker Protection (RWP) standards and to ensure the physical safety of all employees performing inspection, maintenance, or troubleshooting tasks within the alignment.

8.2 DEFINITION

A Safe Zone is a defined area, either adjacent to or within the guideway, where roadway workers can safely stand clear of train and maintenance equipment movement. These zones are physically separated from active track or located within approved clearance limits as verified by the Operations Control Center (OCC) and the Safety Department.

8.3 GENERAL REQUIREMENTS

1. Safe Zones must be established on a case by case basis by the RWIC or lone worker prior to entering the alignment.
2. Roadway workers shall confirm Safe Zone locations during pre-work job briefings and verify accessibility before entering the alignment.
3. No Safe Zone may be within the foul of track, near switch points, or within the clearance of moving equipment.
4. Personnel must remain alert and ready to move into the Safe Zone when a Train Approach Warning (TAW) or OCC instruction is issued.
5. All tools, materials, and equipment must remain within Safe Zones when not actively in use.
6. Safe Zones must maintain an unobstructed path of egress in the event of an emergency or approaching train.

8.4 PHYSICAL CHARACTERISTICS

Safe Zones should conform to the following minimum standards where practicable:

1. Lateral clearance: 6 feet minimum from the nearest rail.
2. Vertical clearance: 7 feet minimum overhead free space.

3. Surface conditions: firm, level, and free of trip hazards.
4. No overhanging OCS, signal, or structural components within the refuge space.
5. Zones located in tunnels, bridges, or elevated structures must be clearly marked and verified for clearance prior to use.

8.5 IDENTIFICATION AND MARKING

1. Safe Zones shall be marked using green reflective paint, tape, or signage labeled “SAFE ZONE / REFUGE AREA.”
2. Track Access Guide diagrams must depict Safe Zones using green rectangular symbols consistent with the legend key.
3. Temporary Safe Zones may be established only under OCC approval and must be recorded in the Job Briefing Log.

8.6 RESTRICTIONS

1. Do not assume a Safe Zone exists without field verification and OCC confirmation.
2. Personnel must not remain between parallel tracks unless sufficient clearance for simultaneous train movement is available.
3. Temporary Safe Zones must not interfere with signal detection circuits, OCS structures, or train operator visibility.

8.7 TRAINING AND COMPLIANCE

All roadway workers shall receive training on Safe Zone identification, verification, and refuge procedures as part of their initial and annual RWP certification. Supervisors and watchpersons are responsible for ensuring Safe Zone use and enforcing compliance during all on-track work activities

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9.0 STREET-SIDE WORK VEHICLE PROTECTION

When roadway work or inspections occur along active streets adjacent to the light-rail guideway, additional safety controls must be established to protect personnel, work vehicles, and the public. All traffic-control devices must conform to the Manual on Uniform Traffic Control Devices (MUTCD) and applicable City of Phoenix / Tempe / Mesa right-of-way permits.

9.1 TRAFFIC CONTROL AND CONE SETUP

Taper Length:
Establish a gradual cone taper to transition traffic safely around the work zone. The standard taper length is **10 feet per 1 mph of posted speed** (e.g., 350 ft for a 35 mph roadway).
For short-duration or low-speed streets (< 30 mph), a **minimum taper of 100 ft** may be used.

Cone Spacing:
- 25 – 30 mph → cone spacing ≈ 20 ft
- 35 – 40 mph → cone spacing ≈ 30 ft
- 45 mph → cone spacing ≈ 40 ft

Cones must be evenly spaced to guide motorists smoothly around the zone.

Buffer Zone:
Maintain a clear buffer area of at least **20 ft between traffic and the first worker or work vehicle**. No personnel, tools, or materials should be placed in the buffer area.

Taper and Work Area Configuration:

1. Advance Warning Area – Post advance signage (“Road Work Ahead,” “Rail Work Ahead”) 200–500 ft before the taper.
2. Transition Area – Use cones to gradually shift traffic away from the work lane.
3. Buffer Space – Provides recovery distance for errant vehicles.
4. Work Area – Includes all workers, vehicles, and materials.
5. Termination Area – Use cones to guide traffic back to normal alignment.
   Minimum Device Standards:
   - Cones must be **28 inches high** with two 6-inch reflective white bands for day and night visibility.
   - Use weighted bases to prevent displacement by wind or passing traffic.
   - For extended or nighttime work, supplement cones with **Type I or II barricades or flashing amber lights.**

9.2 VEHICLE POSITIONING

- Park vehicles parallel to traffic flow and as close to the curb as safely possible.
- Activate amber strobe lights and hazard flashers when workers are on the ground.
- Use the vehicle itself as a barrier when feasible, positioning it between workers and oncoming traffic without fouling the trackway.

9.3 FLAGGING AND COORDINATION

- A trained flagger must be deployed when any traffic lane is obstructed or narrowed.
- Flagger stations should be positioned to maintain direct sightlines with both approaching traffic and the EIC.
- The EIC must coordinate with OCC and the local traffic control agency to confirm proper permits and signal coordination during setup and teardown.

9.4 REMOVAL AND RESTORATION

- Cones and signs shall be removed in reverse order (termination → buffer → taper → advance warning).
- All materials must be cleared up promptly once work is complete, and OCC notified of work zone demobilization.

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10.0 SPEED RESTRICTION REQUIREMENTS

10.1 PURPOSE

This section defines the speed restriction requirements for light rail and streetcar operations when roadway workers, maintenance equipment, or work zones are present on or adjacent to the alignment. Speed restrictions are established to ensure safe train operations, maintain clear communication between the Operations Control Center (OCC) and field personnel, and protect all roadway workers within defined work limits.

10.2 ESTABLISHING SPEED RESTRICTIONS

Speed restrictions are implemented by the OCC based on the type of work activity, location, and level of protection in place. The OCC will issue and log all temporary speed restrictions through the Daily Operating Log and notify all train operators via radio broadcast or Train Orders.

Speed restrictions shall be established when:

- Roadway workers or equipment are within 25 feet of the track centerline without physical barriers or fencing.
- Any portion of the track, OCS, or signal infrastructure is being inspected, repaired, or tested.
- Conditions such as track obstructions, weather impacts, or low visibility exist that may affect train breaking or operator sight distance.
- Equipment or personnel occupy adjacent lanes or guideway shoulders where train movement could pose a hazard.

10.3 SPEED RESTRICTION CATEGORIES

Restriction Type	Max Authorized Speed	Typical Application
Work Zone – Adjacent Track Occupied	10 mph	Workers or vehicles present adjacent to active track under OCC coordination.
Work Zone – Shared Track Occupied	5 mph	Workers or equipment on the same track; train movement under flagger or lookout direction.
Temporary Condition Restriction	15–25 mph	Track defects, weather, or surface conditions.
Special Instruction / Train Order	As directed	Specific location-based restriction issued by OCC.

10.4 OPERATOR RESPONSIBILITIES

- Train operators must acknowledge all speed restrictions and comply immediately upon receipt of OCC instructions or posted bulletins.
- Operators shall sound horns or bell when approaching work zones, as required by OCC.
- Operators must remain prepared to stop short of any obstruction, personnel, or equipment on or near the alignment.
- If unsure of the exact work zone limits or restriction location, the operator must contact OCC for clarification before proceeding.

10.5 ROADWAY WORKER RESPONSIBILITIES

- Roadway workers shall verify that OCC-issued speed restrictions are active prior to occupying the alignment.
- If work area conditions change (e.g., extended limits, additional equipment), workers must request OCC to adjust restriction limits accordingly.
- Work crews must maintain clear visual contact with approaching trains whenever possible and remain within designated safe zones until all trains have passed.

10.6 LIFTING SPEED RESTRICTIONS

Speed restrictions may only be lifted after the roadway workers have cleared the track and safe zones are verified, and OCC has confirmed via radio communication that the track is clear and normal operations may resume.

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11.0 HAZARD IDENTIFICATION, ASSESSMENT, AND MITIGATION

11.1 PURPOSE

This section defines the systematic process for identifying, evaluating, and controlling hazards associated with roadway worker activities along the Valley Metro Light Rail and Streetcar alignments. The goal is to prevent injury, equipment damage, and service disruption by proactively addressing environmental, operational, and procedural risks.

11.2 HAZARD IDENTIFICATION

All employees performing work within the right-of-way must actively identify hazards before, during, and after work activities. Typical hazard sources include:

- Train Operations: Moving LRVs, restricted sightlines, and multiple track movements.
- Track and OCS Infrastructure: Open switch points, energized overhead contact system, and confined clearance zones.
- Environmental Conditions: Excessive heat, rain, low visibility, or high winds.
- Worksite Factors: Equipment placement, vehicular traffic near grade crossings, and limited refuge areas.
- Human Factors: Fatigue, distraction, inadequate communication, or deviation from procedure.

Identified hazards must be immediately communicated to the Operations Control Center (OCC) and documented within the Real Time Risk Solutions (RTRS) digital job briefing system.

11.3 HAZARD ASSESSMENT

Before work begins, the Roadway Worker in Charge (RWIC) or designated supervisor shall:

1. Evaluate identified hazards based on severity, likelihood, and exposure.
2. Use Valley Metro's Risk Matrix (Low–Moderate–High–Critical) to determine the appropriate level of control.
3. Verify that all employees understand the hazards, protection measures, and required PPE.
4. Re-evaluate the site when conditions change (weather, train activity, work scope, etc.).

11.4 HAZARD MITIGATION AND CONTROL

11.4.1 IDENTIFIED HAZARDS

#	Hazard Description	Potential Consequence	Risk Level (Pre-Mitigation)
1	Unauthorized train movement into active switch zone	Collision or worker strike	High
2	Switch movement during inspection	Pinch/crush injury to personnel	High
3	Inadvertent restoration of route by OCC before work completion	Worker exposure to live train movement	High
4	Electrical or mechanical failure while cycling switch	Shock, entrapment, or loss of correspondence	Medium
5	Poor communication between OCC and Signal crew	Confusion about protection status	Medium
6	Limited visibility or noise interference in interlocking area	Missed train approach warning	Medium

11.4.2 CONTROL AND MITIGATION MEASURES

Hazard Reference	Control / Mitigation Measure	Responsible Party
1, 2, 3	OCC must drop routes and confirm no active movement authorities through the interlocking before granting access.	OCC Controller
1, 3	OCC must issue an All-Call to all operators to stop at the nearest station before the affected interlocking.	OCC Controller
1–3	Signal crew must confirm track protection established and route secured via radio acknowledgment before entering the switch area.	RWIC
2, 4	Switch must be mechanically isolated or locked out (if applicable) during hands-on inspection or cycling.	Signal Technician
4	Maintain safe clearance from energized components.	Signal Technician

Hazard Reference	Control / Mitigation Measure	Responsible Party
5	OCC and field crews must maintain continuous two-way radio communication using the assigned channel (Channel 2 for B Line, Channel 1 for A Line, etc.).	OCC & Field Crew
6	Establish a lookout position when visibility or ambient noise conditions are poor.	Field Crew

11.4.3 RESIDUAL RISK EVALUATION (POST-MITIGATION)

Hazard	Residual Risk Level	Acceptability
Unauthorized train movement	Low	Acceptable with controls
Switch movement during inspection	Low	Acceptable with controls
Route restoration error	Low	Acceptable with controls
Equipment failure	Low	Acceptable with controls
Communication failure	Low	Acceptable with controls
Visibility issues	Low	Acceptable with controls

Additional Safety Requirements

- OCC must log all route drops and restoration times in the system event record.
- Signal personnel shall verify switch position visually before and after inspection.
- If any switch correspondence or locking anomaly is detected, the switch shall remain out of service until verified safe by Signal Technician.
- All work within the interlocking must follow RWP Track Protection and OCC communication protocols defined in the Track Access Guide.

Key Safety Reminders

- Never rely solely on visual gate position when protection is in doubt.
- OCC maintains ultimate authority for all train movements through affected crossings.
- All flaggers, operators, and maintenance staff must maintain radio contact with OCC during protection operations.

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12.0 DEPARTMENTAL RESPONSIBILITIES

12.1 TRACK MAINTAINERS

Perform routine and corrective maintenance including rail, tie, and fastener inspections; switch cleaning and adjustment; and geometry verification. Activities may require hand tools or mechanized track equipment within the alignment.

12.2 OVERHEAD CATENARY SYSTEM (OCS) / TRACTION POWER TECHNICIANS

Conduct visual and hands-on inspections of overhead contact systems (OCS), including wire wear checks, pole grounding, and insulator integrity. Utilize non-revenue vehicles or CAT carts to inspect and test contact wire alignment, tension, and electrical continuity. Coordinate with OCC for de-energization when necessary.

12.3 SIGNAL TECHNICIANS

Inspect and test switch machines, signals, and grade crossing warning systems. Activities include verification of interlocking operation, cable continuity tests, and troubleshooting false activations or communication faults.

12.4 FACILITY MAINTENANCE / CONTRACTORS

Perform vegetation and landscape maintenance, litter removal, and minor facility upkeep adjacent to the right-of-way. Work involves operating hand tools, trimmers, and power equipment in proximity to the alignment, requiring situational awareness of train operations and RWP protections.

12.5 OPERATIONS CONTROL CENTER (OCC) COORDINATION

All work activities require prior notification to and ongoing coordination with the OCC to establish track access, verify track occupancy limits, and ensure communication throughout the duration of the work. Lone workers are required to maintain regular check-ins and adhere to watchperson or lookout procedures as specified by RWP policy

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13.0 RWP Role

Role	Description
Roadway Workers	Employees or contractors performing inspection, maintenance, or repair within the rail right-of-way. Must comply with all RWP

Role	Description
	procedures and obtain proper track protection before entering.
OCC Personnel	Coordinate all track access requests, issue track protection, authorize vehicle movement, and maintain communication to ensure safety within the right-of-way.
Rail Transit Vehicle Operators	Operate rail vehicles per OCC instructions and RWP procedures; maintain alertness for roadway workers and comply with speed and signal restrictions.
Maintenance Machine Operators	Operate on-track or maintenance machines under the direction of the Roadway Worker in Charge (RWIC). Must maintain continuous communication and operate only within authorized limits.
Watchpersons / Lookouts	Monitor train movements and provide timely warning to workers. Must maintain clear sightlines and be equipped to issue visual or audible warnings.
Flaggers	Control train and equipment movement through work zones using visual signals or radio communication. Coordinate directly with OCC and the RWIC.
Lone Workers	Conduct work independently without nearby coworkers. Must maintain two-way OCC communication and comply with RWP lone-worker protocols.
Roadway Worker in Charge (RWIC)	Establishes and maintains on-track safety, obtains OCC authority, defines protection limits, and ensures worker briefings and compliance.
Supervisors	Oversee roadway worker activities and ensure compliance with RWP and training requirements.
Maintenance Managers	Develop and enforce maintenance programs ensuring RWP compliance, training, and equipment readiness.
MOE (Maintenance of Equipment)	Responsible for inspection, repair, and servicing of Light Rail Vehicles (LRVs). Must coordinate with OCC and RWIC before any movement or testing of vehicles within the alignment. Required to maintain RWP awareness when operating in or adjacent to the right-of-way.
Contractors (General)	Non-agency personnel performing general construction or maintenance work under

Role	Description
	RWIC supervision. Must comply with all RWP access procedures.
Contractors (Specialized)	Specialists such as signal or traction power engineers requiring track access. Must coordinate with OCC and RWIC and adhere to all RWP safety rules.
Escorted Guests / Visitors	May enter the right-of-way only under continuous escort by a qualified RWIC or roadway worker. No work or unprotected access is permitted.

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14.0 OVERSIGHT, REPORTING, AND DOCUMENTATION

14.1 OVERSIGHT RESPONSIBILITIES

The Valley Metro Safety Department maintains overall responsibility for administration, implementation, and oversight of the Roadway Worker Protection (RWP) Program. This includes ensuring that all applicable Federal Transit Administration (FTA) and Arizona Department of Transportation (ADOT) State Safety Oversight (SSO) requirements are met.

- The Chief Safety Officer (CSO) or designee provides executive oversight and ensures program compliance with 49 CFR Part 674 and FRA 49 CFR Part 214 Subpart C harmonized practices.
- The RWP Program Manager oversees program implementation, training compliance, field auditing, and periodic review of all RWP procedures and documentation.
- Supervisors and crew leaders are responsible for ensuring daily field compliance, conducting job briefings, and verifying that all personnel entering the alignment meet qualification and PPE requirements.

14.2 DOCUMENTATION AND RECORDKEEPING

Accurate and complete documentation is required to demonstrate RWP program compliance and due diligence. The following records must be maintained:

- Daily Job Briefing Forms (digital or hard copy), signed by all participating roadway workers.
- Track Access Requests (TARs) and OCC authorization logs for each work event.
- Training Records confirming completion of RWP certification and any required refresher courses.
- Incident and Near-Miss Reports related to roadway worker activity, submitted through Real Time Risk Solutions (RTRS) or other approved reporting platforms.
- Inspection Reports for work zone setups, lookout assignments, and compliance audits.

All RWP documentation shall be retained for a minimum of three (3) years and made available to regulatory agencies upon request.

14.3 REPORTING REQUIREMENTS

- All RWP incidents, rule violations, or close calls must be immediately reported to the Operations Control Center (OCC) and subsequently documented through the Valley Metro Safety Event Reporting process.
- The Safety Department shall review all incidents for trends, root cause, and corrective actions, reporting findings to the Safety Event Review Board (SERB).
- Quarterly RWP Compliance Reports shall be submitted to executive management and the ADOT SSO office, summarizing audit results, deficiencies, and program improvements.

14.4 PROGRAM REVIEW AND CONTINUOUS IMPROVEMENT

The RWP Program will undergo a comprehensive annual review to ensure continued compliance with FTA, ADOT SSO, and internal safety standards. The review process includes:

- Evaluation of OCC coordination logs and field observation data.
- Analysis of RWP-related incidents and recurring hazards.
- Updates to training materials, procedures, and job briefing templates based on lessons learned.
- Verification that corrective actions have been implemented and validated for effectiveness.

14.5 INTERNAL VALIDATION AND REVIEW

Prior to submittal to the Arizona Department of Transportation (ADOT) State Safety Oversight (SSO) office, the Track Access Guide and associated Roadway Worker Protection (RWP) Program documentation shall be circulated internally for review by key departments, including the Operations Control Center (OCC), Maintenance of Way, and Safety. Each department shall verify procedural accuracy, operational applicability, and compliance with established communication and protection standards before final approval and transmittal

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15.0 AUDITING AND COMPLIANCE VERIFICATION

15.1 PURPOSE

This section establishes the procedures and frequency of internal audits, field observations, and compliance verification activities required to ensure the integrity of Valley Metro's Roadway Worker Protection (RWP) Program. The audit process validates that all roadway worker activities are conducted in accordance with FTA 49 CFR Part 674 and Valley Metro safety standards.

15.2 AUDIT OVERSIGHT AND AUTHORITY

The Safety Department is responsible for conducting RWP audits under the direction of the RWP Program Manager. Audit findings are reviewed by the Chief Safety Officer (CSO) and reported to executive leadership and the ADOT State Safety Oversight (SSO) agency as required.

Authorized personnel may include:

- Safety Officers and RWP Program Managers
- Designated RWP Field Auditors or Compliance Specialists
- Supervisors with delegated audit authority

15.3 TYPES OF AUDITS

RWP audits are conducted using multiple methods to ensure comprehensive program oversight:

Audit Type	Description	Frequency
Field Compliance Audit	On-site observation of roadway worker activity to verify adherence to RWP procedures, safe zones, and OCC communication protocols.	Monthly
Documentation Review	Verification of job briefings, track access requests, and RWP training records.	Quarterly
Program Evaluation Audit	System-level review of RWP program effectiveness,	Annually

Audit Type	Description	Frequency
	including policy updates, training compliance, and corrective actions.	
Incident-Driven Audit	Conducted following any significant RWP violation, near-miss, or FTA-reportable event.	As needed

15.4 AUDIT PROCEDURES

1. Pre-Audit Notification – When practical, field crews and department leads are informed of scheduled audits. Surprise audits may occur to ensure authentic field evaluation.
2. Field Observation – Auditors observe communication protocols, work zone setup, lookout assignments, and compliance with PPE and safe-zone requirements.
3. Record Review – Auditors verify that all job briefing forms, OCC coordination logs, and authorizations are properly documented.
4. Interview and Debrief – Auditors may conduct brief discussions with field personnel to confirm understanding of RWP rules and situational awareness.
5. Findings and Corrective Actions – Non-compliance issues are documented, and responsible departments are assigned corrective actions with specific due dates.

15.5 CORRECTIVE ACTION TRACKING

All corrective actions resulting from audits are entered into the Real Time Risk Solutions (RTRS) or other Valley Metro-approved tracking systems. Each action must include:

- Description of the deficiency
- Assigned responsible party
- Target completion date
- Verification of closure by Safety Department

The Safety Department shall review open corrective actions weekly and report outstanding items during monthly safety management meetings.

15.6 CONTINUOUS IMPROVEMENT AND REPORTING

Audit outcomes are analyzed to identify trends, recurring hazards, or training gaps. The RWP Program Manager compiles results into a Quarterly Compliance Summary Report which includes:

- Audit participation metrics
- Deficiency categories and closure rates
- Recommendations for procedural or training improvements
- Validation of prior corrective actions

This report supports Valley Metro's Safety Management System (SMS) performance monitoring and is distributed to department heads, executive management, and the ADOT SSO office.

Valley Metro B Line (Orange Line + South Central Extension) – South to North

#	Station Name	Cross Street / Notes
1	Baseline / Central Ave	Southern terminal – Park & Ride facility
2	Southern / Central Ave	Residential and arterial corridor
3	Roeser / Central Ave	Local access – narrow median
4	Broadway / Central Ave	Major arterial intersection
5	Pioneer / Central Ave	Neighborhood connection zone
6	Buckeye / Central Ave	Transition to industrial corridor
7	Lincoln / Central Ave	East-side platform (split pair)
8	Lincoln / 1st Ave	West-side platform (split pair)
9	Jefferson / Central Ave	Downtown Phoenix Hub – A Line connection (eastbound)
10	Washington / 1st Ave	Downtown Phoenix Hub – A Line connection (westbound)
11	Van Buren / Central Ave	Government / business district
12	Roosevelt / Central Ave	Roosevelt Arts District
13	McDowell / Central Ave	Cultural corridor – Phoenix Art Museum
14	Encanto / Central Ave	Heard Museum and park access
15	Thomas / Central Ave	Dignity Health / Medical hub
16	Osborn / Central Ave	Midtown
17	Indian School / Central Ave	Park & Ride / Uptown
18	Campbell / Central Ave	Midtown transition
19	Central Ave / Camelback Rd	Connection between Central and 19th corridors
20	7th Ave / Camelback Rd	Transition to 19th Ave corridor
21	19th Ave / Camelback Rd	Interlock point to 19th Ave alignment
22	Glendale / 19th Ave	High-traffic arterial intersection
23	Northern / 19th Ave	Curve transition toward Dunlap
24	19th Ave / Dunlap Ave	Historic northern terminal
25	Mountain View / 25th Ave	End of storage track zone
26	Metro Parkway / 19th Ave	North terminal – Park & Ride facility

Valley Metro A Line (Blue Line) – East to West

#	Station Name	Cross Street / Notes
1	Gilbert Rd / Main St	Eastern terminus – Mesa
2	Stapley Dr / Main St	Mesa section
3	Mesa Dr / Main St	Major bus transfer point
4	Alma School Rd / Main St	West Mesa
5	Country Club Dr / Main St	Connects to downtown Mesa
6	Center St / Main St	Mesa Arts Center area
7	Smith-Martin Dr / Apache Blvd	Transition Mesa → Tempe
8	Veterans Way / College Ave	Tempe Transportation Center
9	University Dr / Rural Rd	ASU Campus
10	Price-101 Fwy / Apache Blvd	Park-and-Ride, 101 Freeway
11	McClintock Dr / Apache Blvd	Tempe residential corridor
12	Dorsey Ln / Apache Blvd	Transition to Mill Ave corridor
13	Mill Ave / 3rd St	Downtown Tempe, bridge over Rio Salado
14	Center Pkwy / Washington St	SkyTrain connection zone
15	50th St / Washington St	ADA-accessible in-fill station
16	44th St / Washington St	SkyTrain Station / Airport Access
17	38th St / Washington St	Washington corridor
18	24th St / Washington St	Westbound platform
19	24th St / Jefferson St	Eastbound platform
20	12th St / Washington St	Westbound platform
21	12th St / Jefferson St	Eastbound platform
22	3rd St / Washington St	Westbound platform (Downtown Phoenix)
23	3rd St / Jefferson St	Eastbound platform (Downtown Phoenix)
24	Downtown Phoenix Hub / Central Station	Western terminus – Connection to B Line and Streetcar

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APPENDIX A – Line Section Maps & Safe Zone Legend

A.1 LINE SECTION OVERVIEW

Line	Section ID	Limits	Key Interlockings / Features	Notes / Hazard Focus
Blue Line (A Line)	BL-A-1	Gilbert Tail Track – Edgemont	Guthrie, Edgemont	End-of-line turnback, signal interference near Horne Roundabout
	BL-A-2	Edgemont – Dobson	Hibbert, Date, Longmore	Tight curvature west of Hibbert; sightline obstruction
	BL-A-3	Dobson – Tempe Bridge	River, Dorsey, Mill Pocket	High-risk RSO zone; bridge approach sight limitation
	BL-A-4	Tempe Bridge – 27th Street	Yard Entrance, 27th St	Yard interfaced double permission required
	BL-A-5	27th Street – 3rd Avenue	11th St, 5th St, 3rd Ave	Downtown crossover interaction
Orange Line (B Line)	OL-B-1	Baseline Tail Track – Sherman	Cocopah, Hidalgo, Raymond	Narrow ROW; street-running sections
	OL-B-2	Sherman – McDowell	Jackson	Historic derailment zone—restricted clearance
	OL-B-3	McDowell – Montebello	Culver, Earll, Pierson	Deck Park Tunnel visibility limitation
	OL-B-4	Montebello – Metro Tail Track	Tuckey, Dunlap, Mountain Point	High pedestrian crossings near Metrocenter
Tempe Streetcar	TSC-1	Hayden Ferry – Dorsey	Marina Heights, 9th & Mill	Street operation; spring switches

A.2 MAP KEY / LEGEND

Symbol	Color	Label	Description
✕	Blue	**Lookout**	Identifies the location of a designated lookout responsible for monitoring train movements and providing audible or visual warnings to workers.
○	Red	**Switch Points**	Indicates track switches or interlocking locations where train routes can be changed or verified.
▭	Green	**Safe Zone**	Designates a protected area where personnel can safely stand clear of train or equipment movements.

Symbol	Color	Label	Description
	Purple	**Grade Crossing**	Represents areas where tracks intersect with a roadway or pedestrian path, typically protected by gates or warning devices.
	Red	**Diamond Crossing**	It indicates a location where two tracks cross, allowing trains from two lines to intersect at grade, with movements controlled in both directions.
	Red	**Red Aspect**	Symbolizes an active red signal aspect displayed to operators, indicating that the route is dropped, no movement authority is granted, and maintenance personnel must remain clear until route reestablishment is confirmed by OCC

Safe Zone - A designated protected area where personnel can safely stand clear of approaching train or equipment movements. Safe Zones must provide adequate clearance for the maximum dynamic envelopes of rail vehicles and allow for the worker to always maintain full situational awareness.

Requirements:

- Safe Zones should be clearly marked on site maps, plans, or field layouts and verified in the field before beginning work.
- Workers must remain within the Safe Zone whenever active train movements are present.
- Personnel shall face approaching train movements and always maintain visual awareness; the worker's back must never face an oncoming train.
- No work shall be performed from within a Safe Zone unless track access has been granted and confirmed through the Operations Control Center (OCC) or the Roadway Worker in Charge (RWIC).
- Safe Zones must be located at a minimum of 15 feet (or local agency standard) from the nearest rail unless otherwise authorized through engineering controls or physical barriers.

A.3 MAP NOTES

- Safe Zones marked GREEN must be verified during the job briefing before occupancy.
- Red signal triangles denote switch or crossing interlocks requiring OCC clearance.
- Maps must be updated after each track modification, new crossover, or capital project.
- Final diagrams are stored in the Valley Metro GIS Safety Map Repository and appended in the controlled version of this guide.

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APPENDIX B – Radio Channel and Call Number Quick Reference

B.1 RADIO CHANNELS

Channel	Purpose / Use
1	🟢 A Line
2	🔵 B Line
3	🚋 Streetcar / Yard Moves
4	⚪ Unused Operations Channel
5	🛠️ LRV Maintenance
6	🚧 Maintenance of Way (MOW)
7	🚓 Security (Primary)
8	🛡️ Security (Secondary / Backup)
9	🚨 Emergency Only
10	🚌 Bus Operations

B.2 UNIT CALL NUMBER REFERENCE

Unit	Department	Description
300	Track Maintenance	Track Maintainers
400	Traction Power	Traction Power Technicians
500	Signal Maintenance	Signal Technicians
600	Operations	ACI Operations / Train Operators
700	Security	Security and Law Enforcement
800	Facilities	Facilities & Grounds Maintenance
900	Contractors / Third-Party	Authorized under permit ID
000	OCC	Operations Control Center

Example Radio Exchange
“OCC, this is 500 Signal at Culver Interlock — requesting switch 3A to reverse.”
“500 Signal, stand clear. Switch 3A passing to reverse.”

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APPENDIX C – Job Briefing and Safety Checklist

C.1 PRE-WORK JOB BRIEFING

Item	Description	Completed (✓)
Work Scope	Define specific task and location (interlock–to–interlock, station–to–street).	
RWP Type	Exclusive Track Occupancy / Verbal Authority / TAW	
RWIC Name		
Crew Members		
Communication Check	Radios tested, channels confirmed.	
Safe Zone Locations	Designated by RWIC	
OCS Status	Energized / De-energized / Grounded	
Hazards Identified	(Debris, poor visibility, heat, etc.)	
Mitigation Plan	Watchperson assigned / cones / signage / PPE	
Emergency Access Route	Defined and confirmed.	
Lone Worker?	Yes / No – If yes, OCC authorization required.	
Signatures	RWIC / Crew / OCC Controller	

C.2 POST-WORK CLOSEOUT

Item	Description	Completed (✓)
Work Complete / Track Clear	All personnel and tools clear of alignment.	
Route Released	OCC notified; authority released.	
Incident or Near Miss?	Reported via RTRS (Real Time Risk Solutions app).	
Equipment Condition	Verified safe for return to service.	
Debrief Conducted	Hazards reviewed for lessons learned.	
Signatures	RWIC / Supervisor / OCC	

C.3 LONE-WORKER REQUIREMENTS

Lone worker status is only allowed when all conditions below remain true throughout the task:

1. Continuous situational awareness
   - Worker can always see AND hear approaching LRVs in both directions
   - No hearing protection required (<85 dBA exposure)
2. Communication
   - Constant two-way radio communication with OCC
   - Job Safety Briefing establishes check-in frequency

If any condition changes → immediate STOP WORK.

Worker must clear the roadway and request RWIC-controlled protection (ETO or TOOS) prior to resuming.

Compliance Basis: §671.39 Situational Awareness; ADOT RWP Review Checklist Item #6

WORK PRACTICES

During operations, the following controls apply:
- Hoses and tools always remain behind tactile edge
- Worker faces direction of nearest train movement
- Refuge path must remain unobstructed
- Cease washing and occupy refuge when LRV is approaching

Hazard lights on vehicles/equipment are permitted as supplemental visual warning only.

PPE REQUIREMENTS

PPE	Requirement
High-visibility Class 2+	Always required
Hearing protection	Required ≥85 dBA (triggers no-lone-worker restriction)
Gloves & slip-resistant footwear	Required
Eye protection	As needed for cleaning agents
Radio + flashlight	Required for night work

EMERGENCY AND LOSS-OF-PROTECTION RESPONSE

The following conditions require immediate roadway clearance and protection upgrade:

- Loss of radio communication with OCC
- Hearing protection becomes necessary during task
- Crowds or conditions impair visibility of LRVs
- Equipment encroaches into the track envelope

Worker will notify OCC and escalate to RWIC protection (ETO/TOOS) prior to resuming.

DOCUMENTATION

The following forms are required:

- Job Safety Briefing documentation
- Daily Work Summary (Track Access Log)
- Noise exposure assessment if ≥85 dBA Per SOP 1500.09
- OCC notifications (start/clear/protection change)

REFERENCES

Reference	Title
FTA §671.39	Situational Awareness
FTA §671.13(c)(4)	Procedures for Accessing the Roadway
OSHA 29 CFR 1910.95	Noise Exposure & Hearing Conservation
SOP 1500.09	Hearing Conservation
SOP 400.2	Speed Restriction & Signage (as applicable)
ADOT RWP Checklist Item #6	Track Access Procedures & Lone Worker

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APPENDIX D – BL-A-1, Gilbert Tail Track to Edgemont

Blue Line (A), Line Section 1, BL-A-1 Gilbert Tail Track to Edgemont

D.1 SECTION OVERVIEW

Locations: Guthrie Interlocking • Edgemont Interlocking
Grade Crossing: Horne Roundabout
Line: Blue Line (A Line) – East Terminal Section
Platforms:

- Gilbert Rd / Main St – East Terminal
- Stapley Dr / Main St – Eastbound / Westbound
- Mesa Dr / Main St – Eastbound / Westbound

Track Type: Double-track alignment featuring primarily straight geometry with moderate curvature near the Horne Roundabout area.

Crossover: Guthrie (Gilbert Station – Between S. Williams & N. Guthrie)

Switch ID	Track	Description / Function
1A	Track 1	Facing-point crossover switch from Track 1 to Track 2 (westbound move).
1B	Track 2	Trailing-point switch paired with 1A for eastbound return movements.
3A	Track 1	Trailing-point switch completing crossover from Track 1 to Track 2.
3B	Track 2	Facing-point crossover paired with 3A for Track 2 to Track 1 movement.

Crossover: Edgemont (Main Street & Edgemont Drive)

Switch ID	Track	Description / Function
1A	Track 1	Facing-point switch allowing movement from Track 1 to Track 2 (eastbound direction).
1B	Track 2	Trailing-point crossover paired with 1A for westbound movements returning to Track 1.

D.2 WORK ACTIVITY DESCRIPTION:

This section includes active mainline track segments, the Horne Roundabout grade crossing, and associated crossover locations extending to the tail track. Multiple departments conduct inspection, maintenance, and troubleshooting activities in this area under full Roadway Worker Protection (RWP) coverage to ensure safe and coordinated field operations.

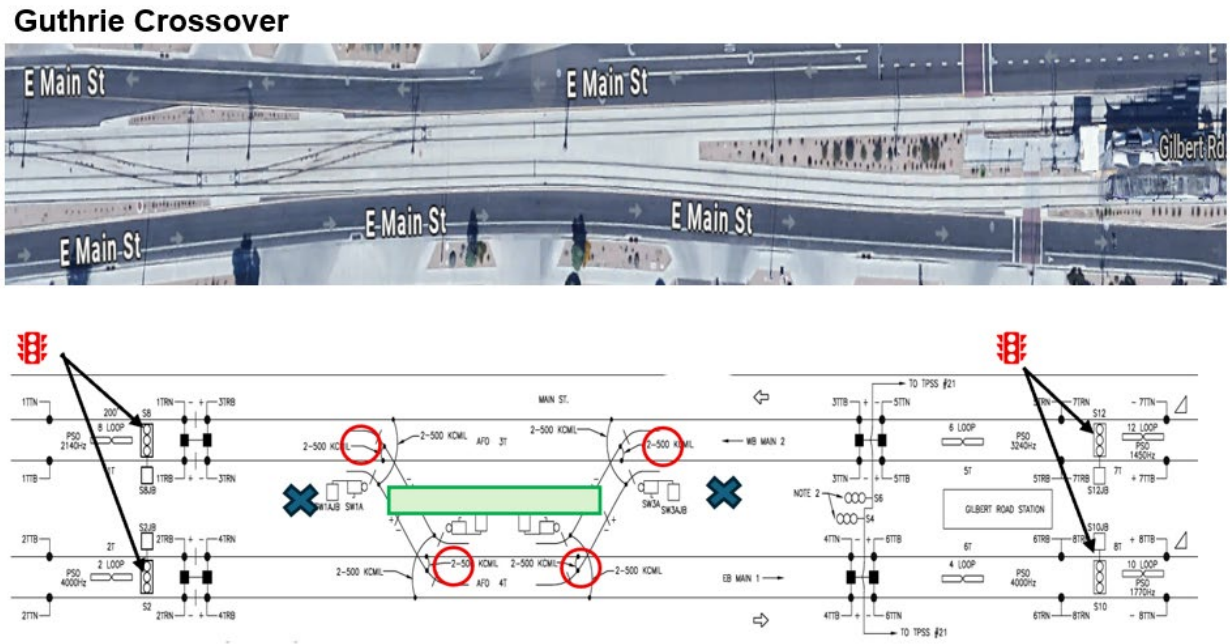
The alignment consists primarily of straight track segments with adequate physical clearance for train operations; however, personnel must utilize only the designated safe zone during field activities or that designated by the RWIC.

The area near the Horne Roundabout crossing includes adjacent vehicular traffic and active train operations, requiring increased situation awareness, continuous communication with OCC, and strict adherence to established RWP access and protection procedures.

Guthrie Tail Track



Guthrie Crossover



D.3 GUTHRIE INTERLOCKING PROTECTION PROCEDURE

Interlocking Control and Limits:
Guthrie Interlocking is located between Stapley Drive Station and Gilbert Road Station. The controlled area extends from the eastbound signal aspect protecting the interlock to the westbound signal aspect leading into the Gilbert Tail Track.

Protection Requirements

1. OCC Coordination:
   - All maintenance personnel must contact OCC prior to entering the interlocking limits.
   - OCC shall verify that no active routes are established and that protection has been applied before granting track access.

2. Operator Instructions:
   - Train Operators approaching Guthrie Interlocking will be instructed to stop at the preceding station platform (Stapley Drive or Gilbert Road) until OCC confirms route clearance and protection removal.
   - Red signal aspects within the interlocking serve as absolute stop protection and indicate that the route is locked and occupied by maintenance personnel.

3. Route Establishment:
   - OCC will notify all on-track maintenance personnel before establishing any route through the interlocking.
   - No route may be established or activated until maintenance staff have confirmed they are in the safe zone.

4. Tail Track Operations:
   - When accessing or performing work near the Gilbert Tail Track, personnel must treat the interlocking as active territory under OCC control.
   - All movements into or out of the tail track require OCC authorization and confirmation that all switches are properly aligned and indicated

D. 4 HAZARD AWARENESS SUMMARY

Hazard	Risk Description	Mitigation / Control
Limited visibility at Horne Roundabout	Curvature and vehicular proximity reduce sightlines for approaching trains.	Assign lookout; maintain continuous OCC radio contact; restrict access during dual train movements.
Dual train approach	Potential entrapment between two active tracks.	Hold one train via OCC until opposing movement clears.
Tail Track switch alignment	Misaligned or unconfirmed switch may lead to unauthorized movement.	OCC confirmation and visual verification before entering work zone.

Summary of Protection Controls

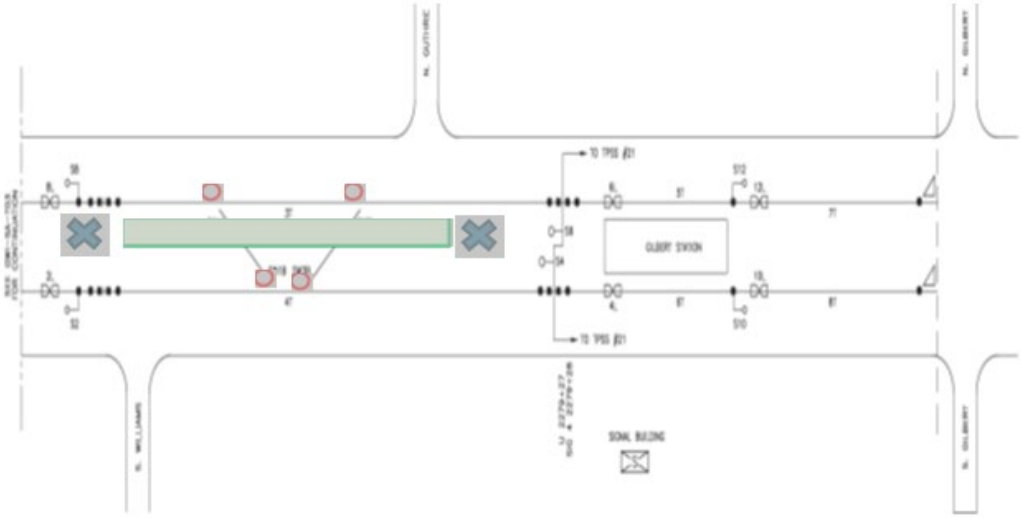
- OCC authorization required prior to entry.
- Absolute-stop signal protection in place during maintenance.
- Tail Track treated as active controlled territory.
- Safe Zone limited to adjacent unoccupied track.
- Increased vigilance and lookout use near Horne Roundabout.

Note: All switches are OCC-controlled electric turnouts. Manual operation requires explicit OCC authorization under RWP protection.



Stapley Dr. Station
Station

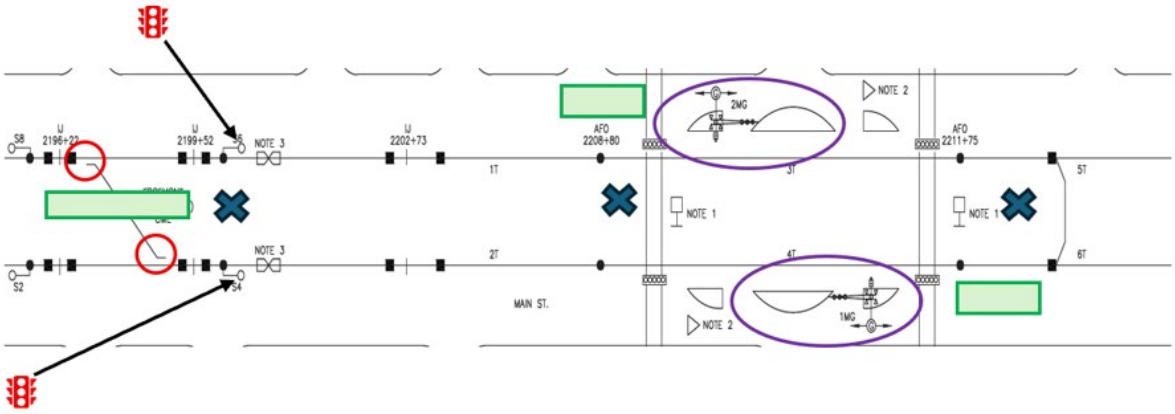
Gilbert Rd.



D.5 HORNE ROUNDABOUT EDGEMONT CROSSOVER







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APPENDIX E – BL-A-2, Edgemont to Dobson

Blue Line (A), Line Section 2, BL-A-2 Edgemont to Dobson

E.1 SECTION OVERVIEW

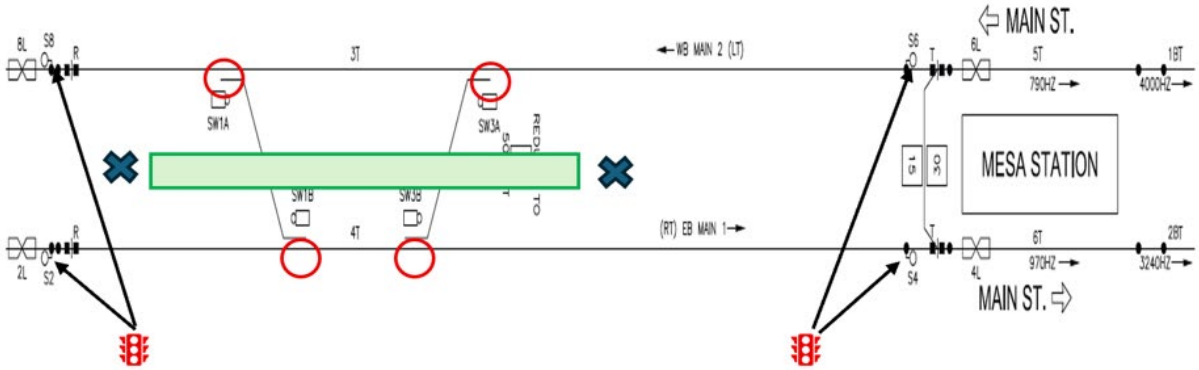
Locations: Hibbert Interlocking • Date Interlocking • Longmore Pocket • Dobson Interlocking
Line: Blue Line (A Line) – Central Mesa Section
Platforms:

- Mesa Dr / Main St – Eastbound / Westbound
- Center St / Main St – Eastbound / Westbound
- Country Club Dr / Main St – Eastbound / Westbound
- Alma School Rd / Main St – Eastbound / Westbound
- Sycamore St / Main St – Eastbound / Westbound

Track Type: Double-track alignment featuring primarily straight geometry with moderate curvature near the Longmore pocket-track area.

HIBBERT INTERLOCKING

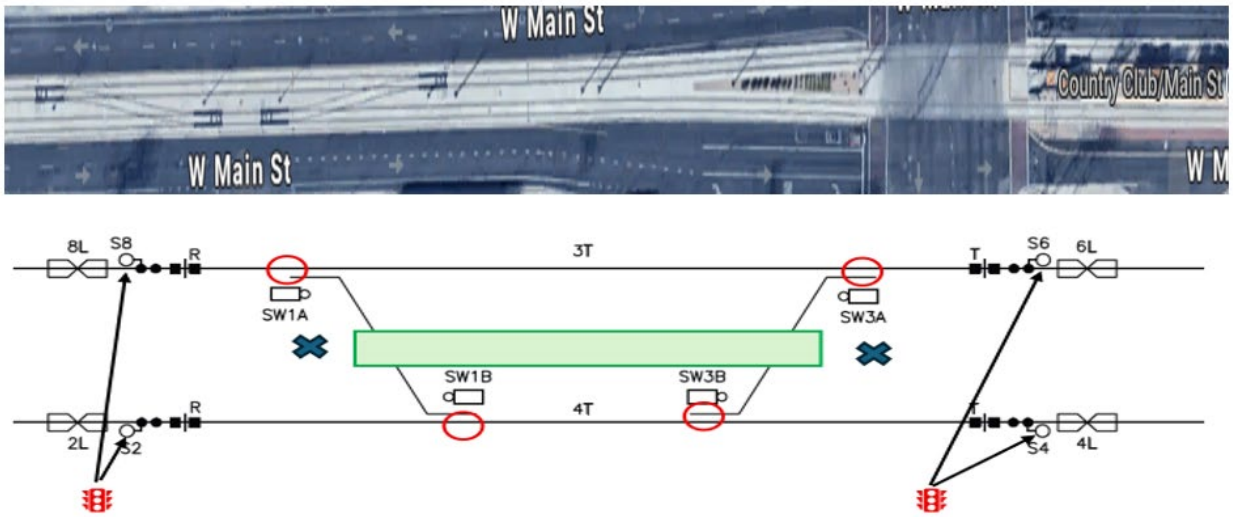




Crossover: Hibbert (Main Street & Hibbert Street)

Switch ID	Track	Description / Function
1A	Track 1	Facing-point crossover switch from Track 1 to Track 2 (eastbound direction).
1B	Track 2	Trailing-point crossover switch paired with 1A for westbound movements back to Track 1.
3A	Track 1	Trailing-point switch completing crossover from Track 1 to Track 2.
3B	Track 2	Facing-point switch paired with 3A for Track 2 to Track 1 alignment.

DATE CROSSOVER

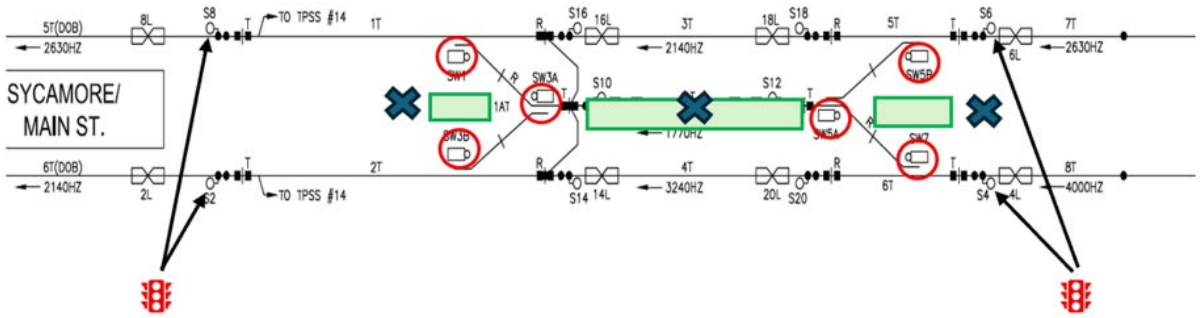


Crossover: Date (Main Street & Date Street)

Switch ID	Track	Description / Function
1A	Track 1	Facing-point crossover switch from Track 1 to Track 2 (eastbound direction).
1B	Track 2	Trailing-point crossover paired with 1A for westbound return movements.
3A	Track 1	Trailing-point switch completing crossover from Track 1 to Track 2.
3B	Track 2	Facing-point crossover paired with 3A for Track 2 to Track 1 alignment.

LONGMORE CROSSOVER

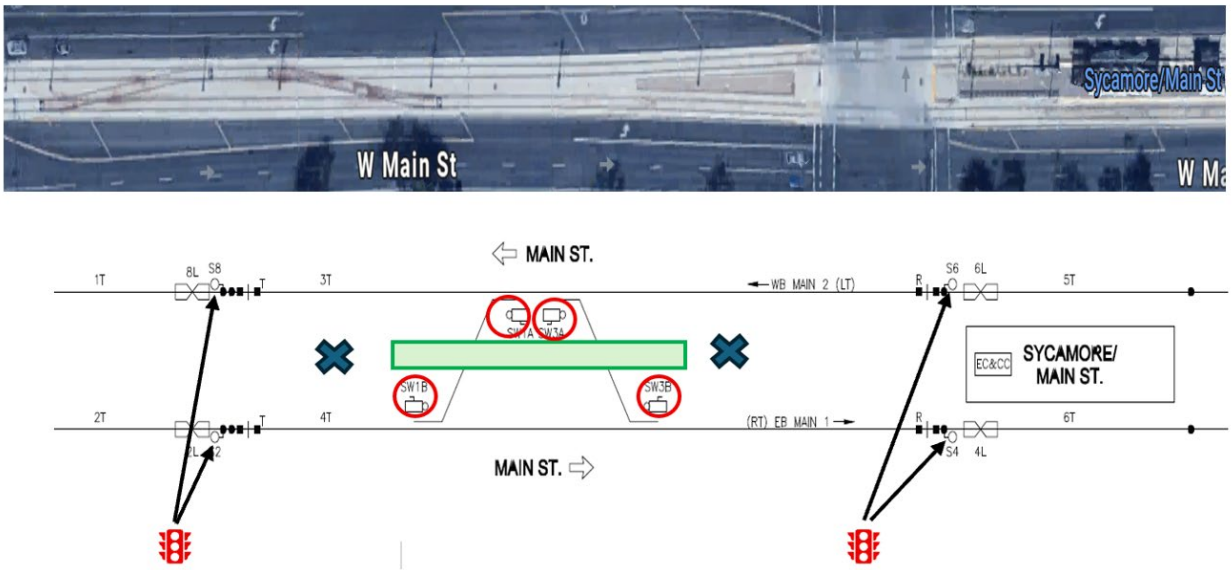




Crossover: Longmore (Main Street & Longmore Avenue)

Switch ID	Track	Description / Function
1	Track 1	Facing-point mainline switch providing crossover access from Track 1 to Track 2 (eastbound).
3A	Track 1	Pocket-track switch allowing entry from Track 1 into the center pocket track (east end connection).
3B	Track 2	Trailing-point crossover switch paired with 1 for westbound movements returning to Track 1.
5A	Track 1	Pocket-track switch allowing exit from pocket track to Track 1 (west end connection).
5B	Track 2	Trailing-point crossover switch paired with 7 for Track 2 to Track 1 alignment.
7	Track 2	Facing-point mainline switch providing crossover access from Track 2 to Track 1 (westbound).

DOBSON CROSSOVER



Crossover: Dobson (Main Street & Dobson Road)

Switch ID	Track	Description / Function
1A	Track 1	Facing-point crossover switch from Track 1 to Track 2 (eastbound direction).
1B	Track 2	Trailing-point crossover switch paired with 1A for westbound movements returning to Track 1.
3A	Track 1	Trailing-point crossover completing Track 1 to Track 2 alignment.
3B	Track 2	Facing-point crossover paired with 3A for Track 2 to Track 1 movements.

E.2 WORK ACTIVITY DESCRIPTION

This section includes active mainline track segments and crossover locations where multiple departments perform inspection, maintenance, and troubleshooting activities under full Roadway Worker Protection (RWP) coverage.

The alignment primarily consists of tangent (straight) track segments that provide adequate physical clearance for train operations. However, roadway workers must occupy only designated safe zones on adjacent unoccupied tracks during field activities. Train movements occur frequently in both eastbound and westbound directions, requiring continuous situational awareness, two-way OCC communication, and strict adherence to established RWP access and protection procedures.

E.3 INTERLOCKING AND POCKET PROTECTION PROCEDURES

Hibbert – Date – Longmore – Dobson are controlled interlockings governed by OCC. Protection and routing within this section follow the same operational control principles as BL-A-1:

- OCC authorization is required before track entry.
- All switches are electrically controlled and remotely aligned.
- Operators are held at the preceding platform until OCC confirms route clearance.
- Red aspects serve as absolute stop protection indicating maintenance occupancy.

The Longmore pocket track may be used for train storage or turnback's. All movements into or out of the pocket require OCC approval, confirmation of switch correspondence, and clear communication with maintenance crews on site.

E. 4 HAZARD AWARENESS SUMMARY

Hazard	Risk Description	Mitigation / Control
Dual train approach	Simultaneous eastbound/westbound movements reduce clearance awareness.	Assign lookout and maintain continuous OCC contact before movement authorization.
Pocket track misalignment	Improper switch position during entry/exit.	OCC to verify indication; visual confirmation by signal or track personnel before movement.
Vehicular proximity near Longmore	Adjacent street traffic poses added hazard during access.	Use spotters, high-visibility PPE, and channelized cone delineation.
Multiple interlockings within short distance	Increased coordination complexity between crews.	Stagger work limits; OCC to track simultaneous work authorizations.

Summary of Protection Controls

- OCC authorization required prior to entry.
- Absolute-stop protection via red aspect during maintenance.
- Pocket track and interlockings treated as active controlled territory.
- Safe zones limited to unoccupied track or defined clearance area.
- Increased vigilance required near Longmore and street-adjacent platforms.

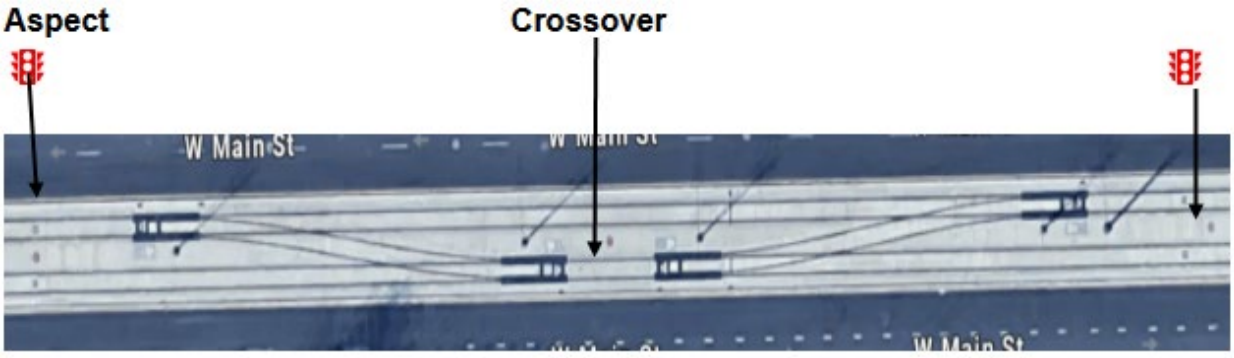
E.5 CROSSOVERS

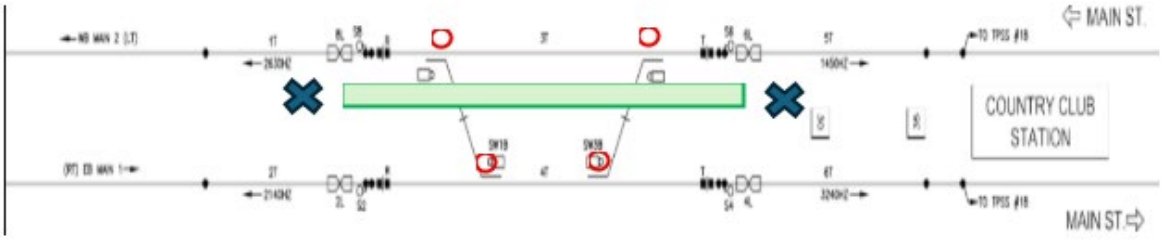
E.5.1 HIBBERT CROSSOVER



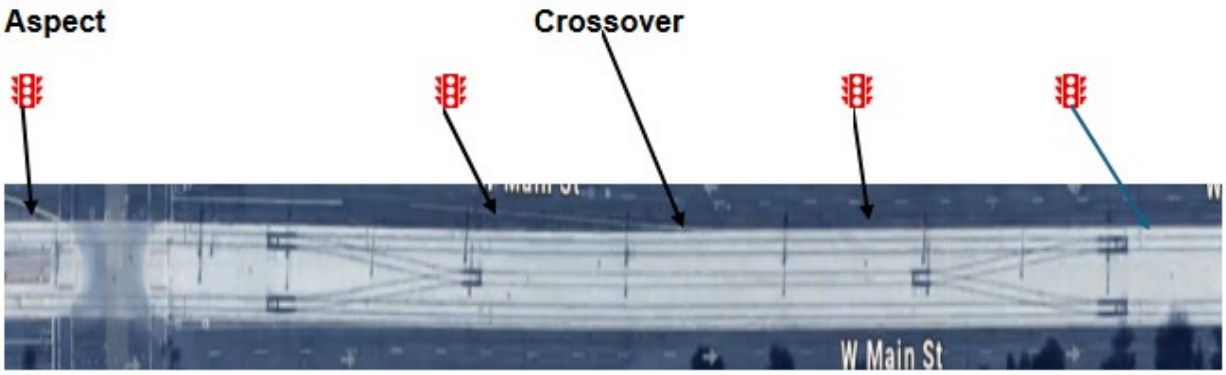
E.5.2 DATE CROSSOVER



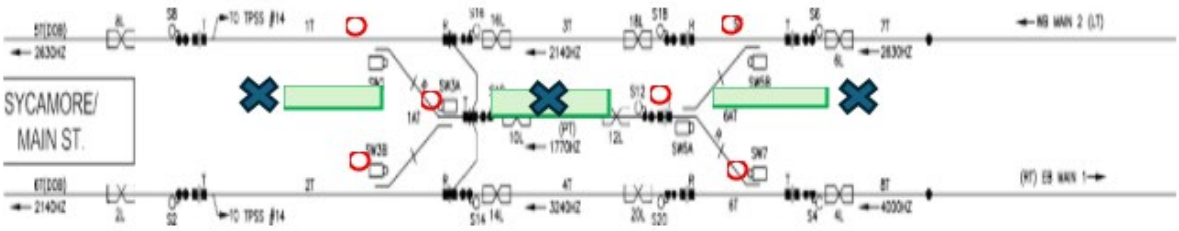

Aspect
Crossover
W Main St
W Main St
Alma School Station
Station
Country Club


MAIN ST
COUNTRY CLUB
STATION
MAIN ST





Sycamore Main ← ----------→ Alma School Main Station



E.5.3 DOBSON CROSSOVER





Price 101 Apache Station ⟷ Alma School Main Station



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APPENDIX F – BL-A-3, Dobson to Tempe Bridge

Blue Line (A) Line Section 3, BL-A-3 Dobson to Tempe Bridge

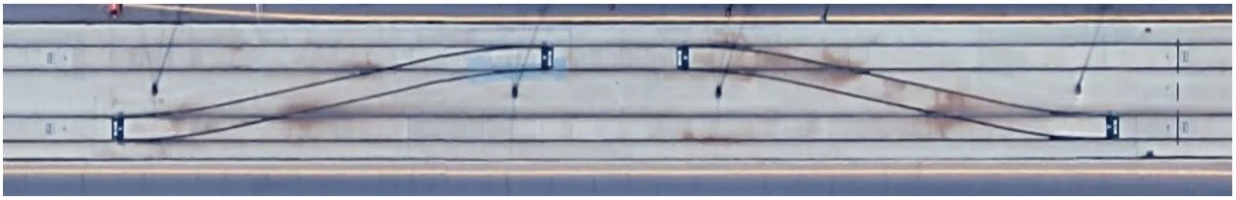
F.1 SECTION OVERVIEW

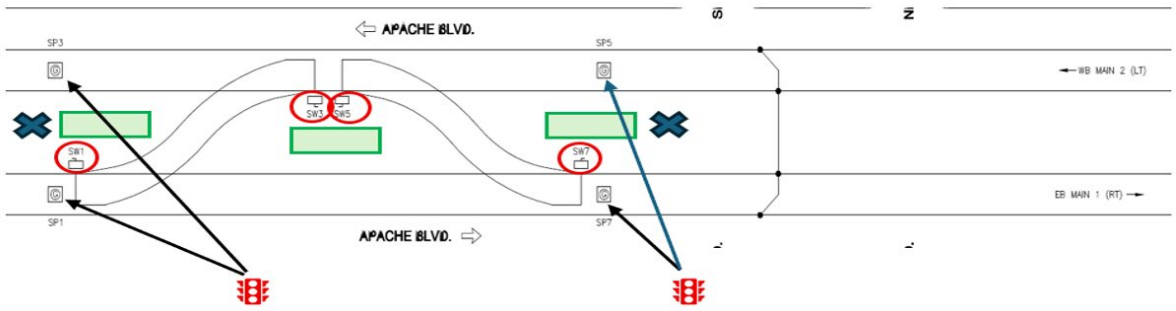
Locations: River Manual Crossover • Dorsey Interlocking • Mill Pocket • Tempe Town Lake Bridge
Line: Blue Line (A Line) – Tempe Section
Platforms:

- Sycamore / Main St – Eastbound / Westbound
- Price Rd / Apache Blvd – Eastbound / Westbound
- Smith Rd / Apache Blvd – Eastbound / Westbound
- McClintock Dr / Apache Blvd – Eastbound / Westbound
- Dorsey Ln / Apache Blvd – Eastbound / Westbound
- Veterans Way / College Ave – Eastbound / Westbound

Track Type: Double-track alignment transitioning from tangent mainline to curved alignment approaching the Mill Avenue bridge, including one manual crossover and a pocket-track configuration at Mill Interlocking.

RIVER MANUAL CROSSOVER





Manual Crossover: River (Rio Salado Parkway & River Drive)

Switch ID	Track	Description / Function
1A	Track 1	Manual facing-point crossover switch from Track 1 to Track 2 (northbound direction).
1B	Track 2	Manual trailing-point crossover paired with 1A for southbound return moves.
3A	Track 1	Manual trailing-point switch completing the crossover from Track 1 to Track 2.
3B	Track 2	Manual facing-point crossover paired with 3A for Track 2 to Track 1 movements

DORSEY CROSSOVER



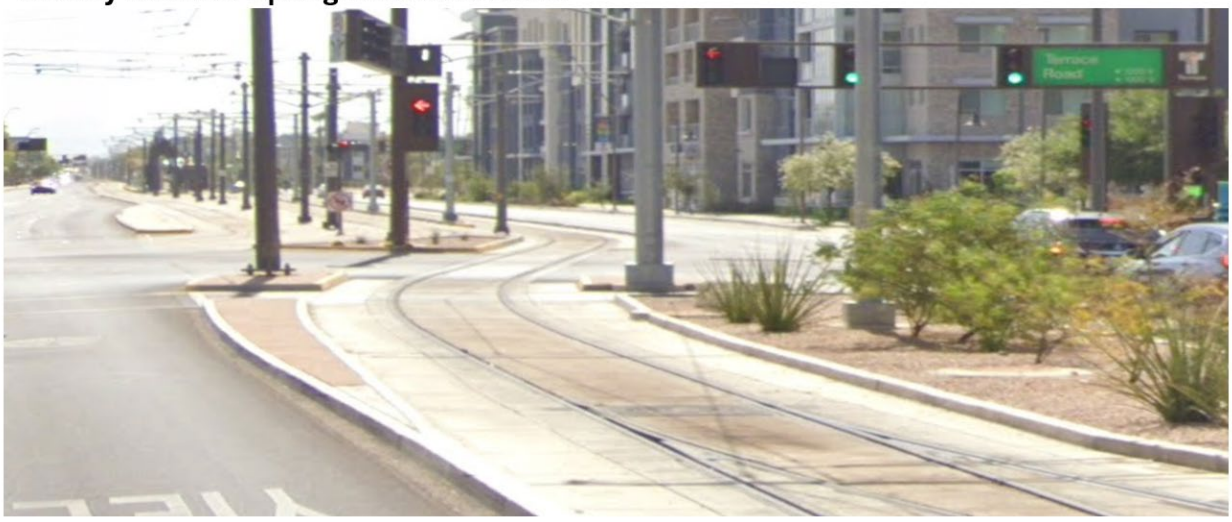




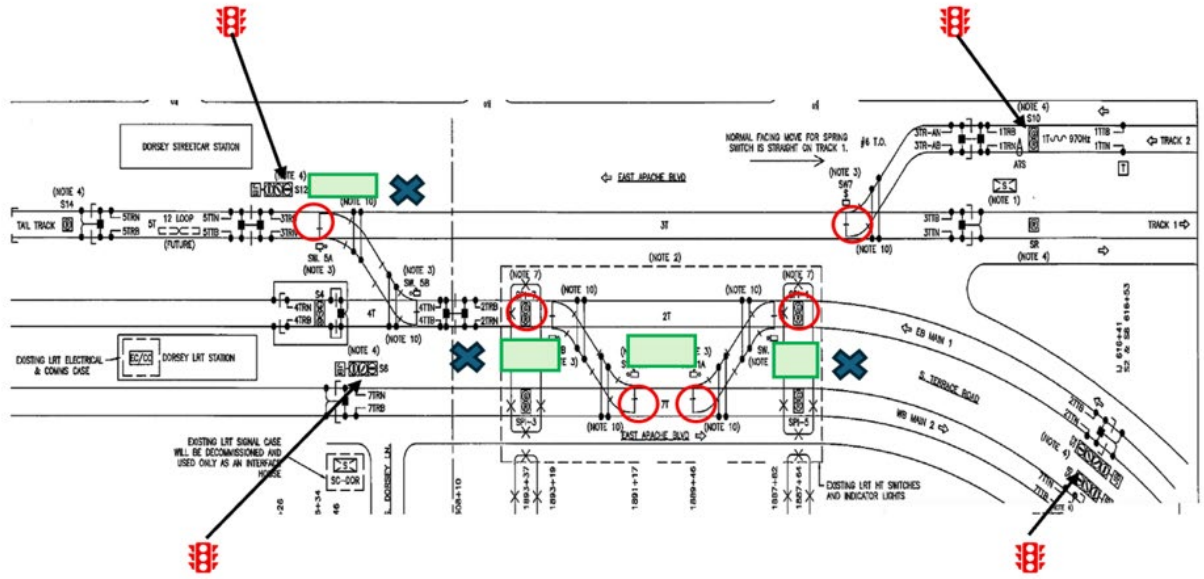


Dorsey Switch 7 Spring Switch - Streetcar

Dorsey Switch 7 Spring switch Streetcar







Crossover: Dorsey (Apache Blvd & Dorsey Lane)

Switch ID	Track	Description / Function
1A	Track 1	Facing-point crossover switch from Track 1 to Track 2 (eastbound direction).
1B	Track 2	Trailing-point crossover switch paired with 1A for westbound movements returning to Track 1.
3A	Track 1	Pocket-track switch allowing movement from Track 1 into center pocket or siding (east end connection).
3B	Track 2	Trailing-point crossover switch completes Track 2 to Track 1 crossover.
5A	Track 1	Pocket-track switch allowing exit from center pocket back to Track 1 (west end connection).
5B	Track 2	Facing-point mainline switch paired with 5A for routing between Track 2 and Track 1.

Crossover: Mill Pocket (Mill Avenue & Rio Salado Parkway)

Switch ID	Track	Description / Function

1A	Track 1	Facing-point crossover switch from Track 1 to Track 2 (eastbound direction).
1B	Track 2	Trailing-point crossover switch paired with 1A for westbound movements returning to Track 1.
3A	Track 1	Pocket-track switch allowing entry from Track 1 into the Mill pocket track (east connection).
3B	Track 2	Trailing-point crossover switch completing crossover from Track 2 to Track 1.
5A	Track 1	Pocket-track switch allowing exit from the Mill pocket track back to Track 1 (west connection).
5B	Track 2	Facing-point mainline switch paired with 5A for routing between Track 2 and Track 1.

Platforms:

Sycamore St & Main St	East / West
Price Rd & Apache Blvd	East / West
Smith Rd & Apache Blvd	East / West
McClintock Dr & Apache Blvd	East / West
Dorsey Ln & Apache Blvd	East / West
Dorsey Ln & Apache Blvd	East / West

Grade Crossing: University, Mission Palms, Macayo's, 1st & Ash

F.2 WORK ACTIVITY DESCRIPTION

This section includes active mainline segments, crossovers, and grade crossings extending through downtown Tempe. Multiple departments perform inspection, maintenance, and troubleshooting under full Roadway Worker Protection (RWP) coverage.

The alignment contains both tangent and curved segments with limited clearance near Mill Avenue and Tempe Bridge. Workers must occupy only designated safe zones and maintain continuous OCC coordination when on or near the trackway.
Frequent train operations in both directions and proximity to vehicular and pedestrian areas require heightened situational awareness, two-way radio communication, and adherence to all established RWP procedures.

F.3 INTERLOCKING AND POCKET PROTECTION PROCEDURES

River (Manual), Dorsey, and Mill are controlled or coordinated interlockings governed by OCC.

Protection protocols mirror those of BL-A-2:

- OCC authorization is mandatory before track entry.
- All switches must be confirmed in correspondence (visually manual, electrically for power).
- Operators are held at preceding platforms until OCC confirms route clearance.
- Red aspects provide absolute stop protection, indicating active maintenance occupancy.
- Pocket track movements at Mill require confirmation from both OCC and onsite personnel prior to switch operation.

F.4 HAZARD AWARENESS SUMMARY

Hazard	Risk Description	Mitigation / Control
Dual train approach	Simultaneous opposing movements reduce clearance awareness.	Assign lookout and maintain continuous OCC communication before authorization.
Manual switch handling (River)	Risk of misalignment or incomplete lock.	Verify manual switch position and ensure OCC acknowledgment before train movement.
Limited clearance on curves	Restricted sightlines at Mill and bridge approach.	Establish safe zones, use spotters, and maintain radio contact during movements.
Shared crossings with UPRR	Federal oversight and active freight movement nearby.	Coordinate with OCC and ensure FTA/UPRR protocols are followed before access.
Proximity to vehicle/pedestrian areas	Increased external hazards near Dorsey, Veterans Way, and Mill.	Use cones, barricades, and PPE; assign traffic control personnel when required.

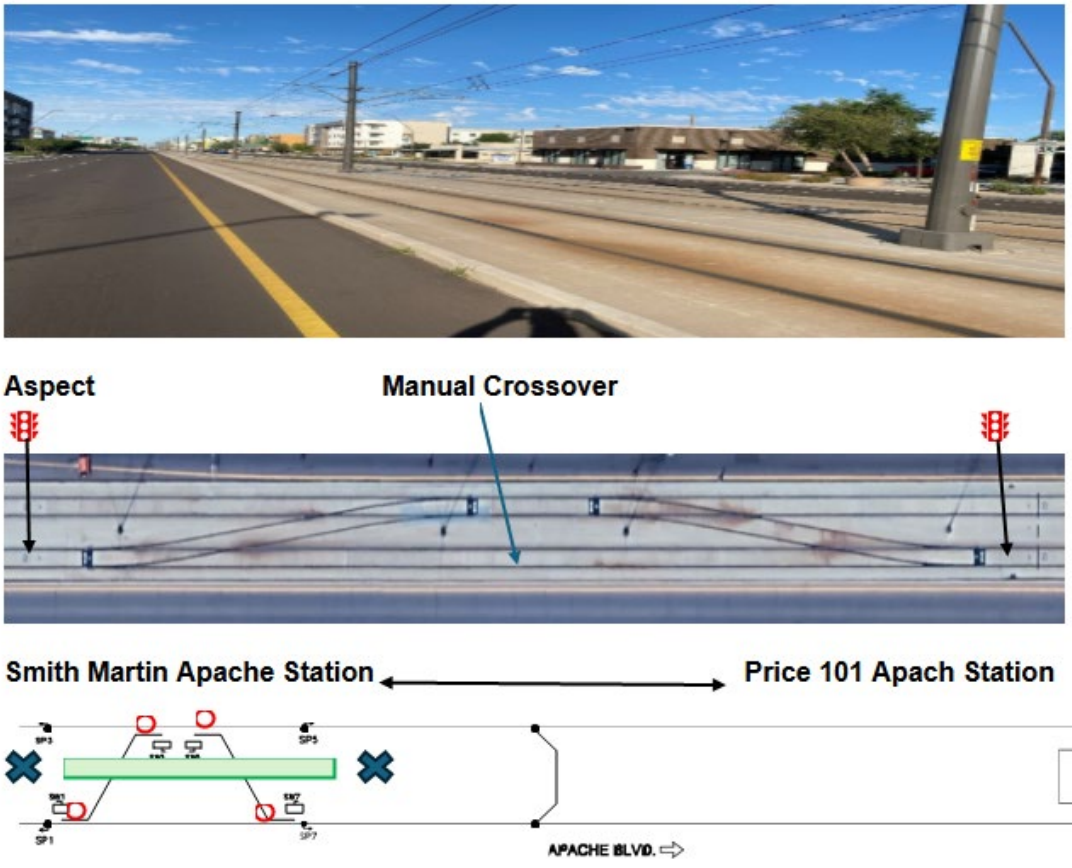
Summary of Protection Controls

- OCC authorization required prior to any entry or movement.
- Manual switches must be confirmed and locked in proper position.
- Absolute-stop protection enforced during maintenance.
- Safe zones restricted to designated clearance areas.

- Continuous radio contact required between field crews and OCC.
- Special caution near UPRR crossing and Tempe Town Lake Bridge.

F.5 PHOTOS/GRAPHICS

F.5.1 RIVER MANUAL CROSSOVER

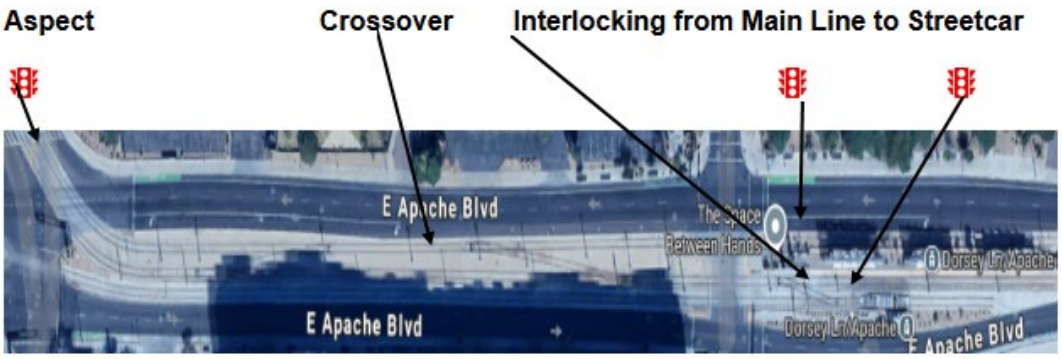


F.5.2 DORSEY CROSSOVER







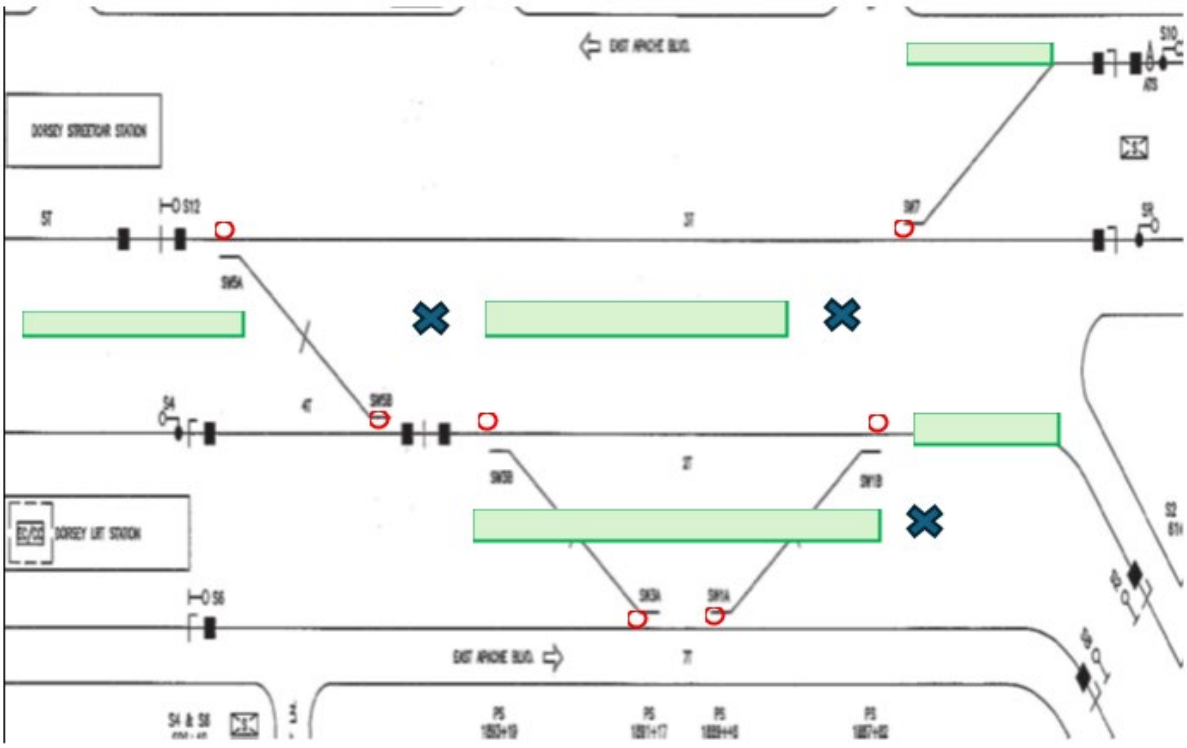


University and Rual Station ⟷ Dorsey Station



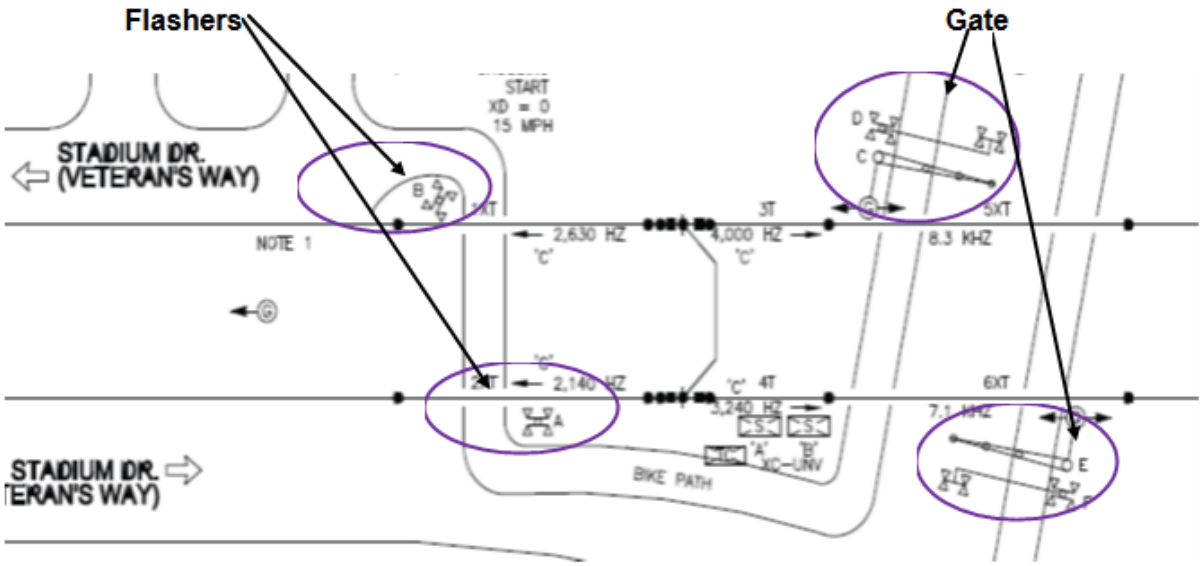
Spring switch 7 at Dorsey for Streetcar

Spring Switch 7 at Dorsey for Streetcar



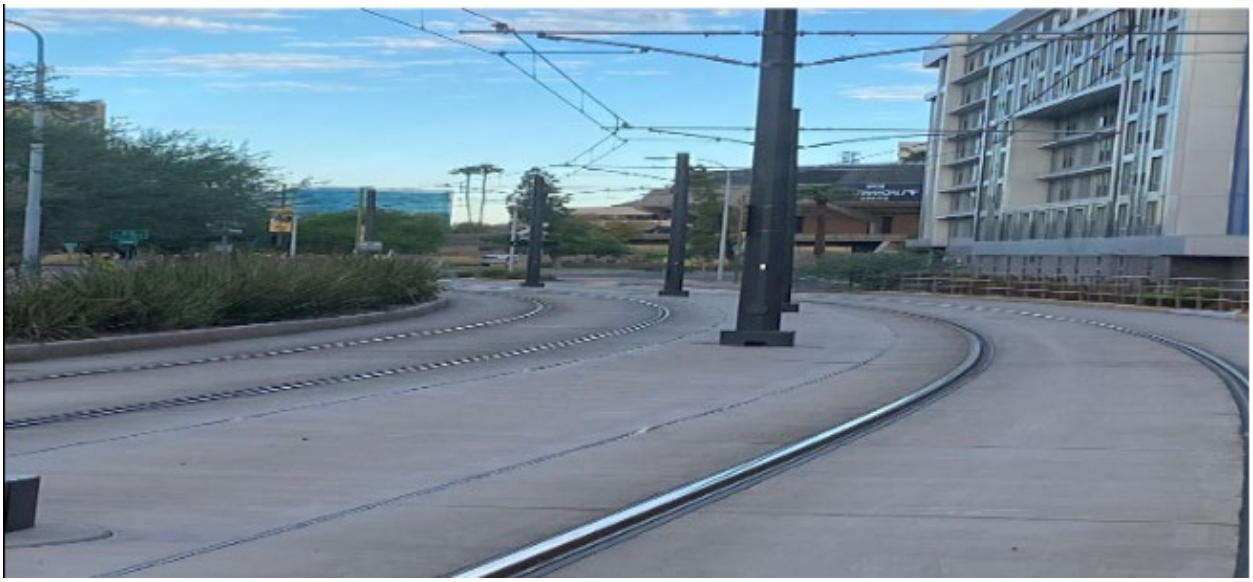
F.5.3 UNIVERSITY GRADE CROSSING



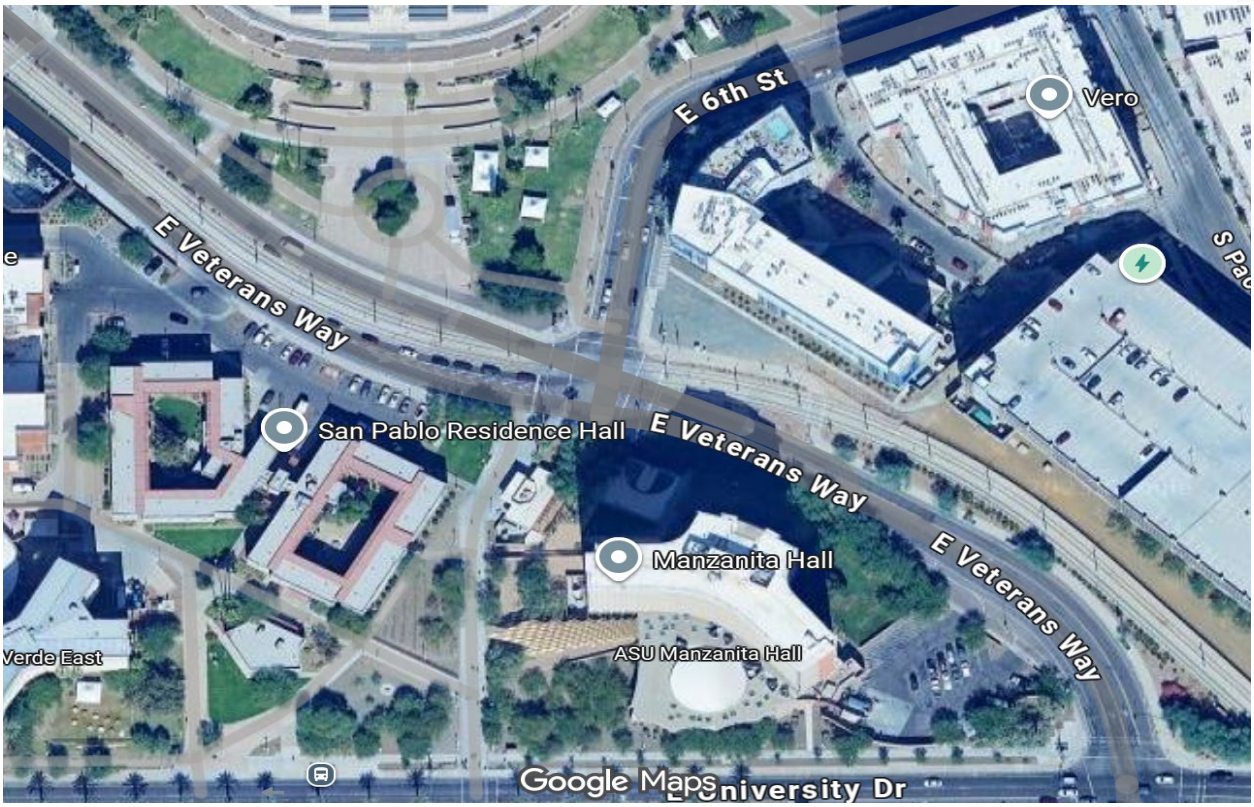


Veterans Way Cruve








E 6th St
Vero
E Veterans Way
San Pablo Residence Hall
E Veterans Way
Manzanita Hall
E Veterans Way
ASU Manzanita Hall
Google Maps



F.5.3.1 Restricted Visibility Zone – Veterans Way Curve (ASU Area)

This segment of alignment along **E. Veterans Way between S. Packard Dr. and E. 6th St.** presents **restricted visibility** conditions due to multiple geometric and environmental factors:

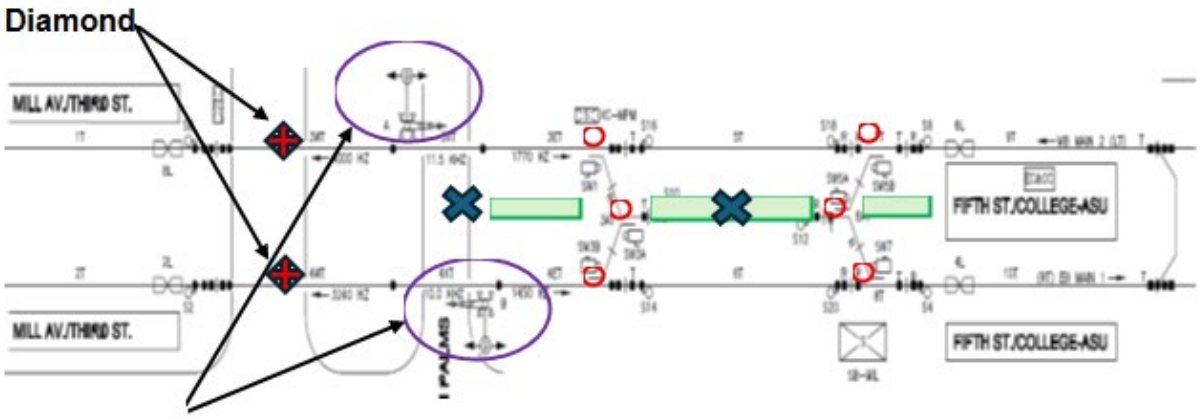
- **Tight Curvature and Reverse Alignment:**
  The track alignment transitions through a compound curve between the 6th Street curve and the Veterans Way straightaway, limiting operator sight distance in both directions.
- **Elevated Structures and Building Massing:**
  Adjacent multi-story structures (Vero Apartments, San Pablo Hall, and Manzanita Hall) create physical obstructions to line-of-sight for both train operators and roadway workers positioned near the right-of-way.
- **Mixed Traffic and Pedestrian Density:**
  The area experiences high pedestrian volumes from ASU residence halls and nearby parking garages, especially during class transition periods and events, increasing the need for heightened situational awareness.
- **Track Curve-Related Sound Reflection:**
  Due to the curve and nearby hard surfaces, the sound of approaching LRVs can be distorted or delayed, reducing the effectiveness of audible warning cues for roadway workers

F.5.4 MILL POCKET



F.5.5 MISSION PALMS GRADE GROSSING





Mission Palms Grade Crossing

F.5.6 MACAYO'S CURVE

Macayo's Curve



Diamond Streetcar Crosses Mainline

Quit Zone

F.5.6.1 Quiet Zone – Ash Avenue / 3rd Street Curve (Tempe)

Location: Between W. 3rd Street and Ash Avenue curve adjacent to the ADP building and Ash Avenue parking structure.
Line: Tempe Streetcar – Downtown Tempe alignment.

Operational Environment

Quiet Zone Designation:
This segment operates within an FRA-approved Quiet Zone, where routine train horn use is restricted to minimize noise impact on surrounding residential and commercial properties. Train operators rely on bell-only operation, except in emergency or special circumstances (e.g., imminent hazard or roadway worker on track).

Alignment Characteristics:
The alignment forms a tight S-curve transitioning between W. 3rd Street and Ash Avenue. Limited sightlines are caused by:

- Building obstructions (ADP Tower and Ash Avenue Garage).
- Track curvature creates restricted forward visibility.
- Tree coverage and street furniture near the right-of-way.

Track Configuration:

- Single-track street-running segment.
- Embedded rail in a shared roadway environment with vehicle and pedestrian interfaces.
- Multiple signalized intersections and pedestrian crosswalks within 300 feet.

Risk Factors

Hazard Type	Descriptions	Contributing Factors
Reduced Auditory Warning	Absence of routine horn use may limit pedestrian or driver awareness of approaching LRVs	FRA Quiet Zone compliance limits audible alerts
Restricted Sight Distance	Curvature and roadside obstructions reduce operator and roadway worker visibility	S-curve geometry, adjacent parking garage, and tree canopy
Pedestrian Crossflow	High foot traffic from nearby businesses and parking structures	ADP building, downtown access paths, and nightlife venues
Confined Workspace	Narrow trackway and minimal clearance from curbs and roadway	Embedded single-track within shared right-of-way

Recommended Safety Controls

OCC Coordination:
All maintenance or inspection activities must be reported to OCC with explicit mention of the Quiet Zone to ensure appropriate train handling and bell-only operations.

Enhanced Visual Warning:
Use portable flashing beacons, flags, or cones when personnel are in or near the alignment to compensate for reduced auditory cues.

Watchperson Requirement:
A qualified lookout is mandatory due to restricted visibility and reduced horn protection.

Restricted Hours for Work:
When feasible, schedule activities during low-traffic periods (e.g., early morning or late evening) to minimize pedestrian and vehicular conflicts.

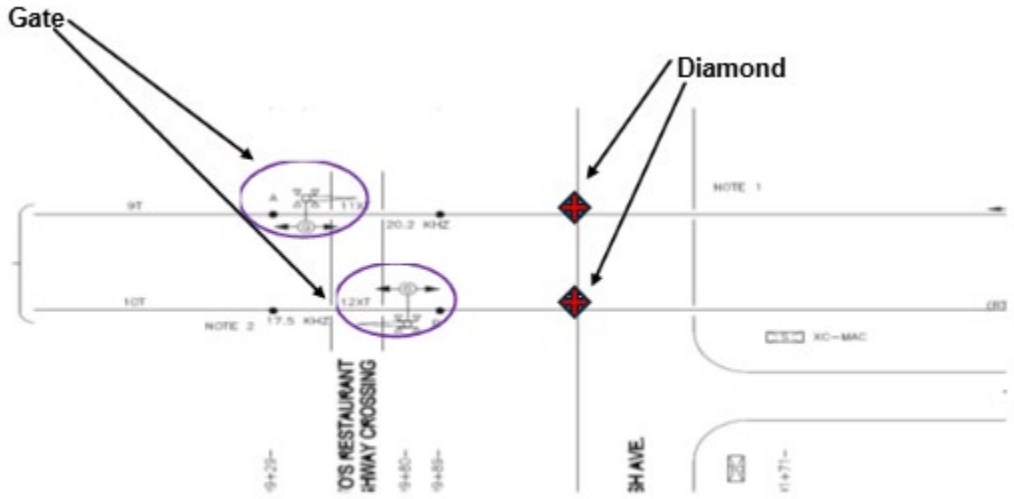
Continuous Communication:
Maintain open radio contact with OCC and adjacent intersections during all on-track movements.

Key Takeaway
This location combines Quiet Zone restrictions, tight curvature, and high pedestrian exposure, requiring maximum situational awareness, visual alerting devices, and strict RWP compliance during any roadway worker activity.

F.5.7 MACAYO'S CROSSING







F.5.8 1ST STREET / ASH AVE CROSSING - THIS CROSSING IS REGULATED BY THE FRA



Looking West at 1st St and Ash Crossing



1st Avenue / Ash Avenue Crossing – FRA / FTA Shared Regulated Crossing

Location: W. 1st Avenue & Ash Avenue, Tempe
Line: Tempe Streetcar Alignment
Crossing Type: At-grade signalized crossing with shared gate control systems

Crossing Overview
This location represents a shared rail-grade crossing jointly regulated by the Federal Transit Administration (FTA) and Federal Railroad Administration (FRA).

The crossing's warning system and gate mechanisms are interconnected with the adjacent Union Pacific Railroad (UPRR) freight crossing, creating a combined control environment requiring coordination between Valley Metro, UPRR, and City of Tempe Traffic Operations.

Key features include:
Active flashing-light signals, audible bells, and automatic gate arms shared between the UPRR and Tempe Streetcar circuits.
Dual regulatory oversight requiring compliance with both FTA Roadway Worker Protection (RWP) and FRA 49 CFR Part 234 requirements.
Street-running embedded rail integrated into a multimodal corridor with adjacent vehicular and pedestrian movements.

F.5.8.1 Safety and Operational Considerations

- Joint Regulatory Interface:
  Any roadway worker presence within or adjacent to this crossing requires prior coordination with both Operations Control Center (OCC) and UPRR Dispatch. Shared circuits mean gate activation timing is dependent on freight and streetcar detection logic.
- Automatic Warning System Integration:
  The warning system operates under interconnected approach circuits; unauthorized occupation can cause false activations or suppress required warnings for freight trains.
- Limited Clearance and Obstructions:
  The gate swing envelope, adjacent traffic lanes, and nearby structures limit workspace. Personnel must remain clear of moving gates and always maintain full situational awareness.
- Urban Visibility Constraints:
  Office buildings, landscaping, and curvature near the intersection reduce line-of-sight visibility for both operators and workers, increasing the need for active lookout protection

Recommended Controls

Control Measures	Descriptions
Joint Authorization	Secure joint clearance from OCC and UPRR Dispatch before entering the work zone or interfering with warning circuits
Exclusive Track Occupancy (ETO)	Establish ETO limits when performing inspection or maintenance affecting active control equipment.
Flagger / Lookout Protection	Deploy qualified watchpersons on both east- and westbound approaches to provide train-approach warnings.
Restricted Work Zone	Keep all personnel, tools, and vehicles outside gate arm travel paths and clear of active pedestrian zones
Pre-Job Briefing	Conduct site-specific briefing outlining FRA / FTA jurisdiction, OCC communication protocols, and gate safety boundaries
Whistle Board	Notify employees train is on approach

Summary

The 1st Avenue / Ash Avenue Crossing is a critical interface between Valley Metro operations and Union Pacific Railroad. Due to its shared activation system and dual regulatory oversight, all work requires precise communication, coordinated authorization, and enhanced roadway worker protection measures to maintain compliance and ensure safety

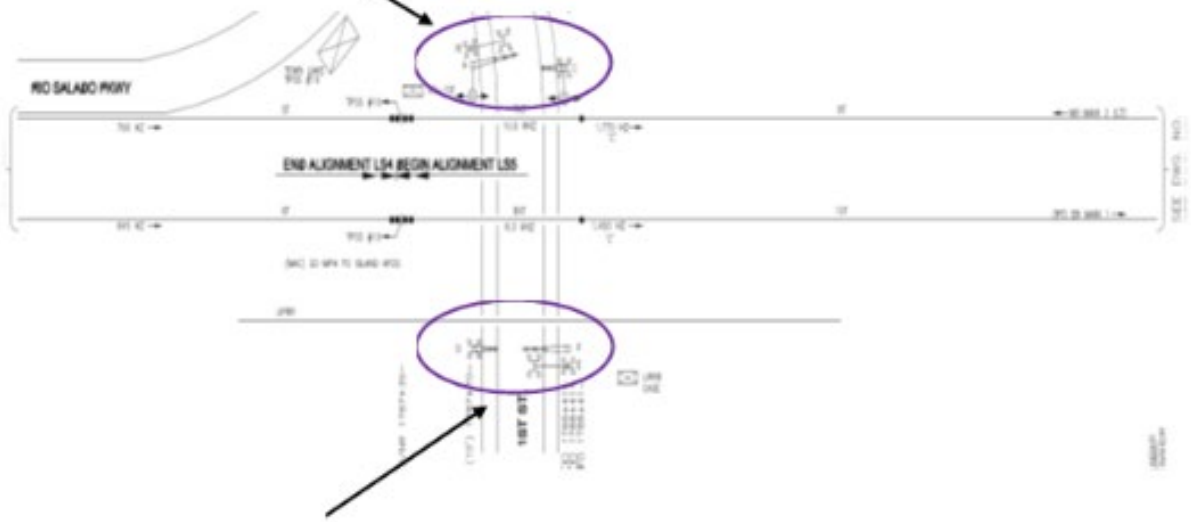
Looking East from 1st & Ash Crossing Down Tempe Bridge





*This location is a shared crossing with Union Pacific Railroad and falls under the jurisdiction and regulatory authority of the Federal Transit Administration (FTA).

Valley Metro Gate



Union Pacific Crossing

Tempe Town Lake Bridge

F.5.9 TEMPE TOWN LAKE

F.5.9.1 Bridge

Looking West



Looking East



F.5.9.2 Bridge Approach; Underpass

Location: West side of Tempe Town Lake Bridge, under the deck structure adjacent to Mill Avenue
Line: Blue Line (A Line) – Tempe Bridge Segment
Section Type: Enclosed underpass and bridge approach

Area Overview

This section consists of a dual-track concrete underpass and bridge approach beneath the deck structure connecting Mill Avenue to the Tempe Town Lake bridge span.

The area transitions from tunnel-like enclosure to open-air bridge deck and contains multiple expansion joints requiring periodic inspection and lubrication by track maintenance personnel.

Key characteristics include:
Confined, low-clear environment with limited ambient lighting and restricted escape routes.
Curved alignment and gradient affecting operator visibility and safe walking distance.
Noise reflection and echo within the structure, reducing the effectiveness of audible cues from approaching trains.
Proximity to water and structural expansion elements, which require specialized maintenance procedures.

Track Maintenance Activity

Typical roadway worker activities within this section include:

- Inspection and lubrication of bridge expansion joints to prevent noise, friction, and mechanical wear.
- Track fastener and rail seat inspection within the enclosed tunnel and transition zone.
- Drainage and walkway cleaning due to moisture accumulation and limited airflow.

These tasks require roadway workers to walk along the protected walkway adjacent to the rail alignment under the structure, maintaining direct communication with the Operations Control Center (OCC).

Hazards and Environmental Risks

Hazard Type	Description	Contributing Factors
Restricted Clearance	Limited headroom and lateral space; restricted ability to step clear during train movements.	Structural design of the deck tunnel.
Reduced Visibility	Low lighting and shadows from structure columns obscure sightlines.	Enclosed concrete ceiling and support beams.
Auditory Distortion	Sound reflections may cause misjudgment of train distance.	Tunnel acoustics and noise echo.
Slippery or Uneven Walking Surface	Potential moisture from expansion joint maintenance or condensation.	Proximity to lake and enclosed airflow.
Limited Egress Options	Only two access points at north and south tunnel ends.	Confined layout

Recommended Controls

Control Measure	Description
OCC Coordination	All access and track occupancy must be authorized by OCC prior to entry. Continuous communication required.
Train Approach Warning (TAW)	Qualified lookout stationed outside the tunnel at both north and south ends.
Lighting Equipment	Workers must use portable, intrinsically safe lighting to enhance visibility.
High-Visibility Apparel	ANSI Class 3 reflective PPE mandatory due to low light and restricted space.
Work Hours	Prefer early morning or daylight hours to reduce shadow hazards and glare transitions.
Fall / Slip Mitigation	Maintain clear walking path and avoid standing water or grease overspill.

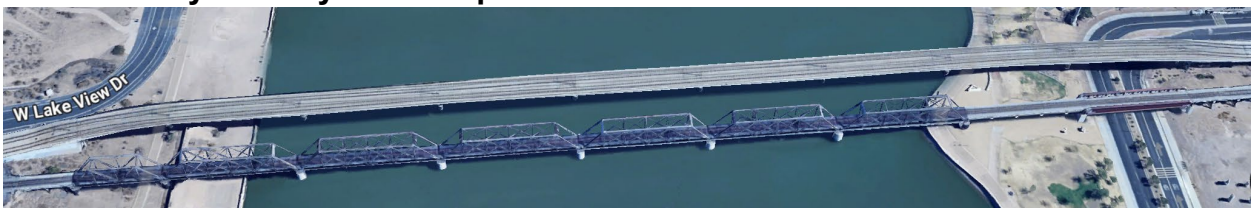
Summary

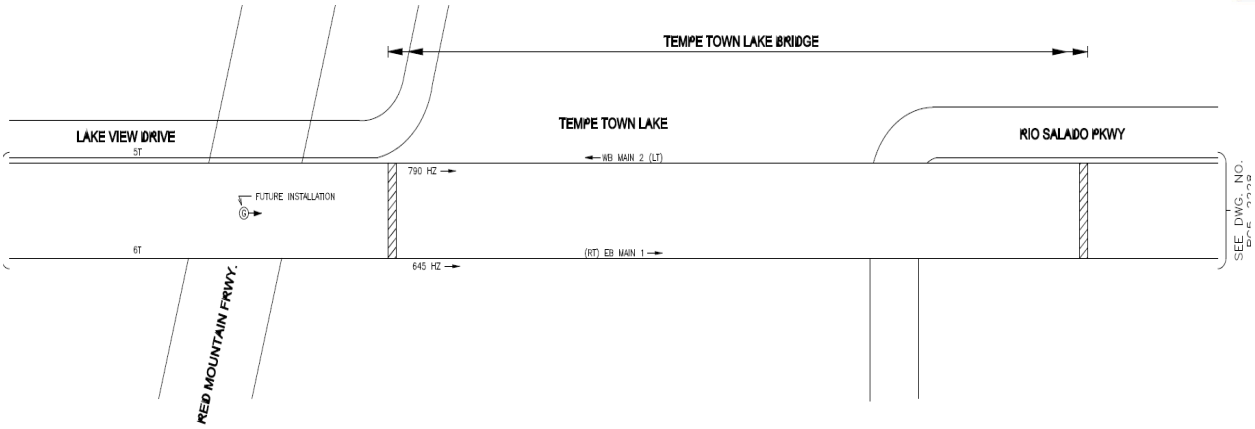
The Tempe Town Lake Underpass and Bridge Approach represent one of the system's most confined and acoustic challenging maintenance environments.

Track inspectors performing expansion joint lubrication or walkway inspections must maintain continuous OCC communication, utilize portable lighting, and coordinate dual lookout protection to ensure safe operations.

View facing north toward Tempe Town Lake Bridge showing bridge approaching trackway and transition to open-air alignment.

View facing south under the deck structure showing confined track alignment and side walkway used by track inspectors.





F.5.9.3 Tempe Town Lake Bridge – Midspan Safe Zone

Location: Between Red Mountain Freeway and Rio Salado Parkway (Tempe Town Lake Bridge Span)
Line: Blue Line (A Line) – Bridge Segment
Track Configuration: Dual-track, open bridge structure with center walkway

Area Overview

The Tempe Town Lake Bridge spans approximately 790 Hz (eastbound) and 645 Hz (westbound) track circuit segments across the lake. This structure supports two mainline tracks (EB Main 1 and WB Main 2) with a central raised walkway designated as a protected Safe Zone for roadway worker access and emergency progress.

The bridge serves as a critical connection between the Rio Salado Parkway alignment to the east and Lake View Drive / Red Mountain Parkway to the west.

Due to its open-water exposure, the area is subject to wind, glare, and environmental noise, requiring careful coordination for inspection and maintenance activities.

Safe Zone Description

The Safe Zone is located between the two mainline tracks on the elevated bridge deck. It provides a continuous, protected walkway with sufficient lateral clearance to allow roadway workers to safely stand clear of passing trains under normal operating conditions.

Key Features:
Continuous concrete walkway separating WB Main 2 and EB Main 1 tracks.
Elevated safety railing on both sides of the bridge structure.
Adequate lateral clearance for personnel to stand clear within dynamic envelopes when trains pass on either track.
Designated access from both east and west bridge approaches under OCC authorization.

Operational Hazards

Hazard Type	Description	Contributing Factors
High Wind Exposure	Gusts across the open water can affect stability or balance of personnel.	Bridge elevation over Tempe Town Lake.
Environmental Noise	Wind and water noise can reduce ability to hear train approach.	Ambient environmental conditions.
Restricted Access Points	Entry/exit only at Lake View Dr. (west) and Rio Salado Pkwy (east).	Limited egress options.
Limited Cover	No overhead shelter; direct exposure to heat and sun.	Bridge deck design.
Narrow Walkway	Central Safe Zone must not be obstructed by tools or materials.	Clearance requirements for dynamic envelope.

Recommended Controls

Control Measure	Description
OCC Authorization	Required before entering bridge alignment; specify “Tempe Bridge – Midspan Safe Zone.”
Two-Person Minimum	Personnel must work in pairs with continuous radio contact.
Weather Assessment	Check wind advisories or excessive heat warnings prior to entry.
Portable Radios & PPE	Use high-visibility Class 3 apparel and secure radios/hard hats against wind gusts.
Material Handling Restrictions	No loose or lightweight equipment permitted due to risk of falling debris.
Designated Safe Zone Use Only	Remain strictly within central walkway during train movements.

Summary

The Tempe Town Lake Bridge Midspan Safe Zone provides a designated protected walkway for roadway worker protection between active mainline tracks.

All work must be authorized by OCC, conducted by qualified employees, and performed under strict wind and weather protocols to maintain safety in this elevated, high-exposure environment.

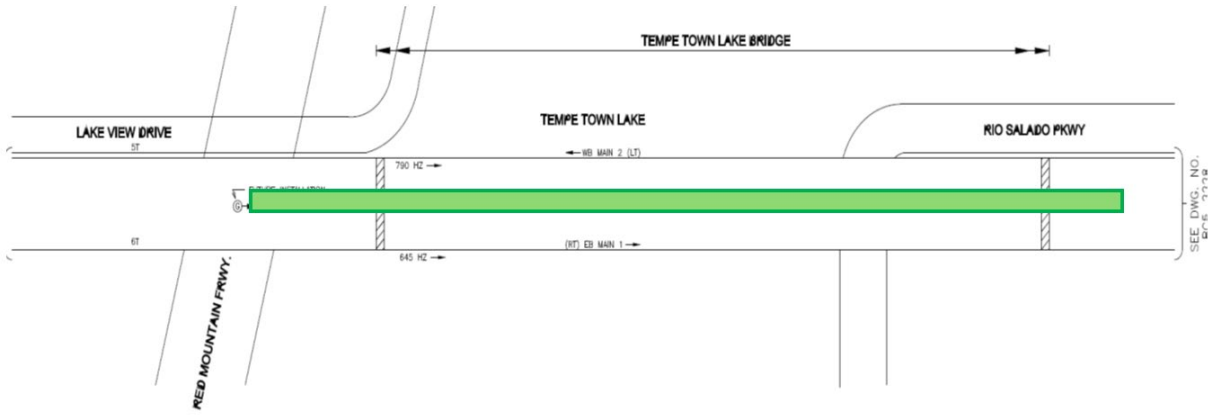


Figure 5.13.5-A: Track schematic showing EB Main 1 and WB Main 2 alignment with designated Safe Zone between tracks (Tempe Town Lake Bridge).

Looking East from Center, Controlled by flashers

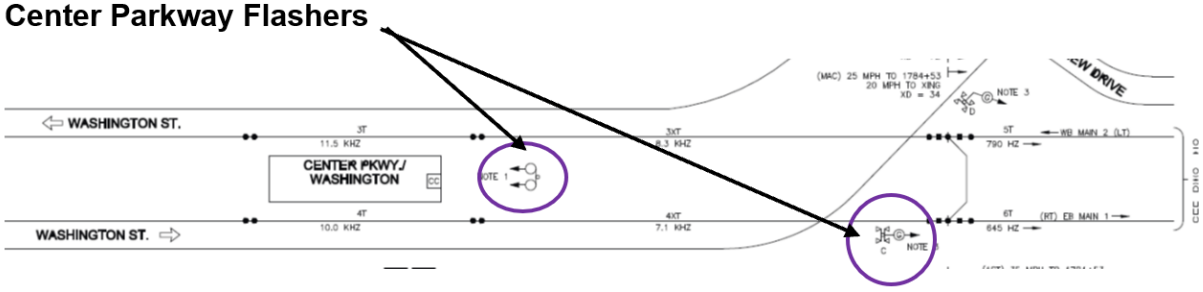


Center Parkway Flashers





Center Parkway Flashers



■ ■ ■

APPENDIX G – BL-A-4, Tempe Bridge to 27th Street

Blue Line (A), Line Section 4, BL-A-4, Tempe Bridge to 27th Street

G.1 SECTION OVERVIEW

Locations: Center Parkway • Yard Entrance • 44th Sky Train • 38th St • 27th St Interlocking
Line: Blue Line (A Line) – Phoenix Section
Platforms:

- Center Parkway / Washington St – EB / WB
- 44th St / Sky Train – EB / WB
- 38th St / Washington St – EB / WB
- 24th St / Jefferson St – EB / WB
- 12th St / Jefferson St – EB / WB
- 3rd St / Washington St – EB / WB
- 27th Ave / Jefferson St – West Terminal

Track Type: Dual-track alignment transitioning from bridge approach to urban median running, with crossovers at Yard Entrance and 27th St Interlocking.

G.1.1 CROSSOVER: YARD ENTRANCE (51ST STREET – 54TH PLACE)

Switch	Track	Description / Function
1A	Track 1	Facing-point switch allowing movement from Track 1 into Yard Lead.
1B	Track 2	Trailing-point crossover switch from Track 2 to Track 1 toward Yard Lead
3	Track 1	Intermediate crossover switch supporting reverse moves toward the yard throat.
5	Track 1	Secondary switch used for yard departure alignment
7A	Track 1	Facing-point switch providing diverging route into yard connection.
7B	Track 2	Corresponding trailing-point crossover switch paired with 7A for entry/exit routing.

G.1.2 CROSSOVER: 27TH STREET (WASHINGTON & JEFFERSON ST)

Switch ID	Track	Description / Function
1A	Track 1	Facing-point switch allowing movement from Track 1 to Track 2 (eastbound diverging move).
1B	Track 2	Trailing-point crossover paired with 1A for reverse or westbound movements
3A	Track 1	Trailing-point switch completing the double crossover for Track 1 to Track 2 alignment
3B	Track 2	Facing-point switch paired with 3A for Track 2 to Track 1 movements

G.2 WORK ACTIVITY DESCRIPTION

This section encompasses the west-end Blue Line alignment from the Tempe Bridge approach through the Yard Entrance and urban corridor to 27th St. Multiple departments perform inspection, maintenance, and troubleshooting under full RWP coverage.

The area includes frequent crossover activity, restricted clearance near the yard throat, and heavy vehicle/pedestrian interfaces along Washington and Jefferson corridors. Continuous OCC coordination and strict safe-zone use are required.

G.3 INTERLOCKING AND PROTECTION PROCEDURES

- OCC authorization required prior to entering or occupying Yard Entrance or 27th St limits.
- Verify all switch correspondence visually and electrically before route is set.
- Operators held at preceding platforms until route confirmation.
- Red aspects provide absolute stop protection during maintenance.
- Manual switch work requires onsite confirmation with OCC.

Hazard Awareness Summary

Hazard	Risk Description	Mitigation / Control
Track split zones	Converging track geometry reduces clearance and safe refuge.	Establish ETO limits and two-person team minimum.
Yard lead movements	Frequent switching activity creates unexpected train movements.	Maintain continuous OCC coordination and use lookouts at entry points.

Hazard	Risk Description	Mitigation / Control
Limited visibility	Guideway walls and curvature reduce sightlines near 51st and 44th St.	Use portable lighting and assign spotters during night work.
Vehicular interfaces	Multiple roadway crossings with shared signals and gates.	Use flaggers and cones to establish protected work zones.
Heat / environment	High temperature and glare exposure along Jefferson corridor.	Implement heat-stress rotation and hydration protocols.

Summary of Protection Controls

- OCC authorization required for all track occupancy.
- Exclusive Track Occupancy or Verbal Work Limits established prior to entry.
- Minimum two-person crew for all yard lead and split track zones.
- Red aspect protection enforced when maintenance in progress.
- Continuous radio contact with OCC and adjacent interlockings.

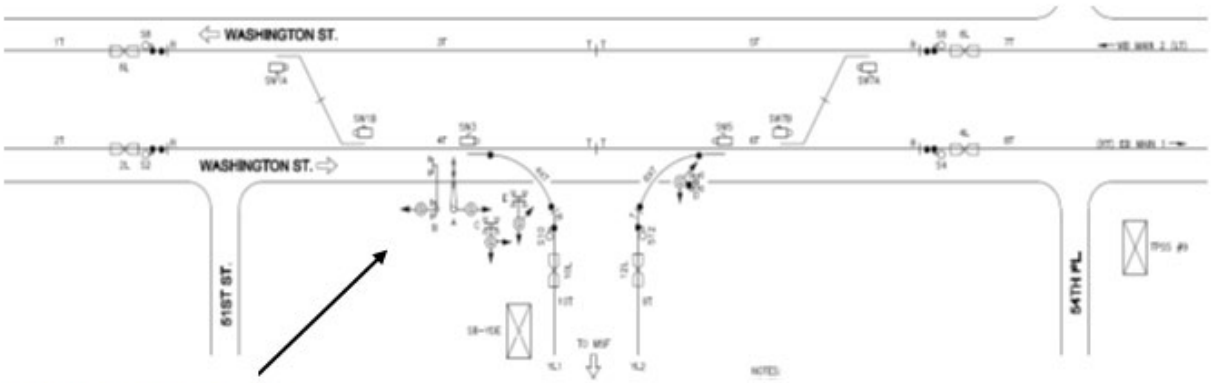
Special Hazard Area – Track Splits and Slip Ramps

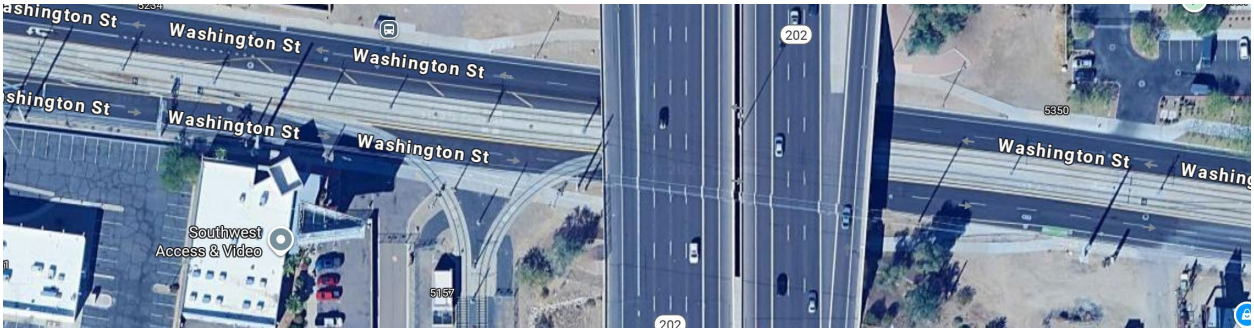
Track split zones between Yard Entrance and 44th St present elevated risk due to restricted refuge and multiple switch paths. Access is permitted only under OCC track protection with a minimum of two qualified workers. Sidewalks or designated refuge areas must be used for safe clearance. All personnel must complete a site-specific briefing before entry.

Summary

The Tempe Bridge to 27th Street segment transitions from bridge structure to dense urban corridor and yard access zone. Its complex switch layout and restricted clearance require strict OCC coordination, designated safe zones, and two-person minimum crews to maintain compliance with FTA RWP standards.

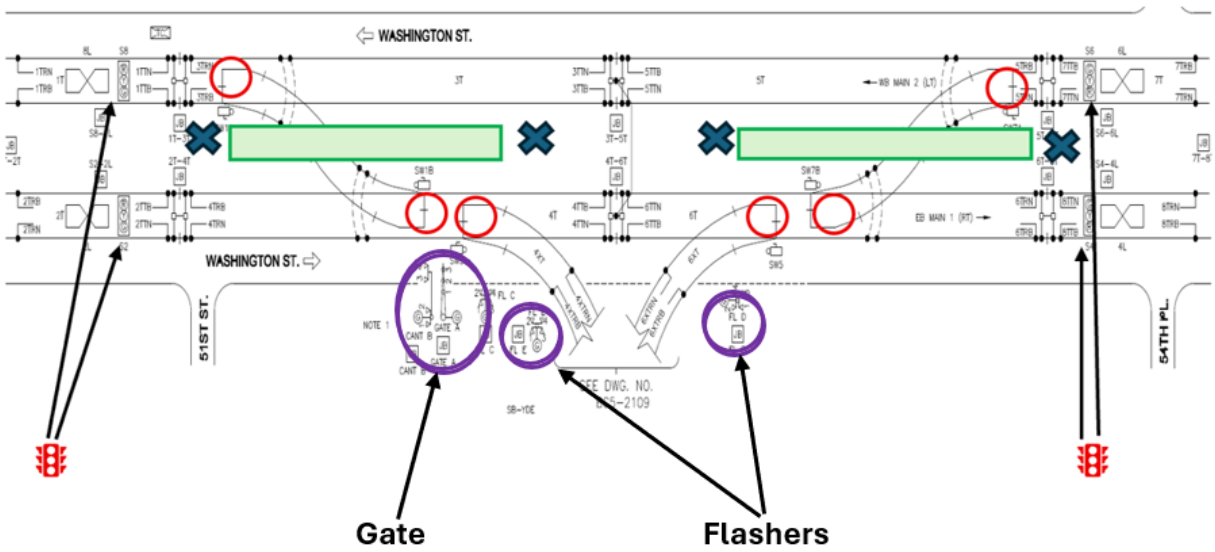
G.4 GRADE CROSSING: 51ST STREET GRADE CROSSING





Yard Entrance Crossover





Yard Exit Crossover







G.5 44TH STREET – SKY TRAIN



G.6 STATE ROUTE 143 OVERPASS





Hazard Assessment: SR-143 Overpass Crossing

Location: Light Rail Alignment beneath SR-143 Overpass
Section Type: At-grade light-rail alignment under elevated freeway structure
Surrounding Features: Multi-leg intersection, on/off ramps, pedestrian crosswalks, limited shoulder access

G.6.1 HAZARD IDENTIFICATION

Hazard ID	Category	Description	Potential Consequences
H-143-01	Visibility / Sightline	Freeway structure and columns obstruct view between train operators, roadway workers, and vehicle drivers.	Increased risk of roadway worker strikes, missed visual signals, and operator reaction delays.
H-143-02	Confined Vertical Clearance	Limited overhead clearance and narrow under-bridge spacing restrict safe positioning for personnel and work vehicles.	Physical injury due to clearance contact, or equipment damage.

Hazard ID	Category	Description	Potential Consequences
H-143-03	Traffic Interaction	High-volume intersection with traffic turning, merging freeway ramps, and queuing vehicles near the guideway.	Vehicle-to-train conflicts, intrusion into work zones, and unpredictable driver movements.
H-143-04	Signal Visibility / Communication	Overhead bridge obstructs view of traffic and train signals; potential radio shadow under structure.	Delayed OCC communication or missed signals.
H-143-05	Environmental / Lighting Conditions	Intense shadow contrast and low visibility under the bridge; glare transition at approaches.	Operator or worker vision impairment, increased risk of trip/fall or struck-by events.
H-143-06	Pedestrian Conflicts	Pedestrian crossings adjacent to abutments and narrow refuge areas.	Worker distraction, pedestrian intrusions into guideway.
H-143-07	Stormwater / Surface Hazards	Water accumulated during rainfall, creating slick rail and pavement.	Slip hazard, traction loss for vehicles and LRVs.
H-143-08	Heat Entrapment / Limited Airflow	Bridge structure traps heat; minimal ventilation during summer.	Elevated risk of heat stress to roadway workers.

G.6.2 RISK EVALUATION

Hazard ID	Likelihood	Severity	Risk Rating	Notes
H-143-01	Likely	Major	High	Persistent obstruction: mitigations required each access.
H-143-02	Occasional	Moderate	Medium	Clearance awareness and cones/barriers required.
H-143-03	Likely	Major	High	Requires active flagging or ETO for any on-track work.
H-143-04	Occasional	Major	High	Ensure redundant comms (radio and hand signals).
H-143-05	Frequent	Moderate	Medium	Lighting plan or auxiliary illumination recommended.
H-143-06	Occasional	Moderate	Medium	Pedestrian control measures during maintenance.
H-143-07	Occasional	Minor	Low–Medium	Inspect and clear drains prior to work.

Hazard ID	Likelihood	Severity	Risk Rating	Notes
H-143-08	Frequent	Moderate	Medium	Enforce hydration and heat-stress plan.

G.6.3 MITIGATION AND CONTROL MEASURES

Engineering Controls

- Install or verify adequate lighting under the structure for nighttime work.
- Use temporary traffic barriers or cones to isolate work vehicles and personnel from turning traffic.
- Verify drainage and surface conditions before work begins.

Administrative Controls

- Require OCC coordination for all track access; recommend Exclusive Track Occupancy (ETO) when performing work directly beneath the overpass.
- Utilize watchperson/lookout positioned outside the shaded zone with clear line of sight.
- Conduct pre-work job briefing addressing visibility, radio shadow, and emergency egress.
- Enforce heat-stress mitigation and lighting transition awareness during long-duration activities.

PPE / Training Requirements

- High-visibility Class 3 apparel with reflective striping visible under artificial lighting.
- Portable lighting or personal illumination devices for workers.
- Heat-stress PPE (cooling vests, hydration kits) during summer months.

Residual Risk

After implementing the above controls, the residual risk rating for this area is assessed as Medium (Acceptable with continuous monitoring) under FTA RWP tolerances.

G.7 27TH STREET CROSSOVER






2416
DO NOT CROSS TRACKS



Hazard Assessment: Washington Street (Cesar Chavez / Curve Alignment)

Location: Washington Street – East of 24th Street, adjacent to Cesar Chavez School
Line Section: Blue Line (A Line) – Central Phoenix Segment
Track Type: Curved double-track alignment transitioning from tangent (straight) to curve
Environment: Adjacent school zone, high pedestrian activity, limited line of sight

G.7.1 HAZARD IDENTIFICATION

Hazard ID	Category	Description	Potential Consequences
H-WA-01	Curved Alignment / Blind Spot	The track curvature limits train operator visibility of roadway workers and vice versa, particularly in eastbound direction.	Increased risk of roadway worker strikes or delayed clearance response.
H-WA-02	Adjacent School Zone	School entrances, crosswalks, and pedestrian crossings within proximity of the guideway.	High risk of pedestrian intrusion and distraction during arrival/dismissal.
H-WA-03	Limited Shoulder / Safe Zone	Minimal lateral clearance between curb line, OCS poles, and light-rail guideway.	Restricted worker refuge area; limited space for equipment or vehicle staging.
H-WA-04	Vehicular Turning Conflicts	Jefferson and Washington intersections include complex turn movements and right turns that cross near the guideway.	Increased probability of vehicle encroachment or mirror strikes to workers or trains.
H-WA-05	Surface Conditions / Drainage	Slight grade changes and debris accumulation in curve section, especially near the vacant lot.	Slip, trip, or derailment hazard during wet or debris-filled conditions.
H-WA-06	Pedestrian Activity / Distraction	Students, parents, and pedestrians frequently cross or walk parallel to tracks near Cesar Chavez campus.	Potential trespassing or inattentive pedestrian incidents during school hours.
H-WA-07	Limited Escape Path	Between retaining wall/fence line and guideway—minimal clearance for rapid egress.	Worker entrapment in emergency or train approach scenario.

G.7.2 RISK EVALUATION

Hazard ID	Likelihood	Severity	Risk Rating	Notes
H-WA-01	Likely	Major	High	Curved geometry and blind spot persist along full segment.
H-WA-02	Frequent	Major	High	Occurs daily during school hours; pedestrian supervision needed.
H-WA-03	Likely	Moderate	Medium–High	Enforce safe-zone designation before access.
H-WA-04	Occasional	Moderate	Medium	Use cone tapering and temporary signage.
H-WA-05	Occasional	Moderate	Medium	Inspect and clean debris prior to work.
H-WA-06	Frequent	Major	High	Requires crossing guards or traffic control when active.
H-WA-07	Occasional	Major	High	No natural escape path; lookout mandatory.

G.7.3 MITIGATION AND CONTROL MEASURES

Engineering Controls

- Install or mark designated Safe Zones on the outer curve side away from train overhang.
- Maintain clear sidewalks and pedestrian barriers near the school frontage.
- Verify and maintain track drainage and debris removal schedule.

Administrative Controls

- All RWP activities should be scheduled outside of school peak hours (7–9 AM, 2–4 PM).
- Require OCC notification and lookout assignment due to curvature visibility limitations.
- Deploy temporary signage or traffic control cones along adjacent lanes for awareness.
- Establish clear radio identifiers (A Line, track 1 or 2) and confirm lookouts' location prior to entry.

PPE / Training Requirements

- High-visibility Class 3 apparel with reflective and fluorescent contrast.
- Mandatory hearing protection during train approach and work within curve.
- Lookout personnel trained to maintain continuous line of sight at curve apex.
- Lone Worker must communicate with OCC to notify that the worker has cleared the track

Residual Risk

After applying all mitigation measures, the residual risk for this location remains Medium (Acceptable with Continuous Monitoring) requiring active lookout use and strict adherence to safe-zone boundaries.

G.7.4 TRACK SPLITS AND SLIP RAMPS

Track Splits

Condition:
Track splits – locations where two tracks diverge, converge, or interlock—present elevated safety risks due to limited clearance, multiple train movement paths, and restricted visibility caused by curvature, guideway walls, or OCS poles. These areas typically lack Safe Zones of Refuge, requiring heightened coordination and situational awareness from all roadway workers.

Hazard Description:

Walking inspections within track split areas expose roadway workers to opposing train movements, blind spots, and reduced sightlines along both tracks. Because these areas have no designated refuge or defined escape path within the guideway, workers are at increased risk if an unauthorized or unanticipated train movement occurs.

The only safe area of refuge in most track split zones is the adjacent sidewalk, which provides separation from both train and roadway vehicle movements.

Safety Requirements:
- **Access Control**: Entry is permitted only under OCC Track Protection, established through direct communication and confirmation with the Operations Control Center.
- **Lookout Limitation:** Lookout protection alone is not permitted within track split zones due to the combination of blind spots and absence of safe refuge.

- **Team Requirement:** A minimum of two qualified roadway workers (inspector and safety watch) must be present during any walking inspection or maintenance activity conducted in these areas.
- **Visibility and Positioning:** Maintain constant visual contact between workers. Stay clear of all active track movement paths and never position yourself between parallel or converging rails.
- **Refuge Location**: When trains or roadway traffic are present, the sidewalk area is the only acceptable safe zone of refuge. Workers must relocate to this area before any train movement is authorized.
- **OCC Coordination:** The Operations Control Center must confirm that all tracks are secured, exit inhibits are applied, and no active or pending train movements exist before authorizing access.
- **Work Planning:** Conduct a thorough pre-job briefing identifying known blind zones, curvature limits, and sidewalk refuge locations prior to entering the area


Crossover
Washington St
Washington St
Washington St
Washington St
S 25th St
S 27th St
El Paso - Los Angeles Limousine Express
VSS Valley Spring Service
E Jefferson St
E Jefferson St
E Jefferson St

Aspect


Lookout
Safe Zone
Switch Points
WASHINGTON ST.
JEFFERSON ST.

■ ■ ■

APPENDIX H – BL-A-5, 27th Street to 3rd Street Platform

Blue Line (A) Line, Section 5, 27th Street to 3rd Street Platform

H.1 SECTION OVERVIEW - DOWNTOWN

Blue Line (A Line) – Downtown Phoenix Section

Locations: 24th Street • 12th Street • 3rd Street Platforms • Downtown Phoenix Hub (End of Walking Track & OCS Inspection)
Line: Blue Line (A Line) – Downtown Phoenix Section

Platforms (Jefferson Street – Eastbound)

Station Name	Cross Street / Notes
24th Street / Jefferson St	Eastbound platform; transition into downtown corridor; limited shoulder width due to curbside obstructions.
12th Street / Jefferson St	Eastbound platform; urban arterial with moderate pedestrian traffic and nearby signal equipment cabinets.
3rd Street / Jefferson St	Downtown Phoenix Hub – Eastbound platform (A Line / B Line interface); high-density area requiring lookout coverage.

Platforms (Washington Street – Westbound)

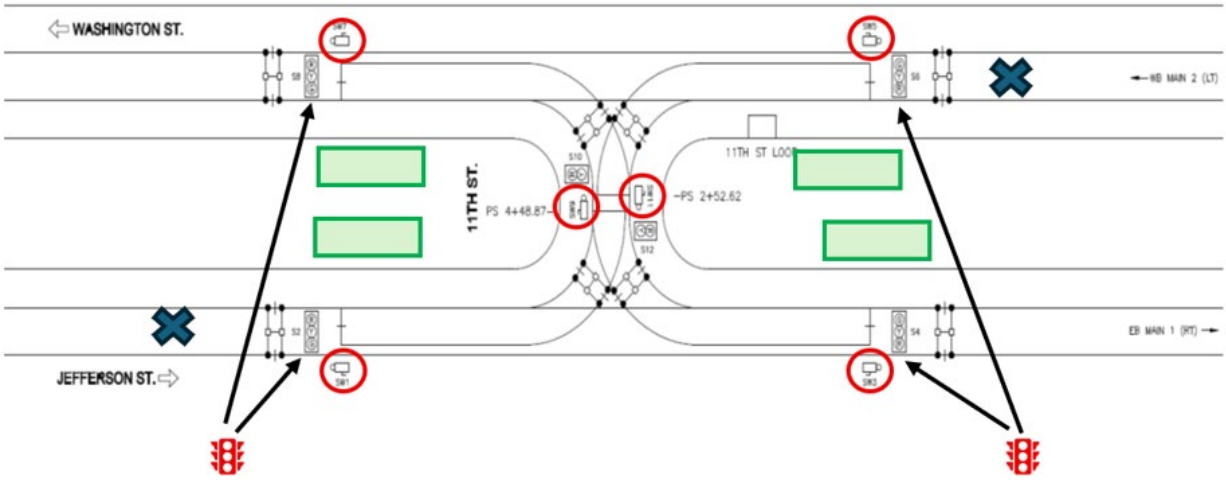
Station Name	Cross Street / Notes
3rd Street / Washington St	Downtown Phoenix Hub – Westbound platform (A Line / B Line interface); major interchange with B Line and Streetcar.
12th Street / Washington St	Westbound platform; constrained clearance between guideway poles and sidewalk; heavy vehicle presence.
24th Street / Washington St	Westbound platform; eastern boundary of downtown segment; limited safe zone area for roadway worker setup.

Track Type: Dual-track urban corridor with mixed tangent and curved geometry, incorporating multiple manual crossovers, signalized intersections, and restricted safe zones near curbside structures.

H.1.1 CROSSOVERS: 11TH STREET LOOP (WASHINGTON ST) • 5TH STREET LOOP (DOWNTOWN PHOENIX ALIGNMENT)






WASHINGTON ST.
JEFFERSON ST.
11TH ST.
PS 4+48.87
PS 2+52.62
11TH ST LOOP
WB MAIN 2 (LT)
EB MAIN 1 (RT)

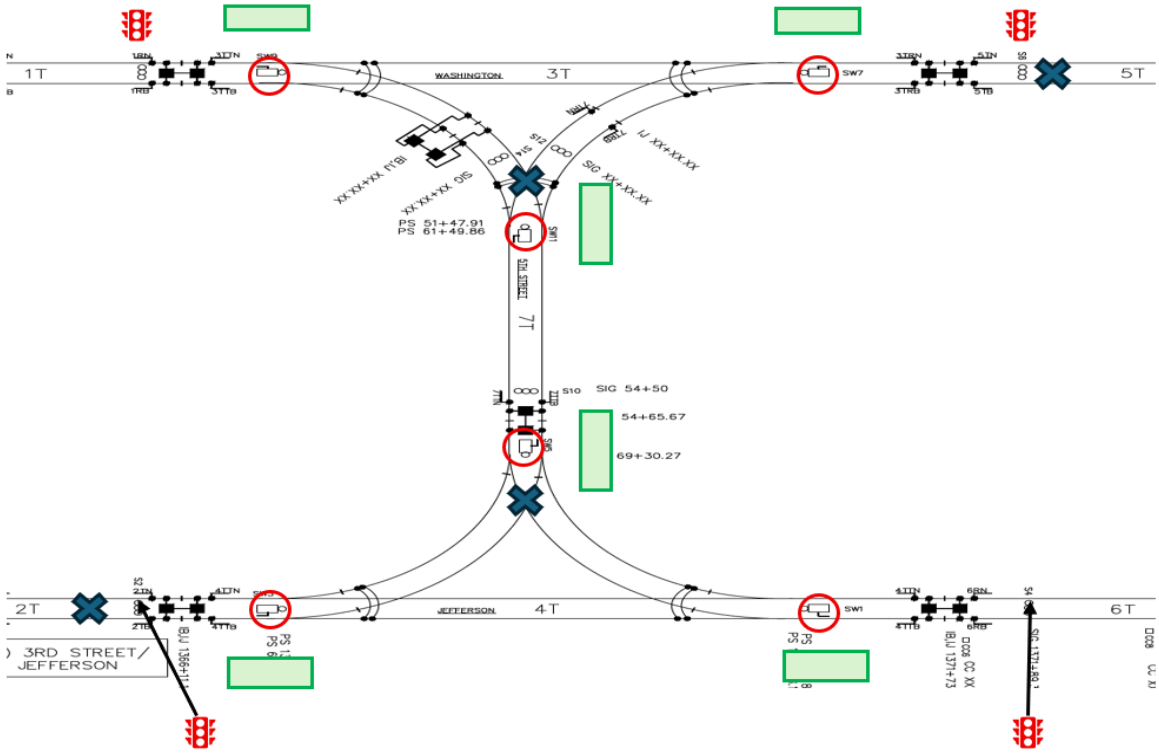
H.1.1.1 Manual Crossover: 11th Street Loop (11th Street & Washington)

Switch ID	Track	Description / Function
1	Track 1	Manual facing-point switch providing crossover access from Track 1 to Track 2 (eastbound).
3	Track 2	Manual trailing-point crossover switch paired with Switch 1 for westbound movements returning to Track 1.
5	Track 1	Manual trailing-point switch used to route trains toward the loop alignment.
7	Track 2	Manual facing-point switch paired with Switch 5 for crossover and loop routing operations.
9	Loop Track	Manual facing-point switch providing entry from Track 1 into the 11th Street loop (loop entry).
11	Loop Track	Manual trailing-point switch allowing exit from the loop back to the mainline (loop exit).

H.1.1.2 Crossover: 5th Street Loop (Downtown Phoenix – 3rd St / Jefferson Alignment)

Switch ID	Track	Description / Function
1	Track 1	Manual facing-point switch allowing access from Track 1 into the 5th Street Loop (northbound).
3	Track 2	Manual trailing-point crossover switch paired with Switch 1 for reverse (southbound) routing.
5	Track 1	Manual trailing-point switch providing return routing from the loop back to Track 1 (north connection).
7	Track 2	Manual facing-point crossover paired with Switch 5 for routing between Track 2 and Track 1.
9	Loop Track	Manual facing-point loop switch connecting Track 1 to the loop entrance.
11	Loop Track	Manual trailing-point loop switch completing the return connection from loop to mainline.

Looking toward Jefferson



Work Activity Description

This section encompasses the western urban corridor through downtown Phoenix, where dual-track alignment transitions between Jefferson and Washington Streets. Work activities include inspection, maintenance, troubleshooting, and vegetation control in areas of limited clearance, heavy traffic interaction, and multiple crossover interfaces.

Departmental Activities:

- **Track Maintainers**: Perform routine inspection, gauging, tie and rail replacement, and switch alignment checks.
- **OCS / Traction Power**: Conduct contact-wire wear inspections, pole grounding checks, and span-wire tensioning, often requiring partial de-energization and OCC coordination.
- **Signal Technicians:** Inspect manual crossover interlocks, verify indicator operation, and test crossing gates at adjacent intersections.
- **Facilities / Contractors:** Perform cleaning, vegetation trimming, and sidewalk repair near the guideway under RWP protection.

Interlocking and Protection Procedures

- OCC authorization required prior to entering 11th Street or 5th Street crossover limits.
- Verify manual switch correspondence visually before establishing any movement route.
- Red aspects shall provide absolute stop protection during maintenance.
- Operators held at preceding platforms until route confirmation.
- For I-10 Underpass and confined sections, Exclusive Track Occupancy (ETO) is required.
- Manual switch work requires two-person verification (switchman and observer) with OCC concurrence.

Hazard Awareness Summary

Hazard	Risk Description	Mitigation / Control
Confined overhead clearance (I-10 Underpass)	Structural beams and columns limit vertical and lateral space.	Enforce ETO; mark clearance limits; use low-profile vehicles.
Complex traffic interaction	High volumes of turning vehicles and bus routes intersecting trackway.	Flaggers and cones required; coordinate with City of Phoenix traffic ops.
Curved track and blind spots (Downtown curve)	Reduced sightlines between 7th Ave – 3rd St segments.	Assign lookouts at curve apex; maintain continuous OCC communication.
Pedestrian interface	High pedestrian density during events and business hours.	Deploy flaggers or watchpersons; restrict access during peak pedestrian periods.

Hazard	Risk Description	Mitigation / Control
Heat / glare conditions	Pavement heat and glass reflection along Washington corridor.	Implement heat-stress plan; use tinted eye protection.

H.1.2 11TH STREET LOOP - RISK ASSESSMENT

Location: 11th St between Washington St and Jefferson St
Function: Manual turnback loop for train reversal and layover (non-automatic interlocking)
Track Configuration: Dual turnout crossover forming a loop track (north–south alignment)
Control Type: Manual – No powered switch machines (hand-throw)
Adjacent Infrastructure: Adjacent commercial building (west), open lot (east), pedestrian sidewalk on both sides

H.1.3 11TH STREET - KEY OPERATIONAL AND SAFETY HAZARDS

Hazard Category	Description	Potential Consequence	Risk Rating	Mitigation / Control
Track Occupancy Conflict	Manual loop operations can lead to OCC communication errors during train reversals. No automatic signal protection.	Collision or side-swipe between active movement and stationary car.	High	Require OCC authorization before train enters or exits loop. Maintain strict radio confirmation for switch alignment and route clearance.
Switch Handling Error	Manual switch throws may not fully seat or lock.	Derailment or misroute.	High	Double verification required by operator and MOW employee. Implement visual confirmation and switch point inspection prior to train movement.
Limited Sight Distance	Curved track and building structure on west side limit visibility	Reduced situational awareness, increased RSO potential.	Medium	Require lookout or flagger during concurrent field work or train reversal. Install

Hazard Category	Description	Potential Consequence	Risk Rating	Mitigation / Control
	between Washington and Jefferson ends.			convex mirror or CCTV for operator visibility if possible.
Pedestrian Proximity	Sidewalk runs adjacent to the loop; pedestrians may encroach near tail tracks.	Worker–public interface, struck-by hazard.	Medium	Use cones/barriers during active work; assign a lookout for pedestrian awareness.
Vehicle Intrusion	Jefferson intersection has potential for unauthorized vehicle entry into the loop street.	Collision hazard.	Medium	Use temporary barricades during work. Coordinate with City of Phoenix Traffic for traffic control plan.
OCS Exposure	Low-clearance overhead wires along loop alignment.	Electric shock, burn injury.	High	Only qualified OCS or authorized personnel permitted within 10 ft of energized equipment. Verify power de-energization for any aerial work.
Heat and Environmental Exposure	Limited shade; high reflective asphalt surface.	Heat stress, fatigue.	Medium	Follow heat mitigation protocols (hydration, rest rotation, shaded staging).
Lack of Designated Safe Zone	No defined ballast-side safe area; sidewalk is the only refuge.	Workers forced near live track or street edge.	High	Define sidewalk zones as safe areas. Mark refuge areas with green delineators for field reference.
Manual Switch Maintenance Activity	Maintenance requires physical	Pinch/crush hazard or trip/fall.	Medium	Implement Job Briefing with specific switch ID references

Hazard Category	Description	Potential Consequence	Risk Rating	Mitigation / Control
	access to confined loop track area.			(S8, S10, S12). Require PPE and radio watch.
Shared Crossing Signals (Washington / Jefferson)	Train and street signal coordination may confuse workers or operators during loop use.	Misinterpretation of aspects.	Medium	Clarify signal aspects and use verbal confirmation with OCC before departure.

H.1.4 SAFE ZONE AND WORKER PROTECTION PLAN

Location	Safe Zone Description	Notes
North end (Washington St)	Sidewalk adjacent to east curb line	Maintain 10 ft clearance from track; avoid standing within curve radius.
South end (Jefferson St)	Sidewalk on west curb line	Limited refuge; use cones to delineate worker position.
Within Loop	No in-ballast safe zone	Workers must clear to sidewalk prior to train movement.

Protection Type Required:

- Train Approach Warning (TAW) for short-duration inspections
- Exclusive Track Occupancy (ETO) when performing switch work or OCS maintenance
- Radio monitoring on Channel 1 (A Line)

Environmental & Infrastructure Considerations

Factor	Observation	Impact
Drainage	Minimal gutter flow path; potential ponding at south end.	Slip hazard during rain.
Lighting	Limited nighttime visibility.	Require portable lighting for night work.
Surface	Asphalt and concrete transitions uneven.	Trip hazard.
Access	Narrow entry from Washington and Jefferson.	Restricts vehicle staging.

Recommended Controls and Improvements

5. Install Safe Zone Markers: Paint or post green reflective delineators on sidewalk areas designated for workers.
6. OCC Authorization Protocol: Require OCC callout before entering/exiting loop for any operation or maintenance.
7. Worker Lookout Requirement: Mandatory during train moves or manual switch operation.
8. Lighting and CCTV Enhancements: Evaluate for nighttime safety improvements.
9. Barriers During Maintenance: Deploy temporary barricades or cones at Jefferson/Washington entries during work periods.

Risk Summary

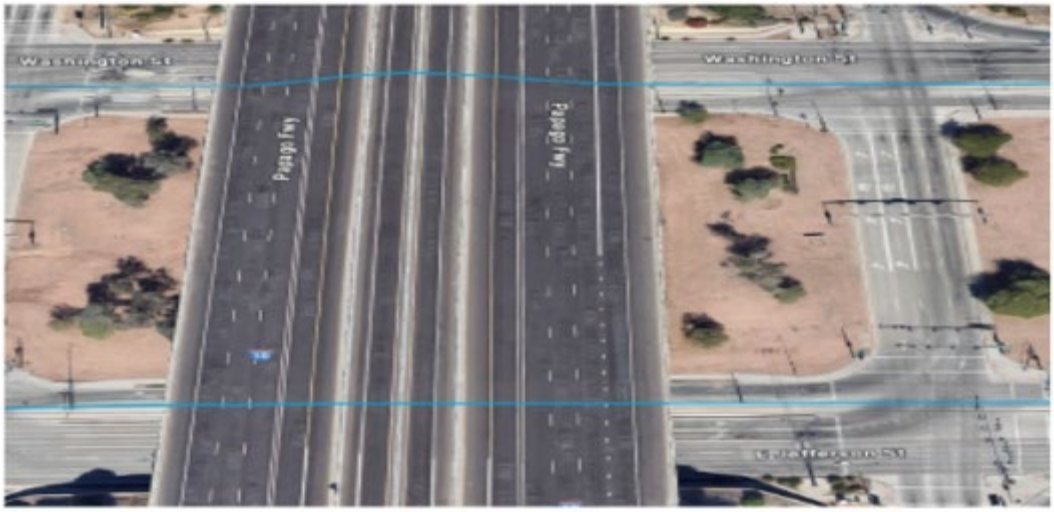
Overall Risk Level	Residual Risk After Mitigation	Notes
High (initial)	Medium (with controls)	Primary hazards are manual switch errors, limited visibility, and lack of refuge area. Continuous OCC coordination and strict procedural compliance are essential.

Summary of Protection Controls

- OCC authorization mandatory for all track access.
- Exclusive Track Occupancy (ETO) or verbal work limits required for confined sections.
- Two-person minimum in all loop and underpass areas preferred. Lone Workers must coordinate with OCC.
- Red aspect protection and flaggers used during active maintenance.
- Continuous radio contact maintained with OCC and adjacent interlockings.

H.2 INTERSTATE 10 (I-10) UNDERPASS (WASHINGTON STREET CORRIDOR) – SPECIAL HAZARD AREA

Location: Beneath I-10 Freeway Structure (between 19th Ave and 15th Ave)
Environment: Confined overhead structure with limited lighting, ventilation, and pedestrian refuge.



H.2.1 HAZARD IDENTIFICATION

Hazard ID	Category	Description	Potential Consequences
H-I10-01	Visibility / Sightline	Support columns and low lighting limit visibility between trains and workers.	Increased risk of worker strike or delayed clearance.
H-I10-02	Clearance / Space	Low vertical and lateral clearance restrict equipment movement.	Injury from contact with structure or equipment damage.
H-I10-03	Lighting Deficiency	Insufficient illumination under bridge.	Slip, trip, or struck-by hazards.
H-I10-04	Radio Shadow	Structure may impede radio signal to OCC.	Loss of communication during protection setup.
H-I10-05	Environmental Heat Entrapment	Limited air circulation raises ambient temperature.	Heat stress or dehydration.

H.2.2 RISK EVALUATION

Hazard ID	Likelihood	Severity	Risk Rating	Notes
H-I10-01	Likely	Major	High	Lighting and column density persist across full segment.
H-I10-02	Occasional	Major	High	Requires clearance awareness training.
H-I10-03	Frequent	Moderate	Medium	Portable lighting mandatory.
H-I10-04	Occasional	Major	High	Redundant communication plan required.
H-I10-05	Frequent	Moderate	Medium	Apply heat-stress and hydration plan.

H.2.3 MITIGATION AND CONTROL MEASURES

Engineering Controls

- Deploy portable LED lighting towers for night or shadowed work.
- Mark structural clearance limits with reflective tape or signage.

Administrative Controls

- Require OCC-established ETO prior to entry.
- Conduct pre-job briefing covering clearance and radio limitations.

PPE / Training Requirements

- Class 3 high-visibility apparel, portable lighting, cooling vests.

Residual Risk: Medium (Acceptable with continuous monitoring).

H.3 HAZARD ASSESSMENT: 5TH STREET LOOP / DOWNTOWN CURVE AREA

Location: Jefferson & Washington Corridors near 5th Street Loop
Line Section: Blue Line (A Line) – Downtown Phoenix Segment
Track Type: Curved double-track with intersecting loop crossovers and high pedestrian density

H.3.1 HAZARD IDENTIFICATION

Hazard ID	Category	Description	Potential Consequences
H-5TH-01	Curvature / Blind Spot	Curve reduces operator sight distance.	Increased risk of late visual detection of workers.
H-5TH-02	Pedestrian Activity	Heavy pedestrian and even foot traffic.	Intrusion into work zone; distraction.
H-5TH-03	Limited Refuge	Narrow medians restrict worker clearance.	Entrapment hazard; limited escape options.
H-5TH-04	Surface Debris / Drainage	Urban runoff accumulates debris on rail.	Slip or derailment hazard.
H-5TH-05	Conflicting Train Routes	Manual loop operations create opposing movements.	Potential for unexpected train entry if route not confirmed.

H.3.2 RISK EVALUATION

Hazard ID	Likelihood	Severity	Risk Rating	Notes
H-5TH-01	Likely	Major	High	Persistent due to curvature.
H-5TH-02	Frequent	Major	High	Event-related crowding common.
H-5TH-03	Likely	Major	High	Narrow alignment: safe-zone required.
H-5TH-04	Occasional	Moderate	Medium	Periodic cleaning reduces risk.
H-5TH-05	Occasional	Major	High	OCC confirmation essential

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H.3.3 MITIGATION AND CONTROL MEASURES

Engineering Controls

- Define Safe Zone markings on outer-curve sidewalk side.
- Maintain drainage and debris-removal schedule.

Administrative Controls

- Schedule work outside event or rush hours.
- Require lookout positioned at curve apex.
- OCC confirmation before any manual switch movement.

PPE / Training Requirements

- High-visibility Class 3 apparel and radio communication training.

Residual Risk: Medium (Acceptable with continuous monitoring).

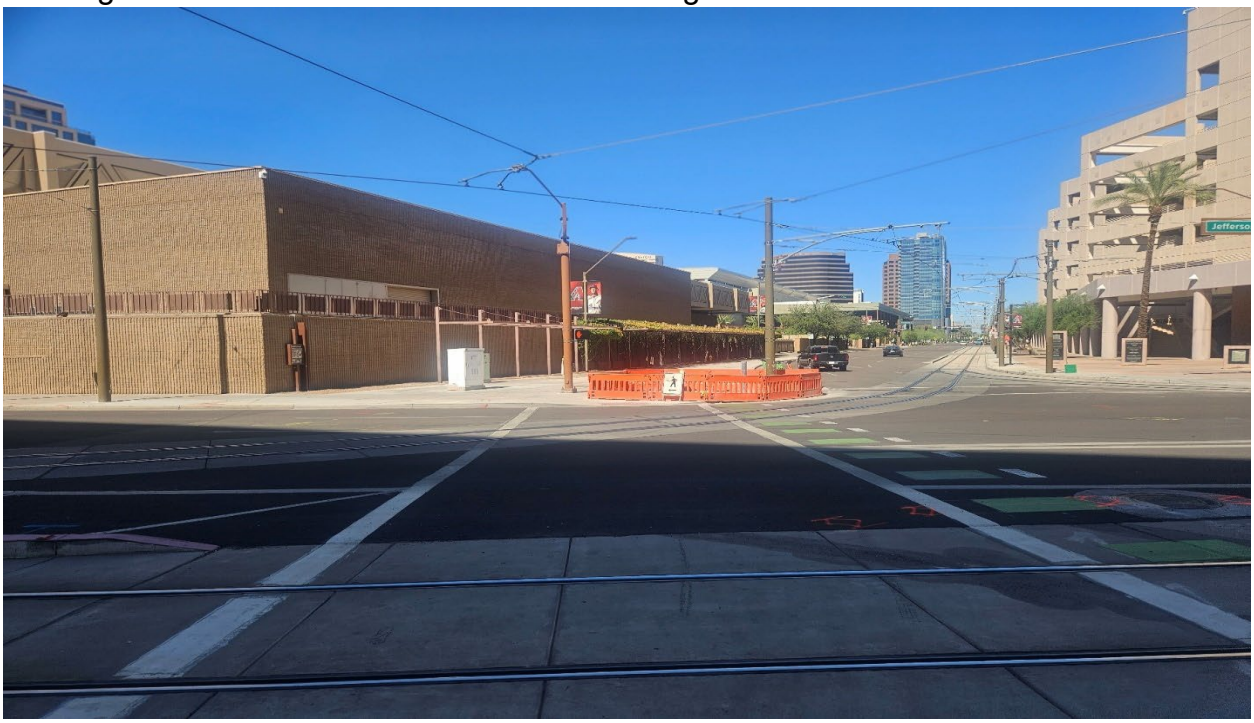
Summary

The 27th Street to 3rd Street segment represents one of the most operationally complex areas of the Blue Line, featuring multiple manual crossovers, constrained clearances, and dense pedestrian activity. Strict adherence to OCC coordination, two-person team minimums, and defined Safe Zone use is required to maintain compliance with FTA Roadway Worker Protection standards.

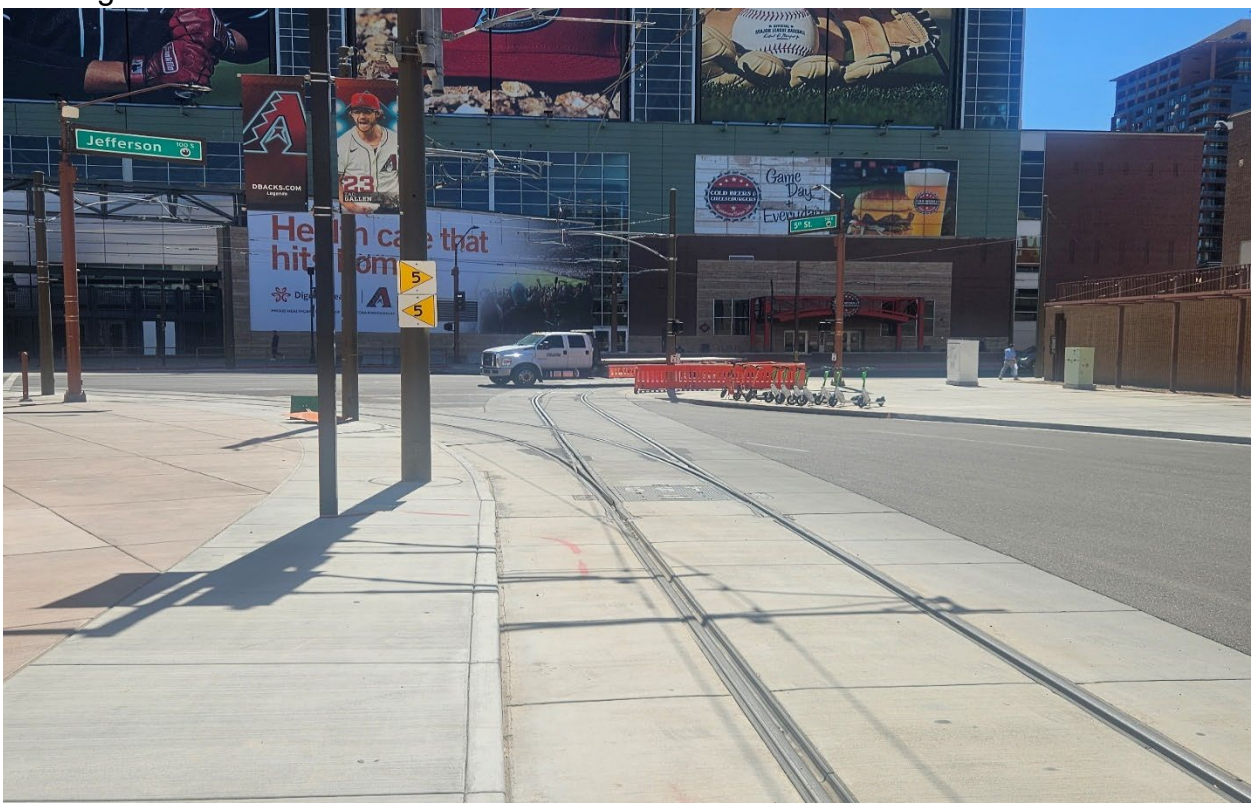
5th Street Loop Looking East on Jefferson

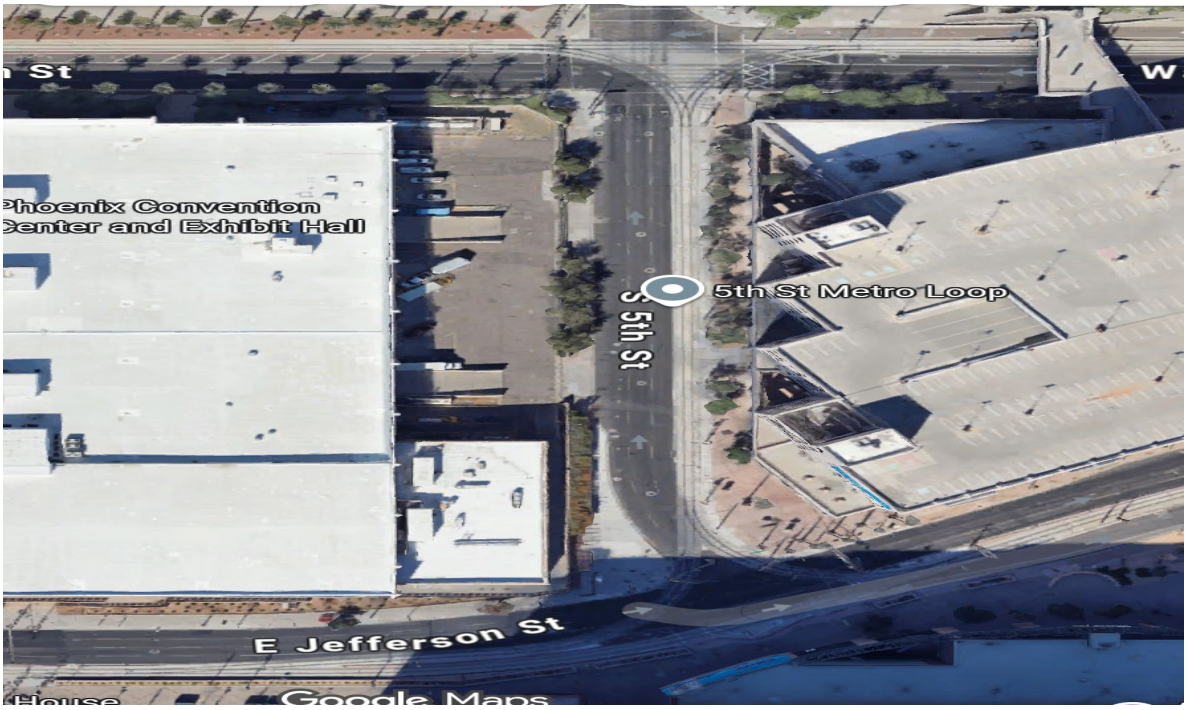


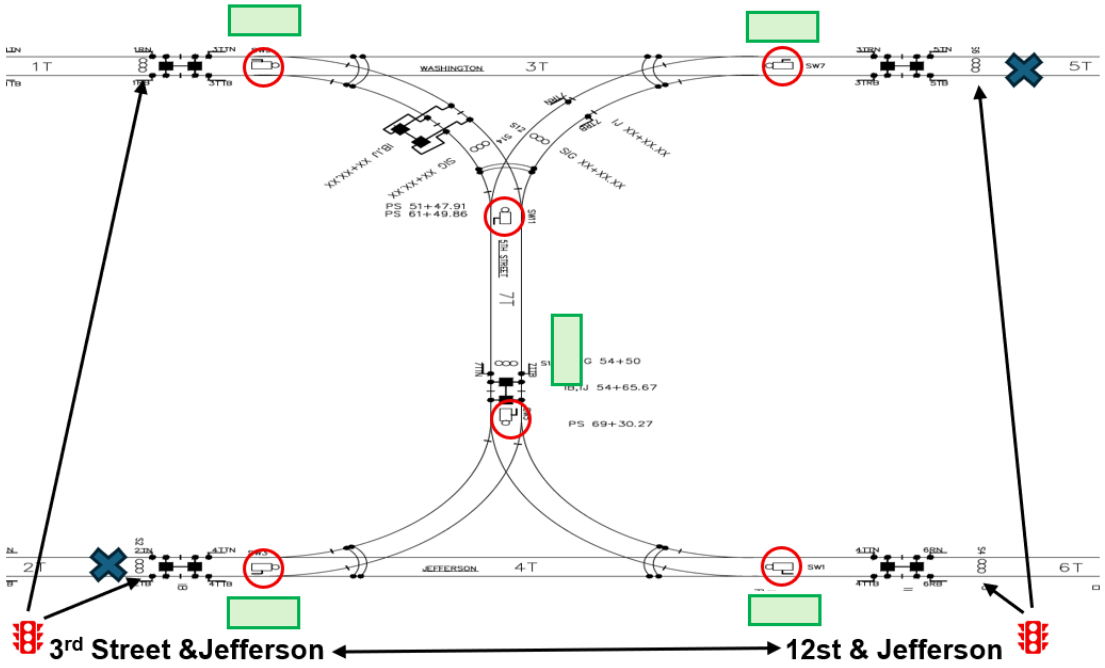
Looking North down 5th Street Towards Washington



Looking South down 5th Street Towards Jefferson







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H.4 HAZARD ASSESSMENT: 5TH STREET INTERLOCKING (DOWNTOWN DIAMOND CURVE AREA)

Location: 5th Street & Jefferson /Washington Corridor – adjacent to Chase Field and Phoenix Convention Center
Line Section: Blue Line (A Line)
Track Type: Double-track, crossing interlocking with curved approaches and heavy multimodal interface.
Environment: Dense pedestrian area, event-based surges, multiple crosswalks, vehicle lanes, and scooter staging zones adjacent to trackway.

H.4.1 HAZARD IDENTIFICATION

Hazard ID	Category	Description	Potential Consequences
H-3J-01	Crossing / Track Split	Intersecting tracks create multiple flange paths and restricted refuge between rail sets.	Worker entrapment or tripping within flangeway;

Hazard ID	Category	Description	Potential Consequences
			increased risk of struck-by incident.
H-3J-02	Curved Alignment / Visibility	Curve and adjacent building walls limit line of sight for operators and roadway workers.	Delayed train detection; increased chance of RSO or late clearance.
H-3J-03	Pedestrian and Event Crowds	Arena events and downtown activities create high pedestrian presence near active track.	Pedestrian intrusion into guideway; distraction or miscommunication.
H-3J-04	Vehicular Conflicts	Adjacent intersections at 4th & 5th Street produce right-turn vehicle movements across track.	Vehicle-to-train or vehicle-to-worker collision potential.
H-3J-05	Scooter and Bicycle Intrusions	Personal mobility devices frequently enter the track flangeway near crosswalks.	Slip/trip hazards; derailment potential if obstruction remains.
H-3J-06	Surface Elevation and Drainage	Concrete panels near the diamond hold water and debris after rain.	Slip hazard; corrosion or electrical grounding issues.
H-3J-07	Glare / Lighting Contrast	Strong sunlight and reflective façades cause visibility loss for operators and workers.	Reduced signal recognition or misjudged clearance.
H-3J-08	Restricted Escape Path	Narrow sidewalks bordered by OCS poles and fencing limit safe refuge.	Delayed egress in emergency; increased struck-by exposure.
H-3J-09	Night / Event Lighting Conditions	Dynamic signage and arena lighting cause fluctuating illumination levels.	Visual confusion, misinterpretation of signal aspects.
H-3J-10	Noise and Distraction	Event music, PA systems, and vehicle horns mask audible train approach.	Reduced situational awareness for workers.

H.4.2 RISK EVALUATION

Hazard ID	Likelihood	Severity	Risk Rating	Notes
H-3J-01	Likely	Major	High	Diamond geometry permanent; refuge limited.
H-3J-02	Likely	Major	High	Curved approach and building obstruction persistent.
H-3J-03	Frequent	Major	High	Event-driven pedestrian surges weekly.
H-3J-04	Occasional	Major	High	Traffic control coordination required.
H-3J-05	Frequent	Moderate	Medium	Scooter staging observed at corners.
H-3J-06	Occasional	Moderate	Medium	Drainage limited by concrete grading.
H-3J-07	Frequent	Minor	Low–Medium	Mitigate with eye protection and timing awareness.
H-3J-08	Occasional	Major	High	Sidewalk refuge narrow; lookout mandatory.
H-3J-09	Occasional	Moderate	Medium	Lighting contrast during night games.
H-3J-10	Frequent	Moderate	Medium	Noise baseline elevated near venue.

H.4.3 MITIGATION AND CONTROL MEASURES

Engineering Controls

- Mark and maintain clearly defined Safe Zones outside flangeway using paint or embedded tiles.
- Install temporary cones or barriers during active maintenance.
- Verify surface drainage and remove debris prior to work.
- Supplement lighting during nighttime or shaded work windows.

Administrative Controls

- Establish Exclusive Track Occupancy (ETO) limits through OCC before entry.
- Prohibit work during high-traffic event ingress/egress periods.
- Assign a dedicated lookout with line of sight toward both track approaches.
- Coordinate with City of Phoenix traffic control for temporary lane closures when required.
- Conduct pre-job briefings identifying escape paths and signal sightlines.

PPE / Training Requirements

- Class 3 high-visibility apparel with reflective contrast.
- ANSI-rated eyewear for glare reduction.
- Hearing protection during event or heavy-traffic periods.
- Training in diamond-crossing navigation and limited-refuge awareness.

Residual Risk

After implementation of engineering, administrative, and PPE controls, residual risk is rated Medium (Acceptable with Continuous Monitoring) per FTA RWP guidelines. A two-person minimum crew and active lookout remain mandatory within the 3rd St / Jefferson diamond zone.

Summary

The 3rd Street / Jefferson Interlocking is a critical downtown hazard area due to its diamond-crossing geometry, dual-curve alignment, and proximity to high-density pedestrian corridors. Safe operations depend on strict OCC coordination, clear communication, barrier use, and real-time situational awareness—particularly during event operations at Chase Field and the Convention Center.

H.5 7TH STREET AND JEFFERSON



From 27th Street Crossover to Culver Street, the Washington and Jefferson corridors operate as split alignments on opposite sides of the roadway. Both segments present limited clearance and constrained right-of-way, making it difficult to establish safe zones within the guideway. The sidewalk areas serve as the only designated safe refuge for roadway workers conducting inspections or maintenance activities.



Restricted Refuge Area – Washington & Jefferson Split Corridor (27th Street to Culver Street)

From 27th Street Crossover to Culver Street, the Washington and Jefferson corridors operate as split alignments, running along opposite sides of the roadway. Both corridors present severely limited right-of-way and restricted clearance, leaving no viable Safe Zones within the guideway itself.

Because of adjacent vehicular lanes, close curb lines, and OCS pole placement, personnel cannot safely stand between the running rails or in the trackway during inspection or maintenance activities. The sidewalk area is the only designated safe refuge for roadway workers performing Track or OCS inspections.

All access within this segment must be established under Exclusive Track Occupancy (ETO) with continuous OCC communication, two qualified personnel (inspector and lookout), and strict adherence to sidewalk-only movement. Work should be scheduled during low-traffic periods to minimize external exposure risks and maintain compliance with FTA Roadway Worker Protection standards.

Hazard Assessment: Jefferson Street Corridor (7th St – 12th St Segment)

Location: East Jefferson Street, 7th Street to 12th Street – Central Phoenix
Line Section: Blue Line (A Line) – Downtown East Segment
Track Type: Double-track tangent alignment in urban median with minimal shoulder clearance and continuous vehicular interface.
Environment: Constrained corridor with curb-tight trackway, limited refuge, heavy bus and local traffic, and pedestrian activity near residences and small businesses.

H.5.1 HAZARD IDENTIFICATION

Hazard ID	Category	Description	Potential Consequences
H-JEF-01	Restricted Clearance / No Safe Zone	Trackway bordered by curb and traffic lanes; no physical refuge between tracks.	High risk of worker strike or entrapment; inability to clear for approaching trains.
H-JEF-02	Adjacent Vehicular Traffic	Westbound and eastbound lanes immediately adjacent to rail alignment.	Vehicle mirrors or turning vehicles can contact workers or equipment.
H-JEF-03	Pedestrian and Driveway Crossings	Frequent driveways and side streets introduce unpredictable pedestrian and vehicle entries.	Distraction and unanticipated encroachments into track area.
H-JEF-04	Surface Conditions	Uneven pavement joints and gutter depressions adjacent to rail.	Trip hazards; difficulty positioning ladders or OCS carts.
H-JEF-05	OCS Pole Placement	OCS supports and signal masts directly against curb line.	Limits safe walking path; restricts equipment movement.
H-JEF-06	Heat / Glare Exposure	Long open stretch with minimal shade and reflective surfaces.	Elevated risk of heat stress and visual fatigue.
H-JEF-07	Communication Shadow	Buildings intermittently block radio reception toward OCC.	Loss of coordination or delayed emergency notification.

H.5.2 RISK EVALUATION

Hazard ID	Likelihood	Severity	Risk Rating	Notes
H-JEF-01	Frequent	Major	High	No in-track refuge; only sidewalk safe zone.
H-JEF-02	Likely	Major	High	Constant traffic adjacency.
H-JEF-03	Occasional	Moderate	Medium	Manage via cones and spotters.

Hazard ID	Likelihood	Severity	Risk Rating	Notes
H-JEF-04	Occasional	Minor	Low–Medium	Routine maintenance mitigates.
H-JEF-05	Likely	Major	High	OCS clearance critical for safety.
H-JEF-06	Frequent	Moderate	Medium	Apply heat-stress plan.
H-JEF-07	Occasional	Major	High	Secondary comms required

H.5.3 MITIGATION AND CONTROL MEASURES

Engineering Controls

- Designate sidewalk-only Safe Zone for all inspections; mark access limits with painted boundary or cones.
- Use portable reflective barriers to delineate sidewalk refuge from roadway traffic.
- Ensure OCS poles and span-wire bases are inspected only from sidewalk side; prohibit standing between pole and track.
- Verify portable lighting for early-morning or dusk inspections.

Administrative Controls

- All track or OCS walking inspections require Exclusive Track Occupancy (ETO) authorization from OCC.
- Prohibit simultaneous train and worker occupancy within this segment.
- Require two-person crew minimum—one qualified inspector and one lookout positioned at each end of the work zone.
- Schedule inspections outside peak vehicular traffic (before 0600 or after 2100 hours).
- Conduct pre-job briefing identifying curb-line hazards, OCS pole spacing, and egress routes.
- Establish continuous radio or cell backup communication with OCC; test prior to entry.

PPE / Training Requirements

- Class 3 high-visibility garments with retro-reflective striping visible from both directions.
- ANSI hard hat and eye protection; heat-stress PPE (cooling vest, hydration pack) required May–September.
- Workers trained in curb-line clearance awareness and OCS energized-equipment proximity.

Residual Risk

After implementing all controls, residual risk is Medium (Acceptable with Continuous Monitoring).

Only sidewalk refuge provides acceptable clearance; therefore, all walking inspections must be conducted from the sidewalk, never between the running rails.

Summary

The Jefferson Street (7th – 12th St) corridor presents no in-track Safe Zones, high adjacent-traffic exposure, and limited communication reliability. All inspections—Track, OCS, or Signal—must operate under OCC-controlled Exclusive Track Occupancy and use sidewalk-only access with a two-person minimum crew. Strict adherence to heat-stress mitigation and communication protocols is mandatory to maintain FTA RWP compliance.

H.6 DOWNTOWN PHOENIX – CENTRAL & 1ST AVENUE

Location: Downtown Phoenix – Central & 1st Avenue (Jackson Interlocking)
Line Intersection:

- Blue Line (A Line) – East/West Jefferson & Washington
- Orange Line (B Line) – North/South Central & 1st Avenue

Assets Involved: Four diamond crossings, two double crossovers, four signal aspects, shared OCS and switch zones.
Adjacent Landmarks: City Scape, Jefferson/Washington platforms, Court Buildings, and downtown traffic corridors.

H.6.1 HAZARD IDENTIFICATION

Hazard ID	Hazard Description	Affected Area	Likelihood	Severity	Risk Rating	Controls / Mitigations
H-1	Diamond crossing misalignment or switch route failure due to complex interlocking logic shared between Blue & Orange lines.	Central Ave / Jefferson & Washington	Medium	High	High	Routine switch correspondence verification before access; SCADA and OCC clearance prior to any field entry; visual confirmation of switch lockout.
H-2	Conflicting train movements between east-west and north-south routes during signal aspect transitions (red/yellow overlap).	Jackson Interlocking (All 4 Diamonds)	Medium	High	High	Coordination via OCC for exclusive track occupancy; maintain visual confirmation of aspect protection; assign dedicated lookout.
H-3	Limited safe zone and worker clearance along Central Ave due to curbline proximity and pedestrian/bike lanes.	Central / Jefferson & Washington	High	Medium	High	Use sidewalks and protected zones only; deploy cones/barriers if occupying track; no worker positioning between diamonds without OCC ETO.
H-4	Vehicular and pedestrian traffic intrusion in shared downtown crossings (high	Jefferson/Washington / City Scape	High	Medium	High	Temporary traffic cones and flagger deployment; maintain lookout;

Hazard ID	Hazard Description	Affected Area	Likelihood	Severity	Risk Rating	Controls / Mitigations
	foot traffic zones).					perform work during off-peak or OCC-scheduled closure.
H-6	Reduced visibility due to surrounding high-rise reflections, signage, and multiple traffic lights.	Central Ave / Washington	Medium	Medium	Medium	Enhanced situational awareness; utilize lookout; wear high-visibility PPE.
H-7	Noise and distraction hazards from street traffic, bus routes, and adjacent businesses.	Entire Downtown Zone	High	Low	Medium	Require radio ear protection with OCC communication monitoring.
H-8	Slip/trip hazards at diamond points and flangeways during inspection or cleaning.	Track bed at diamonds	Medium	Medium	Medium	Walk between flangeways only under stop condition; use non-slip boots; daylight inspections.
H-9	Signal aspect misinterpretation (e.g., wrong signal line-of-sight from adjacent mast).	Central Ave crossovers	Low	High	Medium	Verify aspect identification against signal plate; OCC confirmation before movement.

ENVIRONMENTAL & TRAFFIC CONDITIONS

- Urban core with high pedestrian density (City Scape, court district, offices).
- Frequent vehicular turning conflicts across track zones (notably Central Ave right turns).
- Limited shoulder or right-of-way for work crews; use sidewalk staging areas only.

- Night operations increase visual hazards from ambient light and vehicle glare.
- Shared OCS network with overhead curve-tension transitions between both alignments.

SAFE ZONE & ACCESS CONTROL

Location	Safe Zone Description	Access Control
1st Ave / Jefferson	Sidewalk west side only; avoid lane-side standing.	OCC clearance required for any track walk.
1st Ave / Washington	Protected pedestrian zone west side; maintain lookout.	TAW or ETO protection required.
Central / Jefferson	Use City Scape sidewalk and fountain plaza as clear zone.	OCC radio contact required; cones if near curb.
Central / Washington	East sidewalk preferred; avoid within diamond until ETO established.	ETO / exclusive control under OCC.

COMMUNICATION & CONTROL

- Radio Channel: Channel 1 – Blue Line / Channel 2 – Orange Line
- OCC Call-in: “Central Interlocking – from Jefferson to Washington” or “1st Ave – Washington to Jefferson”
- Protection Type: Exclusive Track Occupancy (ETO) or Train Approach Warning (TAW)
- Required Personnel:
    - Roadway Worker In Charge (RWIC)
    - Designated Lookout (if TAW used)
    - Qualified employee for OCS lockout

RECOMMENDED CONTROLS / MITIGATION ACTIONS

1. Work only during scheduled OCC maintenance windows or with full ETO.
2. Pre-job briefing must include both Blue and Orange Line alignments (shared route control).
3. Double confirmation of signal aspect authority before entering interlocking.
4. Install portable warning devices or cones for visual separation.
5. Prohibit lone worker operations due to overlapping traffic zones.
6. Monitor SCADA alarm log (S2/S8 CALC) for any overrun or mis-route before entering zone.
7. Cross-track inspection only under zero-movement authority; verify via OCC lockout.

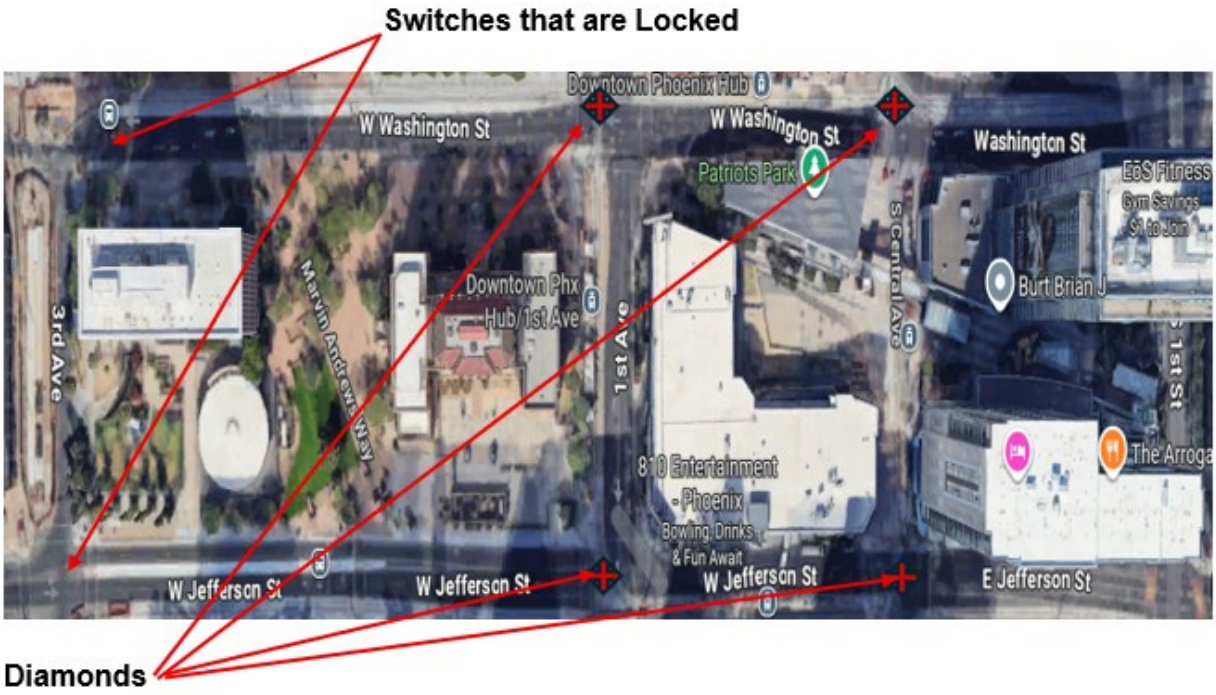
OVERALL RISK SUMMARY

Risk Category	Overall Risk Level	Notes
Train Movement Conflicts	High	Shared route and overlapping signals require continuous OCC coordination.
Pedestrian / Traffic Interaction	High	CityScape and government district foot traffic.
OCS / Electrical	Medium–High	Dual-circuit overhead configuration.
Work Zone Clearance	High	Minimal physical clearance between tracks and curb.
Environmental / Visibility	Medium	Glare and noise add distraction risks.

FINAL RECOMMENDATIONS

- Schedule all inspections between 0100–0430 hours to minimize conflicts.
- Deploy two lookouts (north/south and east/west) when performing multi-directional checks.
- Utilize portable warning horns or strobe flashers during day work near the diamonds.
- Maintain strict OCC communication logs for each track entry and exit.
- Include in FTA RWP Appendix A hazard map (mark 4 red diamonds at Central & 1st intersections).

H.7 DOWNTOWN PHOENIX TURNAROUND (3RD AVENUE TO 1ST AVENUE – JEFFERSON/WASHINGTON SPLIT)



Section Overview

Location: Downtown Phoenix Turnaround Area
Limits: Begins at 3rd Avenue (Eastbound Jefferson) and continues east through 1st Avenue to Central/Washington Interlocking.
Functions:

- Westbound → Eastbound turnaround operations for Blue Line.
- Track and OCS inspections.
- Switches are locked in reverse during inspection to isolate the loop from active route movement.

Track Type: Double-track alignment with split alignment — Jefferson (eastbound) and Washington (westbound).
Environment: High-density downtown area with continuous pedestrian, vehicle, and transit activity.

Work Activity Description

This turnaround area involves inspection and maintenance of track, OCS, and switch equipment between Jefferson and Washington streets. The segment includes interlocked turnouts and OCS crossings used for directional reversal of train movements.

Due to limited clearance, narrow right-of-way, and proximity to active city traffic, work is performed primarily from the sidewalk or curb zone using lookout protection.

H.7.1 HAZARD IDENTIFICATION

Hazard ID	Category	Description	Potential Consequences	Mitigation / Control Measures
H-1	Train Movement	Active LRV movements through downtown; possible wrong-route entry if switch alignment not verified.	Struck-by hazard, near-miss incidents.	OCC notification required before entering; verify switch locked in reverse; maintain constant radio contact.
H-2	Limited Safe Zones	No dedicated clearance pockets between 3rd Ave and 1st Ave.	Workers exposed to live trackway; limited egress options.	Use sidewalks as designated safe zones; assign lookout with clear line of sight; avoid concurrent street-side work.
H-3	Traffic Interface	Adjacent vehicle lanes and intersections (1st Ave, 2nd Ave, 3rd Ave).	Secondly, by hazard from vehicles; distracted pedestrians.	Deploy traffic cones, signage, and reflective barriers; use high-visibility PPE; coordinate with City of Phoenix traffic.
H-4	Electrical / OCS Exposure	Overhead contact system energized during inspection.	Electrical shock or arc injury.	Maintain 10-ft clearance from energized wire; de-energize only under authorized ETO; wear dielectric

Hazard ID	Category	Description	Potential Consequences	Mitigation / Control Measures
				PPE for pole or span work.
H-5	Confined Walking Clearance	Narrow trackway under structures and landscaping (Marvin Andrews Way).	Trip, fall, or entrapment hazard.	Walk single-file; inspect footing before entering; perform daylight inspection when possible.
H-6	Pedestrian Interference	Downtown Hub pedestrian crosswalks and bus stops near 1st Ave.	Unexpected pedestrian entry into work zone.	Establish cones and caution tape buffer; lookout to monitor pedestrian crossings.
H-7	Environmental / Visibility	Night operations and glare from adjacent lighting.	Reduced visibility of trains, tools, or cables.	Use portable LED lighting; high-visibility clothing (Class 3); ensure reflective striping on cones and signage.
H-8	Communication Delay	OCC may experience channel congestion during downtown events.	Delay in granting or cancelling track access; risk of route release.	Use alternate channel backup (Channel 2 if authorized); maintain secondary contact (cell) with OCC supervisor.
H-9	Weather / Heat	Extreme heat or monsoon conditions.	Heat stress, dehydration, or lightning exposure.	Follow SOP 400.7 Adverse Weather; hydration schedule every 30 min; suspend work during

Hazard ID	Category	Description	Potential Consequences	Mitigation / Control Measures
				lightning within 10 mi.

Mitigation Summary

- Track Protection Type: Working Limits by Verbal Authority or Train Approach Warning (TAW) when loop remains live.
- Safe Zone: Utilize sidewalks and curb strips along Jefferson as designated safe areas.
- Lookout Placement: Positioned west of 3rd Avenue and east of 1st Avenue with direct radio contact to OCC.
- Switch Handling: All turnaround switches locked in reverse prior to inspection; verify position both visually and through OCC confirmation.
- Traffic Protection: Deploy cones (20–25 ft spacing), Type III barricades at intersections, and flashing amber light on work vehicles.

Residual Risk Rating

Hazard	Likelihood (L)	Severity (S)	Risk Rating (L×S)	Residual Level
Train Movement	2	5	10	Medium
Limited Safe Zone	3	4	12	Medium
Traffic Interface	3	4	12	Medium
OCS Exposure	2	5	10	Medium
Environmental/Visibility	2	3	6	Low

Notes

- Maintain continuous OCC communication throughout inspection.
- Coordinate with Signal and OCS teams for combined inspections.
- Use body-worn or vehicle strobe lights at night.
- Document completion through RTRS checklist before clearing limits.

Risk Assessment – Diamond Crossings

Applicable Locations:

- Central Ave & Washington St
- Central Ave & Jefferson St
- 1st Ave & Jefferson St
- 3rd Ave & Ash Ave (Tempe)
- Mill Ave & 3rd St (Tempe Streetcar Junction)

Description:

A diamond crossing is a fixed intersection where two rail lines cross at grade, allowing train movements from two distinct alignments to intersect. Each movement is controlled by signal aspects, interlocking logic, and switch correspondence.
These crossings present elevated risks for train conflicts, wheel climb derailments, OCS contact wear, and limited worker clearance, especially during maintenance or inspection under live service.

Operational and Environmental Context

- **Track Type:** Dual-line, fixed geometry crossing with interlocked signals.
- **OCS Configuration:** Dual overhead contact system with section isolators and neutral zones.
- **Environment:** Urban corridor with active LRV and vehicular interfaces, frequent pedestrian activity, and high current density in OCS overlaps.
- **Work Activities:** Track and signal inspection, diamond lubrication, flange-gap maintenance, OCS tension adjustment, and debris removal.

H.7.2 IDENTIFIED HAZARDS AND RISK ASSESSMENT

Hazard ID	Category	Description	Potential Consequences	Mitigation / Control Measures
D-1	Conflicting Train Movements	Two separate routes intersect under interlock control. Inadvertent signal release or operator error can place two trains in the	Collision or near miss between LRVs; major damage or injury.	OCC must establish Exclusive Track Occupancy (ETO) or interlock “red hold.” Verify route integrity before entry.

Hazard ID	Category	Description	Potential Consequences	Mitigation / Control Measures
		crossing simultaneously.		Use radio confirmation and switch correspondence check.
D-2	Wheel Flange Drop / Climb	Diamond frogs create vertical and horizontal gaps; worn guardrails increase derailment risk.	Wheel climb derailment, equipment damage.	Inspect frog wear routinely; verify guardrail alignment. Conduct slow-order restriction (≤5 mph) during maintenance or heat deformation.
D-3	OCS Overlap and Arcing	Overhead wire tension or neutral zone misalignment across intersecting spans.	Electrical arc, flash injury, or loss of power.	Verify isolation section integrity; maintain 10 ft clearance from energized wire. Coordinate OCS de-energization before span work.
D-4	Limited Clearance / No Safe Zone	Narrow geometry between track intersections; no dedicated refuge for workers.	Worker struck-by hazard.	Establish safe zone outside trackway; assign lookout with visual sightline to both approaches.
D-5	Signal / Switch Fault During Maintenance	Grounding or loss of correspondence can release interlock unexpectedly.	Train movement through occupied crossing.	OCC must apply maintenance lockout and notify all operators. Place mechanical shunt or track tag on both approaches.

Hazard ID	Category	Description	Potential Consequences	Mitigation / Control Measures
D-6	Pedestrian / Vehicle Intrusion	High public interface at downtown and Tempe crossings.	Struck-by incidents, distraction hazards.	Use cones, flaggers, and barriers; restrict pedestrian access. Maintain situational awareness during night or event operations.
D-7	Environmental / Noise / Weather	Metal surfaces accumulate heat and water; reduced traction.	Slips, falls, reduced braking adhesion.	Use non-slip mats for workers; clean diamond prior to inspection; suspend work during heavy rain.
D-8	Communication Loss (OCC)	Signal interference or radio congestion downtown.	Delayed route protection, uncoordinated train clearance.	Maintain alternate radio channel; secondary contact via phone with OCC supervisor.
D-9	Vibration and Noise Exposure	Frequent wheel impacts frog joints.	Hearing loss or fatigue for workers in proximity.	Use hearing protection; limit duration in active area.

Mitigation Strategy Summary

- Track Protection:
  - Exclusive Track Occupancy (ETO) when working directly on diamond or signal bungalow.
  - Train Approach Warning (TAW) only when adjacent track remains active and visibility is unobstructed.
- Lockout / Tagout:

- Verify switch correspondence through OCC and on-site confirmation before entry.
- Safe Zone Placement:
  - Workers remain clear of both intersecting alignments; minimum 6 ft from dynamic envelope.
  - Use adjacent sidewalk, curbside, or protected median for staging.
- Inspection Scheduling:
  - Conduct during low-service or overnight windows to minimize exposure.
- Environmental Controls:
  - Use portable lighting and signage at night; ensure clean walking surface.

Residual Risk Rating

Hazard	Likelihood (L)	Severity (S)	Risk Rating (L×S)	Residual Level
Conflicting Train Movements	2	5	10	Medium
Wheel Flange Drop / Climb	3	4	12	Medium
OCS Exposure	2	5	10	Medium
Limited Clearance	3	4	12	Medium
Environmental Factors	2	3	6	Low

Additional Notes

- All diamond inspections must be coordinated with OCC and Signal Control to ensure route interlock isolation.
- Maintain continuous radio watch with OCC; confirm before restoring interlock to service.
- Document via RTRS Digital Checklist under “Diamond Crossing Inspection” category.
- If any guardrail wear, frog defect, or power arcing is observed — initiate Slow Order Notice and record under RWP Section 10: Hazard Identification and Mitigation.

■ ■ ■

APPENIDIX I – OL-B-1, Baseline Tail Track to Sherman

Section Overview

Locations: Baseline Tail Track • Southern Avenue • Roeser Road • Broadway Road • Pioneer Street • Buckeye Road • Lincoln Interlocking • Sherman Yard Entrance
Line: Orange Line (B Line) – South Central Extension / Baseline Segment
Platforms:

- Baseline Rd / Central Ave – South Terminal (EB / WB)
- Southern Ave / Central Ave – EB / WB
- Roeser Rd / Central Ave – EB / WB
- Broadway Rd / Central Ave – EB / WB
- Pioneer St / Central Ave – EB / WB
- Buckeye Rd / Central Ave – EB / WB
- Lincoln St / Central Ave – EB / WB
- Lincoln St / 1st Ave – WB platform (split pair)

Track Type: Dual-track median alignment within Central Avenue corridor featuring a transition from suburban arterial to urban street running. The section includes multiple at-grade crossings with limited safe-zone clearance at narrow medians and terminates at Sherman Yard Entrance and 27th Street Interlocking.

Crossover: Baseline (Baseline Road – South Central Extension)

Switch ID	Track	Description / Function
1A	Track 1	Facing-point crossover switch from Track 1 to Track 2 (northbound direction).
1B	Track 2	Trailing-point crossover switch paired with 1A for southbound movements returning to Track 1.
3A	Track 1	Trailing-point crossover switch completing Track 1 to Track 2 alignment.
3B	Track 2	Facing-point crossover switch paired with 3A for Track 2 to Track 1 movements.
5	Track 1	Diverging switches provide access to auxiliary or test track siding.

Crossover: Hidalgo (Central Avenue & Hidalgo Street – South Central Extension)

Switch ID	Track	Description / Function
1A	Track 1	Facing-point crossover switch from Track 1 to Track 2 (northbound direction).
1B	Track 2	Trailing-point crossover switch paired with 1A for southbound movements returning to Track 1.
3A	Track 1	Trailing-point crossover switch completing Track 1 to Track 2 alignment.
3B	Track 2	Facing-point crossover switch paired with 3A for Track 2 to Track 1 movements.

Crossover: Raymond (Central Avenue & Raymond Street – South Central Extension)

Switch ID	Track	Description / Function
1A	Track 1	Facing-point crossover switch from Track 1 to Track 2 (northbound direction).
1B	Track 2	Trailing-point crossover switch paired with 1A for southbound movements returning to Track 1.
3A	Track 1	Trailing-point crossover switch completing Track 1 to Track 2 alignment.
3B	Track 2	Facing-point crossover switch paired with 3A for Track 2 to Track 1 movements.

Crossover: Cocopah (Central Avenue & Cocopah Street – South Central Extension)

Switch ID	Track	Description / Function
1A	Track 1	Facing-point crossover switch from Track 1 to Track 2 (northbound direction).
1B	Track 2	Trailing-point crossover switch paired with 1A for southbound movements returning to Track 1.
3A	Track 1	Trailing-point crossover completing Track 1 to Track 2 alignment.
3B	Track 2	Facing-point crossover switch paired with 3A for Track 2 to Track 1 movements.

Interlocking: Sherman Loop (Central Avenue & Sherman Street – South Central Extension)

Switch ID	Track	Description / Function
5B	Track 2	Loop entry switch (south end) allows movement from Track 2 into the Sherman Loop.
5A	Track 1	Loop exit switch (north end) allows trains to return from the loop to Track 1.
1A	Track 1	Facing-point crossover switch from Track 1 to Track 2 (northbound direction).
1B	Track 2	Trailing-point crossover switch paired with 1A for southbound return movements.
3A	Track 1	Trailing-point crossover switch completing Track 1 to Track 2 alignment.
3B	Track 2	Facing-point crossover switch paired with 3A for Track 2 to Track 1 movements.

Grade Crossing: Audubon Crossing, Victory Crossing

Work Activity Description

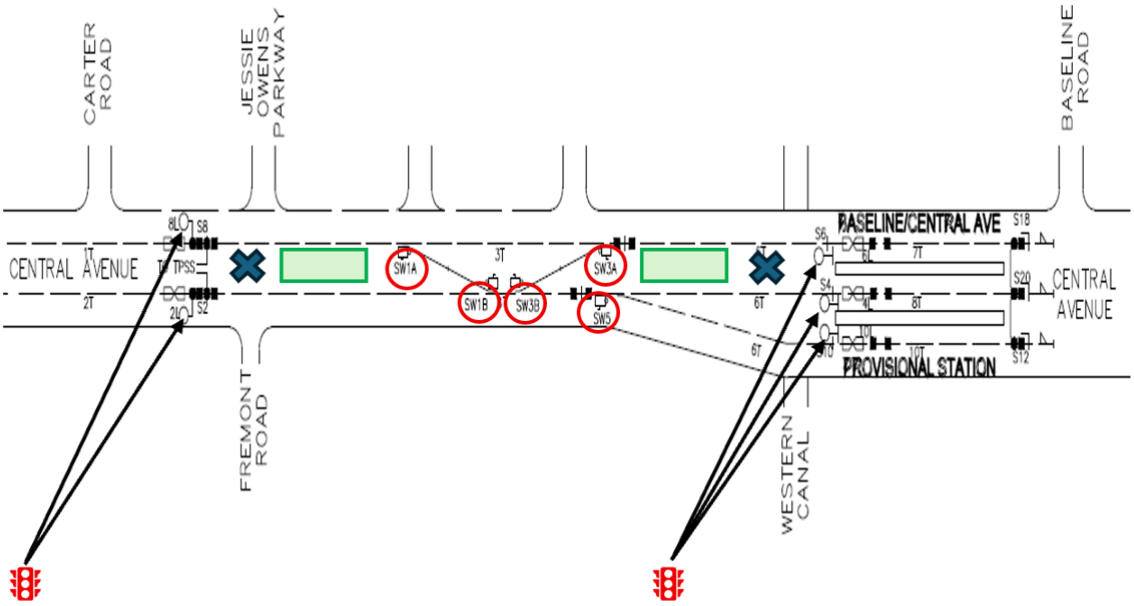
This section encompasses the southern terminal area of the Orange Line where routine track and OCS inspections, switch testing, and yard access operations occur under Roadway Worker Protection (RWP) coverage. The alignment includes a combination of open median track and tight street segments requiring strict adherence to established safe zones and OCC communication protocols.

Personnel must remain clear of active train movements and maintain continuous radio contact on **Channel 2 (B Line)** when performing inspection or maintenance activities. Limited safe-zone clearances exist along Southern Avenue and Buckeye Road, where workers are to use the adjacent sidewalk or designated pull-off areas as temporary safe locations. Due to shared vehicular traffic corridors, high visibility PPE and cone barriers must be deployed per RWP and traffic-control requirements.

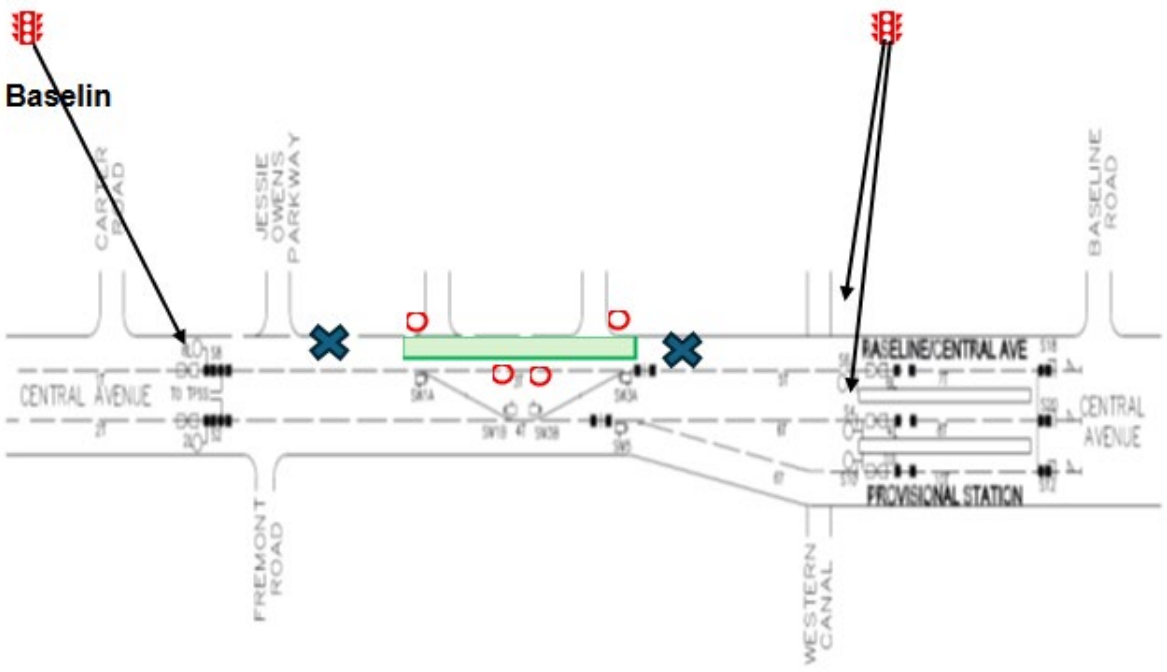
Baseline Terminal End



Baseline Crossover



OL-B-1 – Baseline Crossover Risk Assessment



Location: Baseline Rd & Central Avenue
Line: Orange Line (B Line) – South Central Extension
Track Type: Dual-track median alignment within wide arterial corridor featuring terminal crossover and approach to Baseline / Central Ave Station.
Assets: Switches SW3A, SW3B, signal masts S6–S10, OCS junction over Western Canal, and provisional tail track.

Hazard Identification

Hazard ID	Hazard Description	Likelihood	Severity	Risk Rating	Controls / Mitigations
H-1	Switch misalignment or loss of correspondence due to terminal crossover complexity (SW3A/B).	Medium	High	High	Verify switch position prior to entry; OCC confirmation required; visual indicator check at

Hazard ID	Hazard Description	Likelihood	Severity	Risk Rating	Controls / Mitigations
					ground level.
H-2	Train movement conflicts during OCC route establishment at terminal station.	Medium	High	High	OCC exclusive authority; use Exclusive Track Occupancy (ETO) when performing inspections.
H-3	Limited worker clearance in median during daytime hours with live traffic on both sides.	High	Medium	High	Use sidewalk safe zone near Western Canal; cone barriers required if within curb lane.
H-4	Vehicular and pedestrian intrusion at Baseline intersection and station crosswalks.	High	Medium	High	Assign lookout; deploy cones; coordinate with Traffic Control during work.
H-5	Overhead Contact System (OCS) exposure due to tensioning devices and feeder overlap near Western Canal.	Medium	High	High	Maintain 10 ft minimum clearance; OCS de-energization if elevated work; qualified personnel only.

Hazard ID	Hazard Description	Likelihood	Severity	Risk Rating	Controls / Mitigations
H-6	Slip/trip hazards at crossover frogs and flangeways during wet conditions.	Medium	Medium	Medium	Non-slip footwear; avoid crossing rails when wet; clear debris before inspection.
H-7	Environmental glare from sun alignment (east-west) affecting signal sight lines and visibility.	Medium	Low	Medium	Use shaded positioning; wear anti-glare eyewear; confirm signal aspect audibly via OCC.

Environmental & Traffic Conditions

- High-volume arterial corridor (Baseline Rd) with four-lane cross traffic and adjacent commercial driveways.
- Bus stops and pedestrian crossings adjacent to station platform.
- Wide open median with partial curb barriers, but limited protection from traffic.
- Canal bridge transition introduces surface grade changes that can cause footing hazards.
- Daytime glare and ambient traffic noise reduce situational awareness.

Safe Zone & Access Control

Location	Safe Zone Description	Access Control
Western Canal (north of station)	Sidewalk or utility easement area clear of track; use for observation only.	OCC clearance required; do not occupy track.
Baseline Station	Platform area clear of track gauge; use for brief staging.	TAW or ETO required for any access beyond platform edge.
Median track area	No safe refuge; not authorized for standing or work while trains active.	Exclusive Track Occupancy required.

Communication & Control

- OCC Radio Channel: Channel 2 (Orange Line)
- Call Reference: “Baseline Crossover – from Western Canal to Baseline Station.”
- Protection Type: Exclusive Track Occupancy (ETO) for fixed work; Train Approach Warning (TAW) for mobile or visual checks.
- Minimum Staffing:
    - Roadway Worker In Charge (RWIC)
    - Designated Lookout (if TAW used)
    - Qualified employee for OCS verification

Recommended Controls / Mitigation

- Conduct pre-job briefing covering switch operation, OCS proximity, and expected train frequency.
- Use cone taper at median entry points and post “Track Personnel Ahead” signage.
- Perform switch correspondence test prior to entering the crossover area.
- Limit all on-track time to off-peak or overnight maintenance windows (0100–0430).
- Prohibit lone-worker activities within crossover or station zone.
- Verify SCADA indication stability before setting route for test trains.

Overall Risk Summary

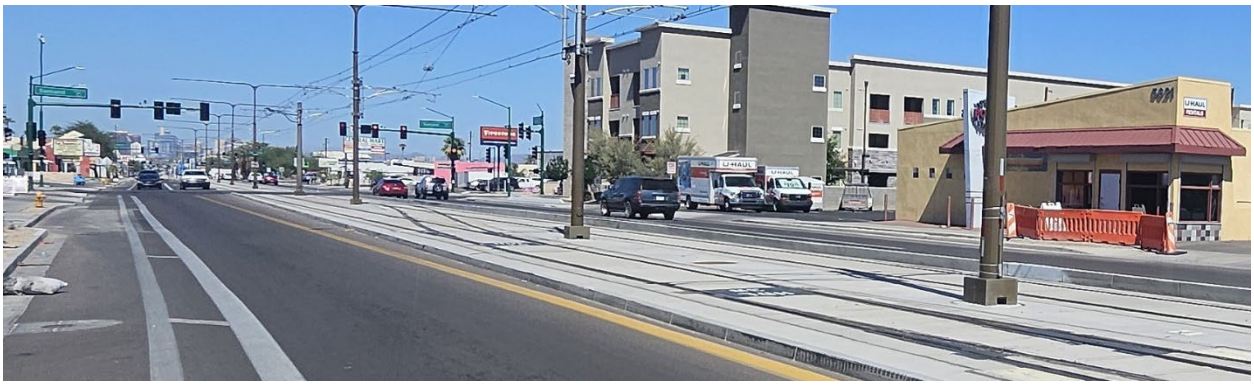
Risk Category	Overall Risk Level
Train Movement Conflicts	High
Traffic / Pedestrian Interaction	High
OCS / Electrical	Medium-High
Work Zone Clearance	High
Environmental / Visibility	Medium

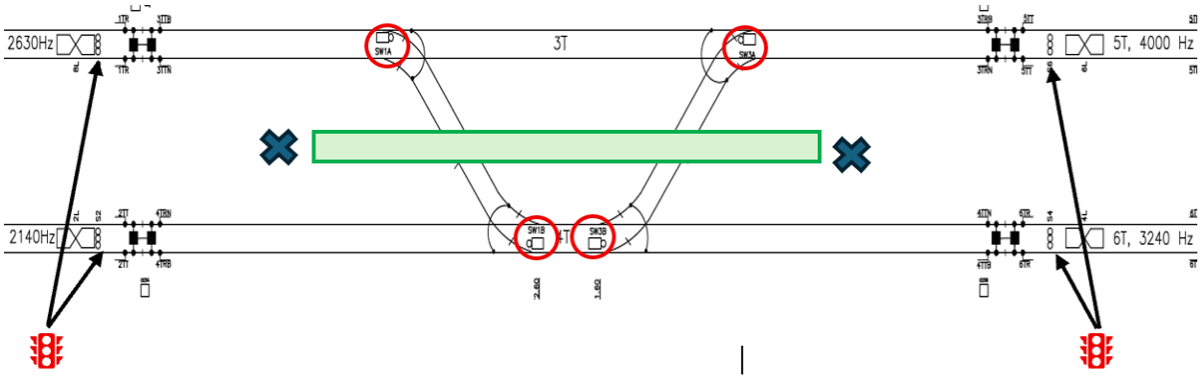
Final Recommendations

- Establish nighttime or early-morning maintenance scheduling to minimize traffic exposure.
- Assign dual lookouts for northbound and southbound train approaches.
- Maintain continuous OCC contact and log track entry/exit.
- Use portable strobe or light beacon to mark crew presence.
- Confirm switch correspondence with OCC after completion of work.

- Include Baseline Crossover in monthly RWP safety audit and annual interlocking inspection plan.

HIDALGO CROSSOVER





Hidalgo Crossover Risk Assessment

Location: Central Avenue & Hidalgo Street
Line: Orange Line (B Line) – South Central Extension
Track Type: Dual-track median alignment through mixed residential and light-commercial corridor, featuring a standard double crossover (SW1A/B and SW3A/B) with full bidirectional route capability.
Assets: Two crossovers, four switch machines, signal masts (S7–S10), OCS tension assemblies, and track circuits 1T through 6T.

Hazard Identification

Hazard ID	Hazard Description	Likelihood	Severity	Risk Rating	Controls / Mitigations
H-1	Switch misalignment or loss of	Medium	High	High	Perform switch correspondence check before

Hazard ID	Hazard Description	Likelihood	Severity	Risk Rating	Controls / Mitigations
	correspondence between SW1A/B and SW3A/B.				entry; verify with OCC signal display; ground visual inspection required.
H-2	Opposing train movements if OCC sets route without full lockout.	Medium	High	High	Establish Exclusive Track Occupancy (ETO) before work; confirm limits via radio before fouling track.
H-3	Restricted safe-zone width in median with active traffic lanes on both sides.	High	Medium	High	Use sidewalk or pull-off zone only; deploy cones and “workers ahead” signage per traffic-control plan.
H-4	Vehicle turning movements and driveway conflicts at adjacent business entrances.	High	Medium	High	Coordinate with City Traffic Control; assign flagger/lookout for vehicle awareness.
H-5	OCS contact or induction hazard from closely-spaced support poles.	Medium	High	High	Maintain 10 ft minimum clearance; de-energize if overhead work planned; qualified OCS staff only.
H-6	Trip hazards from flangeway grooves and frog points	Medium	Medium	Medium	Daylight inspection preferred; use non-slip boots;

Hazard ID	Hazard Description	Likelihood	Severity	Risk Rating	Controls / Mitigations
	along crossover diamond.				remove gravel or debris before walking.
H-7	Limited visibility for northbound operators due to building setbacks and signal mast angles.	Medium	Low	Medium	Approach at restricted speed; install reflective signal target panels; enhance RWIC radio callouts.

Environmental & Traffic Conditions

- Four-lane arterial corridor with high daytime traffic volumes and multiple driveway entrances.
- Residential structures on east side; commercial frontage on west side causes pedestrian mixing near crosswalks.
- Ambient noise from traffic and construction reduces audible warning range.
- Night lighting adequate but introduces headlight glare and shadowing around OCS poles.

Safe Zone & Access Control

Location	Safe Zone Description	Access Control
North end of crossover	Use sidewalk adjacent to U-Haul lot or curb pull-off; do not occupy median.	OCC authorization required before entry.
South end of crossover	West side sidewalk provides limited refuge behind OCS pole line.	TAW or ETO required; designated lookout mandatory.
Median track area	No permanent safe refuge; only access under exclusive track occupancy.	Work limits defined by OCC interlocking clearance.

Communication & Control

- Radio Channel: Channel 2 – Orange Line (B Line)
- Call Reference: “Hidalgo Crossover – between Pioneer and Raymond Segments.”
- Protection Type: Exclusive Track Occupancy (ETO) or Train Approach Warning (TAW).

- Personnel Required: Roadway Worker in Charge (RWIC), Designated Lookout, Qualified OCS Technician (if overhead activity).

Recommended Controls / Mitigation

- Conduct pre-job briefing with OCC and signal maintainers to verify switch status.
- Use portable barriers or cones to separate traffic flow from work zone.
- Schedule maintenance between 0100–0430 hours to reduce exposure.
- Ensure SCADA confirmation of switch status and no active routes before entry.
- Prohibit lone worker operations in this interlocking.
- Inspect for standing water or oil near median drainage grates before walking track.

Overall Risk Summary

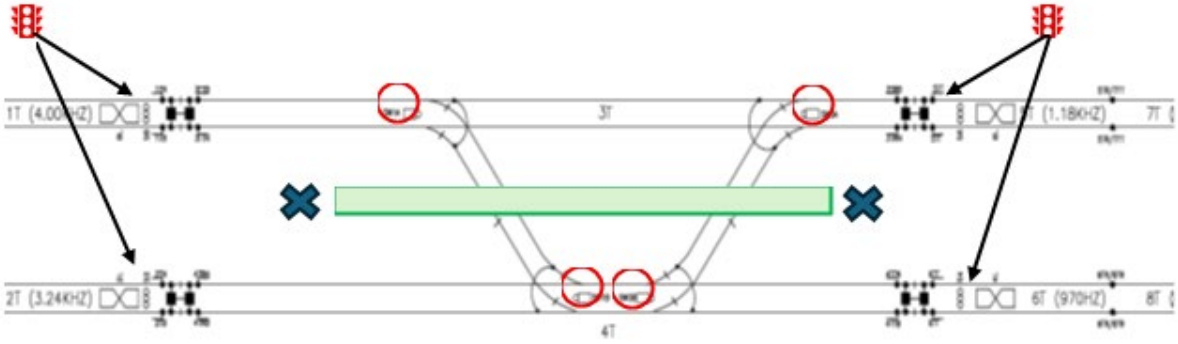
Risk Category	Overall Risk Level
Train Movement Conflicts	High
Traffic / Pedestrian Interaction	High
OCS / Electrical	Medium-High
Work Zone Clearance	High
Environmental / Visibility	Medium

Final Recommendations

- Perform routine inspections only under full OCC coordination and record authority limits in RWP log.
- Assign dual lookouts for northbound and southbound directions.
- Utilize portable strobe beacon or flashing warning device for crew visibility.
- Maintain real-time radio communication with OCC for switch testing and confirmation.
- Include Hidalgo Crossover in monthly RWP field audit and semi-annual signal inspection plan.

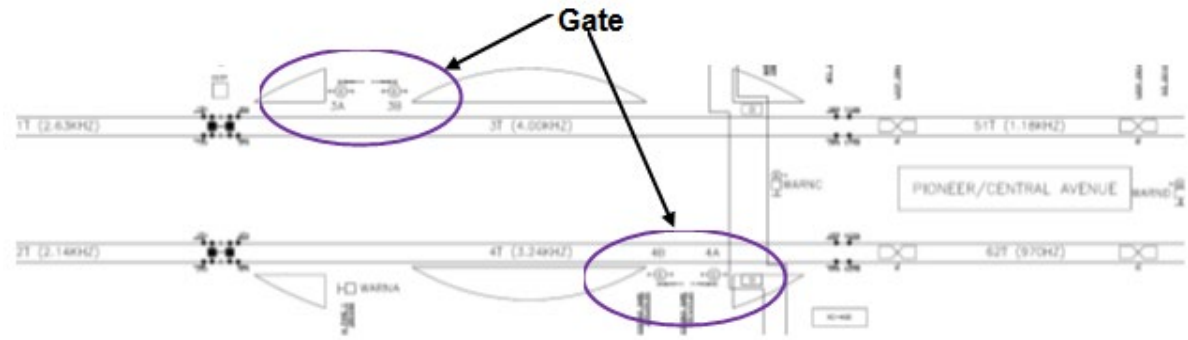
RAYMOND CROSSOVER





Victory Crossing





VICTORY CROSSING – RISK ASSESSMENT

Location: Central Avenue & Victory Street
Line: Orange Line (B Line) – South Central Extension
Track Type: Dual-track median alignment through roundabout intersection with automatic gates and flashing light assemblies.
Assets: Two active grade-crossing gate assemblies, flashing light masts, bells, approach track circuits 1T–6T, OCS pole line, span wire support system, and adjacent traffic signal integration.
Crossing Type: Protected Grade Crossing (No Switches / No Interlocking)

Hazard Identification

Hazard ID	Hazard Description	Likelihood	Severity	Risk Rating	Controls / Mitigations
H-1	Vehicle encroachment into track area within roundabout during gate activation.	High	High	High	Coordinate with City Traffic Control; ensure gates and signals pre-test before arrival; flagger positioned at north approach.
H-2	Confusion of motorists due to roundabout layout and dual gate arms.	High	Medium	High	Place “Train Coming / Stop When Flashing” advance warning signage; portable cones to channel traffic flow.
H-3	Restricted safe-zone access in median—minimal refuge between active lanes and OCS poles.	High	Medium	High	Use only narrow center island between tracks as controlled safe zone; deploy lookout on each approach.
H-4	Pedestrian and cyclist conflict along shared crosswalk alignment adjacent to gate arm.	High	Medium	High	Post temporary pedestrian detour; maintain flagger presence; ensure audible

Hazard ID	Hazard Description	Likelihood	Severity	Risk Rating	Controls / Mitigations
					warnings operational.
H-5	OCS contact hazard from low span wire and pole proximity to roadway.	Medium	High	High	Maintain 10-ft clearance; restrict overhead work unless traction power is de-energized; qualified OCS staff only.
H-6	Limited visibility from southbound operators approaching curve into crossing.	Medium	Medium	Medium	Use enhanced radio communication ("RWIC – Victory Crossing Clear / Occupied"); restrict train speed to 10 mph if work in limits.
H-7	Electrical or grounding hazard from moisture accumulation near mast bases and drainage grates.	Medium	Medium	Medium	Inspect before work; wear dielectric boots; avoid contact with grounded equipment during rainfall.
H-8	Ambient traffic noise and bell tones reduce verbal communication among workers.	High	Low	Medium	Use radios and hand signals; position workers facing train direction; ensure lookout clear line of sight.

Environmental & Traffic Conditions

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- Located within a multi-leg roundabout with continuous vehicular flow.
- Mixed commercial frontage (restaurants, driveways) generating traffic turning near the crossing.
- High pedestrian exposure, especially near the southwest sidewalk and Central Ave bus stops.
- Moderate ambient noise from bells, vehicles, and construction; may mask train horn or RWIC calls.
- Night visibility fair but shadows present along the median—portable lighting recommended for overnight inspections.

Safe Zone & Access Control

Location	Safe Zone Description	Access Control
Center Median Between Tracks	Narrow island between both tracks; only area providing full clearance from passing trains.	Exclusive Track Occupancy (ETO) required; lookout mandatory both directions.
North Approach (toward Pioneer)	Use curb pull-off next to signal mast base; not to exceed 2 personnel.	OCC authorization; cones for traffic separation.
South Approach (toward Baseline)	Sidewalk setback area behind gate arm mechanism; clear view of northbound LRV.	RWIC oversight; do not cross live tracks without OCC approval.

Communication & Control

- Radio Channel: Channel 2 – Orange Line (B Line)
- Call Reference: “Victory Crossing – Central Avenue Roundabout.”
- Protection Type: Exclusive Track Occupancy (ETO) or Train Approach Warning (TAW) depending on scope.
- Personnel Required:
  - Roadway Worker in Charge (RWIC)
  - Designated Lookout / Flagger
  - Signal Maintainer (for gate and flasher testing)
  - OCS Technician (if overhead work required)

Recommended Controls / Mitigation

- Conduct pre-job coordination with OCC and City Traffic Control prior to entering the roundabout.
- Confirm no active LRV movements and verify gate system inactive prior to fouling track.
- When possible, schedule night or early-morning work (0100–0430 hrs) to minimize exposure to vehicle traffic.
- Deploy cones, barriers, and signage ("Rail Work Ahead") per traffic-control standard.
- Maintain dual lookout coverage facing both north and southbound traffic lanes.
- Prohibit lone worker operations due to multi-directional hazards.
- Use portable strobe beacon or reflective vests for increased visibility.
- Document entry and clearance times in RWP Log / RTRS Checklist.

Overall Risk Summary

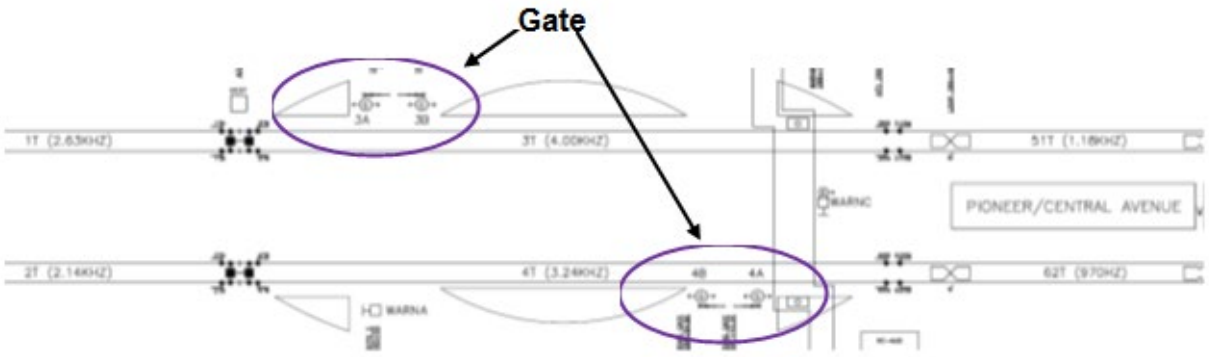
Risk Category	Overall Risk Level
Train Movement Conflicts	High
Traffic / Pedestrian Interaction	High
OCS / Electrical	Medium-High
Work Zone Clearance	High
Environmental / Visibility	Medium

Final Recommendations

- Include Victory Crossing in monthly RWP field audit and semi-annual grade-crossing safety review.
- Coordinate with City Traffic Engineering to evaluate potential installation of advance "Train Signal Activated" beacons for roundabout entries.
- Ensure RWIC briefing includes both train and roadway hazard awareness before any personnel step into the media.
- Consider temporary traffic control officer assignment during major maintenance activities.

AUDUBON CROSSING





Audubon Gate – Risk Assessment

Location: Central Ave @ Audubon (south end of bridge approach)
Line: Orange Line (B Line) – South Central Extension
Crossing Type: Protected grade crossing (gates, flashers, bell). No interlocking within the gate zone; nearest crossover equipment is outside the immediate work limits (verify with OCC).
Assets: Two gate mechanisms with flashers/bells, OCS poles/span, approach track circuits (1T–6T range on this segment), median refuge with landscaping/bollards, adjacent roadway signage.

Context Driver Note: Southbound vehicles descend off the bridge into the crossing, with higher approach speeds and shortened stopping distance.

Hazard Identification

ID	Hazard	Likelihood	Severity	Risk	Controls / Mitigations
H-1	High-speed southbound approach from bridge → longer stopping distance, late red under gate activation.	High	High	High	Night/overnight work where possible; advance “Rail Work Ahead / Be Prepared to Stop” signs 500–800 ft on bridge; portable rumble mats if approved; flagger on southbound approach.
H-2	Queue spillback from downstream roundabout/driveways blocking tracks.	Medium	High	High	RWIC to monitor queues; coordinate with City Traffic for temporary lane control; hold LRV or keep gates up until track is clear.

ID	Hazard	Likelihood	Severity	Risk	Controls / Mitigations
H-3	Limited refuge in median; landscaping/bollards constrain crew movement.	High	Medium	High	Establish tight safe-zone footprint; limit on-track crew size; pre-place cones delineating egress paths; dual lookouts.
H-4	Sight distance / sun-glare for southbound drivers (PM sun) and for operators (AM glare).	Medium	Medium	Medium	Adjust work windows; require high-vis class 3 + strobe beacons; additional lookout focused on southbound lane.
H-5	Ped/bike desire lines near gate mechanisms and sidewalk crossing.	Medium	Medium	Medium	Temporary pedestrian detour; set Type-II/III barricades around bungalow/mast bases; continuous bell verification.
H-6	OCS proximity above median refuge; tools or ladders could reach energized parts.	Medium	High	High	10-ft minimum approach distance; de-energize & ground for overhead tasks; OCS-qualified staff only.
H-7	Electrical/trip hazards at mast foundations,	Medium	Medium	Medium	Daylight inspections;

ID	Hazard	Likelihood	Severity	Risk	Controls / Mitigations
	uneven pavers, flangeways.				non-slip footwear; clear debris; paint flangeway edges if permitted.
H-8	Maintenance vehicle staging conflicts with one-lane taper at bridge end.	Medium	Medium	Medium	Staging on shoulder/off-track pad only; MUTCD-compliant taper and buffer; truck wheels chocked; beacon on.
H-9	Audibility masking (traffic, bells, wind over bridge).	Medium	Low	Medium	Radio headsets for crew; standardized hand signals; lookout maintains line-of-sight at all times.

Environmental & Traffic Conditions

- Down-grade, straight approach off the bridge into the crossing → higher kinetic energy and shorter driver reaction windows.
- Mixed commercial frontage; intermittent driveway turns near the gate island.
- Wind and ambient noise from bridge traffic + bell tones reduce verbal range.
- Night lighting good on roadway; shadowing around OCS poles and cactus plantings can hide workers.

Safe Zones & Access Control

Location	Safe-Zone Description	Access / Limits
Median between	Narrow refuge bounded by embedded rail and bollards;	ETO required for on-track work; max 2–3 personnel; dual lookouts (north & south).

tracks (primary)	workers must face traffic and LRV approach.	
Behind south gate mast	Small setback area behind mechanism case; good for single tech during signal tests (not for group staging).	TAW with lookout acceptable for non-fouling tests; remain outside dynamic envelope.
Sidewalk setback (west or east)	Off-track briefing and tool staging only.	Keep clear path for pedestrians; use cones/tape.

Communication & Control

- Radio Channel: Channel 2 – Orange Line (B Line)
- Call Reference: “Audubon Gate – southbound bridge approach.”
- Protection: Exclusive Track Occupancy (ETO) for any fouling; TAW only for non-fouling signal checks with lookout.
- Crew: RWIC, Designated Lookout(s), Signal Maintainer, OCS Tech (if overhead).

Recommended Controls / Work Methods

1. Pre-job with OCC + City Traffic: confirm timing plans; request temporary speed reduction and “Be Prepared To Stop” sign on bridge.
2. Southbound approach control: place advance warning and a flagger at bridge crest with escape route; consider PCMS during day work.
3. Gate testing: perform during 0100–0430 when feasible; if daytime, hold trains or run manual activation windows coordinated by OCC.
4. Staging: no parking in taper; use shoulder/pad; maintain 100–150 ft buffer per posted speed.
5. Lone worker prohibited within gate island/track area.
6. Document entry/clear times in RTRS; photograph cone layout for audit.

Overall Risk Summary

Category	Level
Train Movement Conflicts	High
Traffic / Ped Interaction	High (due to downhill approach)
OCS / Electrical	Medium–High
Work-Zone Clearance	High
Environmental / Visibility	Medium

Final Recommendations

- Add to monthly RWP field audit and quarterly crossing functional tests with a specific check on southbound approach timing.
- Evaluate advance flashing beacons or rumble treatment on the bridge (City action).
- During any extended work, request temporary officer control at southbound approach.
- Capture near-misses (vehicle roll-throughs under activation) in a crossing log to support timing adjustments.

SALT RIVER BRIDGE







Salt River Bridge – Risk Assessment

Location: Central Avenue Bridge over Salt River
Line: Orange Line (B Line) – South Central Extension
Track Type: Dual-track, long-span elevated bridge structure with no pedestrian crossing points or vehicle intersections.
Work Activities:

- Track and OCS inspection
- Expansion joint greasing
- E-clip and fastener integrity checks

Safe Zone Availability: Only between the two tracks along the full bridge length; no sidewalk or shoulder refuge.

Hazard Identification

Hazard ID	Hazard Description	Likelihood	Severity	Risk Rating	Controls / Mitigations
H-1	Limited or no safe egress — workers confined to narrow space between active tracks.	High	High	High	Exclusive Track Occupancy (ETO) required for full bridge; no partial occupancy permitted.
H-2	Train movement exposure from either direction; insufficient clearance from dynamic envelope.	Medium	High	High	Apply ETO for both tracks; if TAW used for limited inspection, enforce speed restriction ≤ 10 mph and dual lookouts.
H-3	Fall hazard from elevated deck edge (no guardrail beyond parapet).	Medium	High	High	Maintain 6-ft setback; use harness and lanyard within 6 ft of edge; suspend work during high winds.
H-4	OCS contact hazard from low span wires and insulators.	Medium	High	High	Maintain 10-ft clearance; de-energize prior to OCS work; OCS-qualified staff only.

Hazard ID	Hazard Description	Likelihood	Severity	Risk Rating	Controls / Mitigations
H-5	Heat exposure from direct sun; no shade or water access mid-span.	High	Medium	High	Schedule early morning work (<1000 hrs); hydrate every 20 min; use cooling PPE.
H-6	Slips/trips from greased joints and E-clip assemblies.	Medium	Medium	Medium	Use controlled applicators; daylight inspections; wipe excess material immediately.
H-7	Wind exposure causing tool loss or balance hazard.	Medium	Medium	Medium	Suspend overhead work > 25 mph winds; tether all tools.
H-8	Long distance / poor radio coverage along bridge.	High	Low	Medium	Use headsets or repeaters; maintain radio checks every 5 minutes.
H-9	No mid-span vehicle access or emergency egress.	Medium	High	High	Stage vehicles at both ends; RWIC to pre-brief exit routes and confirm rescue plan.

Environmental & Structural Conditions

- Continuous elevated dual-track bridge approximately 2,000 ft in length.
- Exposed to high wind, heat, and solar glare.
- Narrow center refuge only — no walkway or railings beyond parapet.
- Bridge carries OCS poles and tension anchor points; joint access at each end.
- No alternate refuge: all workers must maintain awareness of train direction and clearance limits.

Safe Zone & Access Control

Location	Safe Zone Description	Access Control
Centerline Between Tracks	Only location offering full clearance; minimal lateral space.	ETO required. Under limited TAW conditions for brief inspections, train speed restricted to 10 mph max, dual lookouts required.
North Abutment (approach)	Staging and OCC coordination area; crew entry point.	Radio clearance from OCC; cone perimeter for staging vehicle.
South Approach (Audubon Gate side)	Crew access and pull-off zone.	RWIC monitors southbound traffic; establish taper for work vehicles.

Communication & Control

- Radio Channel: Channel 2 – Orange Line (B Line)
- Call Reference: “Salt River Bridge – between Audubon Gate and Broadway approach.”
- Protection Type: Exclusive Track Occupancy (ETO) or Train Approach Warning (TAW – inspection-only, reduced speed).
- Speed Restriction:
  - Under ETO: No train movement permitted.
  - Under TAW (inspection only): All trains restricted to 10 mph and must provide audible approach signal before entering limits.
  - Work vehicles on approaches: ≤ 5 mph.
- Personnel Required:
  - Roadway Worker in Charge (RWIC)
  - Track Maintainers / OCS Technicians
  - Safety Watchperson with radio headset

Recommended Controls / Mitigation

- Establish full ETO or TAW with speed restriction before entry.
- Require RWIC confirmation of OCC log entry and speed restriction in effect before any work begins.
- Maintain continuous radio contact and check-ins every 5 minutes.
- Use tethered tools and limit carried materials to essentials.
- Conduct heat-stress and hydration check during shift briefing.
- When possible, schedule inspections 0100–0430 hrs or before 1000 hrs during summer months.
- Post “No Refuge – Both Tracks Protected” signage at both ends.
- Verify traction power de-energized for any OCS or joint work.

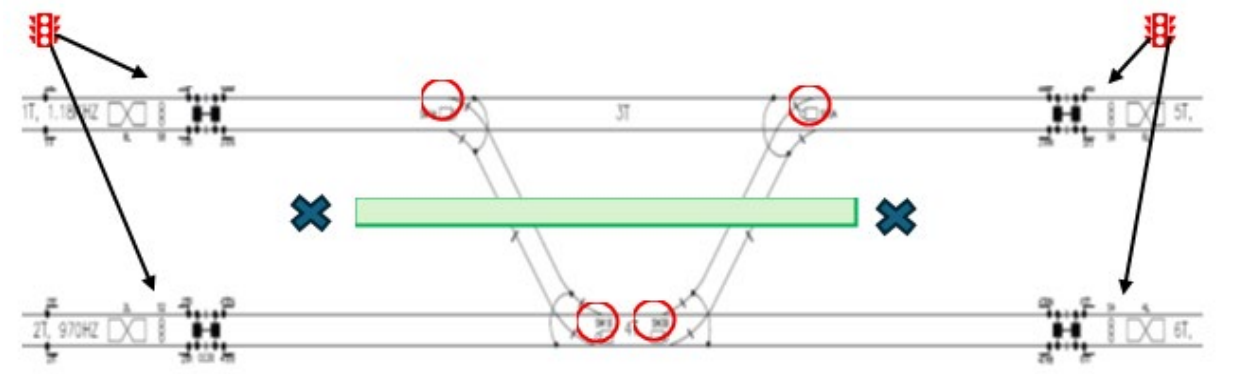
Overall Risk Summary

Risk Category	Overall Risk Level
Train Movement Conflicts	High
Structural / Fall Hazards	High
OCS / Electrical	High
Work Zone Clearance	High
Environmental / Visibility	Medium-High

Final Recommendations

- Include Salt River Bridge in Quarterly RWP and Structural Inspection Audit.
- Require speed restriction confirmation in OCC RWP log for all operations.
- Equip crews with portable radios, strobe beacons, and cooling PPE.
- Maintain dual-track occupancy control and do not authorize single-track work under active service.
- Review SCADA alarm and circuit status post-inspection to verify clearance





Cocopah Crossover – Risk Assessment

Location: 3rd Avenue & Cocopah Street
Line: Orange Line (B Line) – South Central Extension
Track Type: Dual-track median alignment in an industrial corridor with moderate curvature and limited sight distance approaching from the north. Standard double crossover (SW1A/B and SW3A/B) configuration supporting bidirectional moves for operations and maintenance.
Assets: Two crossovers, four switch machines, associated signal masts, OCS supports, and track circuits 1T–6T.

Hazard Identification

Hazard ID	Hazard Description	Likelihood	Severity	Risk Rating	Controls / Mitigations
H-1	Switch misalignment or loss of correspondence between SW1A/B or SW3A/B during manual or OCC-controlled route setup.	Medium	High	High	Perform visual switch correspondence verification; confirm alignment via OCC before fouling the track. Ground check required before occupancy.
H-2	Opposing train movements if ETO or route lockout not properly established.	Medium	High	High	Establish Exclusive Track Occupancy (ETO) with OCC; confirm work limits; maintain radio contact throughout.
H-3	Limited visibility due to bridge grade and curvature approaching southbound direction.	Medium	Medium	Medium	Use designated lookout positioned north of crossover; implement Train Approach Warning (TAW) if ETO not established.
H-4	Worker struck-by hazard from traffic or work vehicles positioned near narrow roadway shoulder.	Medium	Medium	Medium	Use cones, signage, and high-visibility barriers; park work truck parallel to track on west side in designated shoulder space.

Hazard ID	Hazard Description	Likelihood	Severity	Risk Rating	Controls / Mitigations
H-5	Trip hazard from track flange ways and uneven pavement between track slabs.	Medium	Low	Low	Maintain 3-point contact when crossing tracks; wear approved safety footwear with defined sole.
H-6	OCS clearance hazard during overhead inspections or lift-truck operations.	Low	High	Medium	De-energize and ground section before any overhead work; maintain minimum 10-ft clearance when energized.
H-7	Unauthorized access or intrusion by vehicles or pedestrians entering the alignment.	Low	Medium	Low	Use cones and flaggers during active work; post “Track Closed / Do Not Enter” signage when under ETO conditions.

Safe Zone & Watchperson Positioning

Location	Safe Zone Description	Lookout / Watchperson Position
North of crossover (between tracks)	Narrow paved median between track 1 and track 2 – adequate for 2 personnel standing clear with awareness.	Station lookout north of SW1A within sight of approaching train from bridge grade.
South of crossover (near industrial driveway)	Wide paved shoulder adjacent to westbound track, safe for crew staging and vehicle parking.	Secondary lookout monitors southbound approach toward the bridge curve.

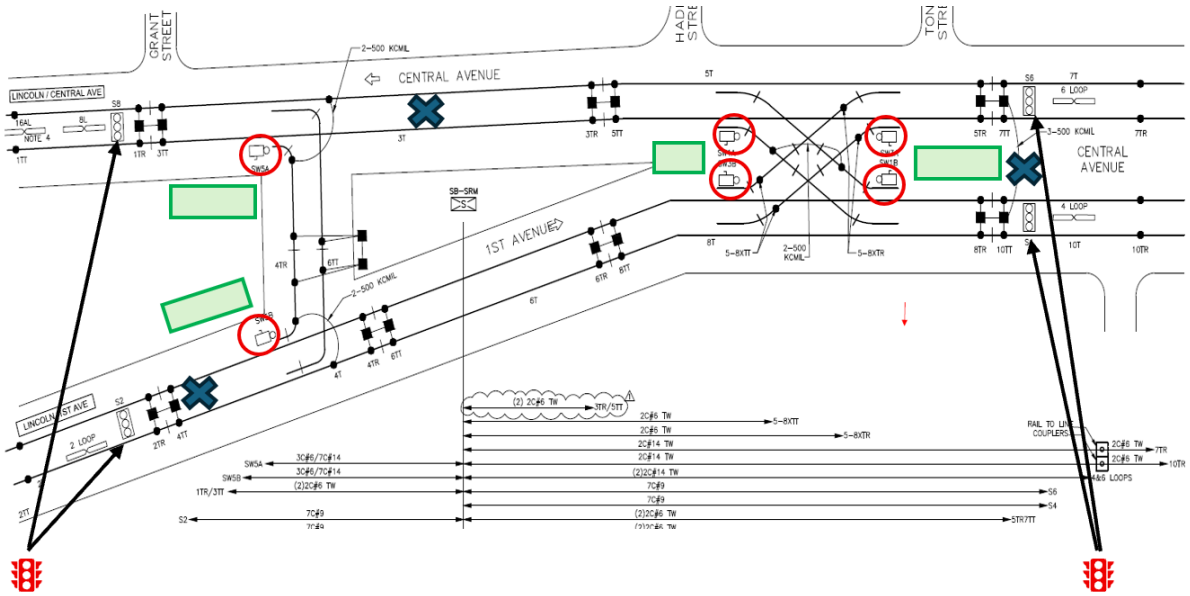
Operational Notes

- Due to southbound traffic descending from the bridge, braking distance for LRVs may be reduced—extra caution required during inspections or switch maintenance.
- All movements through Cocopah Crossover must be confirmed via OCC with switch correspondence verified before entry.
- Work truck setup is tight due to single-lane restriction; use spotter when positioning vehicles.
- Maintain continuous radio monitoring on Channel 2 (Orange Line) and identify as “Signal/Track Crew at Cocopah Crossover.”

Sherman Loop







Sherman Loop – Risk Assessment

Location: 1st Avenue & Central Avenue (Sherman Loop)
Line: Orange Line (B Line) – Downtown Phoenix South Junction
Track Type: Dual-track alignment transitioning into a loop junction where northbound and southbound alignments merge before continuing northbound toward Lincoln Street.
Assets: Loop track connection, crossover (SW1A/B and SW3A/B), OCS pole line, track circuits 3T–8T, switch machines, and signal masts (S5–S8).
Work Activities:

- Track and OCS inspection
- Switch and signal maintenance
- Visual verification of wheel flanges, bond wires, and insulated joints
- Crossover correspondence checks

Hazard Identification

Hazard ID	Hazard Description	Likelihood	Severity	Risk Rating	Controls / Mitigations
H-1	Restricted visibility / blind spots through the loop curve; operators cannot see workers until close range.	High	High	High	Require reduced speed ≤ 10 mph during inspection; lookout positioned on north and south approaches; use high-visibility strobes.
H-2	Tight curve geometry causes wheel flange noise and distraction, limiting audible detection of trains.	High	Medium	High	Use dual lookouts; maintain continuous radio communication with OCC and train operators during test runs.
H-3	Confined clearance in the loop—no sidewalk or median refuge.	High	High	High	Exclusive Track Occupancy (ETO) required; workers positioned between tracks only under full protection.
H-4	Operator line-of-sight obstruction at crossover turnout due to signal mast and pole line.	Medium	High	High	Limit movements through crossover to 10 mph; ensure signal maintainers confirm correspondence before releasing route.
H-5	Simultaneous opposing train entry if OCC sets	Medium	High	High	Verify route lockout through OCC; apply single-direction

Hazard ID	Hazard Description	Likelihood	Severity	Risk Rating	Controls / Mitigations
	both loop and mainline routes.				authority during inspection; log route limits in RWP form.
H-6	Pedestrian interaction at Lincoln/1st Ave crosswalk near station platform.	Medium	Medium	Medium	Deploy cones and “Rail Work Ahead” signage; lookout at pedestrian crossing; work off-peak hours.
H-7	OCS proximity hazard in curve—low contact wire height and close span poles.	Medium	High	High	Maintain 10 ft clearance; de-energize for any overhead work; OCS-qualified personnel only.
H-8	Vehicle right-turn conflicts at Lincoln/1st Ave and Central Ave signals.	Medium	Medium	Medium	Coordinate with City Traffic Control; flagger at intersection during day work.
H-9	Heat and glare from concrete surfaces reduces visibility of hand signals.	High	Medium	High	Schedule early morning/overnight work; reflective PPE and hard-hat strobes required.

Environmental & Traffic Conditions

- Mixed urban arterial intersection with adjacent commercial and industrial frontage.
- Curved alignment creates blind zones for operators traveling northbound from Central and southbound from 1st Avenue.
- High vehicle and pedestrian presence at Lincoln Street crossing and platform area.
- Ambient noise and echo from surrounding walls reduce warning audibility.

- Night lighting fair but creates shadowing between OCS poles and signal masts—portable lighting recommended for night work

Safe Zone & Access Control

Location	Safe Zone Description	Access Control
Between Tracks (Loop Interior)	Only limited refuge between tracks; workers must stay centered and alert to both directions.	ETO required for all track occupancy; dual lookouts mandatory.
North Approach (Central Avenue)	Limited clearance near platform; usable for staging tools only.	OCC authorization; no fouling track.
South Approach (1st Avenue)	Slightly wider pavement shoulder; suitable for safety briefing or temporary refuge.	OCC authorization; cones/barriers required if near live lane.

Communication & Control

- Radio Channel: Channel 2 – Orange Line (B Line)
- Call Reference: “Sherman Loop – between 1st Ave and Central Ave crossovers.”
- Protection Type: Exclusive Track Occupancy (ETO) or Train Approach Warning (TAW – inspection only, reduced speed).
- Speed Restrictions:
  - Under ETO: No train movement.
  - Under TAW: Maximum train speed 10 mph through curve and crossover; audible bell required approaching limits.
  - Switch and signal testing: 5 mph movement for verification only.
- Personnel Required:
  - Roadway Worker in Charge (RWIC)
  - Signal Maintainer
  - OCS Technician (if overhead)

Recommended Controls / Mitigation

- When possible, perform work 0100–0430 hrs when traffic and train volume lowest.
- Pre-brief with OCC and confirm which alignment (Central or 1st Ave) is active.
- Use portable Type III barricades or cones along station edge for pedestrian control.
- Prohibit lone-worker operations in this loop and crossover zone.
- Deploy dual strobes on each end of work limits.

- Confirm switch correspondence and signal aspect dark prior to walking track.
- Apply speed restriction ≤ 10 mph during any TAW condition, and 5 mph during crossover movement testing.
- Maintain continuous radio check-ins every 5 minutes.

Overall Risk Summary

Risk Category	Overall Risk Level
Train Movement Conflicts	High
Visibility / Blind Spots	High
OCS / Electrical	Medium-High
Work-Zone Clearance	High
Traffic / Pedestrian	Medium
Environmental / Lighting	Medium

Final Recommendations

- Include Sherman Loop in monthly RWP field audits and quarterly signal-correspondence verification.
- Install or maintain reflective delineators along curve to improve operator sightline.
- Review CCTV visibility and signal mast placement to reduce blind zones.
- Enforce 10 mph restricted speed during all inspection, greasing, and visual verification activities.
- Coordinate with City of Phoenix Traffic Signal department for any lane closures or detours near Lincoln Street.

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APPENDIX J – OL-B-2, Sherman Loop to McDowell

Section Overview

Location: Downtown Phoenix – Central & 1st Avenue (Jackson Interlocking)
Line Intersection: Blue Line (A Line) – East/West Jefferson & Washington
Orange Line (B Line) – North/South Central & 1st Avenue
Assets Involved: Four diamond crossings, two double crossovers, four signal aspects, shared OCS and switch zones.
Adjacent Landmarks: City Scape, Jefferson/Washington platforms, Court Buildings, and downtown traffic corridors.

Platforms:

- Lincoln St / Central Ave – EB / WB
- Lincoln St / 1st Ave – WB platform (split pair)
- Jefferson St / Central Ave – Downtown Phoenix Hub (EB) – Transfer to A Line
- Washington St / 1st Ave – Downtown Phoenix Hub (WB) – Transfer to A Line
- Van Buren St / Central Ave – EB / WB
- Roosevelt St / Central Ave – EB / WB
- McDowell Rd / Central Ave – EB / WB

Track Type: Dual-track alignment transitioning through the Downtown Phoenix core, operating in a split-pair configuration (Jefferson Street eastbound / Washington Street westbound). The alignment passes through high-density pedestrian zones with signalized intersections and constrained median widths. Track geometry remains primarily straight with minor curvature at transitions near Lincoln and Roosevelt. The section interfaces with A Line crossovers and diamond crossings at Jefferson and Washington Streets.

Work Activity Description

This corridor includes high-traffic downtown operating zones where work activity focuses on track and OCS inspections, signal system verification at interlockings, and routine maintenance of embedded track and special trackwork near the Jefferson/Washington diamond crossings.

- **Access:** Entry via curb ramps or midblock openings with flag protection at intersections.
- **Protection:** Exclusive Track Occupancy (ETO) required when work occurs within or adjacent to the diamond crossing zone.
- **Safe Zones:** Primary safe positioning located along the curb line or protected sidewalk, with designated lookout positions near 1st Avenue and Central Avenue.

- **Visibility:** Reduced by urban lighting glare, bus traffic, and high pedestrian density—especially during daytime events and evening transit peaks.

Interlocking: Jackson Crossover McKinley Loop (Central Avenue & McKinley Street – Downtown Phoenix)

Switch ID	Track	Description / Function
1	Track 1 (South End)	Manual facing-point crossover switch connecting Track 1 to the loop (southbound entry).
3	Track 1 – Fillmore Siding	Spring switch provides automatic trailing-point return from the Fillmore siding to the mainline (normally lined for mainline).
7	Track 2 (North End)	Manual facing-point crossover switch from Track 2 to Track 1 (northbound direction).
9	Track 2 (North End)	Manual loop-access switch allowing movement from Track 2 into the McKinley loop (north entry).
11	Track 1 (South End)	Manual trailing-point switch paired with Switch 1 for return from the loop to Track 1 (south exit).
13	Loop Track	Manual facing-point loop switch connecting within the McKinley loop alignment (mid-loop connection).
15	Loop Track	Manual trailing-point loop switch completing loop circulation and reconnecting toward Track 2.

RISK ASSESSMENT – BLUE LINE SECTION 5 / ORANGE LINE SECTION 2

Hazard ID	Hazard Description	Affected Area	Likelihood	Severity	Risk Rating	Controls / Mitigations
H-1	Diamond crossing misalignment or switch route failure due to complex interlocking logic shared between Blue & Orange lines.	Central Ave / Jefferson & Washington	Medium	High	High	Routine switch correspondence verification before access; SCADA and OCC clearance prior to any field entry; visual confirmation

Hazard ID	Hazard Description	Affected Area	Likelihood	Severity	Risk Rating	Controls / Mitigations
						of switch lockout.
H-2	Conflicting train movements between east-west and north-south routes during signal aspect transitions (red/yellow overlap).	Jackson Interlocking (All 4 Diamonds)	Medium	High	High	Coordination via OCC for exclusive track occupancy; maintain visual confirmation of aspect protection; assign dedicated lookout.
H-3	Limited safe zone and worker clearance along Central Ave due to curbline proximity and pedestrian/bike lanes.	Central / Jefferson & Washington	High	Medium	High	Use sidewalks and protected zones only; deploy cones/barriers if occupying track; no worker positioning between diamonds without OCC ETO.
H-4	Vehicular and pedestrian traffic intrusion in shared downtown crossings	Jefferson/Washington / City Scape	High	Medium	High	Temporary traffic cones and flagger deployment; maintain lookout; perform work during off-peak or

Hazard ID	Hazard Description	Affected Area	Likelihood	Severity	Risk Rating	Controls / Mitigations
	(high foot traffic zones).					OCC-scheduled closure.
H-5	Electrocution / OCS contact hazard due to overhead dual alignment (shared cantilever wires & junction transitions).	Central Ave alignment	Medium	High	High	Maintain 10 ft clearance; de-energize via OCC if elevated work is needed; qualified linemen only.
H-6	Reduced visibility due to surrounding high-rise reflections, signage, and multiple traffic lights.	Central Ave / Washington	Medium	Medium	Medium	Enhanced situational awareness; utilize lookout; wear high-visibility PPE.
H-7	Noise and distraction hazards from street traffic, bus routes, and adjacent businesses.	Entire Downtown Zone	High	Low	Medium	Require radio ear protection with OCC communication monitoring.
H-8	Slip/trip hazards at diamond points and flangeways during inspection or cleaning.	Track bed at diamonds	Medium	Medium	Medium	Walk between flangeways only under stop condition; use non-slip boots;

Hazard ID	Hazard Description	Affected Area	Likelihood	Severity	Risk Rating	Controls / Mitigations
						daylight inspections.
H-9	Signal aspect misinterpretation (e.g., wrong signal line-of-sight from adjacent mast).	Central Ave crossovers	Low	High	Medium	Verify aspect identification against signal plate; OCC confirmation before movement.

ENVIRONMENTAL & TRAFFIC CONDITIONS

- Urban core with high pedestrian density (City Scape, court district, offices).
- Frequent vehicular turning conflicts across track zones (notably Central Ave right turns).
- Limited shoulder or right-of-way for work crews; use sidewalk staging areas only.
- Night operations increase visual hazards from ambient light and vehicle glare.
- Shared OCS network with overhead curve-tension transitions between both alignments.

SAFE ZONE & ACCESS CONTROL

Location	Safe Zone Description	Access Control
1st Ave / Jefferson	Sidewalk west side only; avoid lane-side standing.	OCC clearance required for any track walk.
1st Ave / Washington	Protected pedestrian zone west side; maintain lookout.	TAW or ETO protection required.
Central / Jefferson	Use City Scape sidewalk and fountain plaza as clear zone.	OCC radio contact required; cones if near curb.
Central / Washington	East sidewalk preferred; avoid within diamond until ETO established.	ETO / exclusive control under OCC.

COMMUNICATION & CONTROL

- Radio Channel: Channel 1 – Blue Line / Channel 2 – Orange Line
- OCC Call-in: “Central Interlocking – from Jefferson to Washington” or “1st Ave – Washington to Jefferson”
- Protection Type: Exclusive Track Occupancy (ETO) or Train Approach Warning (TAW)
- Required Personnel:
    - Roadway Worker In Charge (RWIC)
    - Designated Lookout (if TAW used)
    - Qualified employee for OCS lockout

RECOMMENDED CONTROLS / MITIGATION ACTIONS

1. Work only during scheduled OCC maintenance windows or with full ETO.
2. Pre-job briefing must include both Blue and Orange Line alignments (shared route control).
3. Double confirmation of signal aspect authority before entering interlocking.
4. Install portable warning devices or cones for visual separation.
5. Prohibit lone worker operations due to overlapping traffic zones.
6. Monitor SCADA alarm log (S2/S8 CALC) for any overrun or mis-route before entering zone.
7. Cross-track inspection only under zero-movement authority; verify via OCC lockout.

OVERALL RISK SUMMARY

Risk Category	Overall Risk Level	Notes
Train Movement Conflicts	High	Shared route and overlapping signals require continuous OCC coordination.
Pedestrian / Traffic Interaction	High	City Scape and government district foot traffic.
OCS / Electrical	Medium–High	Dual-circuit overhead configuration.
Work Zone Clearance	High	Minimal physical clearance between tracks and curb.
Environmental / Visibility	Medium	Glare and noise add distraction risks.

FINAL RECOMMENDATIONS

- When possible, schedule all inspections between 0100–0430 hours to minimize conflicts.
- Deploy two lookouts (north/south and east/west) when performing multi-directional checks.
- Utilize portable warning horns or strobe flashers during day work near the diamonds.
- Maintain strict OCC communication logs for each track entry and exit.
- Include in FTA RWP Appendix A hazard map (mark 4 red diamonds at Central & 1st intersections).

SOUTH CENTRAL BRIDGE / UNDERPASS FLOOD HAZARD (JACKSON OCC INTEGRATION)

Location: Central Avenue Underpass (Buchanan St → Jackson St)
Corridor: Orange Line (B Line – South Central Extension)
Reference Systems: OCC Flood Sensor X26C “FLOOD LOW”, X26D “FLOOD HIGH”, Pump House “HUS”, JCK OCC Node Display
Applicable To: MOW, Facilities, Traction Power, Signal, and Contractor Personnel
References:

- FTA 49 CFR Part 674.33 – State Safety Oversight
- FRA 49 CFR 214.327(b) – On-Track Safety under Adverse Weather
- Valley Metro SOP 400.7 – Adverse Weather & Flood Response
- Valley Metro SOP 600.13 – Flooded Track / Underpass Procedures

1. Hazard Description

The South Central Bridge underpass is a below-grade corridor monitored by OCC flood detection sensors and sump pumps. The OCC control interface (shown in the first image) indicates flood sensor alarms through nodes X26C and X26D, and supervisory control over the pump house HUS.

When rainfall exceeds drainage capacity or sump pumps fail, rapid flooding can occur in the underpass, submerging rail slabs, OCS pole bases, and electrical enclosures. Water levels can rise within minutes, creating a high-risk hazard for roadway workers and light rail vehicles.

Hazards include electrical shock, slips and falls, loss of traction power grounding, and track washout or subsurface voids caused by erosion and debris deposition.

Four Standard Hazard Categories

Category	Assessment	Description / RWP Impact
Access Limitation	☑ High	Flooded underpass restricts safe entry and exit routes for workers. Standing water and debris create barriers to movement and evacuation.
Braking Distance	☑ Medium	Wet rail surfaces reduce adhesion and extend LRV break distances when approaching or exiting the flooded zone.
Visibility (Curves / Portals / Distractions)	☑ High	Poor lighting and reflective surfaces obscure depth perception; floodwater reflections and overhead lighting can mask hazards or submerged rails.
Environmental Factors	☑ High	Heavy rain, electrical grounding faults, waterborne debris, and silt accumulation affect track structure, OCS grounding, and general worker safety.

Risk Assessment Matrix

Hazard ID	Description	Likelihood	Severity	Risk Rating	Mitigation / Controls
SCB-1	Flood event triggered by rainfall or pump failure (OCC alarm active)	Medium	High	High	OCC monitors sensors X26C/X26D. Upon alarm, suspend roadway access, issue radio alert, and confirm sump pump “HUS” status before authorizing any field presence.
SCB-2	Slips, trips, and falls on slick rail or silted surfaces	High	Medium	High	Facilities clears debris post-storm; barricades installed at portal entries. RWIC establishes dry, stable footing

Hazard ID	Description	Likelihood	Severity	Risk Rating	Mitigation / Controls
					zones and safe pathways.
SCB-3	Subsurface washout or undermined rail slab following flood	Medium	High	High	Track inspection required before resuming service. Maintain ETO until confirmed safe.
SCB-4	Inadequate operator visibility of submerged track	Medium	High	High	Upgrade flood alarm indicators to include flashing white “Flood Active” beacon at the portal. OCC repeats alarm to ACI operators and alerts via radio.

OCC Integration and Response

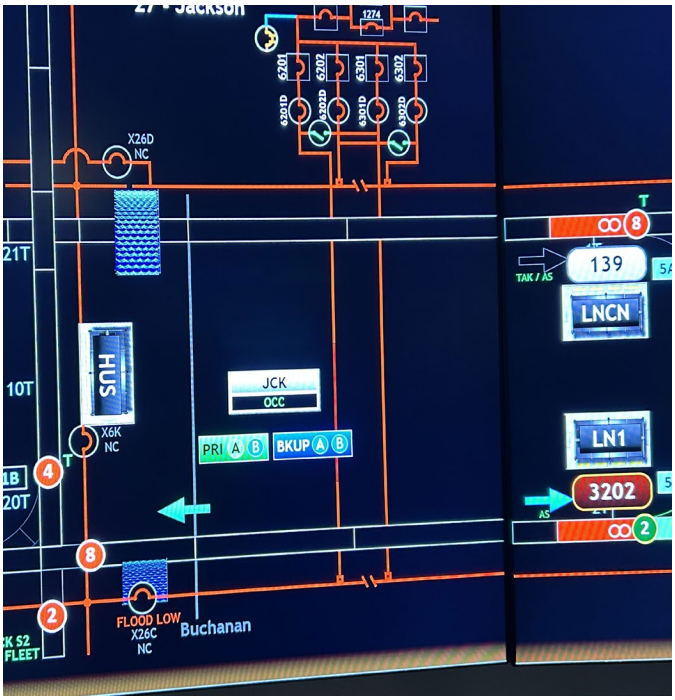
- Flood Detection: Sensors X26C (low) and X26D (high) automatically trigger OCC alarms displayed under “JCK OCC” node on the SCADA screen (as seen in Image 1).
- Pump Monitoring: Jackson or Sherman House pump station reports status to OCC; “PRI” and “BKUP” indicators confirm active channels.
- Response Protocol: Upon alarm, OCC issues “Flood Condition” radio broadcast and locks out access under RWP.
- Re-entry Control: Only authorized RWP crews may enter once the “HIGH FLOOD” alarm clears, and OCC verifies pump status normal.

Mitigation Summary

- OCC Coordination: Maintain SCADA flood alarm monitoring 24/7; dispatch response teams upon any alarm trigger.
- Work Suspension: Halt all underpass work during active flood alarms or when standing water exceeds 1 inch on track slab.
- Post-Event Inspection: MOW inspect track gauge, slab anchors, and traction power cabinets for corrosion or damage.
- Preventive Maintenance: Ensure drains, sumps, and trench grates are clear prior to forecasted rainfall events.
- Enhanced Visual Alerts: Install high-visibility flashing beacons or dynamic signage tied to OCC flood detection logic.

References

- FTA 49 CFR Part 674.33 – State Safety Oversight
- FRA 49 CFR 214.327(b) – On-Track Safety Under Adverse Weather
- Valley Metro SOP 400.7 – Adverse Weather and Flood Response
- Valley Metro SOP 600.13 – Flooded Track & Underpass Entry
- TAG-B-2 Appendix B – Flood Sensor Map (HUS, X26C, X26D, JCK)
- OCC SCADA Reference Screen – Jackson Operations Control Center



OCC Flood and Pump System – Component Definitions

TAG/Device ID	System Name	Function/Description	Normal OCC Indication/Alarm Condition	RWP / Field Relevance
X26C	Flood Low Sensor (Central Ave Underpass – South Portal)	This is a low-level flood sensor installed near the lowest drainage point of the underpass. It detects the initial accumulation of water (e.g., 1–2 inches). When water reaches this probe, OCC receives a “FLOOD LOW” alert.	Normal = “NC” (Normally Closed) Alarm = “Open” (FLOOD LOW ON SCADA)	Indicates early warning — flood pumps should activate automatically; triggers review before work zone entry.
X26D	Flood High Sensor (Central Ave Underpass	Detects elevated water level, typically 12–18 inches above rail level. This signal triggers a high-water alarm at OCC and, if	Normal = “NC” Alarm = “Open” (FLOOD HIGH Active)	Confirms severe flooding; prohibits any roadway worker or

TAG/Device ID	System Name	Function/Description	Normal OCC Indication/Alarm Condition	RWP / Field Relevance
	– North Portal)	configured, automatically shuts down traction power in the affected block		vehicle entry; OCC initiates power isolation and notifies safety.
X6K	Pump Control / Status Node	This represents a control relay or logic point that interfaces with the flood pump motors. It's usually tied to "HUS" pump house status and allows OCC to monitor whether pumps are running	Green arrow (active) = Pumps On Red = Off / Fault	Used by OCC to verify pump operation before authorizing access after rainfall.
HUS	Pump House – Central Avenue Underpass Sump Station	The primary drainage station for the underpass. It contains the main and backup sump pumps that discharge stormwater into the city storm drain system. Its control logic connects through nodes X26C, X26D, and X6K.	"PRI" and "BKUP" indicators on OCC show active or standby status for dual pumps.	Field crews verify mechanical operation, clear debris, and confirm drains are unobstructed. This site is classified as a confined-space entry location under SOP 400.7 and 600.13.

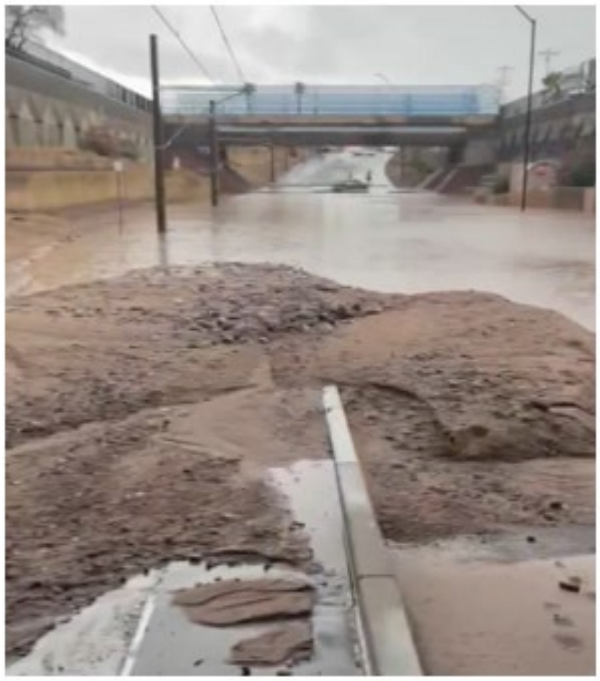
How It Works Together

1. Rainfall / Storm Event Begins
   → Water flows into the Central Ave underpass catch basin.
2. Low-Level Detection (X26C)
   → "FLOOD LOW" triggers at OCC; pumps automatically start (HUS station).
   → OCC confirms green indicator at X6K NC.

3. Pump Operation / Monitoring
   → HUS “PRI” (primary) and “BKUP” (backup) pumps alternate or run simultaneously if needed.
   → OCC verifies both channels operational (“PRI A” / “BKUP A B”).
4. High-Level Detection (X26D)
   → If water continues to rise (pump failure or severe inflow), “FLOOD HIGH” alarm activates.
   → OCC alerts field crews, locks out traction power, and closes underpass to traffic and workers.
5. Recovery Phase
   → Once water subsides, OCC verifies normal (sensors clear), pumps cycle off, and access may resume only after Facilities confirm physical drainage and electrical safety.

In Roadway Worker Protection Context

- Sensors (X26C/X26D) act as automatic hazard detection controls under FRA/FTA RWP hazard mitigation principles (environmental hazard monitoring).
- Pump House HUS is both a control point (OCC-managed) and a field hazard zone requiring confined-space entry precautions.
- OCC Node JCK provides centralized situational awareness — “FLOOD LOW” or “FLOOD HIGH” alarms must appear clear before any RWP entry approval is given.




FT - 6 IN
CENTRAL AVENUE
14 FT 0 IN



Jackson Crossover

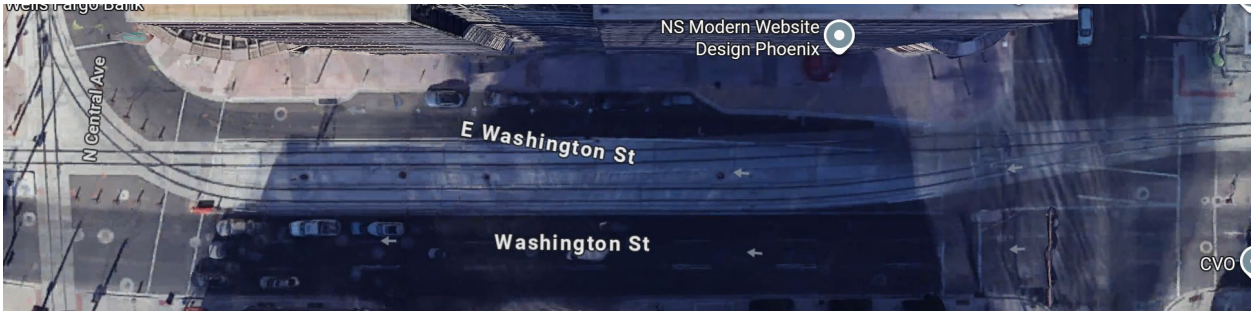


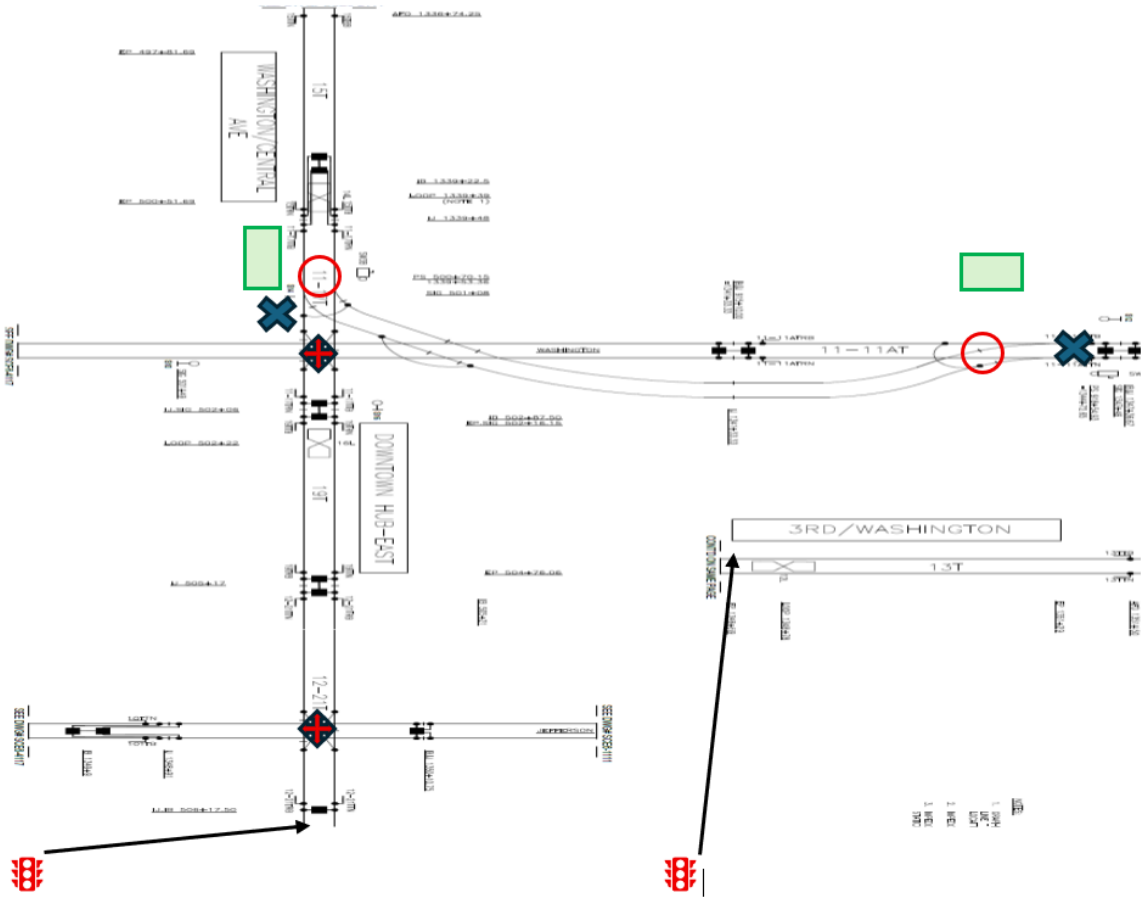
Central & Washington Looking East



Central Looking South to Washington



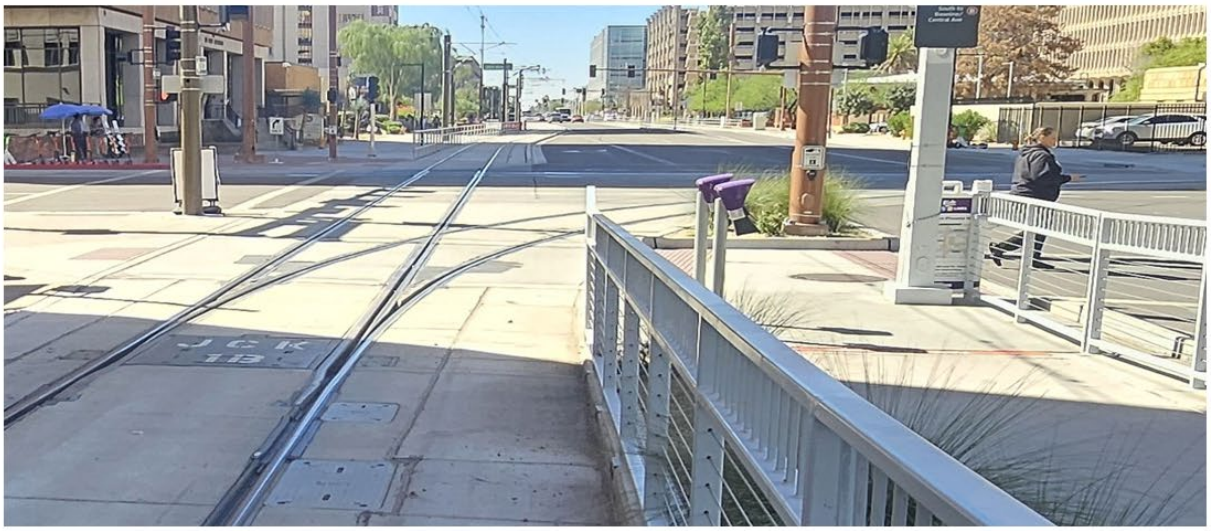

Wells Fargo Bank
NS Modern Website Design Phoenix
N Central Ave
E Washington St
Washington St
CVO


WASHINGTON/CENTRAL AVE
1ST
11
11—11AT
DOWNTOWN HUB-EAST
12-12
3RD/WASHINGTON
1.3T

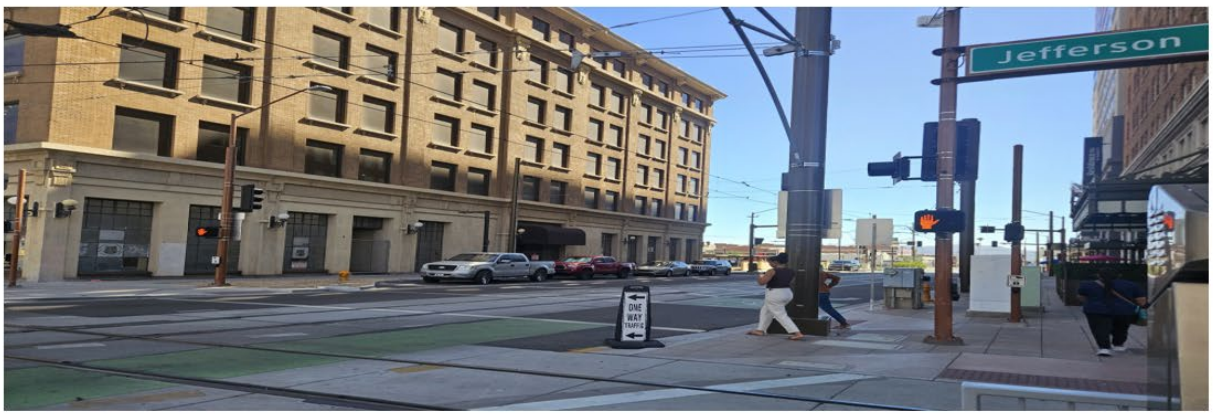
1st Ave & Washington Looking East



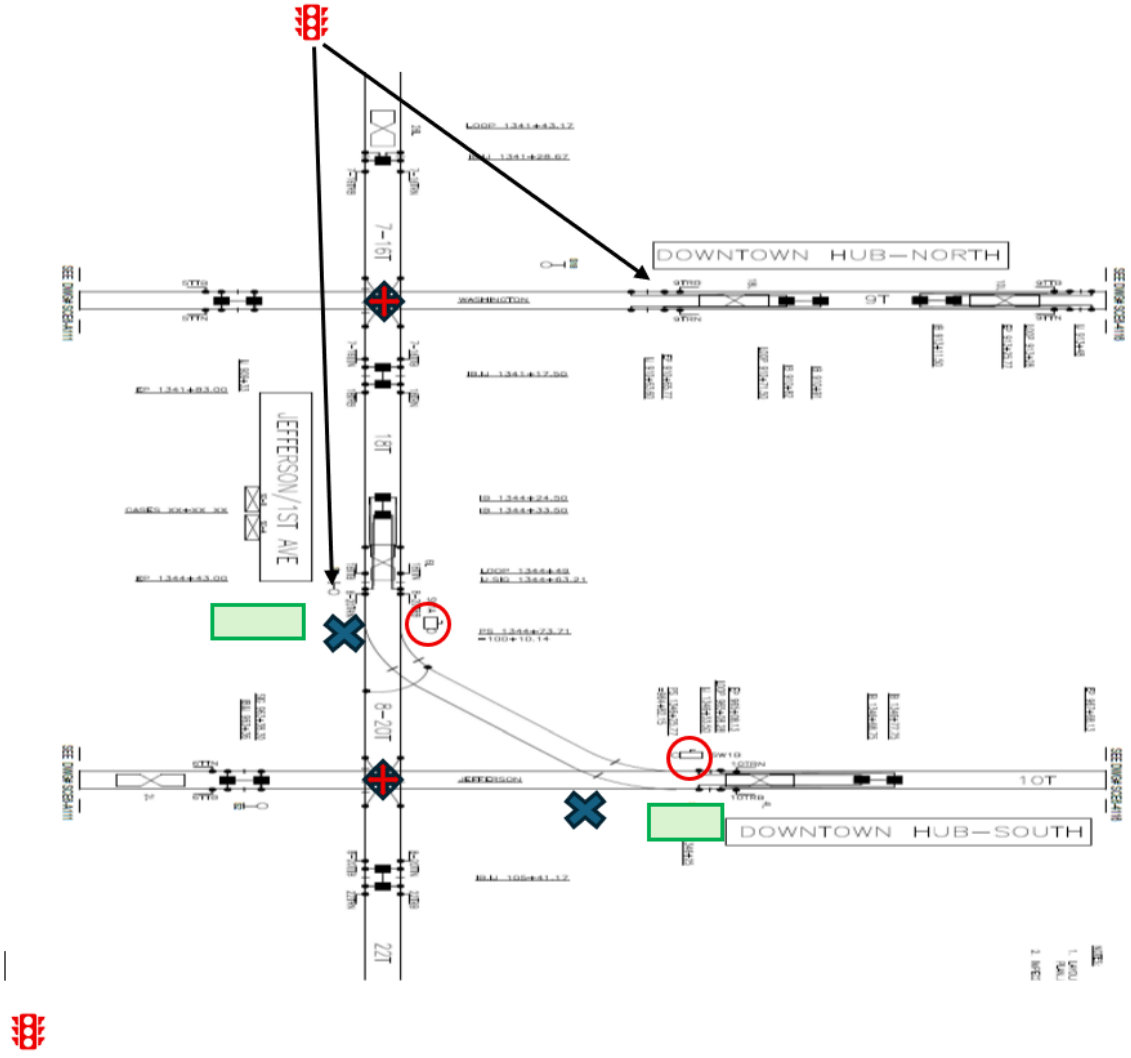
Ave and Jefferson Looking West



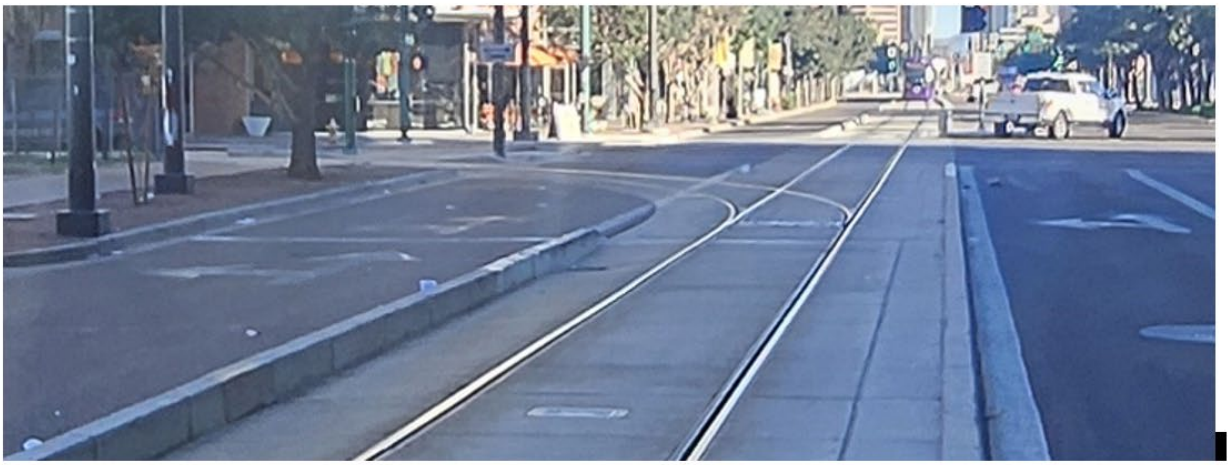
1st Ave & Jefferson Looking South




CityScape West Garage
P
W Jefferson St
Downtown Phx
Hub/Jefferson St


DOWNTOWN HUB—NORTH
DOWNTOWN HUB—SOUTH
JEFFERSON/1ST AVE
7-16T
16T
8-20T
22T
9T
10T

McKinley Crossover

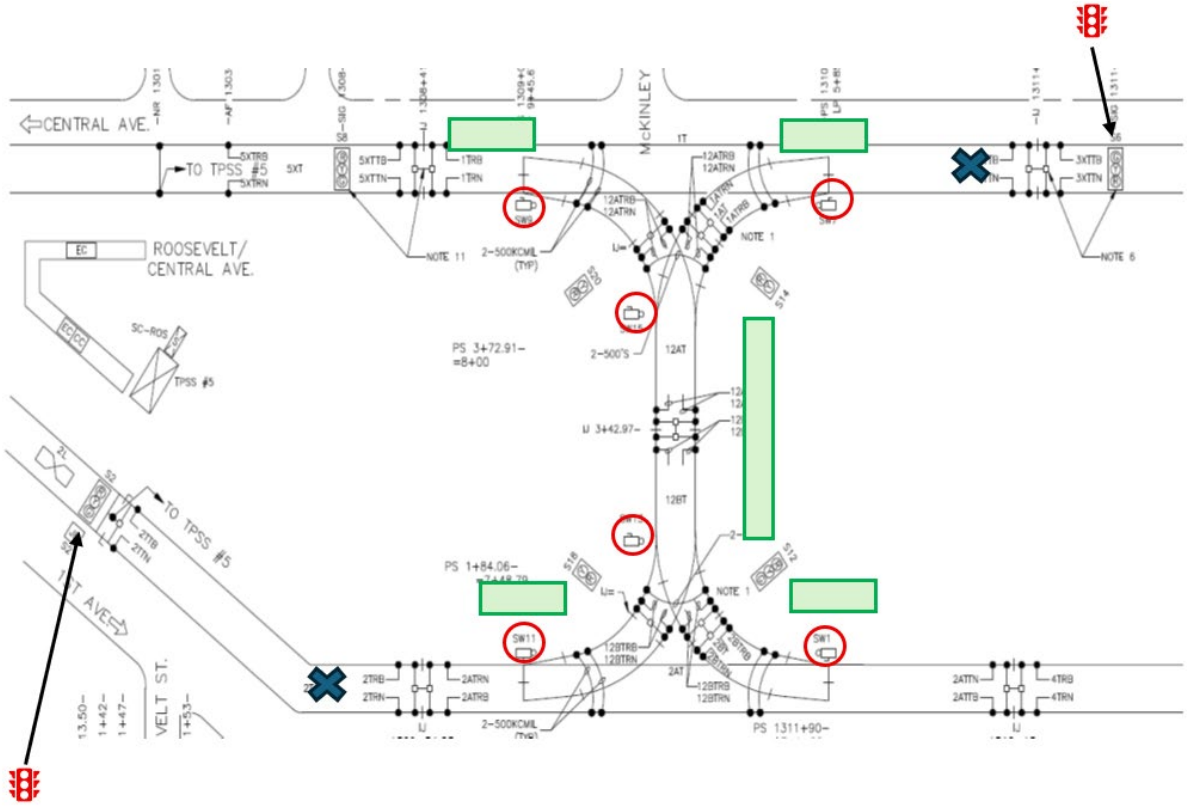




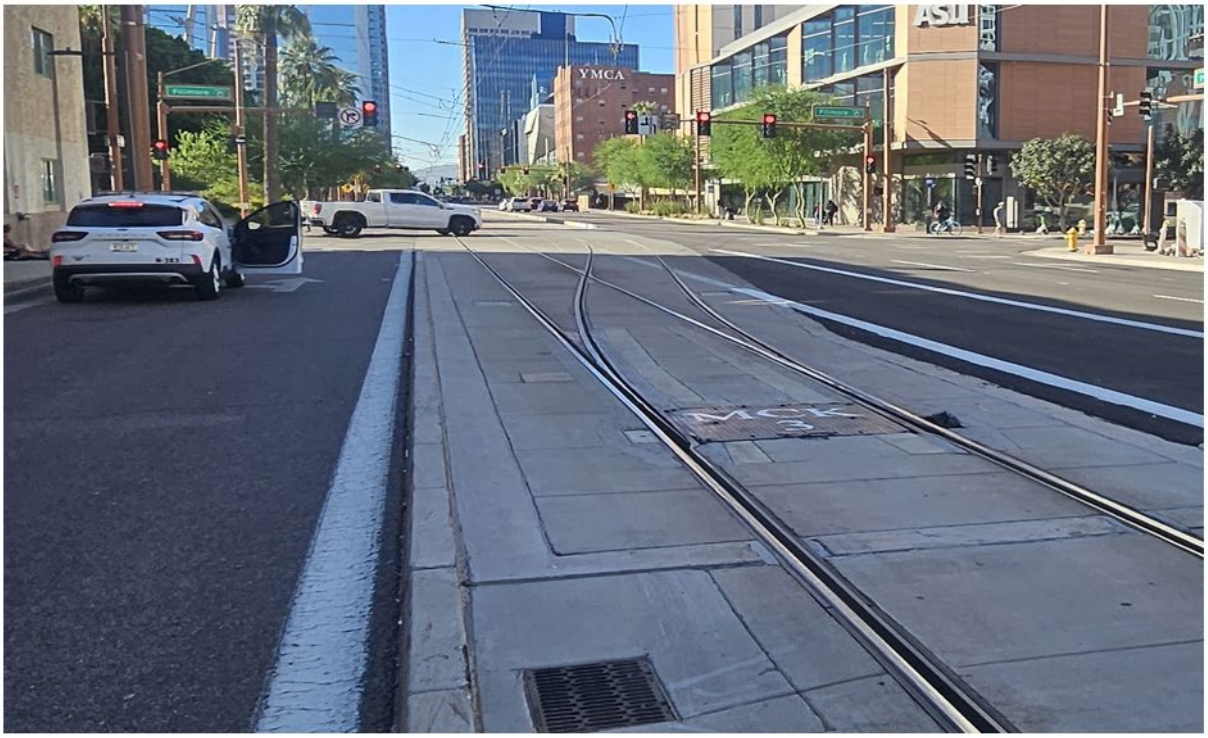



Wallace and Ladino Way
MCK
1


W McKinley St
726

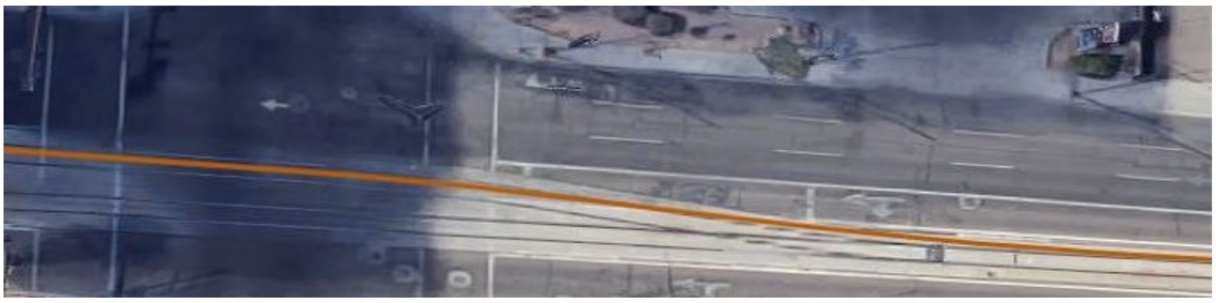

CENTRAL AVE.
TO TPSS #5
ROOSEVELT/
CENTRAL AVE.
TPSS #5
McKINLEY
NOTE 1
NOTE 11
NOTE 6
2-500KCMIL
(TYP)
2-500'S
PS 3+72.91-
=8+00
PS 1+84.06-
PS 1311+90-
VELT ST.

Filmore Siding Spring Switch



Filmore Spring Switch 3





Roosevelt & Central Station



Location

Roosevelt / Central Ave Station
Line(s): Blue Line (A Line) – Southbound via 1st Ave; Orange Line (B Line) – Northbound via Central Ave
Corridor Type: Urban center alignment with split directional guideway (north/south), median platforms, and constrained pedestrian access.

1. Site Description

The Roosevelt platform is located between **N Central Ave and N 1st Ave**, featuring **offset side platforms** within a landscaped median. The southbound track runs adjacent to **N 1st Ave**, and the northbound track parallels **N Central Ave**. Both platforms are surrounded by **dense urban traffic, signalized intersections, and pedestrian crosswalks** connecting to commercial and residential areas.

2. Key Assets

- Dual side platforms (NB/SB)
- OCS poles and traction power feeders
- ADA ramps and crosswalks at both ends
- Station canopy structures with integrated lighting
- Adjacent signalized intersections at Roosevelt St
- Proximity to bus stops and pedestrian mall
- Landscaping elements creating partial visual obstruction

Hazard Identification Table

Hazard ID	Hazard Description	Likelihood	Severity	Risk Rating	Controls / Mitigations
H-1	Limited Safe Zone – Narrow platform clearance and minimal refuge area between track and canopy supports.	Medium	High	High	Establish clear Safe Zone at mid-platform; post signage indicating “Work Beyond This Point Requires OCC Authorization.”
H-2	Restricted Access Routes – Entry/exit limited to end ramps; work vehicles must stage on Roosevelt or 1st Ave with traffic control.	Medium	Medium	Medium	Coordinate with OCC and City Traffic for lane closures; use cones and flaggers during equipment access.
H-3	Visibility Obstruction – Curvature and	Medium	High	High	Assign lookout with clear radio

Hazard ID	Hazard Description	Likelihood	Severity	Risk Rating	Controls / Mitigations
	canopy structures limit operator sightline at north approach.				contact; require reduced speed (≤10 mph) for work zones within 100 ft of station.
H-4	Pedestrian Conflict – Heavy foot traffic and public proximity during maintenance or inspections.	High	Medium	High	Schedule work during off-peak hours; barricade entry points; deploy flaggers at both ends of platform.
H-5	Environmental Exposure – Limited shade and high ambient heat from pavement and reflective surfaces.	High	Medium	High	Implement heat stress plan; provide hydration and rotating personnel; use portable shade tents if extended duration.
H-6	Overhead Clearance Risk – Close OCS wire proximity for platform canopy and signage maintenance.	Medium	High	High	Obtain OCS de-energization clearance from OCC; confirm grounding before work above 8 ft elevation.
H-7	Traffic Interaction – Work trucks	Medium	High	High	Apply MUTCD-compliant

Hazard ID	Hazard Description	Likelihood	Severity	Risk Rating	Controls / Mitigations
	on Roosevelt or 1st Ave adjacent to moving traffic lanes.				traffic control; use Type III barricades and proper taper distance per Section 8.8.1 of TAG.

Safe Zone and Watchmen Locations

- Primary Safe Zone: Between canopy structure and rear curb line (east side of southbound platform and west side of northbound platform).
- Secondary Safe Zone: At north end pedestrian crosswalk refuge between both tracks (limited use).
- Watchmen Staging:
  - One positioned at north approach (1st Ave/Roosevelt) – monitors approaching southbound trains.
  - One positioned at south end (near Portland St) – monitors northbound trains.
  - Both maintain radio contact with OCC and each other on Channel 1 (A Line) and Channel 2 (B Line) as applicable.

Work Activity Considerations

Typical work: OCS inspection, station lighting maintenance, canopy cleaning, and security camera checks.

- All activities require verbal OCC authority for exclusive occupancy or speed restriction setup.
- Due to the split-track configuration, ensure coordination across both Central and 1st Ave work crews to prevent conflicting movements.

Summary Risk Rating

Overall Risk Level: HIGH

Primary Drivers: Limited platform clearance, high pedestrian activity, dual-track visibility constraints, and heat exposure.
Required Controls: OCC coordination, lookout assignment, speed restriction ≤10 mph, traffic control, hydration/heat plan.

■ ■ ■

APPENDIX K – OL-B-3, McDowell to Montabello

Section Overview

Location: Midtown–Uptown Phoenix Corridor (McDowell Rd to Montebello Ave)
Line: Orange Line (B Line) – Central Avenue Mainline
Boundaries: South limit at McDowell Rd / Central Ave and north limit at Montebello Ave / 19th Ave terminal junction.

Assets Involved:
Multiple double crossovers at Culver, Earll, Pierson, and Montebello; continuous embedded track through high-traffic arterial zones; traction power and OCS overlap zones; several signalized grade crossings (notably at Central & Camelback).

Adjacent Landmarks:
Encanto Park area, Steele Indian School Park, Brophy College, Camelback Transit Center, and Uptown Plaza commercial corridor.

Platforms:

- McDowell Rd / Central Ave – EB / WB
- Encanto Blvd / Central Ave – EB / WB
- Thomas Rd / Central Ave – EB / WB
- Osborn Rd / Central Ave – EB / WB
- Indian School Rd / Central Ave – EB / WB
- Campbell Ave / Central Ave – EB / WB
- Camelback Rd / Central Ave – EB / WB
- Montebello Ave / Central Ave – EB / WB

Track Type:
Dual-track median alignment running along Central Avenue through the Midtown and Uptown districts. This section features long straight track geometry with periodic curvature near crossover points and constrained medians near intersections. Several at-grade crossings require coordination with city traffic signal systems.

Work Activity Description:

Routine maintenance and inspection activities within this section include:

- Track and OCS inspections along median guideway segments and crossover switch zones.

- Signal correspondence and route verification at Culver, Earll, Pierson, and Montebello crossovers.
- Grade crossing testing and inspection of flasher and gate assemblies at Central & Camelback.
- Vegetation control and median access work near Encanto and Indian School areas.

Access:
Entry via median openings or designated pedestrian refuge islands. Use flag protection when accessing crossings at Camelback, Indian School, and Thomas.

Protection:
Exclusive Track Occupancy (ETO) required for all work within active crossovers. Coordinate with OCC for route locking at each interlocking prior to entry.

Safe Zones:
Primary safe positioning along designated refuge islands or curbside medians between Encanto and Camelback. Watchmen are staged at the north and south approaches to each crossover during inspections.

Visibility:
Generally good along straight sections; however, reduced by glare, turning vehicle traffic, and median lighting near Camelback and Thomas intersections.

K.1 CROSSOVERS AND GRADE CROSSINGS

Crossover: Culver (Central Avenue & Culver Street – Downtown Phoenix)

Switch ID	Track	Description / Function
1A	Track 1	Facing-point crossover switch from Track 1 to Track 2 (northbound direction).
1B	Track 2	Trailing-point crossover switch paired with 1A for southbound movements returning to Track 1.
3A	Track 1	Trailing-point crossover switch completing Track 1 to Track 2 alignment.
3B	Track 2	Facing-point crossover switch paired with 3A for Track 2 to Track 1 movements.

Crossover: EarII (Central Avenue & EarII Drive – Midtown Phoenix)

Switch ID	Track	Description / Function
1A	Track 1	Manual facing-point crossover switch from Track 1 to Track 2 (northbound direction).
1B	Track 2	Manual trailing-point crossover switch paired with 1A for southbound movements returning to Track 1.
3A	Track 1	Manual trailing-point crossover switch completing Track 1 to Track 2 alignment.
3B	Track 2	Manual facing-point crossover switch paired with 3A for Track 2 to Track 1 movements.

Crossover: Pierson (Central Avenue & Pierson Street – Uptown Phoenix)

Switch ID	Track	Description / Function
1A	Track 1	Manual facing-point crossover switch from Track 1 to Track 2 (northbound direction).
1B	Track 2	Manual trailing-point crossover switch paired with 1A for southbound movements returning to Track 1.
3A	Track 1	Manual trailing-point crossover completing Track 1 to Track 2 alignment.
3B	Track 2	Manual facing-point crossover paired with 3A for Track 2 to Track 1 movements.

Crossover: Montebello (Montebello Avenue – Mainline Terminus)

Switch ID	Track	Description / Function
1A	Track 1	Facing-point crossover switch from Track 1 to Track 2 (northbound / terminal approach).
1B	Track 2	Trailing-point crossover switch paired with 1A for southbound return movements.
3A	Track 1	Trailing-point crossover completing Track 1 to Track 2 alignment.
3B	Track 2	Facing-point crossover paired with 3A for Track 2 to Track 1 movements.

Grade Crossing: Central Avenue & Camelback Road (Flasher Zone)

- Restricted visibility due to adjacent turning lanes and heavy vehicular traffic.

Deck Park Tunnel Bridge Looking North





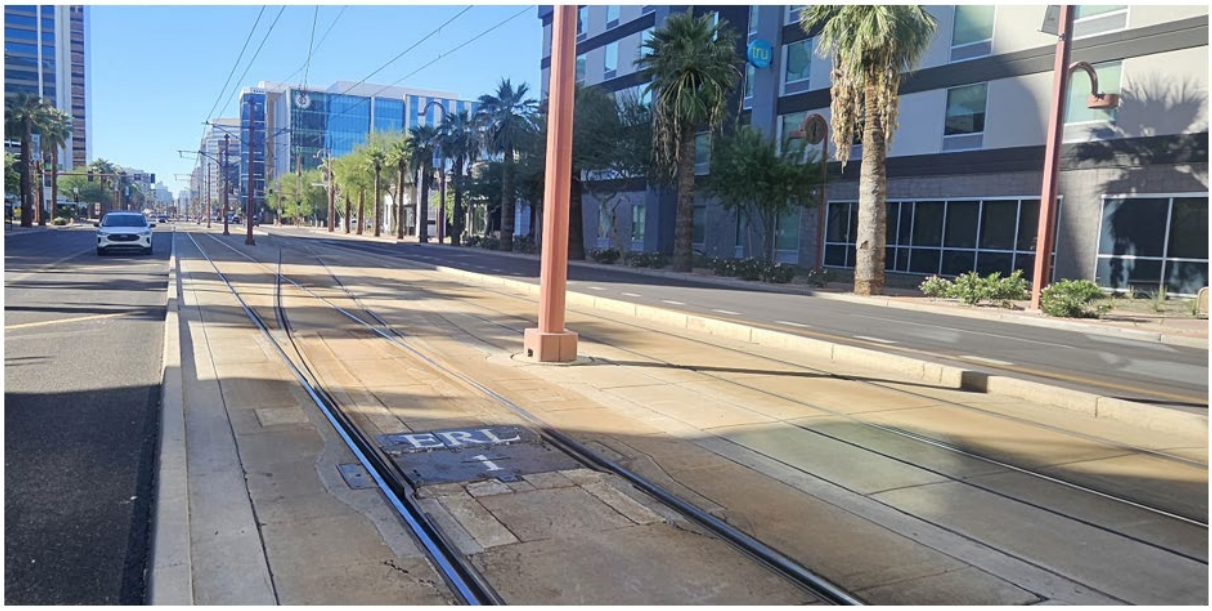
Deck Park Tunnel Bridge Looking South

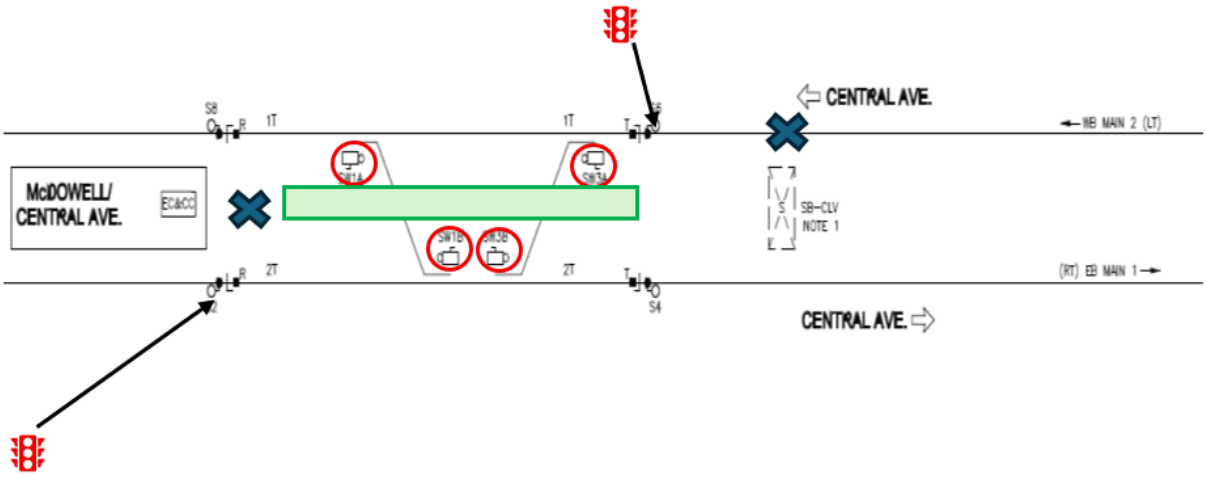


3A Switch first switch coming off the bridge



Switch 1 closest to the platform





Identified Hazards

Hazard ID	Hazard Description	Potential Consequence
H-01	Reduced visibility caused by bridge hump and curvature limits sightlines to be approaching trains from both directions.	Worker struck by train due to insufficient warning time.
H-02	Limited refuge space on bridge deck; no sidewalk or defined Safe Zone within guideway.	No escape route in case of unanticipated train movement.
H-03	Simultaneous multi-track exposure during inspection of both rails and joints.	Workers are trapped between live tracks.
H-04	Noise reflection and echo from tunnel portals masks audible train cues.	Delayed recognition of approaching trains.
H-05	Traction grease and debris accumulation near expansion joints and fasteners increase slip risk.	Slip/trip/fall injuries, contact with energized OCS components.
H-06	Power tool hazard — use of grease gun or torque tools in confined area near live OCS.	Electrical contact, loss of balance, or inadvertent tool-to-wire contact.

Hazard Controls

Control Type	Description
Engineering Controls	Nonavoidable – structure geometry and curvature are fixed; relay on procedural and administrative mitigation
Administrative Controls	• Entry only under OCC Track Protection • Two-person minimum crew (inspector + watchman) • Use of continuous radio communication and flagging at both ends of the bridge • Advance coordination with OCC for movement holds between Encanto Blvd and Culver St
PPE Controls	• High-visibility Class 3 vests • Hard hat with chin strap (wind exposure on bridge) • Non-slip safety footwear • Insulated gloves when handling rail lubricants or fasteners near OCS
Warning / Signage	Post temporary “NO REFUGE – WATCHMEN REQUIRED” signage at both approaches when work is active

Mitigation Measures

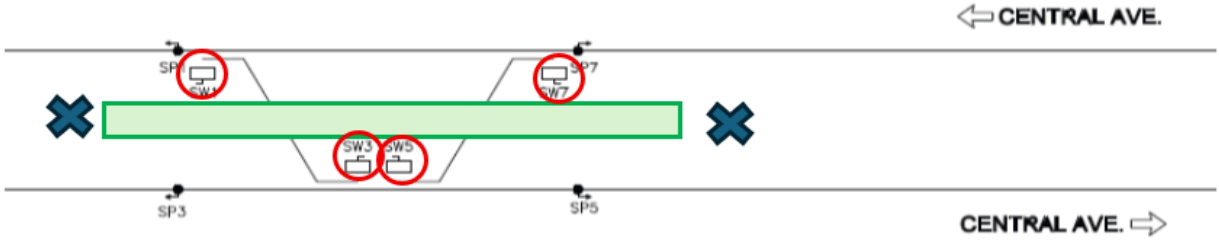
1. Work Authorization:
   OCC must establish full Track Protection before entry. Automatic routes disabled and exit inhibits applied across Culver interlock.
2. Watchman Requirement:
   Lookout positioned at north portal and south approach of bridge with line-of-sight to track curve; must maintain continuous radio contact.
3. Train Notification:
   OCC to issue radio broadcast to all trains in the Central Avenue segment advising "workers on track at Culver Bridge under track protection."
4. Tool Safety:
   Power grease guns only permitted when OCS clearance confirmed and no train movement authorized; hoses and cables must be secured away from rail heads.
5. Safe Refuge:
   Only designated sidewalk area at either end of the bridge (east side near Herberger Theater Park entrance) may be used as temporary refuge.
6. Inspection Sequence:
   Begin from north end, inspect expansion joints moving south in teams of two; do not split across both tracks simultaneously.
7. Environmental Considerations:
   Avoid operations during low visibility conditions (dawn/dusk or rain); require additional flagging lights and portable warning horns after sunset.

Summary

The Deck Park Tunnel Bridge / Culver Crossover section presents elevated risks due to limited visibility, absence of refuge, and noise interference. All inspections (E-clip, expansion joint, or OCS hardware) require two-person crews, active OCC Track Protection, and dual watchman coverage. The only safe refuge is the sidewalk approach at either end of the bridge.

Earll Manual Crossover



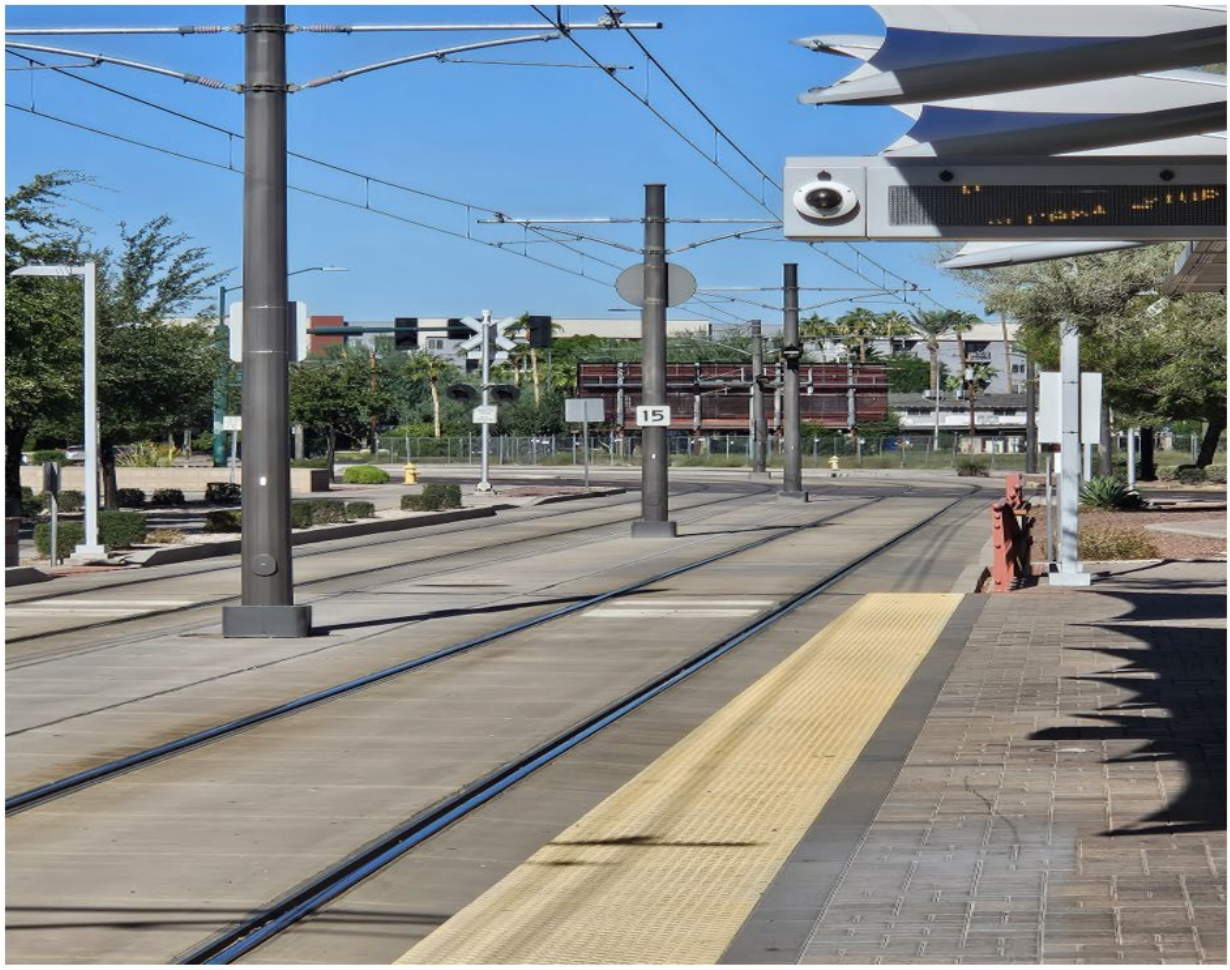


Pierson Crossover & Grade Crossing Central and Camelback Flashers



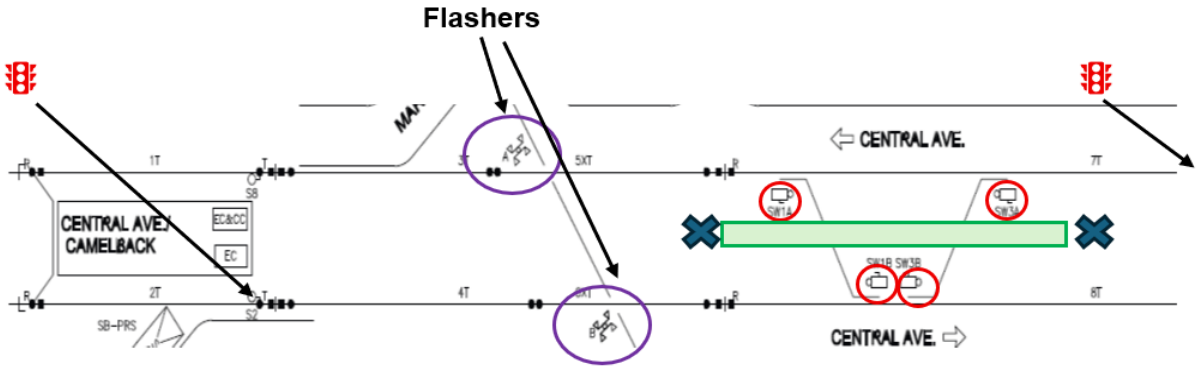

KING PIGEON

Looking North for Cambleback & Central Platform



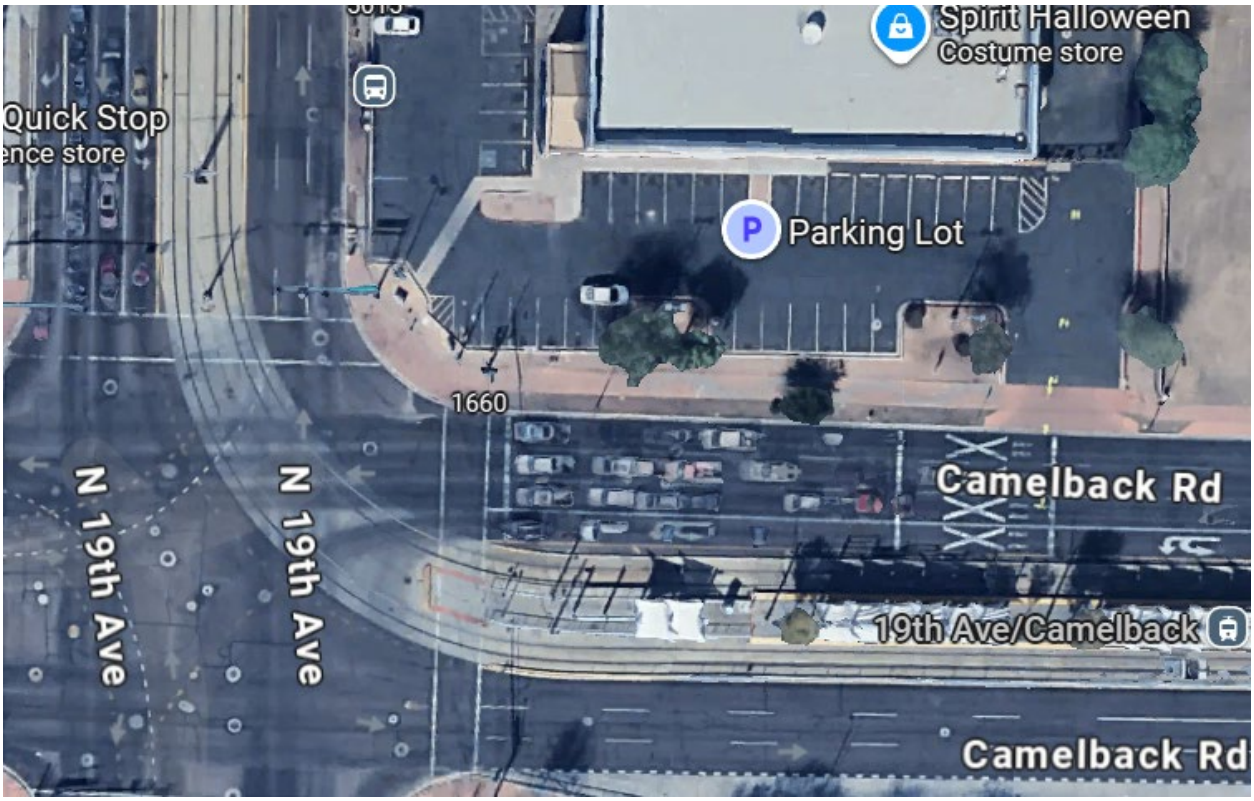



N Central Ave
N Central Ave
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N Central Ave
N Central Ave
Yama Sushi House - Premium AYCE Sushi
Sushi
The Greedy Hamster
JL Patisserie
Men's Apparel Club
Men's clothing store
Landmark Towers
W Pierson St


Flashers
CENTRAL AVE.
CENTRAL AVE./ CAMELBACK
EC&CC
EC
SB-PRS
CENTRAL AVE.

19th Ave &Camelback Curve

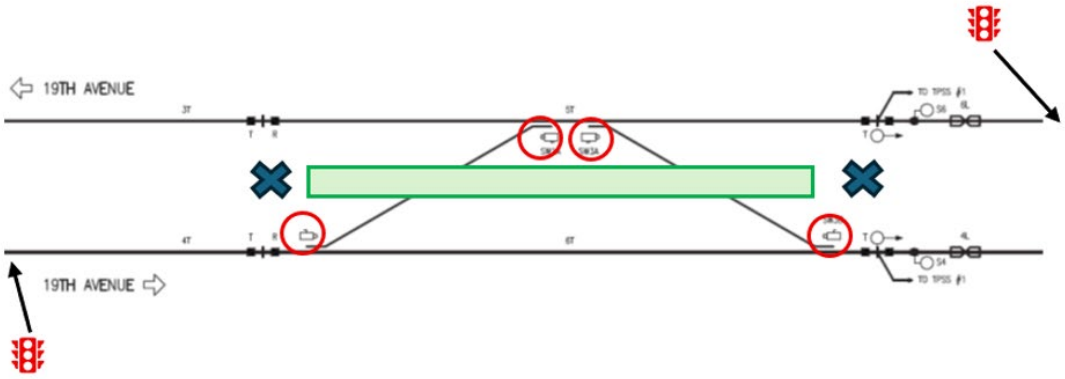




Montebello Crossover







■ ■ ■

APPENDIX L – OL- B-4, Montabello to Metro Trail Track

Section Overview

Locations: Montebello Avenue • Glendale Avenue • Northern Avenue • Dunlap Avenue • Mountain View Road • Metro Parkway • Tail Track (North Terminal)
Line: Orange Line (B Line) – Northwest Extension (OL-B-4 Montebello → Metro Tail Track)

Platforms:

- Montebello Ave / 19th Ave – EB / WB
- Glendale Ave / 19th Ave – EB / WB
- Northern Ave / 19th Ave – EB / WB
- Dunlap Ave / 19th Ave – EB / WB
- Mountain View Rd / 25th Ave – EB / WB
- Metro Parkway / 19th Ave – North Terminal

Track Type:
Dual-track median alignment within 19th Avenue corridor, transitioning to a single-track tail track north of Metro Parkway. The alignment features multiple at-grade intersections, three interlockings, and terminal turnback operations. The track runs within a constrained roadway median bordered by live traffic lanes, creating limited safe-zone access and restricted step-off areas.

Crossover: Tuckey (19th Avenue & Tuckey Lane – Northwest Extension)

Switch ID	Track	Description / Function
1A	Track 1	Facing-point crossover switch from Track 1 to Track 2 (northbound direction).
1B	Track 2	Trailing-point crossover switch paired with 1A for southbound movements returning to Track 1.
3A	Track 1	Trailing-point crossover completing Track 1 to Track 2 alignment.
3B	Track 2	Facing-point crossover paired with 3A for Track 2 to Track 1 movements.

Crossover: Morten (19th Avenue & Morten Avenue – Northwest Extension)

Switch ID	Track	Description / Function
1A	Track 1	Facing-point crossover switch from Track 1 to Track 2 (northbound direction).
1B	Track 2	Trailing-point crossover switch paired with 1A for southbound movements returning to Track 1.
3A	Track 1	Trailing-point crossover switch completing Track 1 to Track 2 alignment.
3B	Track 2	Facing-point crossover switch paired with 3A for Track 2 to Track 1 movements.

Crossover: Dunlap (19th Avenue & Dunlap Avenue – Northwest Extension Terminal)

Switch ID	Track	Description / Function
1A	Track 1	Facing-point crossover switch from Track 1 to Track 2 (northbound terminal approach).
1B	Track 2	Trailing-point crossover switch paired with 1A for southbound return movements.
3A	Track 1	Trailing-point crossover completing Track 1 to Track 2 alignment.
3B	Track 2	Facing-point crossover switch paired with 3A for Track 2 to Track 1 movements.

Crossover: Mountain View (25th Avenue & Mountain View Road – Northwest Extension II)

Switch ID	Track	Description / Function
1A	Track 1	Facing-point crossover switch from Track 1 to Track 2 (northbound approach to terminal).
1B	Track 2	Trailing-point crossover switch paired with 1A for southbound return movements.
3A	Track 1	Trailing-point crossover completing Track 1 to Track 2 alignment.
3B	Track 2	Facing-point crossover switch paired with 3A for Track 2 to Track 1 movements.

Grade Crossing

Dunlap Grade Crossing (19th Ave & Dunlap Ave)

High-traffic arterial crossing adjacent to terminal interlocking; includes coordinated signal phasing between Valley Metro signal house and City of Phoenix traffic control. Crossing protection consists of active gates, bells, and flashers with interlocked route control.

Work Activity Description

This section supports turnback operations, switch inspections, OCS tension adjustments, and signal correspondence verification across the northwest terminal zone.

- Access: Entry points available at Montebello Park & Ride, Glendale pocket access, and Dunlap intersection via traffic-controlled work truck setup.
- Protection: Work within the crossover zones or tail track requires Exclusive Track Occupancy (ETO) and coordination with OCC for switch lockouts.
- Safe Zones: Limited shoulder clearances—primary safe zones located at median refuges near Northern and Dunlap; supplemental safe positioning available at Mountain View tail track.
- Visibility: Generally open alignment with long sight distances; however, northbound curvature at Morten and sun glare along 19th Avenue corridor create potential blind spots during morning/evening hours.
- Environmental Factors: High heat reflection from paved medians, heavy vehicle proximity, and noise from adjacent arterial traffic.

Orange Line (B Line) Section 4 – Hazard Assessment

Section Limits: Montebello Avenue → Metro Tail Track
Corridor Type: Dual-track median alignment transitioning to single-track tail track north of Metro Parkway
Interlockings/Crossovers: Tuckey • Morten • Dunlap • Mountain View
Key Features: At-grade arterial crossings, limited shoulder clearance, terminal operations at Metro Tail Track

Hazard Identification

Hazard ID	Hazard Description	Likelihood	Severity	Risk Rating	Controls / Mitigations
H-1	Switch misalignment or loss of correspondence at Tuckey, Morten, Dunlap, or Mountain View crossovers.	Medium	High	High	Perform manual verification and visual inspection of all switches prior to fouling track; confirm switch correspondence with OCC.
H-2	Train movement conflict or route overlap due to terminal operations at Dunlap / Metro tail track.	Medium	High	High	Establish Exclusive Track Occupancy (ETO); maintain constant OCC communication; use proper switch lockouts and radio identification.
H-3	Work vehicle exposure to adjacent live traffic on 19th Avenue median.	High	Medium	High	Deploy cones and signage per 8.8.1 Traffic Control; use flaggers; park vehicles parallel to track where possible.
H-4	Limited shoulder space creating restricted safe zones near Dunlap and Morten intersections.	Medium	Medium	Medium	Use designated median refuges for safe zones; maintain clear escape paths; assign lookout for north/south approaches.
H-5	Sun glare affecting visibility of train operators and	Medium	Medium	Medium	Schedule work to avoid glare periods; require high-visibility

Hazard ID	Hazard Description	Likelihood	Severity	Risk Rating	Controls / Mitigations
	workers (AM/PM along 19th Avenue).				PPE and flashing beacons; position lookout facing approaching trains.
H-6	Heat exposure and dehydration risk from paved median surface and reflected heat.	High	Medium	High	Implement heat illness prevention plan; rotate crews; provide water breaks and shade as feasible.
H-7	Noise and vibration interference from heavy traffic and construction nearby.	Medium	Low	Low	Maintain radio communication checks; position lookout within audible range; use hand signals as backup.
H-8	Unauthorized pedestrian or vehicular entry into track alignment during maintenance.	Low	Medium	Low	Place barricades or cones; deploy flaggers; post “Do Not Enter – Track Work” signage.
H-9	Overhead clearance hazard when performing OCS inspections or using lift trucks near energized wire.	Low	High	Medium	Verify OCS de-energized before overhead work; maintain 10-foot minimum clearance from live wire; ground as required.

Hazard ID	Hazard Description	Likelihood	Severity	Risk Rating	Controls / Mitigations
H-10	Slip/trip hazard from uneven pavement and flange-way gaps within crossovers.	Medium	Low	Low	Maintain situational awareness; use proper footwear; limit crossing of track to perpendicular movements.

Safe Zone Locations

Area	Safe Zone Description	Notes / Lookout Positioning
Northern Ave median	Median refuge area between tracks – suitable for two workers clear of dynamic envelope.	Assign lookout north of Northern Avenue platform.
Dunlap Interlocking	Narrow shoulder refuge near signal bungalow; limited space – single-person occupancy only.	Place lookout near curb facing southbound approach.
Mountain View / 25th Ave	Wider paved shoulder area with tail track clearance – suitable for crew staging and vehicle setup.	Ideal for maintenance truck staging and lookout position.

Operational and Environmental Notes

- Work Access Points: Montebello Park & Ride, Glendale pocket access, Dunlap intersection.
- Protection Type: Exclusive Track Occupancy (ETO) required for all crossover and terminal activities.
- Visibility: Generally open alignment; blind spots at Morten curve and Dunlap approach due to roadway curvature.
- Environmental Considerations: High heat index; reflective glare from adjacent pavement; high vehicle density.
- Radio Channel: Channel 2 (Orange Line – B Line). Identify crew as “Track / Signal Crew in OL-B-4 Zone.”

SEGMENT HAZARD CHECKLIST – OL-B-4 MONTEBELLO → METRO TAIL TRACK

Line: Orange Line (B Line) – Northwest Extension (Track 1 South / Track 2 North)

Line / Section	Segment Limits	Access	Braking	Visibility (Curves / Portals / Distractions)	Environmental	Notes / Comments
OL-B-4: Montebello → Metro Tail Track	Montebello Avenue to Metro Tail Track (19th Avenue Corridor)	☑	☑	☑ (Curves / Distractions)	☑	Median-running alignment with limited shoulder width and multiple high-volume intersections at Glendale, Northern, and Dunlap. All work requires ETO protection; maintain lookout coverage and traffic control setup.
Tuckey Crossover	19th Avenue & Tuckey Lane	☑	☑	☑ (Curves)	☐	Facing- and trailing-point crossovers; verify switch correspondence with OCC prior to fouling. Northbound curve reduces approach visibility.

Line / Section	Segment Limits	Access	Braking	Visibility (Curves / Portals / Distractions)	Environmental	Notes / Comments
Morten Crossover	19th Avenue & Morten Avenue	☑	☑	☑ (Curves / Glare)	☑	Curved alignment with morning sun glare. Assign lookout on southbound approach. Maintain radio contact due to limited sight distance.
Dunlap Crossover / Grade Crossing	19th Avenue & Dunlap Avenue (Terminal)	☑	☑	☑ (Distractions / Traffic Signals)	☑	High-traffic arterial and terminal interlocking with shared signal phasing. Maintain OCC communication and switch lockouts. Noise and visual distractions from adjacent traffic.
Mountain View Crossover	25th Avenue & Mountain View Road	☑	☑	☑ (Curves)	☑	Curved tail-track approach with good overall sight distance but elevated heat and pavement reflection. Suitable area

Line / Section	Segment Limits	Access	Braking	Visibility (Curves / Portals / Distractions)	Environmental	Notes / Comments
						for vehicle staging.
Metro Tail Track (North Terminal)	Terminal pocket north of Metro Parkway	☑	☐	☐ (Open Sight)	☑	Single-track stub with restricted egress; ensure ETO and radio clearance before entry. Exposure to heat and limited refuge areas.

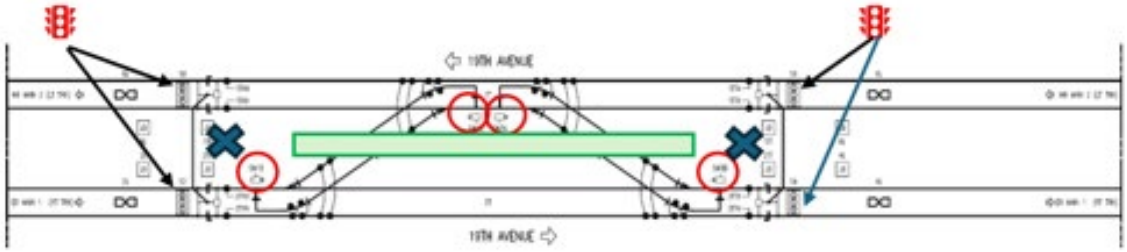
Summary Observations

- **Access Limitations:**
  Median alignment with narrow shoulders and restricted step-off space. Primary safe-zones located near Northern Avenue, Dunlap, and Mountain View Road.
- **Braking Distance:**
  Generally favorable along straight segments but reduced at crossovers and terminal switches; ETO or speed restrictions recommended during active work.
- **Visibility:**
  Mostly open corridor; localized blind-spots at Morten and Dunlap due to curvature and glare. Continuous lookout coverage required in those zones.
- **Environmental Factors:**
  High radiant heat and reflected glare from paved surfaces, heavy traffic noise, and limited ventilation between barriers—workers must adhere to heat-illness prevention protocols and high-visibility PPE standards.

Tuckey Crossover



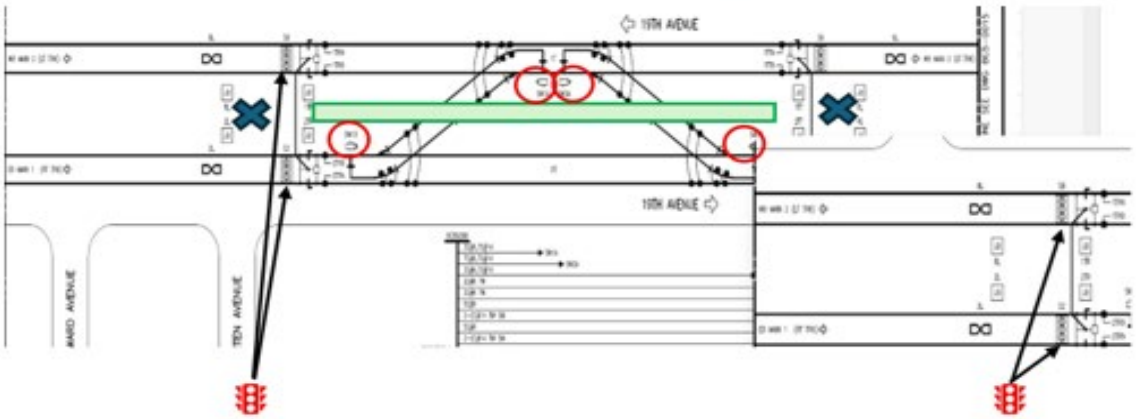




Morten Crossover



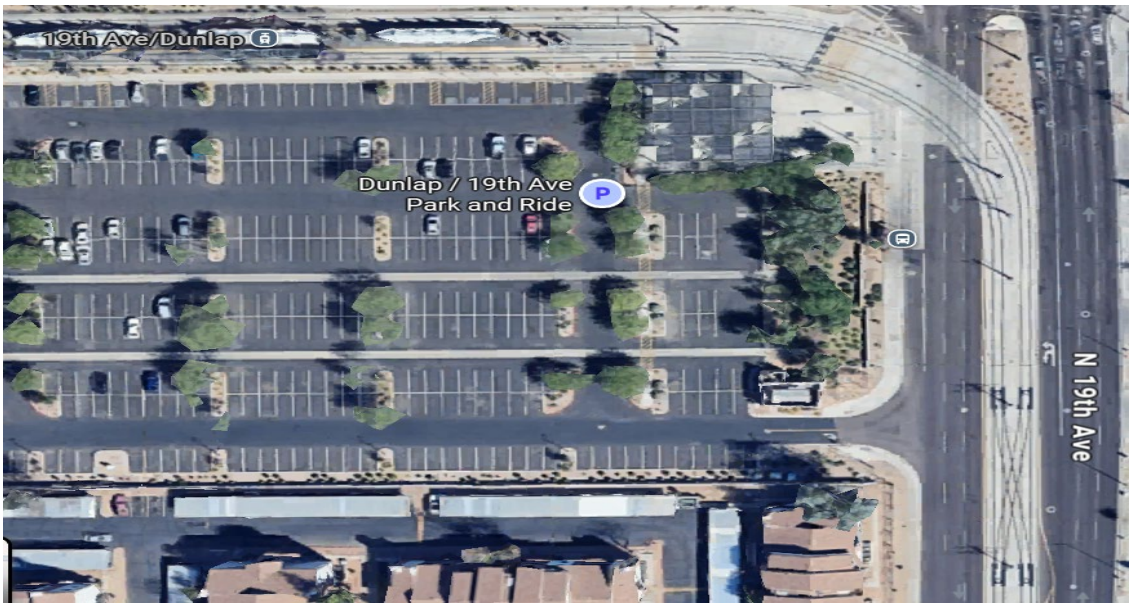


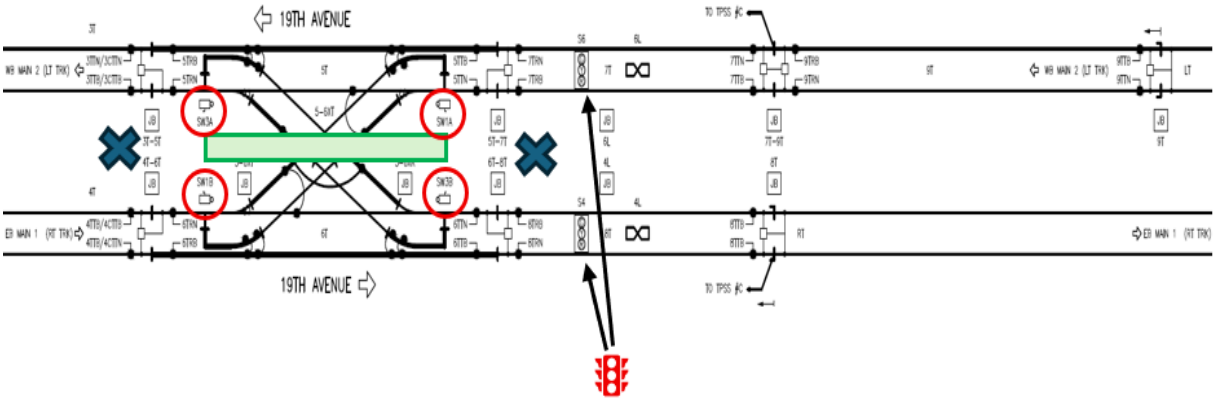


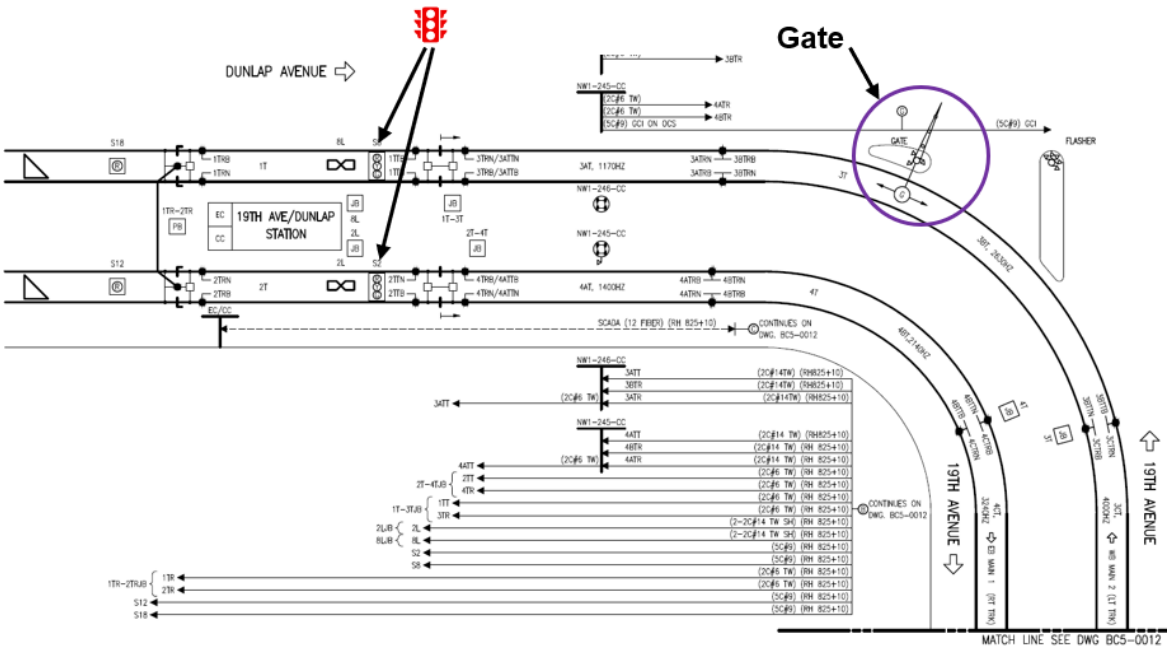
Dunlap Crossover






19th Ave/Dunlap
Dunlap / 19th Ave
Park and Ride
P
N 19th Ave


19TH AVENUE
19TH AVENUE



Dunlap Grade Crossing



Dunlap Curve going into Dunlap & 19th Ave station



Dunlap & 25 Ave Curve

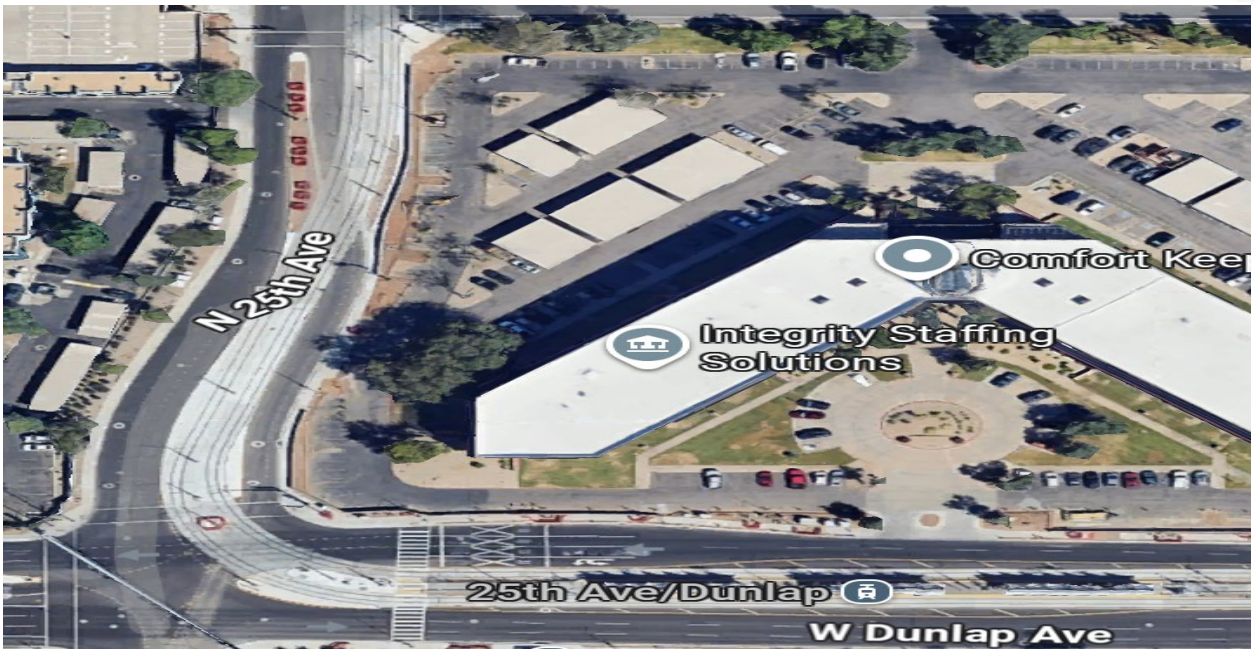












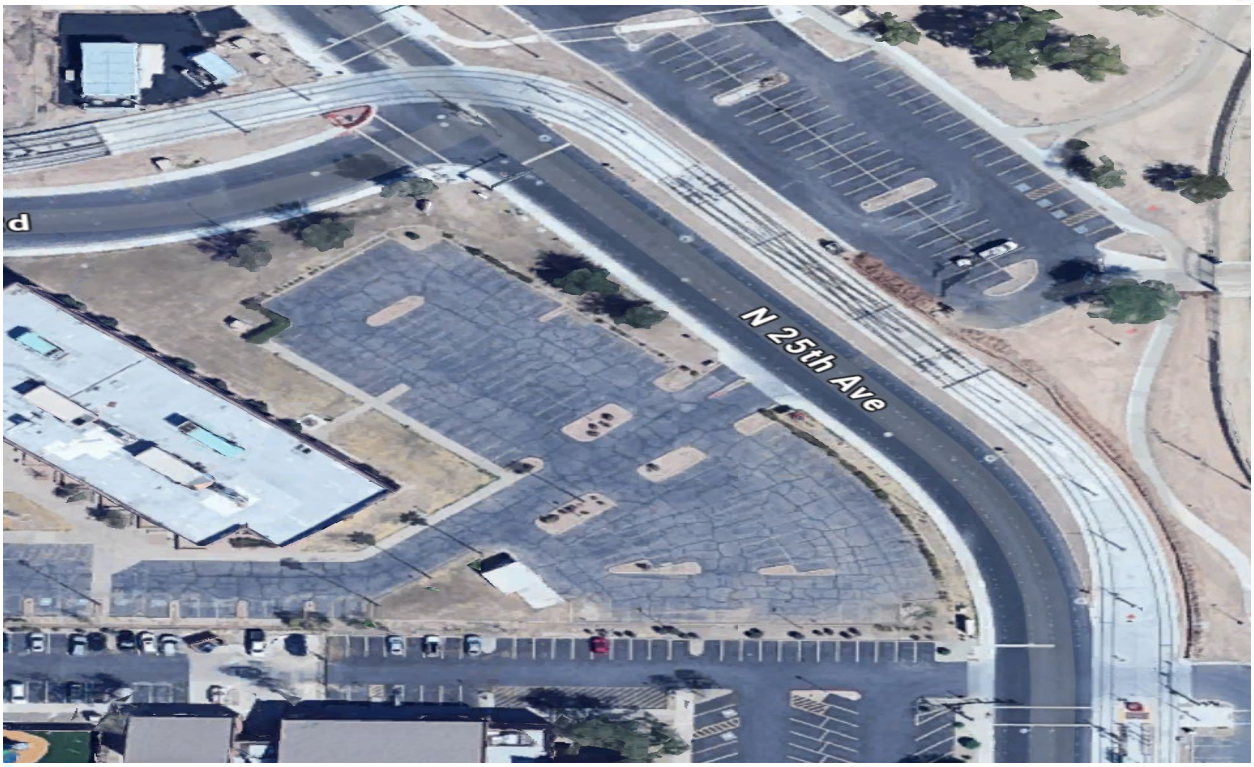
Mountain Point Curve

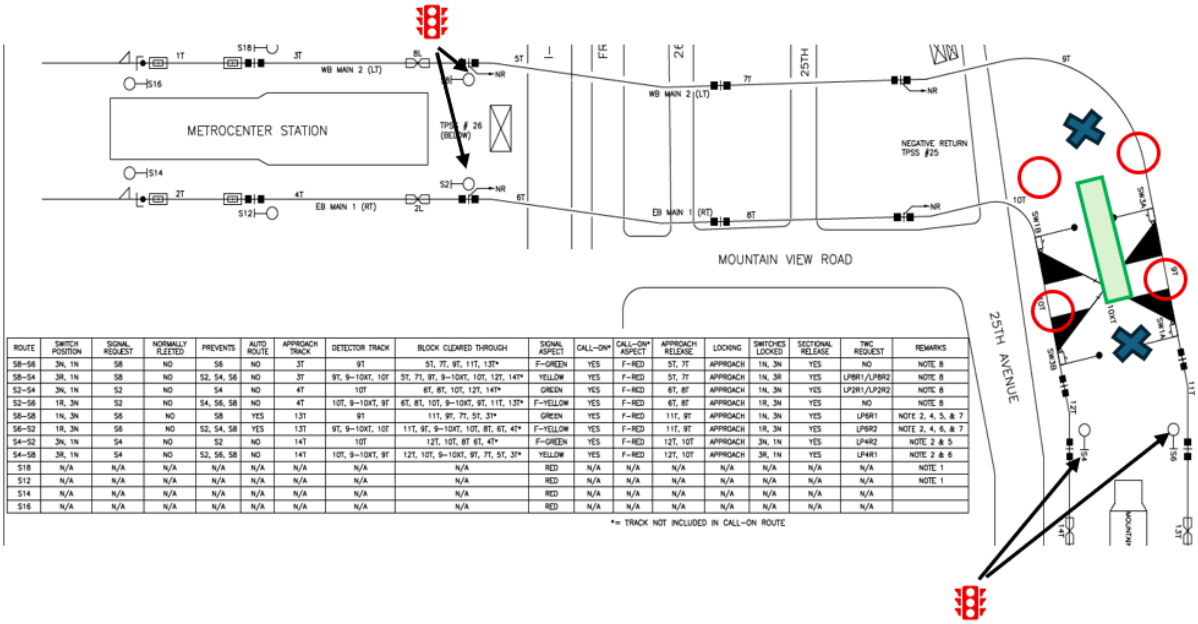


Mountain View Crossover









ROUTE	SWITCH POSITION	SIGNAL REQUEST	NORMALLY FLEETED	PREVENTS	AUTO ROUTE	APPROACH TRACK	DETECTOR TRACK	BLOCK CLEARED THROUGH	SIGNAL ASPECT	CALL-ON*	CALL-ON* ASPECT	APPROACH RELEASE	LOCKING	SWITCHES LOCKED	SECTIONAL RELEASE	TWC REQUEST	REMARKS
S8–S6	3N, 1N	S8	NO	S6	NO	3T	9T	5T, 7T, 9T, 11T, 13T*	F–GREEN	YES	F–RED	5T, 7T	APPROACH	1N, 3N	YES	NO	NOTE 8
S8–S4	3R, 1N	S8	NO	S2, S4, S6	NO	3T	9T, 9–10XT, 10T	5T, 7T, 9T, 9–10XT, 10T, 12T, 14T*	YELLOW	YES	F–RED	5T, 7T	APPROACH	1N, 3R	YES	LPBR1/LPBR2	NOTE 8
S2–S4	3N, 1N	S2	NO	S4	NO	4T	10T	6T, 8T, 10T, 12T, 14T*	GREEN	YES	F–RED	6T, 8T	APPROACH	1N, 3N	YES	LP2R1/LP2R2	NOTE 8
S2–S6	1R, 3N	S2	NO	S4, S6, S8	NO	4T	10T, 9–10XT, 9T	6T, 8T, 10T, 9–10XT, 9T, 11T, 13T*	F–YELLOW	YES	F–RED	6T, 8T	APPROACH	1R, 3N	YES	NO	NOTE 8
S6–S8	1N, 3N	S6	NO	S8	YES	13T	9T	11T, 9T, 7T, 5T, 3T*	GREEN	YES	F–RED	11T, 9T	APPROACH	1N, 3N	YES	LPBR1	NOTE 2, 4, 5, & 7
S6–S2	1R, 3N	S6	NO	S2, S4, S8	YES	13T	9T, 9–10XT, 10T	11T, 9T, 9–10XT, 10T, 8T, 6T, 4T*	F–YELLOW	YES	F–RED	11T, 9T	APPROACH	1R, 3N	YES	LPBR2	NOTE 2, 4, 6, & 7
S4–S2	3N, 1N	S4	NO	S2	NO	14T	10T	12T, 10T, 8T 6T, 4T*	F–GREEN	YES	F–RED	12T, 10T	APPROACH	3N, 1N	YES	LP4R2	NOTE 2 & 5
S4–S8	3R, 1N	S4	NO	S2, S6, S8	NO	14T	10T, 9–10XT, 9T	12T, 10T, 9–10XT, 9T, 7T, 5T, 3T*	YELLOW	YES	F–RED	12T, 10T	APPROACH	3R, 1N	YES	LP4R1	NOTE 2 & 6
S18	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	RED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NOTE 1
S12	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	RED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NOTE 1
S14	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	RED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
S16	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	RED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

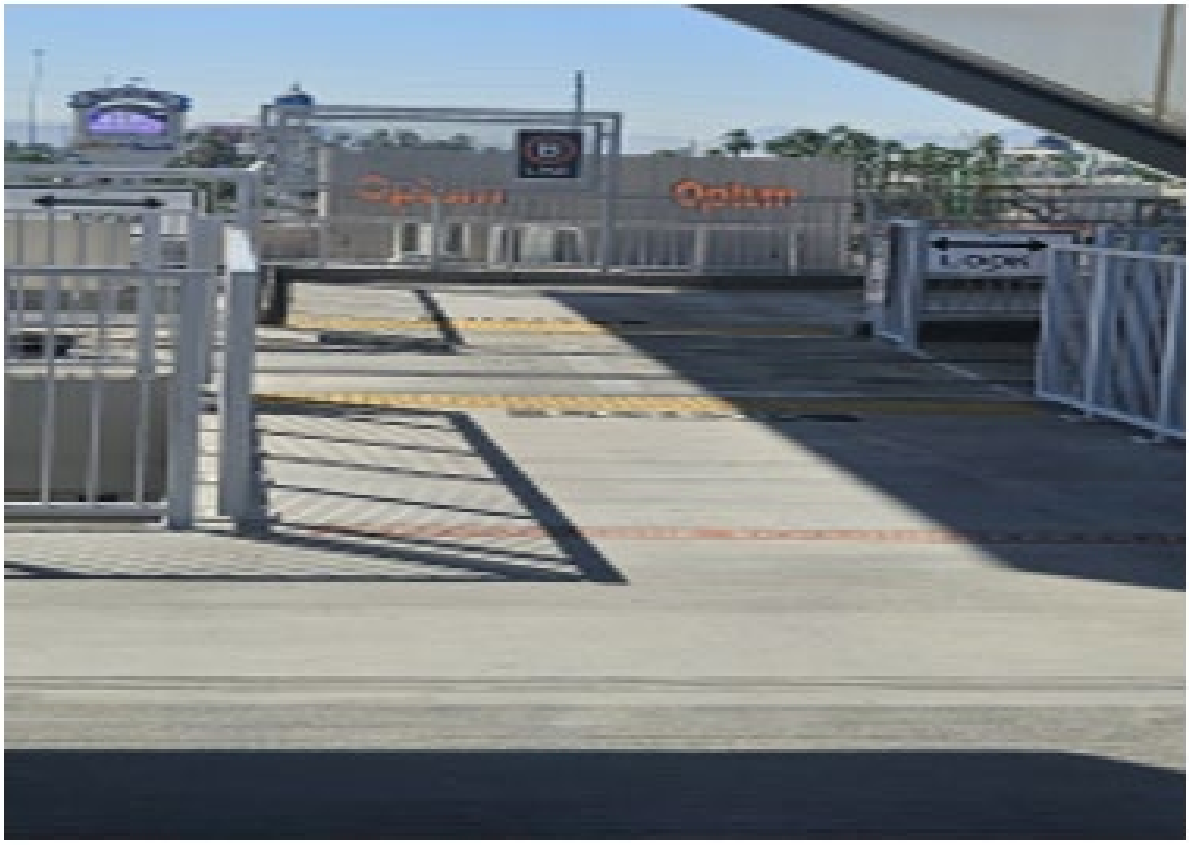
*= TRACK NOT INCLUDED IN CALL-ON ROUTE

I-17 Bridge



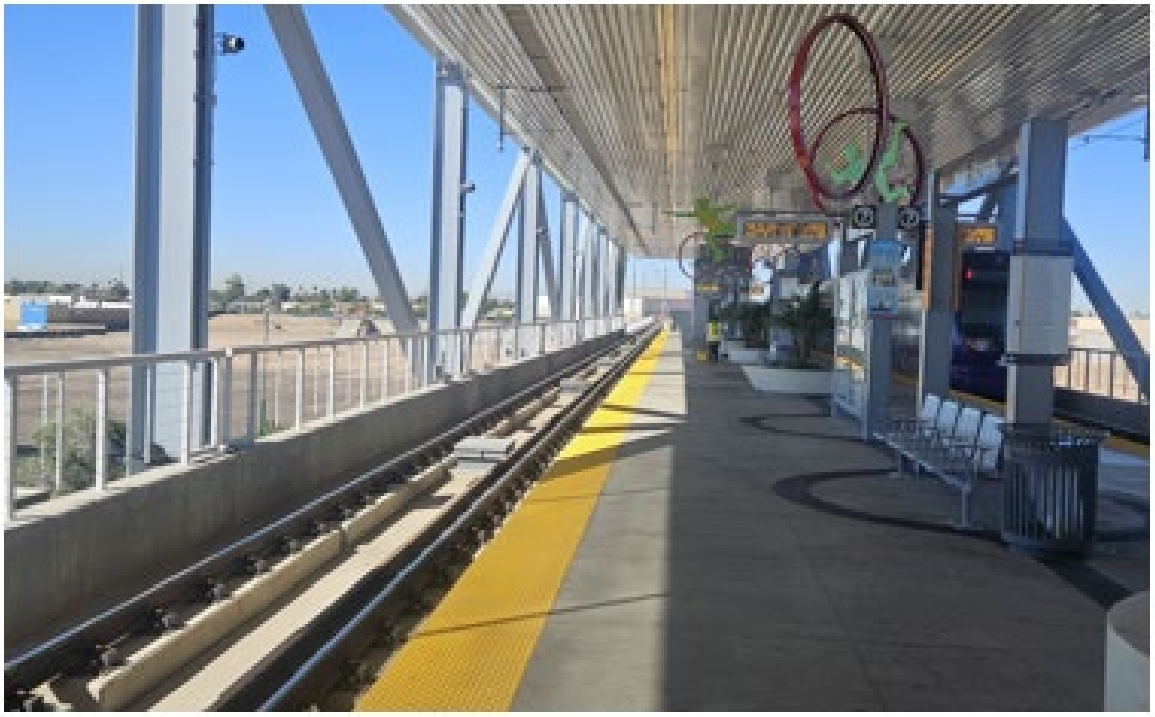












Metro Tail Track




DANGER
HIGH
VOLTAGE
DO
NOT
ENTER


Metro Pkwy
Metro Pkwy

Safe Zone Analysis – OL-B-4 Montebello → Metro Tail Track

Overview

The OL-B-4 segment runs within the 19th Avenue median corridor, where physical refuge areas are limited due to narrow shoulders, active traffic lanes, and high heat exposure from the surrounding pavement.
Safe zones along this section are designated primarily within median refuges and select terminal pockets that provide adequate clearance from the dynamic train envelope. Each area is evaluated for worker visibility, braking distance, and environmental protection.

1. Montebello to Glendale Segment

Safe Zone Type: Curbside refuge and Park-and-Ride access point.
Description:

- Workers can utilize the paved shoulder near the Montebello Park & Ride access gate for short-duration staging.
- Clearance allows two personnel to stand clear of the dynamic envelope while maintaining direct radio line-of-sight to the approaching train.

Notes: Suitable for pre-work briefings or light inspections only — avoid prolonged occupation due to traffic noise and glare.

2. Northern Avenue Median Refuge

Safe Zone Type: Central median refuge between Track 1 and Track 2.
Description:

- Offers a two-person clear zone with visibility in both directions.
- Located mid-block north of Northern Avenue station where the median widens slightly.
- Ideal for watchperson positioning or safe clearance during passing movements.

Refinement: Use designated median refuges (clearly marked on OL-B-4 map) for safe zones.

3. Dunlap Interlocking and Grade Crossing

Safe Zone Type: Narrow shoulder refuge adjacent to signal bungalow.
Description:

- Minimal shoulder width; accommodates one person maximum.
- Use only as temporary refuge while coordinating OCC route confirmation or switch alignment checks.
- Workers must remain alert to simultaneous train and roadway traffic movements.

Refinement: Exposure to high radiant heat and constrained refuge space—enforce rotation and hydration protocol.

4. Mountain View / 25th Avenue Tail Track Area

Safe Zone Type: Paved shoulder and tail-track clearance zone.
Description:

- Provides the widest paved staging area along the section, suitable for maintenance vehicles and two-to-three-person crews.
- Adequate clearance for workers to stand outside the dynamic envelope and perform OCS or signal work.
- Recommended primary safe zone for extended duration work.

Notes: Maintain cone barriers for separation from adjacent roadway; ensure OCS clearance for elevated work.

5. Metro Parkway / North Terminal Pocket

Safe Zone Type: Terminal stub track clearance zone.
Description:

- Located beyond the final switch north of Metro Parkway, within the single-track tail section.
- Provides refuge for small crews performing terminal inspections, switch maintenance, or vehicle staging.
- Constrained egress — must secure Exclusive Track Occupancy (ETO) and OCC clearance prior to entry.

Refinement: Exposure to high radiant heat and limited air flow—apply heat stress prevention measures and limit time-on-track.

General Safe-Zone Practices for OL-B-4

Condition	Required Action
Limited shoulder or median refuge	Position lookout on open sightline side (north/south approach).
Heat index > 100°F	Rotate crews every 30 min minimum; provide hydration and shaded rest areas.
Low visibility or glare	Use flashing beacons and high-visibility PPE; lookout must face direction of travel.
Multi-crew operations	Assign separate lookouts for northbound and southbound tracks.

Summary

Safe-zone opportunities on OL-B-4 are limited but manageable through proper planning and adherence to RWP procedures.

Primary safe areas include:

- Northern Avenue median refuge,
- Dunlap interlocking shoulder, and
- Mountain View tail-track shoulder (preferred).

All zones must be clearly marked on the OL-B-4 line map and verified during the pre-job briefing. When conditions restrict clearance, crews shall use roadside sidewalk staging until ETO and traffic control are in place.

■ ■ ■

APPENDIX M – TSC Tempe Streetcar Track

Section Overview

Locations: Hayden Ferry Loop • Marina Heights • 9th Street & Mill Avenue • Dorsey Lane • Ash Avenue • Rio Salado Parkway Roundabout
Line: Tempe Streetcar (TSC) – Downtown Tempe & Marina Corridor

Platforms:

- Hayden Ferry / Marina Heights – WB / EB
- Marina Heights / Rio Salado Pkwy – WB / EB
- Mill Ave / 9th Street – WB / EB
- Ash Ave / 3rd Street – WB / EB
- Dorsey Ln / Apache Blvd – WB / EB

Track Type:

Single-track and double-track street-running alignment fully integrated with vehicular traffic, operating within shared travel lanes through downtown Tempe, Marina Heights, and the Rio Salado corridor. The system features multiple manual and spring switches, including those at Hayden Ferry, Marina Heights, 9th & Mill, and Dorsey, as well as a diamond crossing and roundabout where trains and POVs share the same roadway.

The entire alignment is embedded in asphalt pavement with limited shoulder access and minimal step-off clearance, requiring strict coordination with the Operations Control Center (OCC) and City of Tempe Traffic Operations during any track or OCS activity.

Work Activity Description:

OCS and track inspections are performed during non-revenue service hours to minimize exposure within shared-traffic conditions. Crews utilize a maintenance truck towing an illuminated arrow trailer equipped with flashing amber strobes to provide downstream traffic warning and work-zone visibility.

Typical work includes switch inspection, rail and OCS tension checks, and diamond-crossing verification conducted under Exclusive Track Occupancy (ETO) authority issued by OCC. Flaggers and lookouts are positioned at both ends of the active work zone, and safe zones are generally established along curbside refuge points or sidewalk areas.

Environmental conditions such as heat reflection, glare from vehicle headlights, and high noise levels from adjacent traffic are common throughout this corridor, requiring enhanced situational awareness, PPE compliance, and adherence to Valley Metro's heat and fatigue management protocols.

Crossovers:

Tempe Streetcar – Switch Reference (West to East Alignment)

Switch ID	Location	Type	Description / Function
1	Hayden Ferry	Manual Spring Switch	Facing-point switch allowing west-end loop entry; returns to normal after trailing movement.
3	Hayden Ferry	Manual Spring Switch	Mid-loop trailing switch providing westbound return alignment toward Marina Heights.
5	Hayden Ferry	Manual Spring Switch	Exit switch for west-end alignment leading into Marina Heights segment.
7	Marina Heights	Manual Spring Switch	Facing-point Spring switch controlling eastbound entry into Marina Heights.
9	Marina Heights	Manual Spring Switch	Trailing-point Spring switch completes eastbound movement through Marina Heights.
1	9th & Mill	Manual Switch	Facing-point switch; requires full hand-throw operation for movements between Mill Avenue and 9th Street.
3	9th & Mill	Manual Switch	Trailing-point paired switch for 9th Street return alignment must be manually aligned.
7	Dorsey	Manual Spring Switch	East-end trailing switch providing return from 9th Street to Tempe loop alignment.

Tempe Streetcar (TSC) — Hazard & Risk Assessment

A. Risk Matrix Key (Qualitative)

- Likelihood (L): Low / Med / High
- Severity (S): Low / Med / High
- Risk Rating: Low / Med / High (qualitative field evaluation for RWP planning)

B. Location: Hayden Ferry (Spring Switches 1, 3, 5)

Shared-lane rail section adjacent to Marina Heights and Tempe Beach Park.

Hazard ID	Hazard Description	L	S	Risk	Controls / Mitigations
HF-1	Spring switch fails to return to normal after trailing movement	Med	High	High	Verify spring action prior to entry; OCC confirmation; hand-verify point closure before releasing limits.
HF-2	Vehicle encroachment into shared rail lane during setup or switching	High	High	High	City-approved TCP; dual flaggers; arrow-board truck staged at rear of work zone; reflective cones and delineators.
HF-3	Pedestrian intrusion during waterfront events	Med	Med	Med	Temporary barricades or tape line; assign lookout; coordinate work windows with event management.
HF-4	Limited refuge and step-off clearance near curb	Med	Med	Med	Identify refuge pockets prior to start; stagger crew positions; maintain radio contact with lookout.

C Location: Marina Heights (Spring Switches 7, 9)

Active shared-traffic corridor with continuous vehicle and cyclist presence.

Hazard ID	Hazard Description	L	S	Risk	Controls / Mitigations
MH-1	Reduced visibility through curve in mixed-traffic area	Med	High	High	Place lookout at curved apex; restrict work to non-revenue hours; deploy arrow-board truck with flashing beacons.
MH-2	Spring switch correspondence not verified before movement	Low	High	Med	OCC confirmation; physical point check; perform throw-and-restore under ETO.
MH-3	Radiant heat from embedded track pavement	High	Med	High	Work/rest rotation; hydration and shade; reflective clothing; monitor WBGT index.

D. Location: 9th & Mill (Manual Switches 1, 3)
Heavily shared corridor with dense pedestrian and vehicular interface.

Hazard ID	Hazard Description	L	S	Risk	Controls / Mitigations
9M-1	Manual switch hand-throw within active traffic lane	High	High	High	Perform during non-revenue hours; lane closure via City TCP; arrow trailer deployed behind truck for traffic warning.
9M-2	Pedestrian congestion and reduced sightlines	High	Med	High	Assign pedestrian spotter; use audible warnings; restrict work during event surges.
9M-3	Curbside delivery vehicles obstructing refuge area	Med	Med	Med	Coordinate with adjacent businesses; pre-stage cones to preserve safe-zone width; adjust work window if blocked.

E. Location: Dorsey (Spring Switch 7)
Transition between shared-lane street running and dedicated rail alignment.

Hazard ID	Hazard Description	L	S	Risk	Controls / Mitigations
DR-1	Switch fails to latch after trailing move	Med	High	High	Inspect spring and correspondence; OCC verification prior to reopening.
DR-2	Worker exposure to live traffic in narrow shoulder	Med	High	High	Conduct only under non-revenue; arrow-board truck with flashing strobes; dual flaggers.
DR-3	Nighttime glare and limited peripheral lighting	Med	Med	Med	Supplemental task lighting; orient away from vehicle headlights; reflective PPE required.

F. Shared-Use Feature: Roundabout (Street-Running Segment)
Most of the Tempe Streetcar alignment, including this segment, operates within mixed-traffic lanes shared with automobiles and bicycles.

Hazard ID	Hazard Description	L	S	Risk	Controls / Mitigations
RB-1	Conflicting train/vehicle movements inside shared roundabout	High	High	High	Exclusive work period during non-revenue hours; con-controlled closure; two-flagger system with radios.
RB-2	Driver confusion causing wrong-way or close passes	Med	High	High	Channelization cones; advance “TRAIN WORK AHEAD” boards; arrow trailer positioned downstream.
RB-3	Limited refuge inside center island	Med	Med	Med	Identify island refuge; limit crew exposure time; continuous lookout coverage

G. Special Trackwork: Diamond Crossing (Train–Train Interface)
Located within a shared roadway section connecting multiple lines.

Hazard ID	Hazard Description	L	S	Risk	Controls / Mitigations
DX-1	Conflicting movement between intersecting lines	Med	High	High	Exclusive Track Occupancy for both lines; OCC lockout; lookouts positioned on each approach.
DX-2	Flangeway obstruction during slow-order testing	Low	High	Med	Clean and inspect groove; restricted-speed test; chock & blue-flag if static.
DX-3	Pedestrian or cyclist intrusion into flangeway area	Med	Med	Med	Barricades and audible alerts; deploy pedestrian spotter; maintain cone buffer.

H. Work Activity Description

Tempe Streetcar operations take place almost entirely within shared-use lanes where rail vehicles operate alongside general traffic.

To minimize exposure, all OCS and track inspections are performed during non-revenue service hours—typically overnight—under Exclusive Track Occupancy (ETO) issued by the OCC.

Inspection crews utilize a maintenance truck towing an illuminated arrow trailer equipped with flashing amber strobes and directional boards to provide downstream driver warning and maintain work-zone visibility.

During these operations:

- Arrow-board trailer is positioned behind the work truck to deflect approaching vehicles.
- Flaggers are stationed on each approach to the active work zone.
- Lookouts maintain radio communication with the OCC and field crew.
- All switching and inspection activities must be completed and cleared before the first revenue train departs the yard.

I. Common Controls (Applies to All TSC Segments)

- Shared-Lane Operation: Most of TSC track is embedded within public roadways shared with POVs.
- Work Authority: OCC-issued ETO; verbal read-back before entry.
- Traffic Control: City of Tempe-approved TCP; MUTCD tapers; arrow trailer and flaggers required.
- Lookouts: Mandatory; maintain radio contact and visual signals.
- Safe Zones: Curbs, refuge islands, or sidewalk step-offs pre-identified before start.
- Environmental: Heat, glare, and noise exposure mitigated via Valley Metro's heat stress and fatigue protocol.
- Documentation: RTRS job briefing and OCC clearance required before and after work.

Segment Hazard Checklist

Line / Section	Segment Limits	Access	Braking	Visibility (Curves / Portals / Distractions)	Environmental	Notes / Comments
TSC – Downtown Tempe & Marina Corridor	Hayden Ferry → Dorsey Ln / Apache Blvd	☑	☑	☑ (Distractions / Curves)	☑	Street-running guideway fully shared with vehicular traffic. Access limited to curb and midblock openings; high pedestrian density near Mill Ave and Marina Heights. Inspections conducted during non-revenue hours using truck and arrow trailer for safety visibility.

The Four Standard Hazard Categories

1. Access Limitation –
   Restricted entry points and narrow shared lanes limit worker mobility and access to track or OCS components. Work often requires midblock entry and pre-approved City of Tempe traffic control setups.

2. Braking Distance –
   Streetcar operations occur in mixed traffic with low operating speeds but short approach distances. During work periods, vehicles may enter the shared lane unexpectedly; hence all inspections occur during non-revenue hours to eliminate braking hazards.

3. Visibility –
   Visibility is affected by curves through the roundabout, headlight glare from vehicles, and urban lighting clutter in downtown Tempe. Pedestrian crossings and parked vehicles create constant sightline changes.

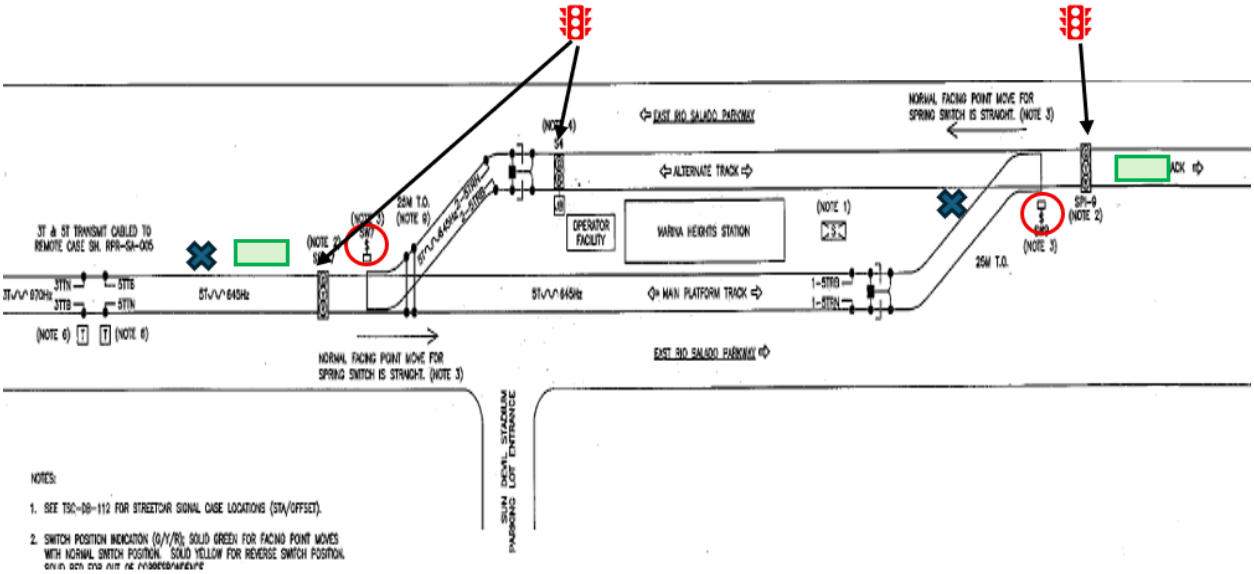
4. Environmental Factors –
   Workers are exposed to heat reflection from asphalt, high ambient noise, and vehicular exhaust. During summer months, heat-index monitoring, hydration breaks, and shaded rest setups are required under Valley Metro's environmental safety standards.

Marina Heights Spring Switch 7



Marina Heights Spring Switch 9 Tail Track





Rio Salado Parkway Curve



Rio Salado Spring Switch 1

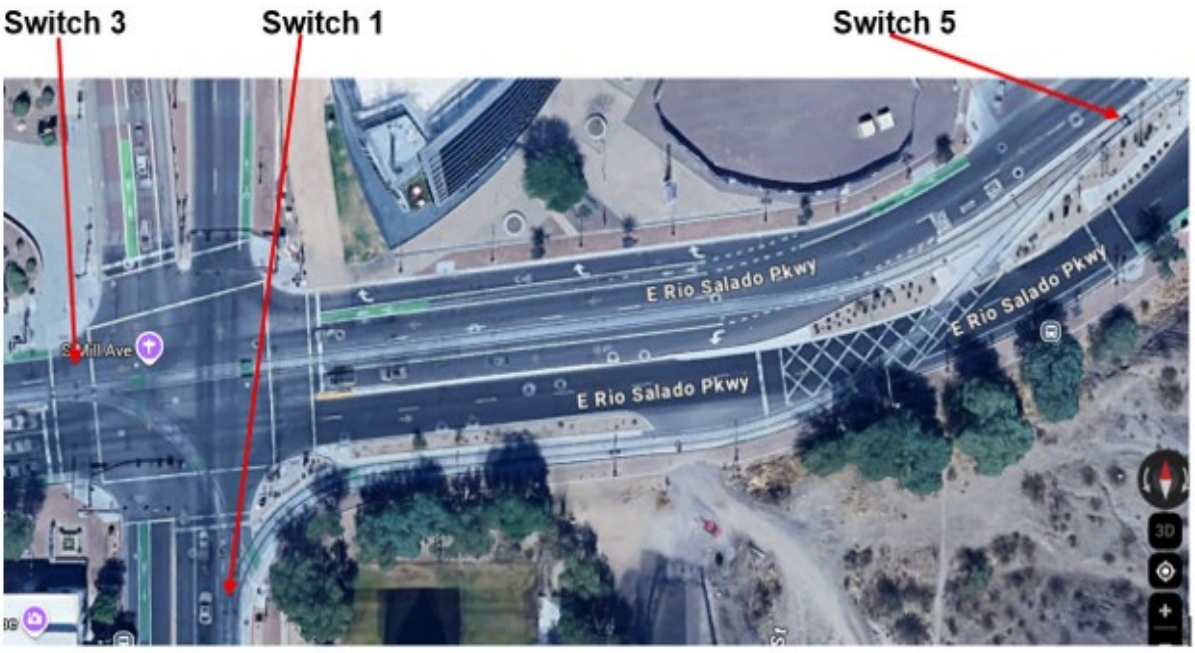


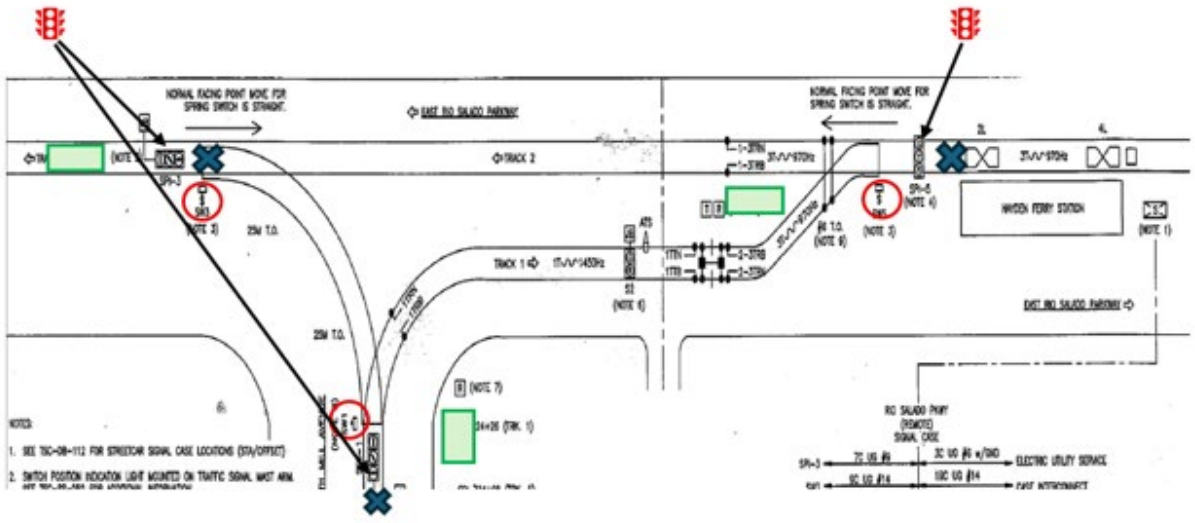
Rio Salado Spring Switch 3



Rio Salado Spring Switch 5







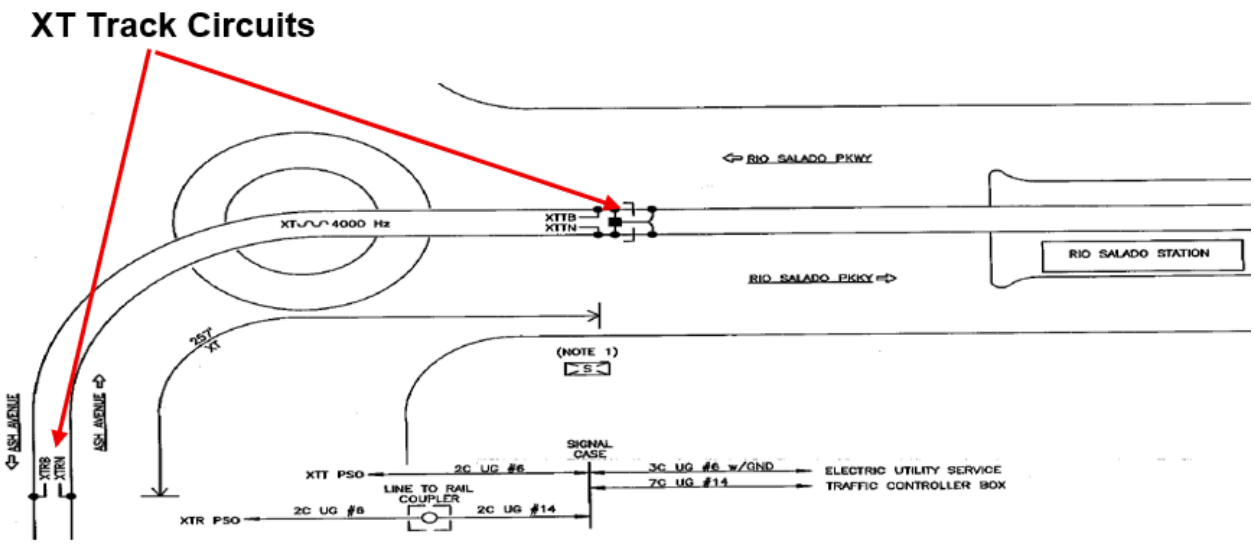
Rio Salado & Ash Roundabout











Rio Salado Parkway Curve – Roundabout Segment (Ash Avenue to Rio Salado Station)

This segment features a curved single-track alignment guiding the Tempe Streetcar through the Rio Salado Parkway roundabout. The alignment includes an active XT Track Circuit (XT1/0+000 Hz) that communicates with the City of Tempe traffic signal controller for vehicle preemption and timing synchronization through the roundabout approaches. The curvature is moderate, with embedded track panels running adjacent to live vehicular lanes. Visibility is constrained by landscaping and circulating traffic, and the area experiences constant mixed-use activity from vehicles, pedestrians, and cyclists accessing Rio Salado Parkway and nearby parking structures.

Risk Assessment – Signal Maintenance and Troubleshooting Activities

Hazard ID	Hazard Description	Likelihood	Severity	Risk Rating	Controls / Mitigations
H-1	Limited access and restricted workspace due to continuous traffic flow within the roundabout and minimal shoulder width along the embedded track.	High	High	High	Coordinate with OCC and City of Tempe; establish temporary traffic control with flaggers; perform maintenance during low-traffic or non-revenue hours.
H-2	Vehicle conflict hazard from circulating cars and buses in the roundabout during signal or circuit troubleshooting.	High	Medium	High	Set up advance warning signage on each entry leg; deploy a work vehicle with flashing beacons; utilize cones or barricades to define a work perimeter.
H-3	Reduced sightlines for approaching streetcars and motorists due to the circular geometry and landscaping obstructions.	Medium	High	High	Require lookout with radio contact to OCC; advise operators of on-track personnel; limit

Hazard ID	Hazard Description	Likelihood	Severity	Risk Rating	Controls / Mitigations
					exposure time within curve limits.
H-4	Electrical and signal hazards during maintenance of the XT circuit wiring, line-to-rail coupler, or signal case adjacent to the roundabout.	Medium	High	High	Confirm traffic signal cabinet power isolation through City coordination; use insulated tools; follow Valley Metro LOTO procedures and wear arc-rated PPE.
H-5	Pedestrian and cyclist proximity from crosswalks and shared-use paths intersecting the roundabout.	Medium	Low	Medium	Post pedestrian warning signs; maintain a spotter for public interface; clearly mark work boundaries with cones or caution tape.

Additional Notes

- Circuit Function: XT Circuit XT1/0+000 Hz transmits streetcar occupancy data to the City's traffic controller to manage signal preemption timing and clearance through the roundabout.

- Access Point: Technicians should access via the southwest sidewalk near the signal case on Ash Avenue. Entry into the live roundabout should occur only under OCC and City approval with traffic control in place.
- Safe Zone: Use the sidewalk refuge adjacent to the signal case as the designated safe zone. No in-track safe refuge is available within the circular alignment.
- Coordination: All circuit testing, troubleshooting, or adjustments must be pre-coordinated with OCC and City of Tempe Signal Operations to avoid unintended preemption activations or system faults.

3rd Street & Ash Avenue Crossing – Point of intersection between the Blue Line (A Line) and Tempe Streetcar tracks.



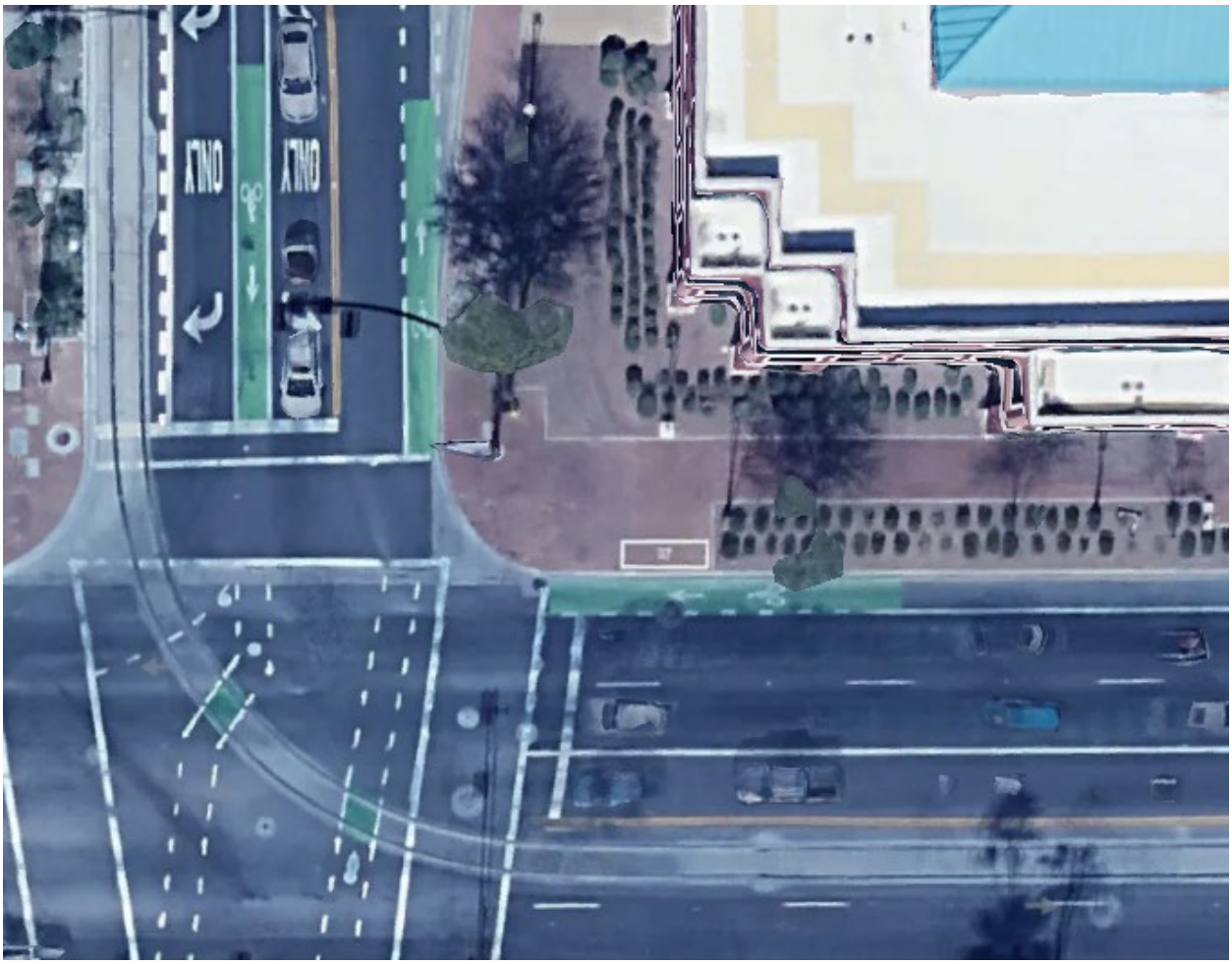


Ash Avenue Curve – Constrained alignment with limited shoulder clearance beneath the CenterPoint pedestrian bridge. The curvature restricts sightlines and requires designated safe zones on the east sidewalk for roadway worker protection.





Ash Avenue Curve – University Drive Intersection



This segment represents the curved track alignment where the Tempe Streetcar transitions from University Drive onto Ash Avenue (northbound approach).

The area includes an active track circuit (XT Track Circuit 703+50) designed to communicate with the City of Tempe traffic signal system for preemption and signal coordination.

The alignment passes through a high-traffic intersection bordered by vehicular lanes, bike lanes, and pedestrian walkways, with limited shoulder clearance and restricted sightlines due to the curve geometry and surrounding development.

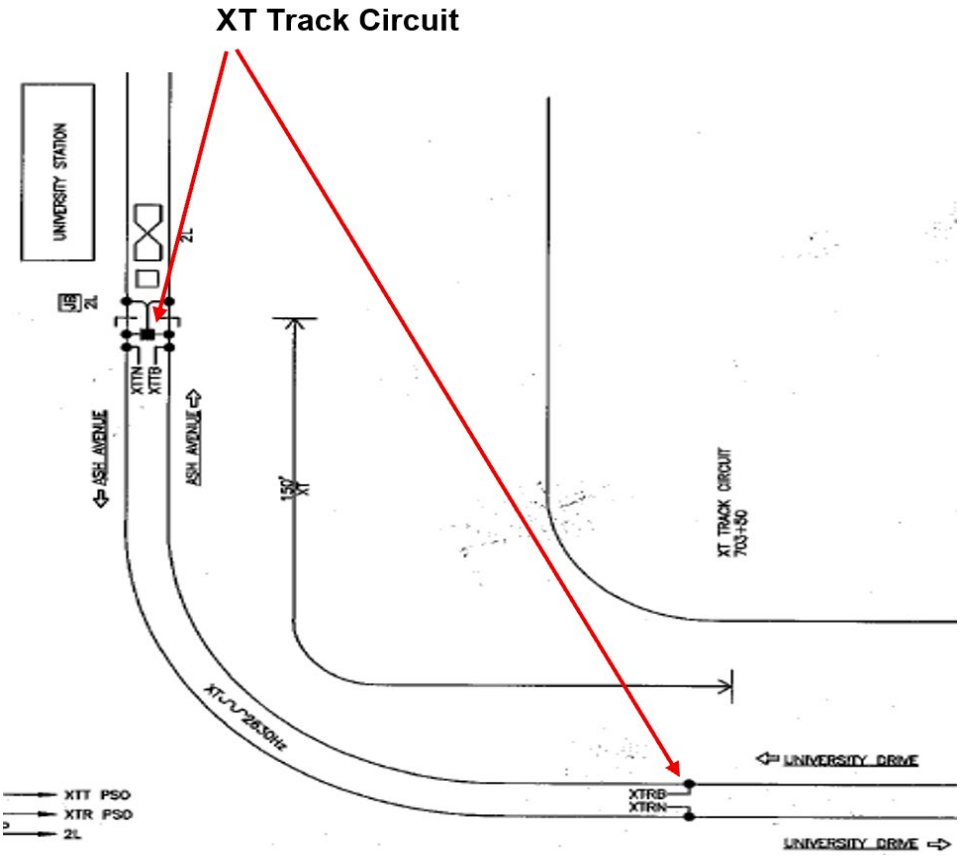
Risk Assessment – Signal Maintenance and Troubleshooting Activities

Hazard ID	Hazard Description	Likelihood	Severity	Risk Rating	Controls / Mitigations
H-1	Restricted access to signal and circuit equipment located adjacent to active traffic lanes and the curved track alignment.	Medium	High	High	Coordinate with OCC and City of Tempe before site entry; establish safe work limits using cones or barricades; use sidewalk access when possible.
H-2	Exposure to moving traffic from turning vehicles at University Drive and through lanes along Ash Avenue.	High	Medium	High	Implement temporary traffic control per MUTCD; deploy a watchperson; use a work vehicle with flashing amber beacons for visibility.
H-3	Reduced operator visibility approaching from University Drive due to curvature and adjacent structures.	Medium	High	High	Notify OCC prior to work; ensure operators are advised of on-track personnel; position a lookout with radio contact.
H-4	Electrical and signal hazards	Medium	High	High	Confirm signal

	when accessing communication or detection cables tied to the traffic preemption circuit.				cabinet power isolation through the City of Tempe; use insulated tools and PPE; follow Valley Metro LOTO procedures.
H-5	Pedestrian and cyclist conflict along shared sidewalks and bike lanes adjacent to the curve.	Medium	Low	Medium	Post warning signage; maintain clear delineation of work area; limit obstruction of public pathways.

Additional Notes

- Track Circuit Function: XT Track Circuit 703+50 transmits approach and occupancy information to the City's traffic signal controller to trigger preemption and optimize signal phasing for streetcar operations.
- Access Point: Technicians should enter from the east sidewalk near the University Drive signal cabinet, avoiding entry from live traffic lanes.
- Safe Zone: Utilize the east sidewalk and planter buffer area as a designated refuge; no in-track safe zone exists within the curve.
- Coordination: All troubleshooting or testing of this circuit must be pre-coordinated with OCC and City of Tempe Signal Operations to prevent unintended signal interruptions.



Mill Avenue Curve – University Drive Intersection

This segment features the curved track alignment connecting Mill Avenue and University Drive, a critical transition zone for Streetcar operations within the downtown Tempe corridor.

The area includes two track circuits (XT Circuit 698+00 and XT Circuit 700+94) that provide traffic signal communication to the City of Tempe's signal controller system for preemption and coordination at the Mill Avenue / University Drive intersection.

Due to its tight curvature, limited sidewalk buffer, and high pedestrian and vehicle activity, this location presents increased exposure risks for field technicians conducting troubleshooting, testing, or signal system maintenance.

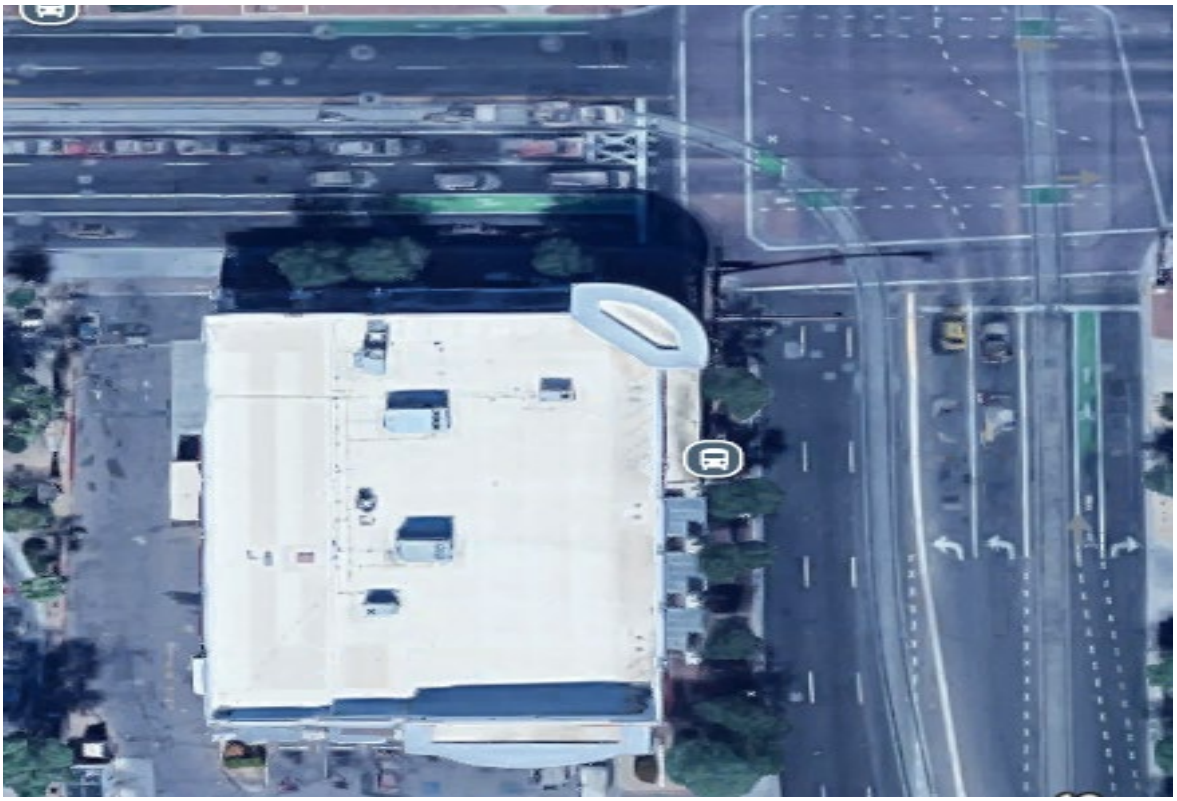
Risk Assessment – Signal Maintenance and Troubleshooting Activities

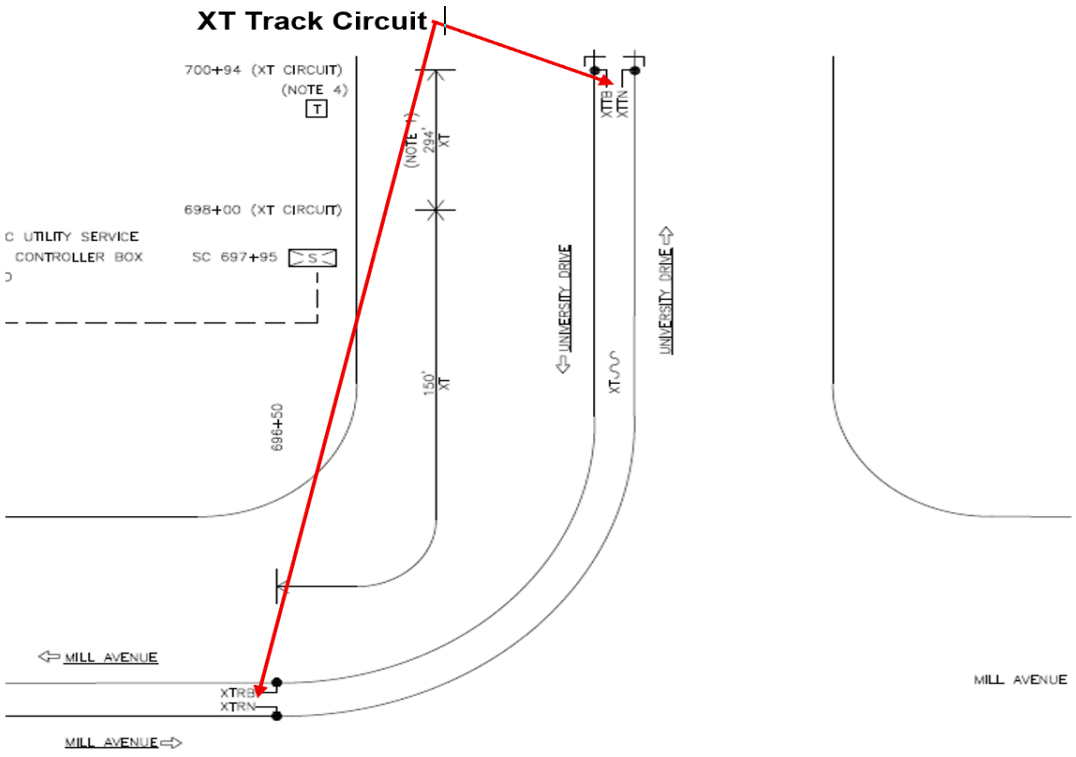
Hazard ID	Hazard Description	Likelihood	Severity	Risk Rating	Controls / Mitigations
H-1	Limited clearance and workspace due to the curved geometry and adjacent roadway traffic at Mill Avenue and University Drive.	Medium	High	High	Coordinate with OCC and City of Tempe before accessing the area; use sidewalk or curb lane for technician staging; deploy traffic cones and safety signage per MUTCD.
H-2	Exposure to high-volume vehicle and pedestrian crossings within the downtown corridor.	High	Medium	High	Schedule work during off-peak or non-revenue hours; assign a watchperson; establish visual and audible warning systems.
H-3	Reduced sightlines for approaching streetcars entering or exiting the curve.	Medium	High	High	OCC to notify all operators in the vicinity; post lookout on curve approach; use radio communication for movement verification.
H-4	Electrical hazards associated with troubleshooting or replacing	Medium	High	High	Confirm coordination with City signal technician for

Hazard ID	Hazard Description	Likelihood	Severity	Risk Rating	Controls / Mitigations
	signal/communication wiring tied to XT Circuits 698+00 and 700+94.				circuit isolation; follow Valley Metro lockout/tagout procedures; use insulated tools and PPE.
H-5	Limited refuge area for workers if trains or traffic approach unexpectedly.	Medium	High	High	Utilize east sidewalk or setback area near the University Drive controller cabinet as the designated safe zone; maintain continuous situational awareness.

Additional Notes

- Circuit Function: XT Circuits 698+00 and 700+94 transmit streetcar detection data to the City's traffic controller to manage preemption timing at the Mill Avenue and University Drive intersection.
- Access Point: Primary access is from the north sidewalk of University Drive, adjacent to the controller cabinet near the curve.
- Safe Zone: Utilize the sidewalk buffer north of University Drive as the designated technician refuge area; no in-track safe zone is available within curve limits.
- Coordination: All circuit or signal work must be pre-coordinated with OCC and City of Tempe Signal Operations to avoid signal preemption disruptions and ensure traffic signal safety.




XT Track Circuit
700+94 (XT CIRCUIT)
(NOTE 4)
T
698+00 (XT CIRCUIT)
C UTILITY SERVICE
CONTROLLER BOX
SC 697+95
S
696+50
(NOTE 2)
294'
XT
150'
XT
XTR
XTRN
UNIVERSITY DRIVE
XT
UNIVERSITY DRIVE
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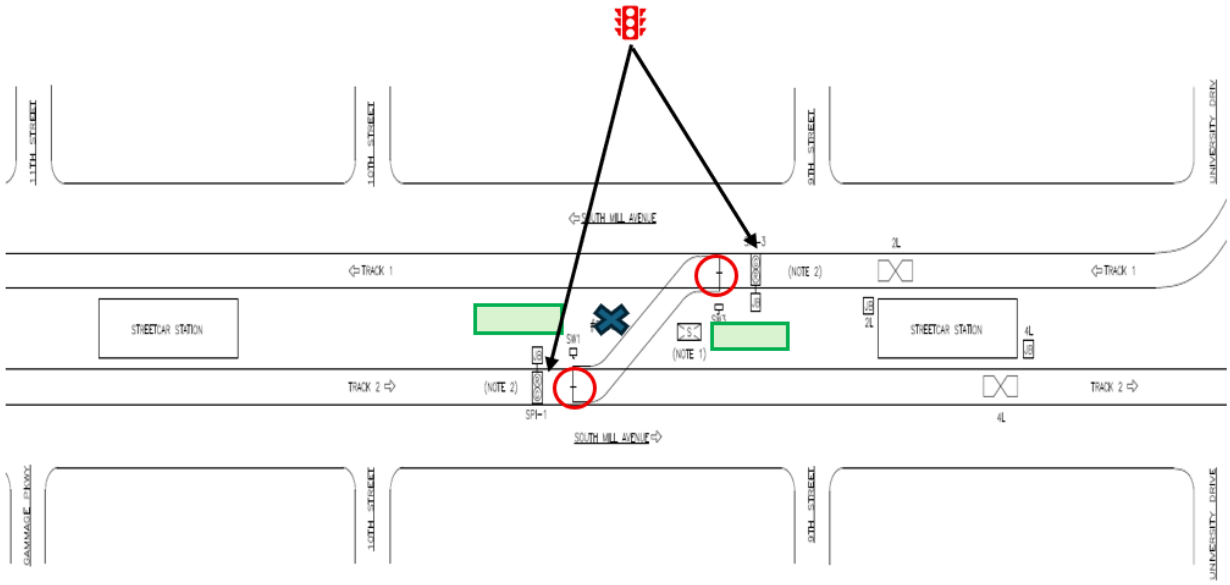
9th & Mill Manul Switch 3



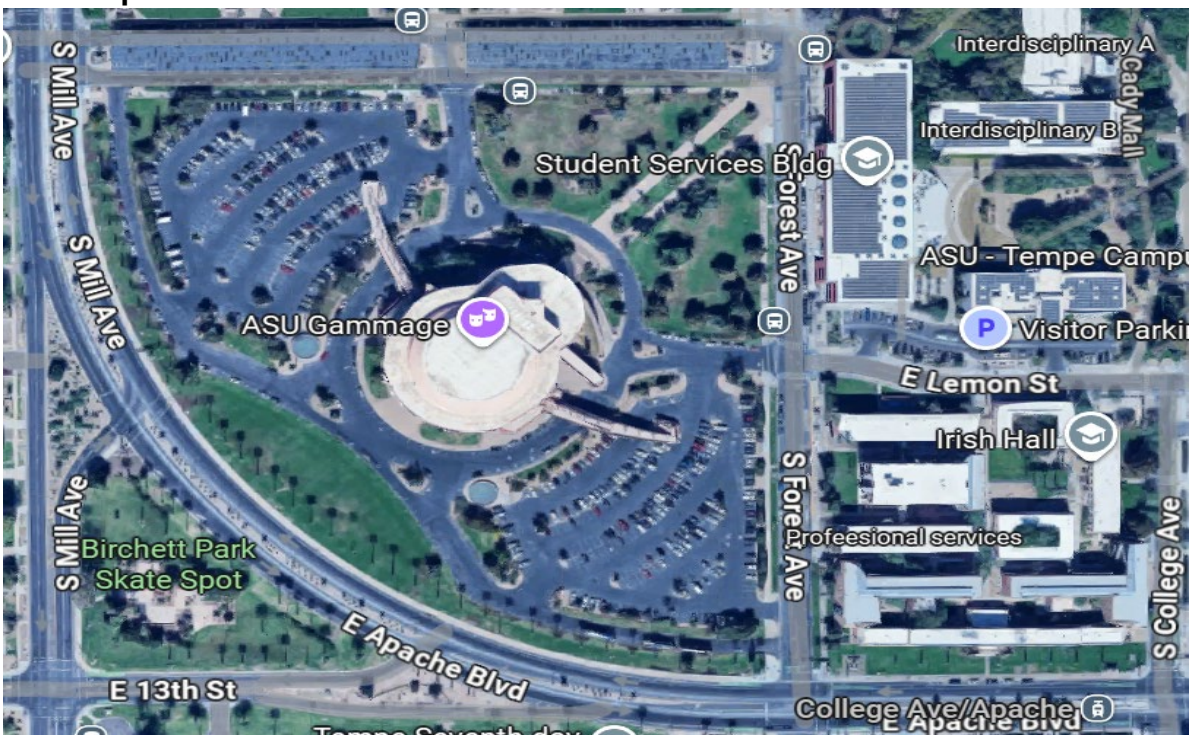
9th & Mill Manul Switch 3




S Mill Ave
S Mill Ave
Ninth St/Mill


11TH STREET
10TH STREET
9TH STREET
UNIVERSITY DRIVE
SOUTH MILL AVENUE
TRACK 1
TRACK 2
STREETCAR STATION
(NOTE 1)
(NOTE 2)
SW1
SPI-1
SPI-2
3
2L
4L
GAMMAGE PKWY

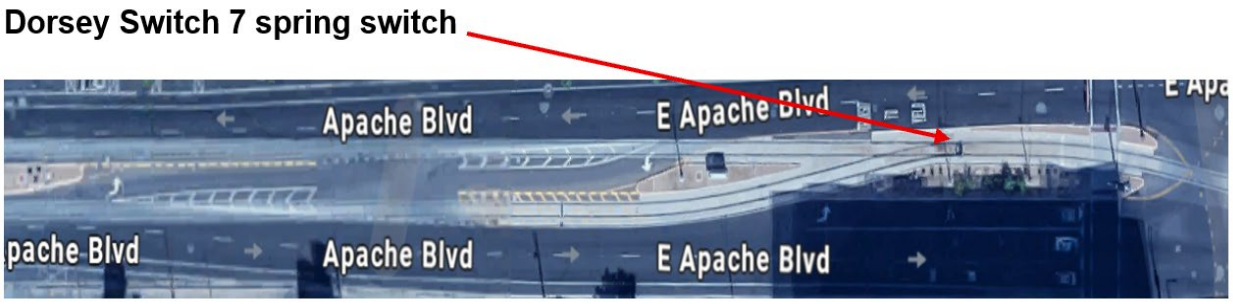
Mill & Apache Blvd Curve



Dorsey Switch 7 spring switch



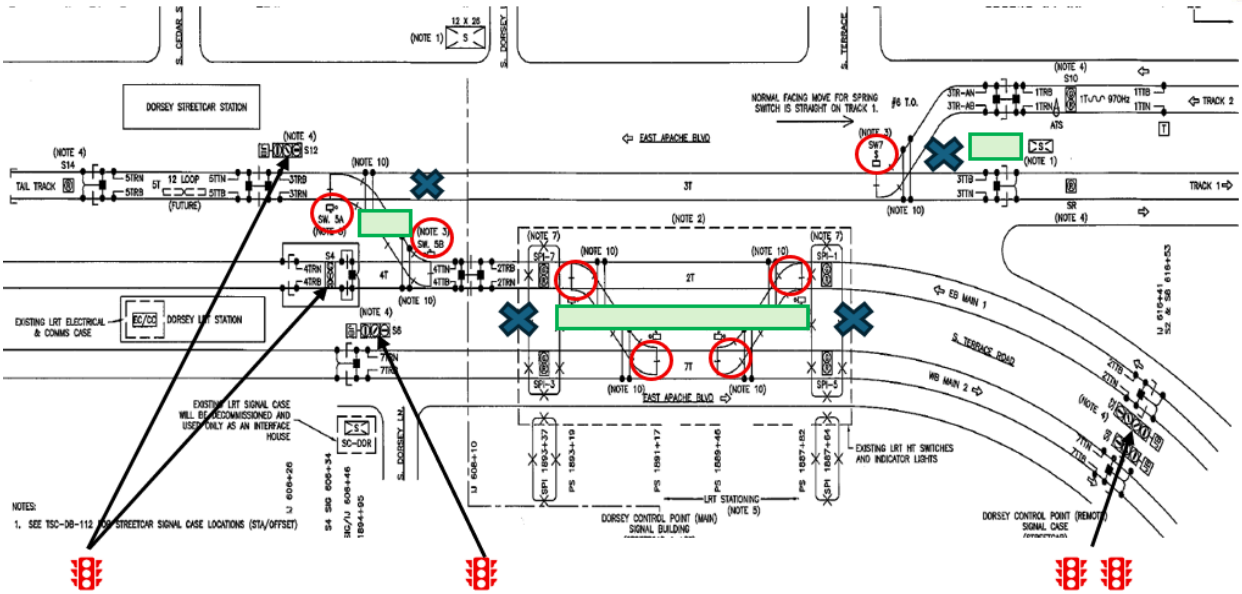




Dorsey Switches 5A and 5B are powered switches that provide the transition between the main line and the Tempe Streetcar alignment.


5


Dorsey Ln/Apache Blvd
Apache Blvd
E Apache Blvd
Dorsey Ln/Apache


DORSEY STREETCAR STATION
EAST APACHE BLVD
TRACK 1
TRACK 2
TAIL TRACK
(FUTURE)
EXISTING LRT ELECTRICAL & COMMS CASE
DORSEY LRT STATION
EXISTING LRT SIGNAL CASE WILL BE DECOMMISSIONED AND USED ONLY AS AN INTERFACE HOUSE
NORMAL FACING MOVE FOR SPRING SWITCH IS STRAIGHT ON TRACK 1.
#6 T.O.
EB MAIN 1
WB MAIN 2
S. TERRACE ROAD
EXISTING LRT HF SWITCHES AND INDICATOR LIGHTS
DORSEY CONTROL POINT (MAIN) SIGNAL BUILDING
DORSEY CONTROL POINT (REMOTE) SIGNAL CASE
LRT STATIONING (NOTE 5)
NOTES:
1. SEE TSC-08-112 FOR STREETCAR SIGNAL CASE LOCATIONS (STA/OFFSET)

■ ■ ■

APPENDIX N – Storage Yard

Storage Yard Track Access Guide (RWP-SY)

1. Section Overview

Locations: Yard Led • Mainline Crossover (Switches 1A / 1B) • Inspection Tracks (1–6) • Wash Track • Shop Access Track • OCS Yard Feed Poles • Storage Staging Lanes
Line: Blue Line (A Line) / Orange Line (B Line) – Operations & Maintenance Yard Interface
Track Type:
Combination of ballasted lead track and embedded yard slab track within a secured facility. The yard connects to the mainline through powered switches and features manual hand-throws for storage and inspection tracks. The alignment supports low-speed train movements under OCC control, with limited clearances, overhead OCS poles, and multiple walkway crossings.

2. Work Activity Description

All roadway worker protection (RWP) activities within the Storage Yard are coordinated through the Operations Control Center (OCC) and Maintenance of Equipment (MOE).

Typical activities include:

- Switch inspection, adjustment, and lubrication.
- OCS and feeder maintenance on fixed-pole structures.
- Inspection pit access and undercarriage examination. (Movement governed by non-controlled tracks and SOP 1700.01)
- Track tamping, alignment checks, and debris removal.
- Wash track and pantograph inspection activities.

All work must occur under Exclusive Track Occupancy (ETO) or In-Charge Person (ICP) authority. Movements of LRVs, shop trucks, or maintenance vehicles must be suspended within defined limits.

Crews use barricades, cones, or blue flags at track entry points. At this point, movements within the shop are done under non-controlled tracks and SOP 1700.01. A lookout or watchperson must be assigned when multiple tracks are active.

Safe zones are located along the yellow-striped walkways and between designated refuge platforms; step-off clearance is restricted between storage tracks. Overhead OCS

hazards exist throughout; all employees must observe the 20-foot minimum approach unless OCS power has been de-energized and grounded

Risk & Hazard Assessment

Location	Hazard ID	Hazard Description	L	S	Risk	Controls / Mitigations
Yard Lead / Switches 1A–1B	SY-1	Conflicting movement with yard or mainline train during entry/exit.	Med	High	High	OCC coordination and radio clearance required; ETO limits must cover both switches; yard gates locked and flagged.
	SY-2	Switch misalignment or power correspondence fault.	Low	High	Med	Verify indication via OCC and visual check before release; inspect switch rods before movement.
	SY-3	Restricted step-off areas near powered switch motors.	Med	Med	Med	Use designated walkway; post cones; maintain 3-foot clearance.
Storage Tracks (1–6)	SY-4	Worker struck or pinned between stored LRVs.	Med	High	High	Verify no equipment movement; apply blue flags both ends; ensure OCC aware of personnel on track.

Location	Hazard ID	Hazard Description	L	S	Risk	Controls / Mitigations
	SY-5	Limited refuge between parallel tracks.	High	Med	High	Identify escape route prior to entry; maintain lookout; position tools clear of walkways.
Inspection Pit / Shop Access	SY-6	Fall hazard into open pit or trench.	Med	High	High	Use guardrails or covers; ensure pit lighting and ventilation; post “Open Pit” signage.
	SY-7	Electrical hazard from OCS proximity above pit.	Med	High	High	Confirm OCS de-energized before roof-mounted work; use LOTO tags; maintain 20-foot clearance.
	SY-8	Slip hazard from fluids, grease, or cleaning residue.	Med	Low	Med	Maintain housekeeping; use absorbent mats; wear slip-resistant footwear.
Wash Track Area	SY-9	Unauthorized vehicle entry into wash lane.	Med	Med	Med	Close gates and post “Do Not Enter” signs; maintain supervision during wash operations.
	SY-10	Chemical exposure from	Low	Med	Low	Use PPE and eye protection;

Location	Hazard ID	Hazard Description	L	S	Risk	Controls / Mitigations
		detergents and spray.				confirm wash chemicals stored per SDS; ventilate area.
OCS Yard Poles / Feeder Line Zone	SY-11	Electrical contact during maintenance.	Low	High	High	De-energize and ground; confirm isolation via OCC; maintain LOTO tagout until release.
	SY-12	Elevated work near parked trains or cranes.	Med	Med	Med	Maintain 10-foot setback; use spotter; barricade lift zone.
Yard Gate & Vehicle Interface	SY-13	Collision with maintenance trucks or LRV during gate transition.	Med	High	High	Assign flagger at gate; radio clearance with OCC; stop LRV outside gate until clear.
	SY-14	Poor visibility at night or during rain.	High	Med	High	Use portable lighting; reflective PPE; minimize vehicle crossings.

4. Segment Hazard Checklist

Segment	Access	Braking	Visibility (Curves / Portals / Distractions)	Environmental	Notes / Comments
Yard Lead / Switches 1A–1B	☑	☑	☑ (Curves near gate)	☑	Dual-track lead with powered switches; limited walkway clearance near fence line.
Storage Tracks (1–6)	☑	☐	☑ (Obstructed by parked LRVs)	☑	Narrow spacing and confined walkways; high visibility vest required.
Inspection Pit / Shop Access	☑	☐	☑ (Interior glare / shadows)	☑	Pit fall risk; ensure ventilation and lighting.
Wash Track	☑	☐	☑ (Wet floor reflection)	☑	Surface wetness and noise; watch electrical panels.
OCS Feeder / Yard Poles	☑	☐	☑ (Overhead obstructions)	☑	Maintain clearance; use lift spotters.

5. The Four Standard Hazard Categories

Access Limitation –
Restricted walkways, fencing, and stored LRVs reduce available movement space. Entry and egress points are fixed and require controlled gate access. All personnel must sign in/out with OCC and MOW Yardmaster prior to entry.

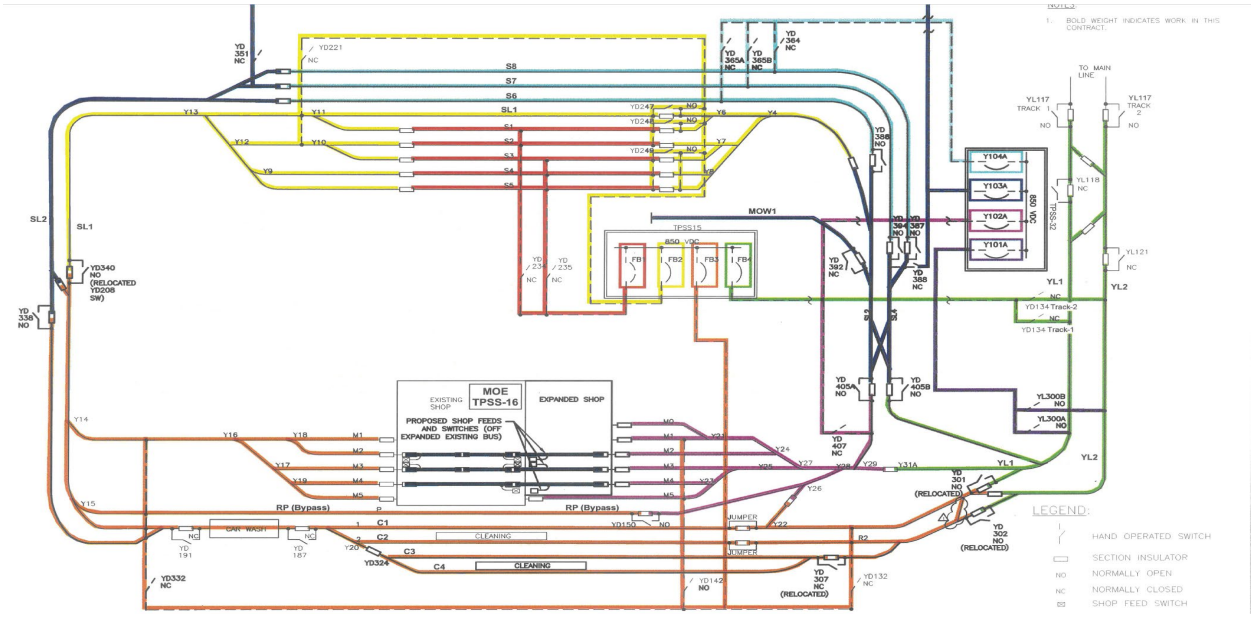
Braking Distance –
LRVs operate at low speeds within the yard (≤5 mph), but short stopping distances and multiple crossovers create collision potential if clearance is not confirmed. Yard personnel must maintain visual contact and radio coordination when any movement is authorized.

Visibility –
Obstructed sightlines from parked vehicles, equipment, and OCS poles limit operator and worker visibility. Night operations require portable lighting and reflective PPE, and may optionally have a designated watchpersons to maintain situational awareness.

Environmental Factors –
Workers are exposed to high radiant heat from concrete slabs, water overspray from the wash track, noise from compressors, and glare from yard lighting. Enforce heat stress protocols, hydration, and hearing protection as required by Valley Metro SOP 400.7 (Adverse Weather) and SOP 500.3 (Shop Operations).




Sonora Granite
202
202
4


MOE
TPSS-16
EXISTING SHOP
EXPANDED SHOP
PROPOSED SHOP FEEDS AND SWITCHES (OFF EXPANDED EXISTING BUS)
RP (Bypass)
RP (Bypass)
CLEANING
CLEANING
CAR WASH
MOW1
TPSS15
TPSS32
TO MAIN LINE
LEGEND:
HAND OPERATED SWITCH
SECTION INSULATOR
NORMALLY OPEN
NORMALLY CLOSED
SHOP FEED SWITCH







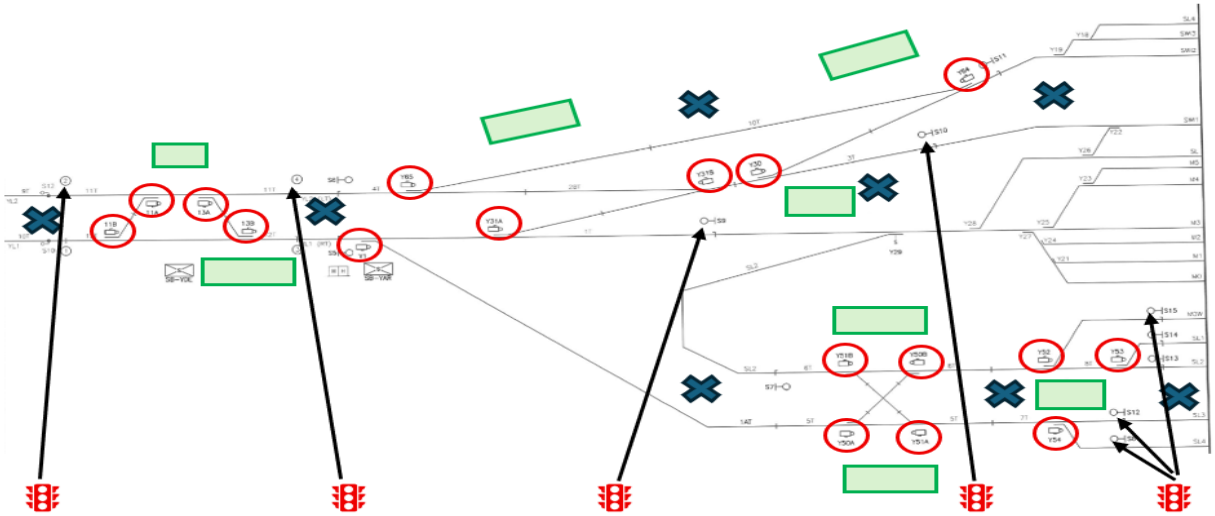


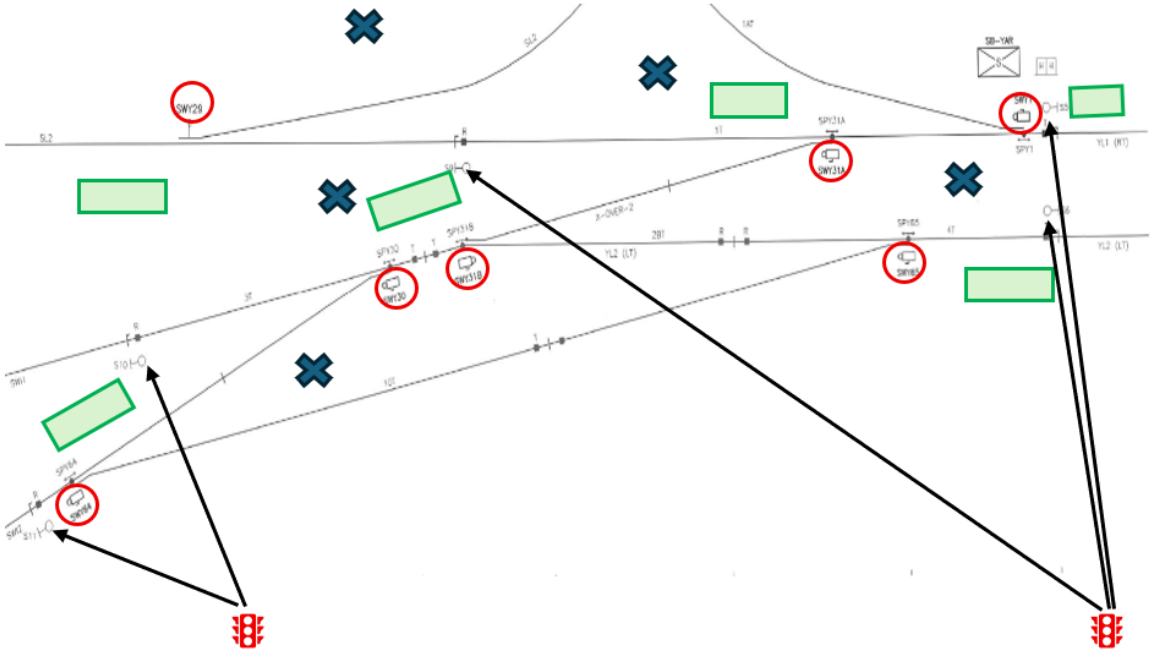

S5
S5

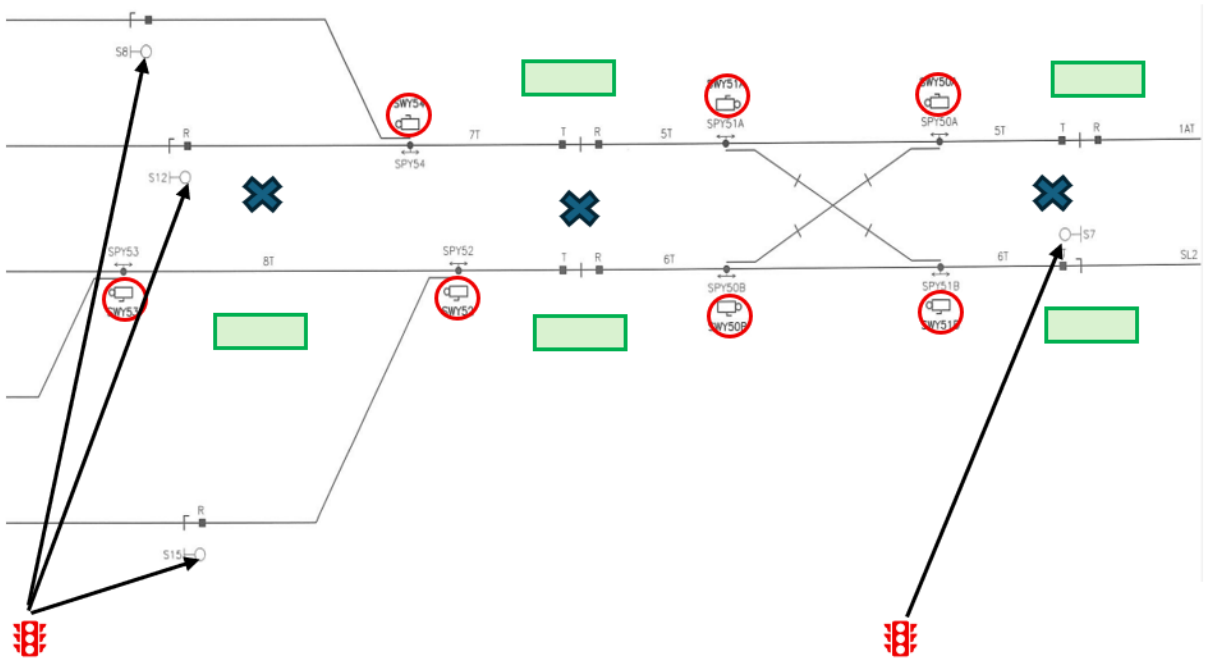









SW29
SPY31A
SW31A
SW
SPY1
SPY31B
SW31B
SW30
SPY65
SW65
SPY30
SW1
S10
SPY1A
SW1A
S11
S9
S8
SL2
YL1 (RT)
YL2 (LT)


S8
SW54
SPY54
7T
5T
SPY51A
SW51A
SPY50A
SW50A
1AT
S12
SPY53
SW53
8T
SPY52
SW52
6T
SPY50B
SW50B
SPY51B
SW51B
S7
SL2
S15

Storage Yard — Powered Switches & Signal Aspects (Operations Within Yard Limits)

Aspect conventions (yard):
• STOP = Red (default / not lined / occupied / blue-flag / LOTO)
• PROCEED (yard move) = Lunar/Restricting or Green (when lined, track circuit clear, protections removed)
• DIVERGING = Yellow (if equipped; many yard dwarfs show Restricting instead of a full diverging)
• Signals remain STOP on any occupancy, conflicting route, loss of correspondence, or active blue-flag.

Yard Led (inside yard limits)

Switch ID	Default Aspect	Cleared Aspect (when route lined & TC clear)	Notes
11A	Red	Amber or Green	Paired with 11B; yard dwarf/home indications.
11B	Red	Amber or Green	Route must be fully proved; blue-flag overrides.
13A	Red	Amber or Green	Often used for ladder access within lead.
13B	Red	Amber or Green	Verify correspondence before movement.

East Yard

Switch ID	Default Aspect	Cleared Aspect (when route lined & TC clear)	Notes
50A	Red	Amber or Green	East ladder may feed multiple storage tracks.
50B	Red	Amber or Green	Interlocked with adjacent ladder routes.
51A	Red	Amber or Green	Same ladder group as 51B.
51B	Red	Amber or Green	Maintain lookout due to close clearances.
52	Red	Amber or Green	Single powered turnout; check local indicator.
53	Red	Amber or Green	Typical dwarf aspects for yard shoves.

54	Red	Amber or Green	Conflicts locked out by occupancy logic.

South Yard

Switch ID	Default Aspect	Cleared Aspect (when route lined & TC clear)	Notes
1	Red	Amber or Green	South ladder; short approaches.
30	Red	Amber or Green	Verify route through adjacent ladders.
31A	Red	Amber or Green	Paired with 31B on same ladder.
31B	Red	Amber or Green	Watch close clearances between parked LRVs.
64	Red	Amber or Green	May be tied to wash/shops interlocks if nearby.
65	Red	Amber or Green	Local panel indication should prove correspondence.

Operational notes (apply to all above)

- Default is STOP (Red) until the switch is aligned, correspondence proved, track circuit is clear, and any blue-flag/LOTO is removed.
- Where installed, yard dwarf signals may display Green for a proved straight route and Yellow for diverging—confirm against the MSF BC sheets.
- Loss of correspondence, occupied block, or conflicting lined route will hold at STOP.
- Treat wash/shops interlocks (if any are tied to these ladders) as higher-priority inhibits—no aspect will clear until those systems are satisfied.

■ ■ ■

APPENDIX O – Standard Operating Procedures (SOP) Cross Reference Matrix

(Incorporates all uploaded SOPs through the 800-series OCC communications set)

Purpose:
This appendix aligns each section of the Track Access Guide – Introduction with the corresponding Valley Metro Standard Operating Procedures (SOPs).

It serves as an audit-ready reference for ADOT SSO and FTA 49 CFR 674 compliance, ensuring every procedural topic within the TAG has a governing SOP linkage.

TAG Section	Applicable SOP # / Title (Revision)	Integration / Application Notes
1.0 Purpose & Scope	SOP 1000.01 – Track Right-of-Way Inspection (Rev C) SOP 1000.04 – Track Standards (Rev D)	Establishes Valley Metro's engineering and inspection baseline; provides regulatory alignment with FRA 214 and FTA 674 requirements
2.0 System Overview & OCC Coordination	SOP 600.05 – Manual Operation of OMC Powered Switches (Rev C) SOP 600.14 – Switch Operation Procedures (Rev D) SOP 800.01 – Handling of Incoming Calls by OCC (Rev A)	Defines OCC control of interlockings and powered switches; all communications recorded per SOP 800.01
3.0 Field Roles & Responsibilities	SOP 600.12 – Mainline Switch Inspections (Rev C) SOP 600.13 – Mainline Switch Repairs (Rev E) SOP 1600.1 – Right-of-Way Access for Maintenance Purposes (Rev D)	Specifies inspection and repair roles, RWP duties, and ROW access levels with OCC notification.
4.0 Communication & Movement Control	SOP 800.03 – Radio Communication (Rev C) SOP 800.04 – Reporting & Documentation by OCC (Rev A)	Standardizes radio protocols, documentation, and blue-flag protection; ensures OCC maintains

TAG Section	Applicable SOP # / Title (Revision)	Integration / Application Notes
	SOP 1700.29 – Use of Blue Track Flags & Master Controller Flags (Rev D) SOP 1700.01 – LRV Movement & Operation (Rev I)	command authority for all on-track movements
5.0 Safety & PPE Requirements	SOP 700.01 – Personal Protective Equipment Minimum Requirements (Rev D) SOP 1500 Series – Safety & Health Programs	Defines minimum PPE, FR clothing, visibility, and fall-protection standards for all Traction Power staff.
6.0 Hazard Identification & Mitigation	SOP 1000.04 – Track Standards (Rev D) SOP 1600.1 – Right-of-Way Access (Rev D)	Integrates the Four Standard Hazard Categories—Access Limitation, Braking Distance, Visibility, Environmental—into TAG risk evaluations
7.0 Traction Power & OCS Safety	SOP 700.05 – Emergency Overhead Catenary System Repair (Rev D) SOP 700.21 – Tangled LRV Pantograph (Rev D)	Provides traction-power de-energization and pantograph incident procedures with OCC coordination.
8.0 Documentation & Reporting	SOP 600.13 – Mainline Switch Repairs (§ 3) SOP 1000.01 – Track ROW Inspection (§ 3) SOP 800.04 – OCC Reporting (Rev A)	Requires all inspection, repair, and incident data to be entered in EAM; OCC documents all infractions per SOP 800.04
9.0 Training & Certification	SOP 2300 – Training & Certification Requirements	Establishes training and renewal standards; integrates with Absorb LMS for compliance tracking
10.0 OCC & Emergency Communication	SOP 800.01 – Handling of Incoming Calls by OCC (Rev A) SOP 800.03 – Radio Communication (Rev C)	Details emergency-call routing, dual-channel notification, and radio-priority procedures

Summary of System Coverage

- Track Infrastructure: SOP 1000-series defines inspections and standards.
- Access & Worker Safety: SOP 1600.1 and 700.01 govern ROW entry and PPE.
- Switch & Track Operations: SOP 600.05–600.14 control inspection, repair, and operation.
- Traction Power: SOP 700.05 and 700.21 manage energized OCS work and pantograph events.
- Vehicle Movement & Protection: SOP 1700.01 and 1700.29 cover yard moves and blue-flag isolation.
- OCC Communication & Reporting: SOP 800.01–800.04 define communication, recording, and rule-violation documentation.

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APPENDIX P – Interlock Work Zone Call Points

Purpose

To identify and control risks associated with train movements through interlocking and crossover limits during roadway worker activities.

Establishing designated OCC call-points ensures operators maintain safe separation and route verification before entering any work zone that involves switch, signal, or OCS infrastructure.

Hazard Identification

Hazard ID	Description	Likelihood	Severity	Risk Rating	Mitigation / Control
H-1	Unauthorized train movement into an active interlock work zone	Medium	High	High	Mandatory OCC call at designated station pair; exclusive track occupancy (ETO) enforced.
H-2	Miscommunication between OCC and train operator regarding route alignment or switch position	Medium	High	High	Operators stop at predefined call-points; OCC verbally confirms route and alignment; RWP Supervisor acknowledges via radio.
H-3	Operator fails to recognize interlock limits during maintenance activity	Medium	Medium	Medium	Visual signage or temporary flags at call-points; operator

Hazard ID	Description	Likelihood	Severity	Risk Rating	Mitigation / Control
					training includes interlock map awareness, Signals as parameters of interlock limits
H-4	Unexpected switch movement or signal loss of correspondence while workers are on track	Low	High	Medium	OCC places switches in “blocked” status; field verifies physical switch alignment before work begins.
H-5	Reduced visibility or distraction in complex downtown interlock areas (e.g., Jackson, Culver, Dorsey)	Medium	Medium	Medium	Dual verification (Operator & OCC); speed restriction to 5–10 mph approaching call-points; lookout protection in congested areas.

Risk Control Evaluation

Control Type	Description	Implementation
Procedural Control	OCC authorization required designated call-points before entering interlock limits.	All operators trained during RWP module and enforced through Train Orders.
Administrative Control	Interlock call-point list maintained in RWP TAG Appendix D; reviewed quarterly.	Safety & OCC jointly maintain updates.
Engineering Control	Interlock switches placed under OCC block; signal routes locked against conflicting movement.	Signal technicians coordinate before releasing for train movement.
Communication Control	Two-way radio confirmation between Operator, OCC, and RWP Supervisor prior to entry.	Logged via radio timestamp and OCC work order.

Residual Risk Assessment

After all mitigations are applied, residual risk for interlock work zone incursions is Low / Acceptable under FTA 49 CFR 674 and FRA 214 Subpart C criteria, provided all communication and call-point protocols are followed.

Verification and Monitoring

- Random OCC audits of call-point compliance (minimum 1 per month per line).
- Safety Department performs field observations during scheduled maintenance activities.
- Any missed call or premature movement recorded as a Rule Violation – RWP Protocol Breach and reviewed by SERB.

Supporting Documentation

- Appendix D: Interlock Call-Points
- SOP 600.13: Mainline Switch Repair
- SOP 500.3: LRV Derailment / Switch Failure Response
- FTA 49 CFR Part 674.27: Accident Prevention & Corrective Actions

Summary Statement

Designated interlock call-points act as procedural barriers preventing trains from entering active work zones without OCC clearance.

This control directly mitigates the hazard of roadway worker strike, signal interference, and unintended switch movement, aligning with Valley Metro's RWP Hierarchy of Controls and FTA safety certification standards.

CALL POINTS

ORANGE LINE (B LINE)

South Central Extension (OL-B-1)
(Baseline Tail Track → Sherman St / Central Ave)

- Baseline Crossover: Between Baseline Rd / Central Ave → Southern Ave / Central Ave
- Cocopah Crossover: Between Southern Ave / Central Ave → Hidalgo Ave / Central Ave
- Hidalgo Crossover: Between Hidalgo Ave / Central Ave → Raymond Rd / Central Ave
- Raymond Crossover: Between Raymond Rd / Central Ave → Buckeye Rd / Central Ave
- Sherman Crossover: Between Buckeye Rd / Central Ave → Lincoln St / Central Ave

Downtown Corridor (OL-B-2)
(Sherman St / Central Ave → McDowell Rd / Central Ave)

- Jackson Interlock: Between Downtown Phoenix Hub (Jefferson / Washington) → Roosevelt St / Central Ave → Van Buren St / 1st Ave

Central Phoenix (OL-B-3)
(McDowell Rd / Central Ave → Montebello Ave / 19th Ave)

- Culver Interlock: Between Roosevelt St / Central Ave → McDowell Rd / Central Ave
- Earll (Manual Switches): Between Thomas Rd / Central Ave → Osborn Rd / Central Ave
- Pierson Interlock: Between Campbell Ave / Central Ave → Camelback Rd / Central Ave
- McKinley Crossover: Between Van Buren St / Central Ave → Roosevelt St / Central Ave

Northwest Extension (OL-B-4)
(Montebello Ave / 19th Ave → Metro Pkwy / 25th Ave)

- Montebello Interlock: Between Glendale Ave / 19th Ave → Montebello Ave / 19th Ave
- Tuckey Interlock: Between Northern Ave / 19th Ave → Glendale Ave / 19th Ave
- Morten Interlock: Between Northern Ave / 19th Ave → Glendale Ave / 19th Ave
- Dunlap Interlock: Between Dunlap Ave / 19th Ave → Northern Ave / 19th Ave
- Mountain View Interlock: Between Mountain View Rd / 25th Ave → Metro Pkwy / 19th Ave

BLUE LINE (A LINE)

Central Mesa Extension (BL-A-1)
(Gilbert Tail Track → Edgemont)

- Guthrie Interlock: Between Gilbert Rd / Main St → Stapley Dr / Main St
- Edgemont Interlock: Between Mesa Dr / Main St → Stapley Dr / Main St

Central Mesa (BL-A-2)
(Edgemont → Dobson)

- Hibbert Interlock: Between Center St / Main St → Mesa Dr / Main St
- Date Interlock: Between Alma School Rd / Main St → Country Club Dr / Main St
- Longmore Pocket: Between Sycamore St / Main St → Alma School Rd / Main St
- Dobson Interlock: Between Price 101 / Apache Blvd → Sycamore St / Main St

Central / Tempe Town Lake Section (BL-A-3)
(Dobson → Center Pkwy / Washington)

- River Interlock: Between Smith-Martin / Apache Blvd → Price 101 / Apache Blvd
- Dorsey Interlock: Between University Dr / Rural Rd → Dorsey Ln / Apache Blvd
- Mill Pocket Interlock: Between Mill Ave / 3rd St → Veterans Way / College Ave

Phoenix East Corridor (BL-A-4)
(Center Pkwy / Washington → 27th Ave / Washington)

- Yard Entrance Crossover: Between 50th St / Washington St → Priest Dr / Washington St
- 27th St Interlock: Between 24th St / Jefferson St → 38th St / Washington St

Downtown Phoenix Section (BL-A-5)
(27th Ave / Jefferson St → 3rd Ave / Washington St)

- 11th St Loop: Between 3rd St / Washington St → 12th St / Washington St & 3rd St / Jefferson St → 12th St / Jefferson St
- Jackson Interlock: Between Downtown Phoenix Hub (Jefferson / Washington) → 3rd Ave / Washington St → 1st Ave / Jefferson St

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APPENDIX Q – Station Platform Power Washer Operations

Location: All Valley Metro Station Platforms (Blue Line • Orange Line • Tempe Streetcar)
Applicable To: Facilities Maintenance, Custodial Contractors, Safety Oversight, OCC
References:

- FTA 49 CFR Part 674.33 – State Safety Oversight
- FRA 49 CFR 214.327 – On-Track Safety for Adverse Environmental Conditions
- Valley Metro SOP 400.7 – Adverse Weather & Surface Cleaning
- Valley Metro SOP 600.5 – Station Platform Maintenance
- 49 CFR Part 671 – Roadway Worker Protection
- 49 CFR Part 672 – Safety Training & Certification
- OSHA 29 CFR 1910.95 – Occupational Noise Exposure
- Valley Metro SOP 1500.09 – Hearing Conservation

PURPOSE

To establish required protection, communication, and situational awareness standards for all personnel performing power-washing activities on platforms located within the roadway.

APPLICABILITY

This procedure applies to Valley Metro employees and contractors at all operational hours and locations where platform power-washing is required on LRV and Streetcar alignments.

RWP CLASSIFICATION

Power-washing is considered work within the roadway and requires:

1) RWP Training & Certification
2) OCC Track Access Authorization
3) Job Safety Briefing
4) Identified refuge area not fouling the track

Power-washing may be performed as a lone-worker activity only when conditions in §3.12.5 are met.

HAZARD DESCRIPTION

Facilities Maintenance personnel frequently use electric or gas-powered pressure washers to clean station platforms, shelters, tactile strips, and OCS pole bases. These tasks are typically done during non-revenue hours but may occur under OCC-authorized single-track protection during daylight for special cleaning events.

The mixture of water spray, electrical systems, and public access areas introduces multiple hazard vectors:

- Contact with energized metallic components (light poles, ticket machines, OCS poles).
- Overspray onto track rails cause unintentional conductivity or traction power return path issues.
- Slip and fall risks from pooled water or detergent residue.
- Noise, vibration, and limited situational awareness near active trackway.

HAZARD IDENTIFICATION

Hazard	Description	Required Mitigation
Noise exposure ≥85 dBA	Hearing protection required → reduced audible train detection	Escalate to RWIC protection
Wet/slippery surfaces	Hose and water on platform edge	Stage equipment behind tactile edge, maintain refuge
Train approach	Bidirectional train movements	Continuous sight and sound monitoring
Public interaction	Pedestrian interference	Work timing and crowd management

Hazards must be reviewed during the Job Safety Briefing and documented.

Four Standard Hazard Categories

Category	Assessment	Description / RWP Impact
Access Limitation	☑ Medium	Equipment hoses and cord reels can block egress routes or platform edge clearance zones. Trip hazards occur near ADA ramps or between platform segments.
Braking Distance	☑ Low	Minimal direct impact to break distance; however, overspray on running rail or embedded slab can reduce traction for LRVs entering stations.

Category	Assessment	Description / RWP Impact
Visibility (Curves / Portals / Distractions)	☑ Medium	Spray mist, steam, and reflection from lighting can reduce operator and worker visibility, masking LRV approach lights or audible alarms.
Environmental Factors	☑ High	Water and cleaning agents introduce electrical conductivity, slip hazards, and chemical exposure risk. Work during rain multiplies hazard likelihood.

Risk Assessment Matrix

Hazard ID	Description	Likelihood	Severity	Risk Rating	Mitigation / Controls
PW-1	Electrical shock from overspray contacting energized OCS base, ticket machine, or light pole	Medium	High	High	Maintain ≥ 3 ft standoff from electrical enclosures; use GFCI-protected outlets; inspect cords and connectors; prohibit use during active precipitation.
PW-2	Slips or falls on wet platform or tactile tile	High	Medium	High	Post “Wet Surface” signage; cone off work zone; apply non-slip boots; dry area before reopening to passengers.
PW-3	Water or debris carried onto trackway	Medium	High	High	OCC to verify no active train movement;

Hazard ID	Description	Likelihood	Severity	Risk Rating	Mitigation / Controls
	causing traction or braking issues				RWIC to inspect rail heads; remove pooled water before restoring service.
PW-4	Contact with moving LRV or insufficient clearance from platform edge	Low	High	Medium	Perform work only under OCC-granted track protection; maintain 4-ft minimum clearance; deploy lookouts when adjacent track active.
PW-5	Noise and spray reducing situational awareness	Medium	Medium	Medium	Require high-visibility vests, hearing protection, and two-way radios; RWIC to maintain visual contact with all crew members.

Mitigation Summary

- Authorization: All platform power washing requires OCC notification and RWP clearance prior to start.
- Equipment Safety: Inspect for leaks and damage before use.
- Surface Control: Barricade platform zones with cones or caution tape; ensure tactile warning areas remain visible before passenger use.
- Electrical Isolation: Maintain standoff from OCS poles, luminaire bases, and ticket vending machines. De-energize affected circuits if within 3 ft proximity.
- Environmental Containment: Prevent chemical runoff into track drains; use biodegradable detergents approved under Valley Metro environmental compliance plan.
- Communication: RWIC to maintain open radio channel with OCC; all personnel wear high-visibility garments with retro-reflective striping visible under mist or lighting.

References

- FTA 49 CFR Part 674.33 – State Safety Oversight
- FRA 49 CFR 214.327 – On-Track Safety (Adverse Weather)

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APPENDIX R – Signals, Switches and Crossings

Dunlap Crossing



Camelback Flashers



Audubon



Victory



51 St



Center Parkway Flashers



Mayco's



Mission Palms



University



Horne



CROSSING GATES RISK ASSESSMENT

To identify, evaluate, and control hazards associated with the use, operation, or temporary alteration of crossing gates while conducting works on or adjacent to the Valley Metro Light Rail system.

This assessment applies to all contractors, subcontractors, and Valley Metro personnel who operate gates, escort vehicles across the right-of-way, or manage site access at grade crossings under OCC authorization.

HAZARD IDENTIFICATION

Hazard ID	Description	Likelihood	Severity	Risk Rating	Mitigation / Control
CG-1	Unexpected opening of gate	Medium	High	High	Gate operations only under valid Track Access Permit; PIC confirms protection with OCC; two-person verification before opening.
CG-2	Poor sightlines or visual obstruction when crossing	Medium	High	High	Use additional lookouts, stop boards, or temporary flaggers; postpone work if sightlines inadequate.
CG-3	In case gate left open or unsecured after use	Medium	High	High	Implement lock-and-tag procedure; PIC verifies closure and records in site log before releasing track.
CG-4	Vehicle or plant fouling the crossing (beyond foul point)	Medium	High	High	Mark foul limits; use banksman or ground guide; apply

Hazard ID	Description	Likelihood	Severity	Risk Rating	Mitigation / Control
					physical barriers; pre-move briefing required.
CG-5	Mechanical or electrical failure of gate / warning system	Medium	Medium	Medium	Suspend operations; notify OCC and Signals; use temporary traffic control and lookouts until repaired.
CG-6	Slip, trip, or fall around uneven crossing surface	Medium	Medium	Medium	Maintain clear walking path; use proper footwear; deploy portable lighting at night.

RISK CONTROL EVALUATION

Control Type	Description	Implementation
Procedural Control	OCC-issued Track Access Permit and verbal authorization before any gate operation.	Required per 49 CFR 214.321 (Exclusive Track Occupancy).
Engineering Control	Physical lock-and-tag devices, foul-limit markers, and temporary barricades.	Applied at all controlled crossings.
Administrative Control	Job briefing defines roles of PIC, gate operator, lookout, and banksman.	Documented on RWP Daily Log.
Communication Control	Continuous radio contact with OCC; read-back verification of gate status and time of operation.	Mandatory per OCC SOP.
PPE Control	Class 3 vest, safety boots, (may be situationally required: hard hat, hearing protection, and eye protection.)	Always required within ROW

Supporting Documentation

- FTA 49 CFR 214.321: Exclusive Track Occupancy Protection
- FRA 49 CFR 234: Grade Crossing Signal System Safety
- Valley Metro Track Access Permit Procedure
- Valley Metro SOP 600.4

CVS- 23 Spring Switch



CVS 24 T-Rail



CVS 24 K-Rail



CVS 24 T-Rail Yard



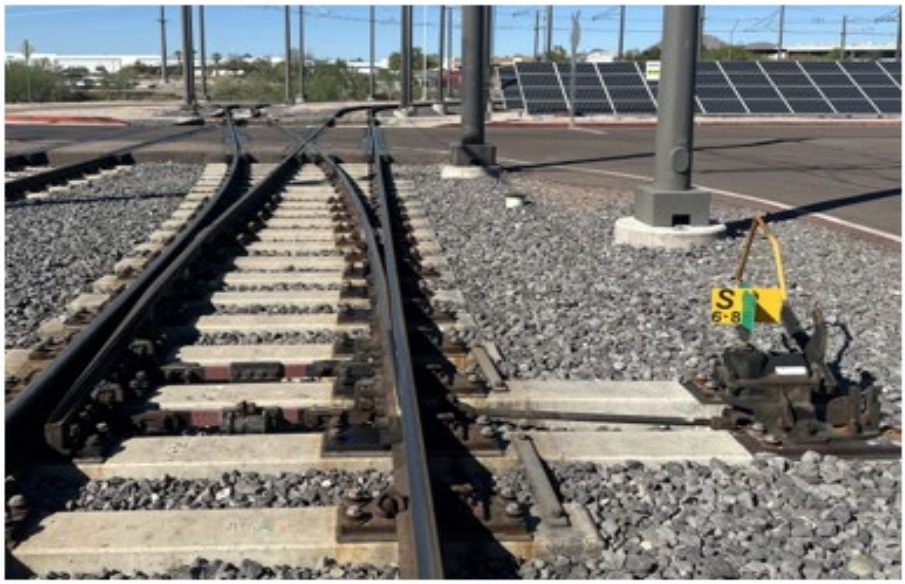
M-3



SYM-10 Yard Lead



Yard Manual Switch



SWITCH MAINTENANCE AND INSPECTIONS RISK ASSESSMENT

To identify, evaluate, and control hazards associated with inspection, adjustment, and maintenance of power and manual switch machines on the Valley Metro mainline, yard, and streetcar systems.

This assessment applies to all maintenance staff, signal technicians, and roadway workers performing work within switch limits or adjacent track zones under OCC protection.

HAZARD IDENTIFICATION

Hazard ID	Description	Likelihood	Severity	Risk Rating	Mitigation / Control
S-1	Unexpected switch movement during work (powered switch not blocked or locked out)	Medium	High	High	OCC applies signal block; and tagged out before entry.
S-2	Contact with energized components inside power switch machine (electrical hazard)	Low	High	Medium	De-energize power supply when practical; lockout/tagout; verify zero voltage prior to maintenance.
S-3	Pinch or crush injury from moving switch rods or points	Medium	High	High	Nobody parts in point gap; communicate before power throw.
S-4	Slip, trip, or fall near switch pit or ballast edge	Medium	Medium	Medium	Maintain clear footing; provide portable lighting; remove debris before start.
S-5	Struck-by hazard from train movement	Medium	High	High	Establish Exclusive Track Occupancy (ETO); designate

Hazard ID	Description	Likelihood	Severity	Risk Rating	Mitigation / Control
	through adjacent track				watchperson; maintain safe zone
S-6	Failure to restore switch to proper correspondence after testing	Low	High	Medium	Perform dual verification (field + OCC indication); record confirmation in work log; post-work test train if required.

RISK CONTROL EVALUATION

Control Type	Description	Implementation
Procedural Control	Exclusive Track Occupancy (ETO) or "Switch Block" issued by OCC; no movement authorized until work released.	Required under RWP 214.327(a).
Engineering Control	Blocking of switch points when practical to prevent pinch point	Used on all powered machines.
Administrative Control	Job briefing conducted prior to work; roles for lookout, flagger, and supervisor defined.	Documented on RWP Daily Log.
Communication Control	Continuous radio contact with OCC; read-back verification of switch ID, location, and status.	Mandatory per OCC SOP.
PPE Control	Safety boots, Class 3 vest, insulated gloves, hearing protection, and eye protection. (situational)	Always Worn

Supporting Documentation

- SOP 600.13: Mainline Switch Repair
- SOP 400.7: Adverse Weather Operations (frozen/heat-expanded switches)
- FTA 49 CFR 674.27 & FRA 214.327: RWP Protection of Workers on or Near Switches

RED SIGNAL OVERRUN (RSO)

S2 Dorsey



S6 Guthrie



S2 Guthrie



Jackson S2



Jackson S6



RISK ASSESSMENT

A Red Signal Overrun (RSO) occurs when an operator fails to stop the LRV at a red signal aspect, resulting in the train entering a protected block, interlocking, or crossover without authorization. RSOs present a critical risk to roadway workers, especially when maintenance crews, inspectors, or equipment occupy the track under Exclusive Track Occupancy (ETO) or Work Zone Limits (WZL) protection.

RSOs may result from operator distraction, misinterpretation of aspects, inadequate braking distance, low visibility (sun glare, curve alignment, portals), or delayed route confirmation from OCC.

HAZARD CAUSES

Category	Potential Causes
Human Factors	Operator distraction, misjudged braking, fatigue, unfamiliar route conditions, inattention to signal status.
Technical / Equipment	Signal lamp failure, switch correspondence error, or signal system latency.
Environmental	Glare, fog, rain, low lighting, or obstructed signal visibility due to adjacent traffic or infrastructure.
Procedural / Organizational	Inconsistent operator refresher training, unclear OCC communication, or ineffective safety audits in high-risk interlocks. (unless otherwise specified in Job Safety Briefing)

RISK EVALUATION

Likelihood	Severity	Risk Rating
Medium	Catastrophic	High

An RSO can directly result in collision with personnel, work equipment, or other trains, especially in interlockings or adjacent work limits. Even near misses erode safety culture and may violate FTA reporting thresholds under 49 CFR Part 674.33.

EXISTING CONTROLS

Control Type	Description
Engineering Controls	Automatic signal enforcement (where applicable), track circuit interlocking protection.
Administrative Controls	OCC-issued ETO limits, RWP briefings emphasizing “Red Aspect Awareness,” operator training on signal approach distances.

Control Type	Description
Procedural Controls	Flagging and lookout positions placed prior to red aspects; verbal confirmation with OCC before entering signal territory; periodic RSCP audits.
Monitoring & Reporting	Daily OCC Red Signal Log, Safety Event Review Board (SERB) tracking, SCADA signal aspect analytics.

RECOMMENDED MITIGATIONS

Action Type	Mitigation Measure	Responsible Party
Engineering	Evaluate feasibility of automatic stop enforcement or audible “Signal Ahead” alerts in high-RSO zones (e.g., Guthrie, Jackson, Dorsey).	Signal/ATP Engineering
Procedural	Enforce mandatory stop-and-hold until OCC grants authority after RSO event; introduce “RSO Red Zone Audit” protocol in work areas.	OCC / Safety
Training	Implement periodic “Red Aspect Awareness” module for operators; simulate RSO prevention in CORYS simulator scenarios.	ACI / Operations Training
Administrative	Include RSO locations in RWP safe-zone mapping	RWP Coordinators / Field Supervisors

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Quick Reference

CROSSING GATES

PURPOSE

To define the hazard controls and procedures required when operating or temporarily altering any crossing gate (road, pedestrian, or private access) within the Valley Metro Light Rail right-of-way during RWP activities as well as to define mandatory protections and controls when work is performed within or affecting Valley Metro grade crossings, where rail vehicles and the public intersect.

SCOPE

Applies to all workers, contractors, and Valley Metro personnel responsible for operating, maintaining, or securing crossing gates while performing work that affects train movement or public access.

APPLICABILITY

This section applies to all roadway workers, contractors, and authorized personnel performing work that:

- Occurs on or adjacent to a grade crossing
- Involves vehicular or pedestrian movements across track
- Impacts crossing warning systems (XWS: gates, flashers, bells)
- Requires manual gate operation, testing, or adjustment

FOUR STANDARD HAZARD CATEGORIES

- Access Limitation – Restricted approach zones and adjacent live tracks.
- Braking Distance – Train approach speeds require extended clearance.
- Visibility – Curved approaches and glare reduce sightlines.
- Environmental – Heat, dust, and rainfall affect visibility and braking.

HAZARDS & CONTROLS (SUMMARY)

Hazard Category	Examples at LRT Crossings	Required Controls
Public Interaction	Pedestrians bypassing arms, distraction from mobile devices	Stewarding, channelization, cones/barriers, clear pedestrian path
Vehicle Clearance	Limited space for vehicles/equipment near foul point	Ground guide, foul point markers, one vehicle at a time

Train Approach Direction	Bi-directional train movement, near-side signals	Lookout posted; enhanced audible + visual alerting
Warning System Alteration	Gates/lights/bells timing adjusted or out-of-service	Treat crossing as unprotected until PIC verifies performance
Slips/Trips/Falls	Flangeway gaps, uneven road surface or platform transitions	Walkway maintenance; night lighting; proper footwear

ROLES AND WORKFORCE ACTIONS

Role	Responsibility at Grade Crossings
PIC / RWIC	Obtains OCC authority; leads job briefing; verifies restoration
Lookout	Monitors train approach and provide continuous warning
Ground Guide	Manages vehicle/equipment movements; protects foul point
Pedestrian Steward	Directs public through safe zones near platforms

Note: Minimum staffing is PIC + Lookout when any public hazard exists.

OCC COMMUNICATION REQUIREMENTS

Before any work affecting a grade crossing:

- Confirm location, track, limits, and gates/signals impacted
- Read-back authority type and duration (e.g., TAW, ETO, TOOS)
- Report all status changes including when returned to service

Rail vehicle detection is never the only form of protection (FTA §671.39).

RISK MATRIX

- Likelihood: Medium | Severity: High | Risk Rating: High
- Residual Risk (after mitigation): Low / Acceptable

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REQUIRED RWP CONTROLS

- Obtain OCC authorization before raising gates.
- Lock/tag procedures.
- Maintain lookout protection and foul-limit markings.
- Report all faults to Signals and OCC immediately.

VERIFICATION & MONITORING

PIC logs gate operations and verifies closure before releasing track. Monthly audits by Safety & Signals.

REFERENCES

FTA 49 CFR 214.321 • FRA 49 CFR 234 • Valley Metro Track Access Manual

SWITCH MAINTENANCE & INSPECTION

PURPOSE

To control hazards associated with inspection, adjustment, or maintenance of power and manual switch machines on the Valley Metro system.

SCOPE

Apply to signal technicians, track maintainers, and RWP workers within switch limits or adjacent live tracks.

FOUR STANDARD HAZARD CATEGORIES

- Access Limitation – Tight clearances at interlocks.
- Braking Distance – Short approach distances.
- Visibility – Obstructions from cabinets or structures.
- Environmental – Heat, noise, and poor lighting.

RISK MATRIX

- Likelihood: Medium | Severity: High | Risk Rating: High
- Residual Risk: Low / Acceptable.

REQUIRED RWP CONTROLS

- Obtain Exclusive Track Occupancy (ETO) from OCC.
- Maintain lookout protection and PPE compliance.
- Verify correspondence before restoring service.

TRACK CIRCUIT FAULTS & SIGNAL COORDINATION

PURPOSE

To define safe response and coordination procedures when track circuit faults or signal system alarms occur.

SCOPE

Applies to PICs, RWP staff, and Valley Metro Signal Maintainers during field troubleshooting.

FOUR STANDARD HAZARD CATEGORIES

- Access – Confined track areas.
- Braking – Trains may approach unprotected.
- Visibility – Night or glare conditions.
- Environmental – Weather exposure and electrical hazards.

RISK MATRIX

- Likelihood: Medium | Severity: High | Risk Rating: High
- Residual Risk: Medium / Acceptable with monitoring.

REQUIRED RWP CONTROLS

- Treat all failed circuits as occupied track.
- Only qualified Signal Maintainers may perform testing.
- Establish OCC protection and communication log.
- Stop working if unsafe indication is observed.

VERIFICATION & MONITORING

Signal Maintainer verifies restoration at field and OCC, PIC records protection release.

REFERENCES

FTA 49 CFR 214.321

RED SIGNAL OVERRUN (RSO)

PURPOSE

To identify and mitigate hazards related to unauthorized train movement past a red signal aspect.

SCOPE

Applicable to all interlocks, crossovers, and mainline operations within Valley Metro LRT and Streetcar systems.

FOUR STANDARD HAZARD CATEGORIES

- Access – Limited safe zones in medians.
- Braking – Short approach blocks reduce margin.
- Visibility – Glare, clutter, and low light.
- Environmental – Weather and lighting distortion.

RISK MATRIX

- Likelihood: Medium | Severity: Catastrophic | Risk Rating: High
- Residual Risk: Medium / Acceptable.

REQUIRED RWP CONTROLS

- OCC-issued ETO before entering red aspect zones.
- Dual confirmation of signal hold and route lock.
- Establish red aspect safe zones.
- Conduct simulator-based training on RSO prevention.

VERIFICATION & MONITORING
Weekly OCC–Safety review of interlocks; quarterly RSO trend reporting.

REFERENCES
FTA 49 CFR 674.33 • FRA 49 CFR 214.335 • Valley Metro SOP 500.4

HIGH DECIBEL NOISE EXPOSURE

PURPOSE
To protect workers from hazardous noise exposure during RWP and maintenance operations. Valley Metro currently does not have any location with this exposure.

SCOPE
Applies to all staff working near plant, track equipment, or high-noise environments.

FOUR STANDARD HAZARD CATEGORIES
- Access – High traffic and confined zones.
- Braking – Reduced hearing of warnings.
- Visibility – Dust and poor lighting reduce awareness.
- Environmental – Prolonged high decibel exposure.

RISK MATRIX
- Likelihood: Likely | Severity: Major | Risk Rating: High
- Residual Risk: Low / Acceptable with PPE and monitoring.

REQUIRED RWP CONTROLS
- Conduct noise risk assessment and demarcate high-noise zones.
- Provide and enforce hearing protection.
- Use visual and radio-based communication systems.
- Limit exposure duration via rotation.

VERIFICATION & MONITORING
Periodic sound level monitoring; review of PPE compliance and exposure records.

REFERENCES
OSHA 29 CFR 1910.95 • RIS-3119-TOM • Valley Metro Safety Plan

SWITCH & RAIL PROFILES
- CSV-34 – Manual trail switch for short-turns and Streetcar interface.
- CVS-24 – Standard powered crossover for mainline interlocks.
- M-3 – Power switch for direct-fixation interlocks (Longmore, Date, Hibbert, Edgemont).

- SYM-10 – Electric switch used in yard lead (low-speed routing).
- T-Rail: Used in ballasted, direct-fixation, and yard tracks.
- K-Rail: Grooved rail used between Montebello–Dobson for embedded sections.
- Track Structures: Embedded slab (urban), direct-fixation (interlocks), ballasted (yard and Mountain View).

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