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)

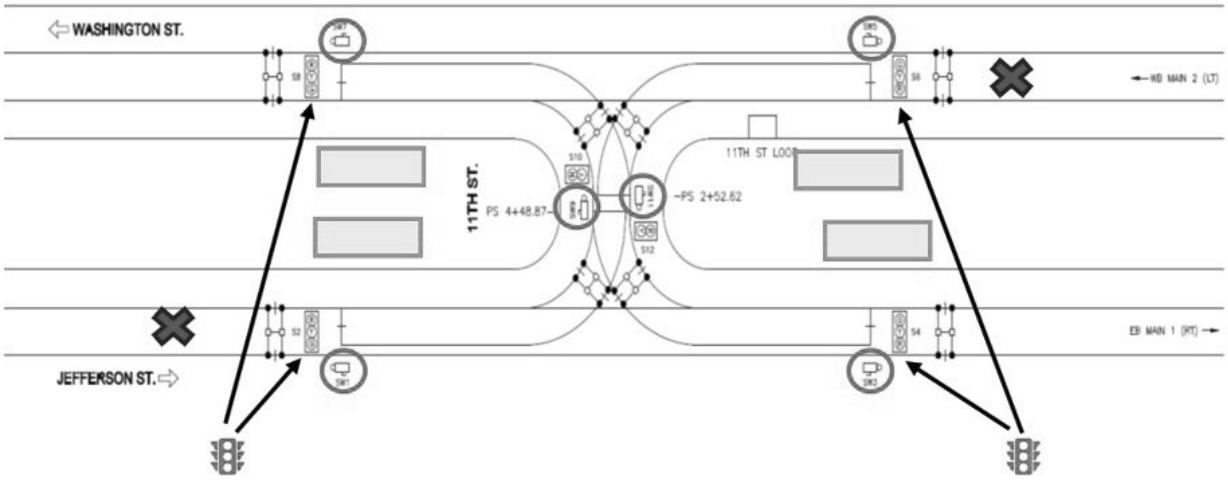
Station Name	Cross Street / Notes
3rd Street / Washington St	Downtown Phoenix Hub – Westbound platform (A Line / B Line interface); major interchange with B Line and Streetcar.
12th Street / Washington St	Westbound platform; constrained clearance between guideway poles and sidewalk; heavy vehicle presence.
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.
11TH ST LOOP
PS 4+48.87
PS 2+52.62
WB MAIN 2 (LT)
EB MAIN 1 (RT)
S2
S4
S6
S8
S10
S12
SW1
SW2
SW3

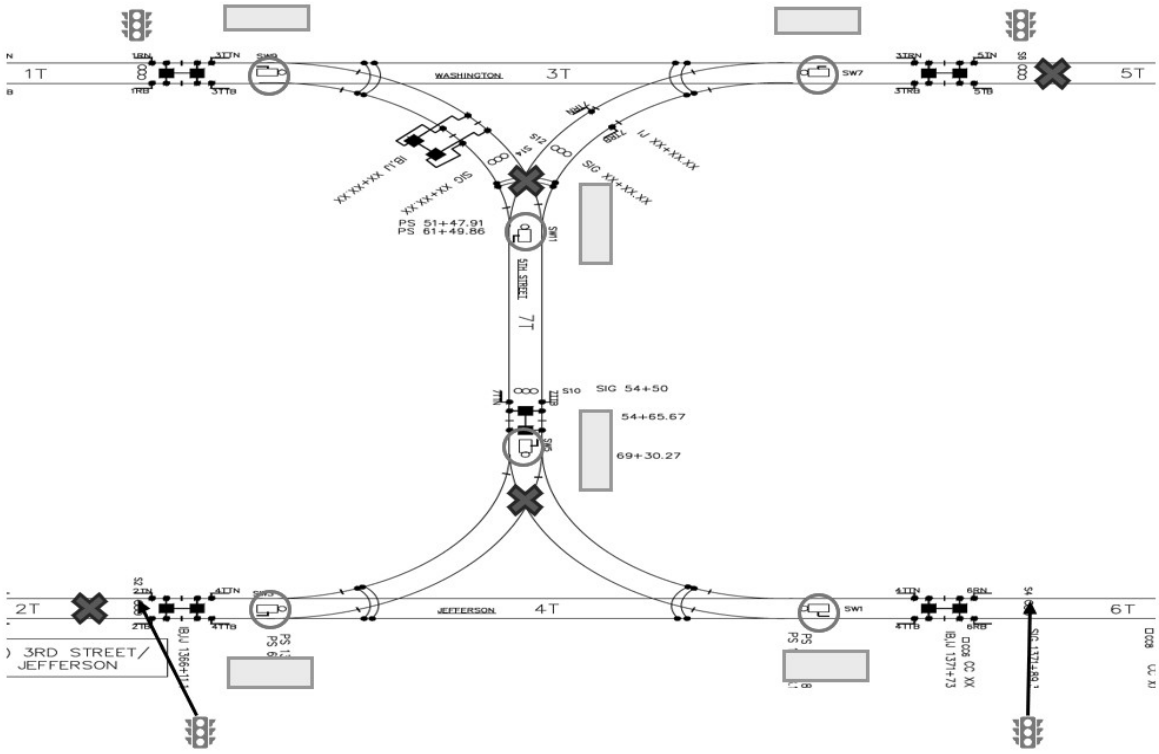
H.1.1.1 Manual Crossover: 11th Street Loop (11th Street & Washington)

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

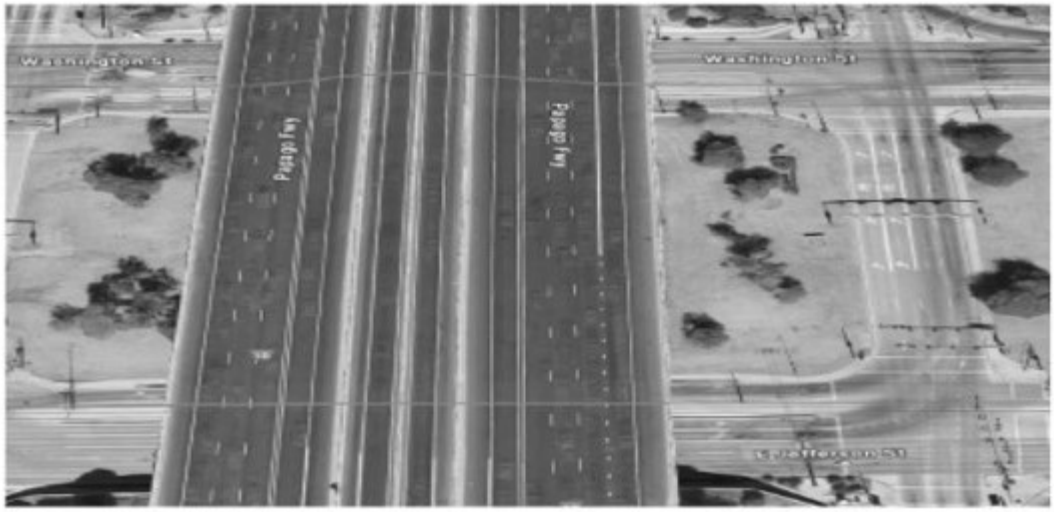
Overall Risk Level	Residual Risk After Mitigation	Notes
High (initial)	Medium (with controls)	Primary hazards are manual switch errors, limited visibility, and lack of refuge area. Continuous OCC coordination and strict procedural compliance are essential.

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



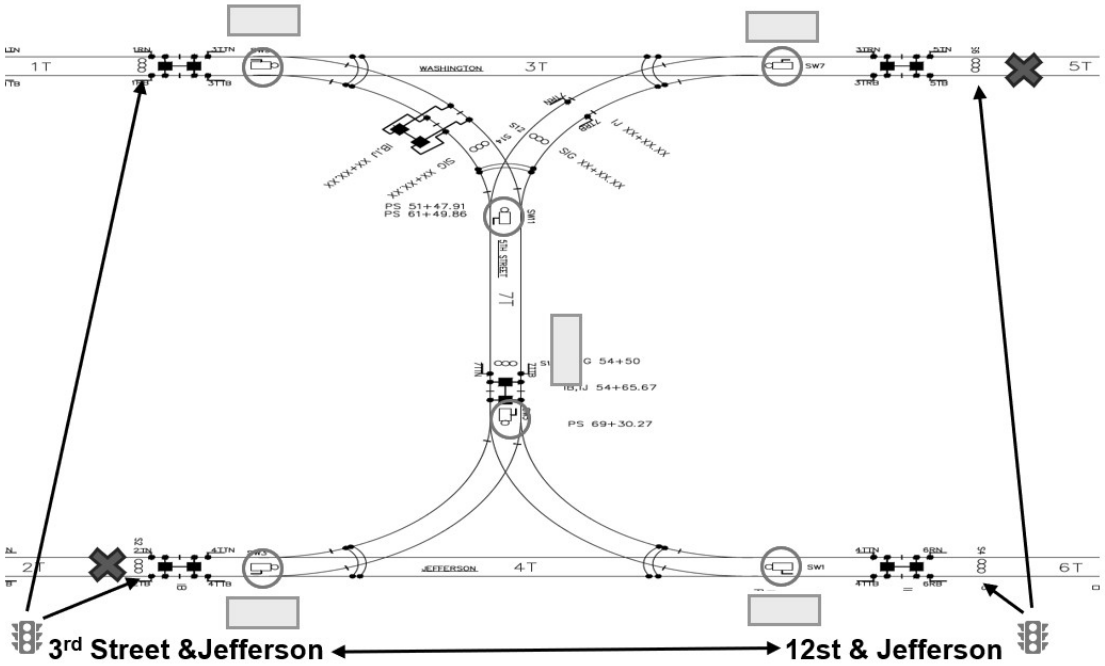
Looking North down 5th Street Towards Washington



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.

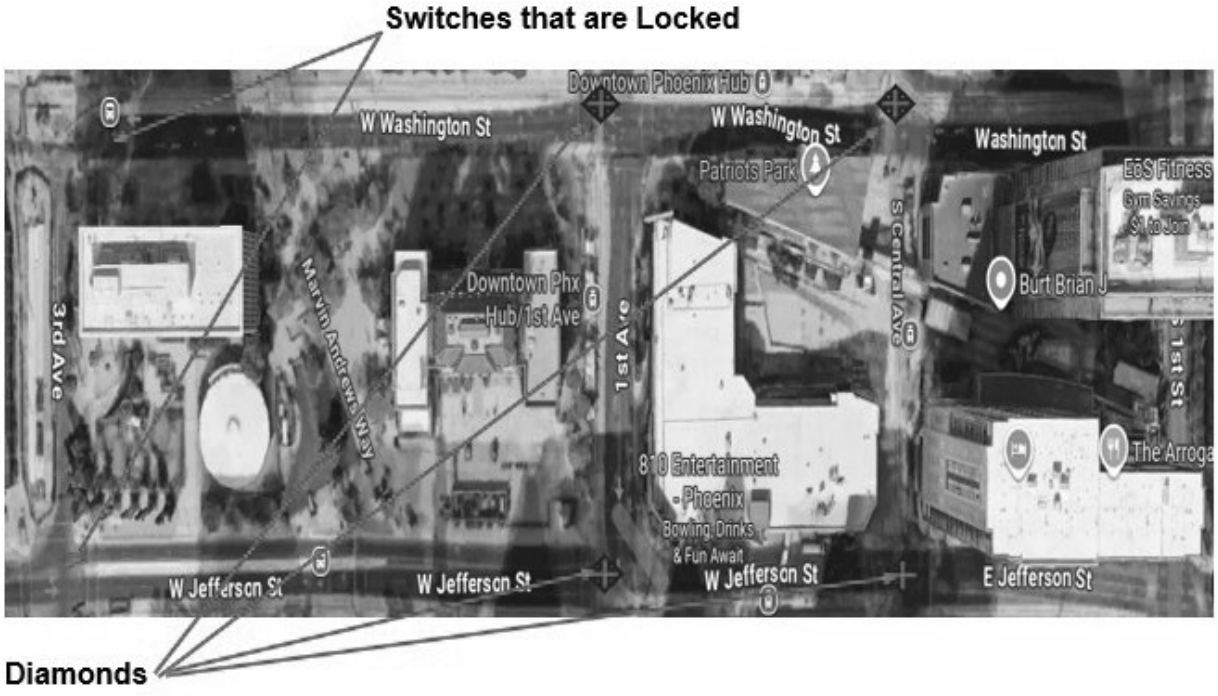
OVERALL RISK SUMMARY

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.

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