2017 Companion Study for: Grade Separation Priority Update Study for Alameda Corridor East (Riverside County), 2012

Riverside County Transportation Commission
4080 Lemon Street, 3rd Floor
P.O. Box 12008
Riverside, CA 92502-2208

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1 Introduction

In the Years 2000 and 2006, in response to the rapid increase in train traffic carrying goods coming through the Ports of Los Angeles and Long Beach, the Riverside County Transportation Commission (RCTC) conducted its first railroad grade separation priority studies. Those studies evaluated the 62 at-grade crossings along the Union Pacific Railroad (UP) and BNSF Railway (BNSF) main lines in Riverside County, and prioritized 20 crossings as top candidates for grade separation. In 2006 and again in 2008, RCTC developed a funding strategy to serve as a blueprint for constructing grade separations for many of these at-grade crossings.

Since 2006 approximately $500 million in local, state and federal funding has been invested in constructing 14 railroad grade separations and closing two at-grade crossings to facilitate goods movement through Riverside County and reduce conflict points between rail and highway traffic on the UP and BNSF main lines. To date, the following grade separation projects have been either completed and opened to traffic or have been permanently closed due to roadway reconfiguration.

Project	Location	Project	Location
Auto Center Drive	Corona	Jurupa Avenue	Riverside
Avenue 48/Dillon Road	Coachella	Magnolia Avenue	Riverside
Avenue 50	Coachella	Streeter Avenue	Riverside
Avenue 52	Coachella	Riverside Avenue	Riverside
Columbia Avenue	Riverside	Mountain Avenue	Riverside (Permanently Closed)
Iowa Avenue	Riverside	Jane Street	Riverside (Permanently Closed)

Grade Separation Project Completed recently (FY 2016-2017)

Project	Location	Project	Location
Magnolia Avenue	County	Clay Street	Jurupa Valley
Sunset Avenue	Banning	Avenue 56/Airport Boulevard	County

In March 2012, RCTC adopted a Grade Separation Priority Update Study[1] (2012 Study) for the remaining 46 at-grade crossings located on the UP and BNSF main lines in Riverside County (see Table 1.1). The funding sources used to construct the 14 grade separations have now been expended. Of the remaining 46 crossings, funding commitments have been secured to grade separate one location (Avenue 66) and partial funding has been secured for one other (McKinley Street).

The 2012 Study prioritized the 46 at-grade crossings using the same criteria as the 2000 and 2006 studies (accident rates, existing and future vehicle delay, vehicle emissions from idling, horn noise impacts on residential areas, adjacency to existing grade separations, and local priority), as well as two additional criteria: project readiness and isolated location. The 46 at-grade crossings were grouped in priority categories of 1 through 5, where 1 represented the highest priority level and 5 the lowest (presented in Table 1.1).

[1] 2012 Grade Separation Priority Update Study for Alameda Corridor East, InfraConsult, March 2012

Table 1.1: 2012 Grade Crossing Priority List

Priority Ranking	Jurisdiction	Rail Line	Cross Street
1: 9 Locations	Riverside	BNSF & UP (SB SUB)	Spruce Street
	Corona	BNSF (SB SUB)	McKinley Street
	Riverside	BNSF & UP (SB SUB)	Chicago Avenue
	Banning	UP (YUMA MAIN)	Hargrave Street
	Riverside	BNSF & UP (SB SUB)	3rd Street
	Corona	BNSF (SB SUB)	Joy Street
	Riverside	BNSF (SB SUB)	Madison Street
	Riverside	BNSF (SB SUB)	Adams Street
	Riverside	BNSF (SB SUB)	Tyler Street
2: 9 Locations	Jurupa Valley	UP (LA SUB)	Bellegrave Avenue
	Jurupa Valley	UP (LA SUB)	Jurupa Road
	Banning	UP (YUMA MAIN)	22nd Street
	Beaumont	UP (YUMA MAIN)	Veile Avenue
	Banning	UP (YUMA MAIN)	San Gorgonio Avenue
	Riverside County	UP (YUMA MAIN)	Avenue 62
	Riverside County	UP (YUMA MAIN)	Avenue 66
	Riverside	BNSF (SB SUB)	Pierce Street
	Beaumont	UP (YUMA MAIN)	California Avenue
3: 11 Locations	Corona	BNSF (SB SUB)	Sheridan Street
	Jurupa Valley	UP (LA SUB)	Rutile Street
	Riverside	BNSF (SB SUB)	Mary Street
	Riverside	BNSF (SB SUB)	Jackson Street
	Corona	BNSF (SB SUB)	Smith Avenue
	Beaumont	UP (YUMA MAIN)	Pennsylvania Avenue
	Riverside County	BNSF & UP (SB SUB)	Center Street
	Riverside	BNSF (SB SUB)	Washington Street
	Riverside	BNSF & UP (SB SUB)	7th Street
	Riverside County	UP (YUMA MAIN)	Apache Trail
	Corona	BNSF (SB SUB)	Cota Street
4: 8 Locations	Riverside	BNSF (SB SUB)	Buchanan Street
	Riverside County	UP (YUMA MAIN)	Broadway
	Riverside	BNSF (SB SUB)	Jefferson Street

Table 1.1: 2012 Grade Crossing Priority List

Priority Ranking	Jurisdiction	Rail Line	Cross Street
	Corona	BNSF (SB SUB)	Railroad Street
	Calimesa	UP (YUMA MAIN)	San Timoteo Canyon Road
	Riverside	BNSF & UP (SB SUB)	Palmyrita Av (UP)
	Coachella	UP (YUMA MAIN)	Avenue 54
	Riverside	UP (LA SUB)	Brockton Avenue
5: 9 Locations	Riverside	BNSF & UP (RIV)	Cridge Street
	Riverside	UP (LA SUB)	Panorama Road
	Palm Springs	UP (YUMA MAIN)	Tipton Road
	Riverside	BNSF (SB SUB)	Harrison Street
	Riverside	UP (LA SUB)	Palm Avenue
	Corona	BNSF (SB SUB)	Radio Road
	Riverside County	BNSF & UP (SB SUB)	Main Street
	Riverside County	UP (YUMA MAIN)	Avenue 58
	Riverside	BNSF (SB SUB)	Gibson Street

Source: 2012 Grade Separation Priority Update Study for Alameda Corridor East, InfraConsult, March 2012

Grade separations provide multiple benefits to the community: elimination of potential train-vehicle conflict at crossings, reduction of delay and emissions because vehicles no longer wait for trains at rail crossings, and elimination of noise impacts caused by train horns which must be sounded when the train approaches an at-grade crossing.

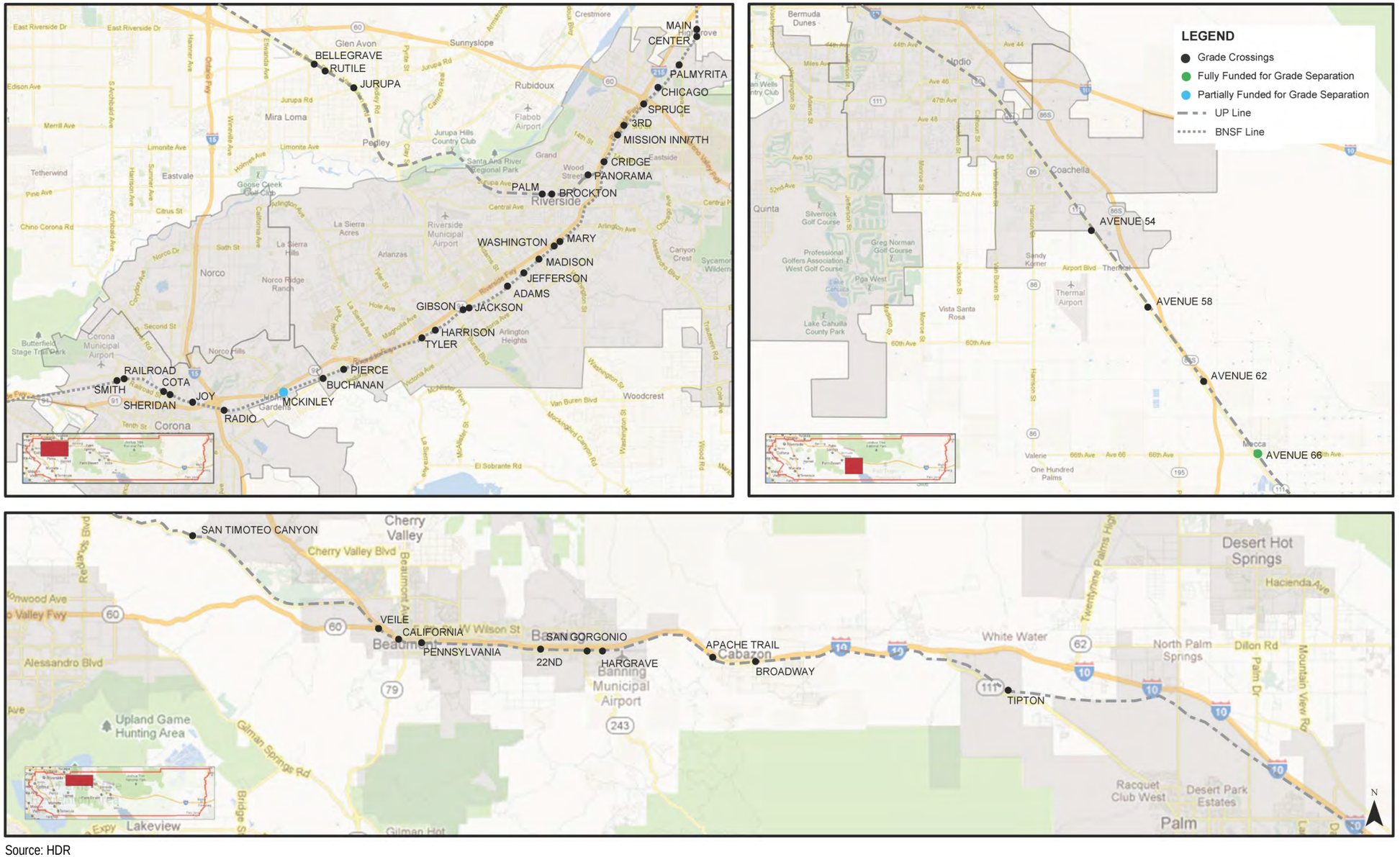
The purpose of this Companion Study to the 2012 prioritization is to obtain updated information regarding the feasibility and desirability of improving each of the remaining 46 at-grade crossings. The study analysis provides information to address the following key questions:

- For which locations is a grade separation feasible to construct, and for which is it not feasible?
- For which locations are grade separations desirable in the near term (within the next 10 years)?
- For which locations are grade separations desirable in the longer-term future (more than 10 years)?
- Should any of the existing at-grade crossings be closed?

Additionally, this study is also examining which locations could be candidates for quiet zone implementation in the near future. In recent years many communities around the country, including the City of Riverside, have been taking steps to reduce the noise impact of train horns on nearby residential communities by establishing “Quiet Zones” in accordance with procedures established by the Federal Railroad Administration (FRA). Quiet Zones are not a substitute for grade separation because they are specifically intended to reduce train horn noise. To help the cities investigate the possibility of Quiet Zones this study also provides information about the feasibility of establishing Quiet Zones along the UP and BNSF main lines.

Figure 1.1 presents the area covered for this study and identifies the location of each at-grade crossing. Chapter 2 presents updated information on grade separation feasibility, as well as local agency priorities for grade separation timing, closures, and Quiet Zones. Chapter 3 presents technical evaluation of Quiet Zone feasibility. Chapter 4 presents the study's findings and recommendations.

Figure 1.1: Locations-of-the 46 At-Grade Crossings



Source: HDR

2 Feasibility and Priority Updates

2.1 Methodology

Updated information about the 46 remaining at-grade crossings was obtained in consultation with the staff of the local jurisdictions. At the onset of the project, a questionnaire was distributed to the cities that have at-grade crossings in their jurisdiction. Based on the questionnaire, updated information about the feasibility and desirability of improvements was obtained through a series of meetings between RCTC staff, the consultant team, and local agency staff. These meetings included staff from the cities of Corona, Jurupa Valley, Riverside, Banning, Beaumont, Calimesa, Coachella, Palm Springs, and the County of Riverside. The discussions explored issues related to improving each crossing, including whether:

- Grade separations are technically feasible, or still viable;
- Recent events or circumstances have changed the project priority for the local agency;
- Desired grade separations are near-term or long-term projects;
- Any at-grade crossings should be completely closed;
- Quiet Zones (QZ) with safety features are desired by the local jurisdiction for some areas. (This chapter presents the desires for QZ expressed by agency staff, and Chapter 3 presents a technical analysis of which areas qualify for QZ based on FRA criteria.)

2.2 Information Updates

Key summary points from the local agencies' information updates are as follows:

- Funding: Only two of 46 locations have any substantial funding for a grade separation identified – Avenue 66 is fully funded at approximately $39.08 million[2], and the City of Corona has obtained about $7.3 million[3] (8% of the total cost of $91.3 million[4]) from various sources for a grade separation at McKinley. No funding has been identified for any of the other desired grade separations, and the prospects for obtaining needed funds are uncertain at best given the current status of potential funding sources. The California Public Utilities Commission (CPUC) provides funding for grade separation projects, but this funding is highly competitive and is typically limited to about $15 million, distributed among three or four projects each fiscal year)[5]. A percentage of the 2015 federal transportation bill – the Fixing America's Surface Transportation (FAST) Act – is designated for goods movement projects such as grade separations, but it is not known how successfully Riverside County will be able to compete for these funds. Another potential source of funding is the Western Riverside County Transportation Uniform Mitigation Fee (TUMF) which generates funds that are eligible for spending on grade separations for roadways on the TUMF network, but these funds are based on development activity, making it an uncertain funding source.

[2] 2017 Federal Transportation Improvement Program: Project List

[3] Based on input from City of Corona's response to questionnaire

[4] RCTC Metrolink and Amtrak Grade Separations Project, Transit and Intercity Rail Capital Program (TIRCP) Funding Application, April 2016

[5] Railroad Crossing Funding Programs, Section 190 Grade Separation Program (http://www.cpuc.ca.gov/General.aspx?id=2891)

- Priority: Local agency priority has changed for a few locations based on local circumstances and direction from elected officials. On May 05, 2015, the Riverside City Council adopted a policy establishing grade separation projects at Jackson Street, Madison Street, Spruce Street and 3rd Street as the City's current priority locations. In the questionnaire for this study, the City indicated that the grade separation project at Madison Street has been replaced by Mary Street in the priority list. In the 2012 study the crossings at Spruce Street, 3rd Street, and Madison Street were included in Priority Group #1, while the crossings at Mary Street and Jackson Street were included in Priority Group #3. On February 09, 2017, the City of Riverside Transportation Committee recommended that the City Council approve 3rd Street as the City's top priority grade separation project, and adopt a priority for grade separation projects at Spruce Street, Mary Street, and Jackson Street (Full content of this council action is presented in Appendix A).
- Technical Feasibility: Only four (Cota Street, Sheridan Street, Joy Street and Radio Road in Corona) of the 46 locations have been determined to be technically infeasible for constructing a grade separation. The County of Riverside indicated that grade separation feasibility at four locations within their jurisdiction (Apache Trail, Broadway, Avenue 58 and Avenue 62) is not certain at this time because feasibility studies have not been conducted; these will be assumed to be feasible for purposes of this analysis.
- Desired Timing: Of the 42 locations that are feasible, 11 are desired in the near-term future (next ten years). This includes the fully-funded grade separation at Avenue 66, the partially-funded McKinley Street crossing, and nine with no identified funding – one in Beaumont (Pennsylvania Avenue), two in Banning (San Gorgonio Avenue and Hargrave Street), two in Jurupa Valley (Bellegrave Avenue and Jurupa Road), and four in the City of Riverside (Jackson Street, Mary Street, 3rd Street and Spruce Street). These 11 locations were either in Group 1 (McKinley Street, Hargrave Street, Spruce Street and 3rd Street), Group 2 (Avenue 66, San Gorgonio Avenue, Jurupa Road, Bellegrave Avenue), or Group 3 (Pennsylvania Street, Jackson Street and Mary Street) in the 2012 Study.
- Closure: Three locations (California Avenue in Beaumont, Avenue 54 in Coachella, and Rutile Street in Jurupa Valley) are possible candidates for full closure, depending on the outcome of other circulation improvements in the vicinity.
- Quiet Zones: Most of the at-grade crossings in the cities of Riverside and Corona are considered by the local agency as candidates for QZ, along with locations in Banning and the County of Riverside. This study's technical analysis of QZ feasibility in Chapter 3 applies technical criteria from the FRA's guidelines to evaluate which locations qualify for QZ application.

The updated information about funding, priority, feasibility, timing, QZ and closure potential is provided in Table 2.1.

Table 2.1: Grade Crossing Questionnaire

Jurisdiction	Rail Line	Crossing Location	2012 Priority Group*	Funding Situation or Agency Priority Changed? Yes / No	Grade Separation Technically / Physically Feasible? Yes / No / Not Available (NA)	Grade Separation desired to be built by 2026 (in the next 10 years)	Possibility of Grade Separation built by 2036 (in the next 10 - 20 years)	Candidate for Quiet Zone? Yes / No	Candidate for Full Closure? Yes / No	Notes from One-on-One Meetings
Pass Area										
Calimesa	UP (YUMA MAIN)	San Timoteo Canyon Road	4	No	Yes	No	Yes	No	No	
Beaumont	UP (YUMA MAIN)	Veile Avenue	2	No	Yes	No	Yes	No	No	Grade separation is essential for development access if new SR-60/Portrero Boulevard interchange not built
Beaumont	UP (YUMA MAIN)	California Avenue	2	No	Yes	No	No	No	Yes	Closure needs to be evaluated in conjunction with Veile crossing and SR-60/Portrero Boulevard interchange
Beaumont	UP (YUMA MAIN)	Pennsylvania Avenue	3	Funding: No Priority: Yes	Yes	Yes	Yes	No	No	Beaumont's top priority for grade separation
Banning	UP (YUMA MAIN)	22nd Street	2	No	Yes	No	Yes	Yes	No	
Banning	UP (YUMA MAIN)	San Gorgonio Avenue	2	No	Yes	Yes	Yes	No	No	Although possible, this project is constrained by the existing I-10/San Gorgonio Avenue undercrossing.
Banning	UP (YUMA MAIN)	Hargrave Street	1	No	Yes	Yes	Yes	Yes	No	
Riverside County	UP (YUMA MAIN)	Apache Trail	3	No	NA	No	Yes	Yes	No	
Riverside County	UP (YUMA MAIN)	Broadway	4	No	NA	No	Yes	No	No	
Coachella Valley										
Palm Springs	UP (YUMA MAIN)	Tipton Road	5	No	Yes	No	Yes	No	No	Long term possibility of development in area
Coachella	UP (YUMA MAIN)	Avenue 54	4	No	Yes	No	Yes	No	Possibly	City might consider permanent closure.
Riverside County	UP (YUMA MAIN)	Avenue 58	5	No	NA	No	Yes	No	No	
Riverside County	UP (YUMA MAIN)	Avenue 62	2	No	NA	No	Yes	No	No	
Riverside County	UP (YUMA MAIN)	Avenue 66	2	Yes	Yes	Yes	No	No	No	Project fully funded and approved by California Transportation Commission. Date for construction pending final alignment.
Northwest Riverside County										
Jurupa Valley	UP (LA SUB)	Bellegrave Avenue	2	No	Yes	Yes	Yes	No	No	Jurupa Valley priority #2; Preliminary design concepts previously completed by County of Riverside Transportation & Land Management Agency (TLMA)
Jurupa Valley	UP (LA SUB)	Rutile Street	3	No	Yes	No	Yes	No	Possibly	Jurupa Valley priority #3; During current Jurupa Valley General Plan (GP) Update, staff will evaluate possible deletion of this GP roadway connection to Van Buren Boulevard. This is to be resolved on adoption of GP Update Early 2017
Jurupa Valley	UP (LA SUB)	Jurupa Road	2	No	Yes	Yes	Yes	No	No	Jurupa Valley priority #1; Previously committed funds transferred to Clay Street Grade Separation Project. Preliminary design completed by TLMA

Table 2.1: Grade Crossing Questionnaire

Jurisdiction	Rail Line	Crossing Location	2012 Priority Group*	Funding Situation or Agency Priority Changed? Yes / No	Grade Separation Technically / Physically Feasible? Yes / No / Not Available (NA)	Grade Separation desired to be built by 2026 (in the next 10 years)	Possibility of Grade Separation built by 2036 (in the next 10 - 20 years)	Candidate for Quiet Zone? Yes / No	Candidate for Full Closure? Yes / No	Notes from One-on-One Meetings
Riverside	UP (LA SUB)	Palm Avenue	5	No	Yes	No	NA	Yes	No	Active QZ project - in design
Riverside	UP (LA SUB)	Brockton Avenue	4	No	Yes	No	NA	Yes	No	Active QZ project - in design
Riverside	UP (LA SUB)	Panorama Road	5	No	Yes	No	NA	Yes	No	Active QZ project - in design
Corona	BNSF (SB SUB)	Smith Avenue	3	No	Yes	No	Yes	Yes	No	Corona priority #2 - ideal candidate for Quiet Zone
Corona	BNSF (SB SUB)	Railroad Street	4	No	Yes	No	Yes	Yes	No	Corona priority #3 - ideal candidate for Quiet Zone
Corona	BNSF (SB SUB)	Cota Street	3	No	No	No	No	Yes	No	Corona priority #4 - ideal candidate for Quiet Zone
Corona	BNSF (SB SUB)	Sheridan Street	3	Most improvements recently constructed for Quiet Zone	No	No	No	Yes	No	Corona priority #7 - ideal candidate for Quiet Zone
Corona	BNSF (SB SUB)	Joy Street	1	No	No	No	No	Yes	No	Corona priority #6 - ideal candidate for Quiet Zone
Corona	BNSF (SB SUB)	Radio Road	5	No	No	No	No	Yes	No	Corona priority #5 - ideal candidate for Quiet Zone
Corona	BNSF (SB SUB)	McKinley Street	1	$7.3 M allocated from various sources	Yes	Yes	Yes	No	No	Corona priority #1
Riverside	BNSF (SB SUB)	Buchanan Street	4	No	Yes	No	NA	Yes	No	Establish QZ - 3rd quarter 2016
Riverside	BNSF (SB SUB)	Pierce Street	2	No	Yes	No	NA	Yes	No	Establish QZ - 3rd quarter 2016
Riverside	BNSF (SB SUB)	Tyler Street	1	No	Yes	No	NA	Yes	No	Establish QZ - 3rd quarter 2016
Riverside	BNSF (SB SUB)	Harrison Street	5	No	Yes	No	NA	Yes	No	Establish QZ - 3rd quarter 2016
Riverside	BNSF (SB SUB)	Gibson Street	5	No	Yes	No	NA	Yes	No	Establish QZ - 3rd quarter 2016
Riverside	BNSF (SB SUB)	Jackson Street**	3	Funding: No Priority: Yes	Yes	Yes	Yes	Yes	No	Establish QZ - 3rd quarter 2016
Riverside	BNSF (SB SUB)	Adams Street	1	No	Yes	No	NA	Yes	No	Establish QZ - 3rd quarter 2016
Riverside	BNSF (SB SUB)	Jefferson Street	4	No	Yes	No	NA	Yes	No	Establish QZ - 3rd quarter 2016
Riverside	BNSF (SB SUB)	Madison Street	1	Funding: No Priority: Yes	Yes	No	NA	Yes	No	Establish QZ - 3rd quarter 2016
Riverside	BNSF (SB SUB)	Washington Street	3	No	Yes	No	NA	Yes	No	Establish QZ - 3rd quarter 2016
Riverside	BNSF (SB SUB)	Mary Street**	3	No	Yes	Yes	Yes	Yes	No	Establish QZ - 3rd quarter 2016
Riverside	BNSF & UP (RIV)	Cridge Street	5	No	Yes	No	NA	Yes	No	Active QZ project - in design

Table 2.1: Grade Crossing Questionnaire

Jurisdiction	Rail Line	Crossing Location	2012 Priority Group*	Funding Situation or Agency Priority Changed? Yes / No	Grade Separation Technically / Physically Feasible? Yes / No / Not Available (NA)	Grade Separation desired to be built by 2026 (in the next 10 years)	Possibility of Grade Separation built by 2036 (in the next 10 - 20 years)	Candidate for Quiet Zone? Yes / No	Candidate for Full Closure? Yes / No	Notes from One-on-One Meetings
Riverside	BNSF & UP (SB SUB)	7th Street	3	No	Yes	No	DK	Yes	No	QZ Planned for City FY 2020/2021
Riverside	BNSF & UP (SB SUB)	3rd Street**	1	No	Yes	Yes	Yes	Yes	No	QZ Planned for City FY 2020/2021
Riverside	BNSF & UP (SB SUB)	Spruce Street**	1	Funding: No Priority: Yes	Yes	Yes	Yes	Yes	No	QZ Planned for City FY 2020/2021
Riverside	BNSF & UP (SB SUB)	Chicago Avenue	1	No	Yes	No	NA	Yes	No	Potential QZ (next 5 to 10 Years)
Riverside	BNSF & UP (SB SUB)	Palmyrita Av (UP)	4	No	Yes	No	NA	Yes	No	Potential QZ (next 5 to 10 Years)
Riverside County	BNSF & UP (SB SUB)	Center Street	3	No	Yes	No	Yes	Yes	No	
Riverside County	BNSF & UP (SB SUB)	Main Street	5	No	Yes	No	Yes	Yes	No	

Source: HDR

*2012 Study priority ranking 1 (highest priority) – 5 (lowest priority)

** Jackson Street, Mary Street, Spruce Street, and 3rd Street are the City of Riverside's current top priorities.

3 Quiet Zone Analysis

Grade separations are capital intensive projects, and since funding for grade separations is scarce, QZs can be implemented as a means of reducing train horn noise impacts and enhancing safety at grade crossings near residential areas. QZs are not a substitute for grade separation because they are specifically intended to reduce the sounding of train horns while grade separations also eliminate vehicle-train conflict points as well as delay and idling of waiting vehicles. To help the cities investigate the possibility of QZ implementation, this chapter provides information about the feasibility of establishing QZ corridors along the UP and BNSF main lines.

3.1 QZ Methodology

A QZ is a section of a rail line (at least one-half mile in length) that has one or more consecutive public highway-rail at-grade crossings where locomotive horns are not routinely sounded. A QZ is typically implemented to reduce the train-related noise in residential areas. The FRA has established guidelines and criteria for implementing quiet zones, which consider such factors as crossing location, adjacent land uses, train and vehicular traffic, and accident history data. Adjacent land uses were reviewed as the first screening criterion for determining which of the 46 at-grade crossings could be potential candidates for QZ implementation. The consultant team used GIS analysis to identify the land uses within a 1,200-foot radius of each crossing. Figure 3.1 provides a map showing the location of each grade crossing, along with the surrounding land uses. If there were no residential land uses within the buffer area, then that particular crossing was eliminated from further consideration.

The following crossings were eliminated because there are no residential land uses within the 1,200-foot buffer:

- Three locations the City of Corona on the BNSF San Bernardino Subdivision:
    - Radio Road, Railroad Street, and Smith Avenue
- One location in the City of Palm Springs on the Yuma Subdivision:
    - Tipton Road

The second screening step identified locations that are already included in QZ projects and therefore do not need to be evaluated for QZ feasibility. This includes crossings that are included in QZ projects that have been implemented or are currently in development, as well as locations that already contain wayside horns, which is another method used to reduce the noise impact of trains.

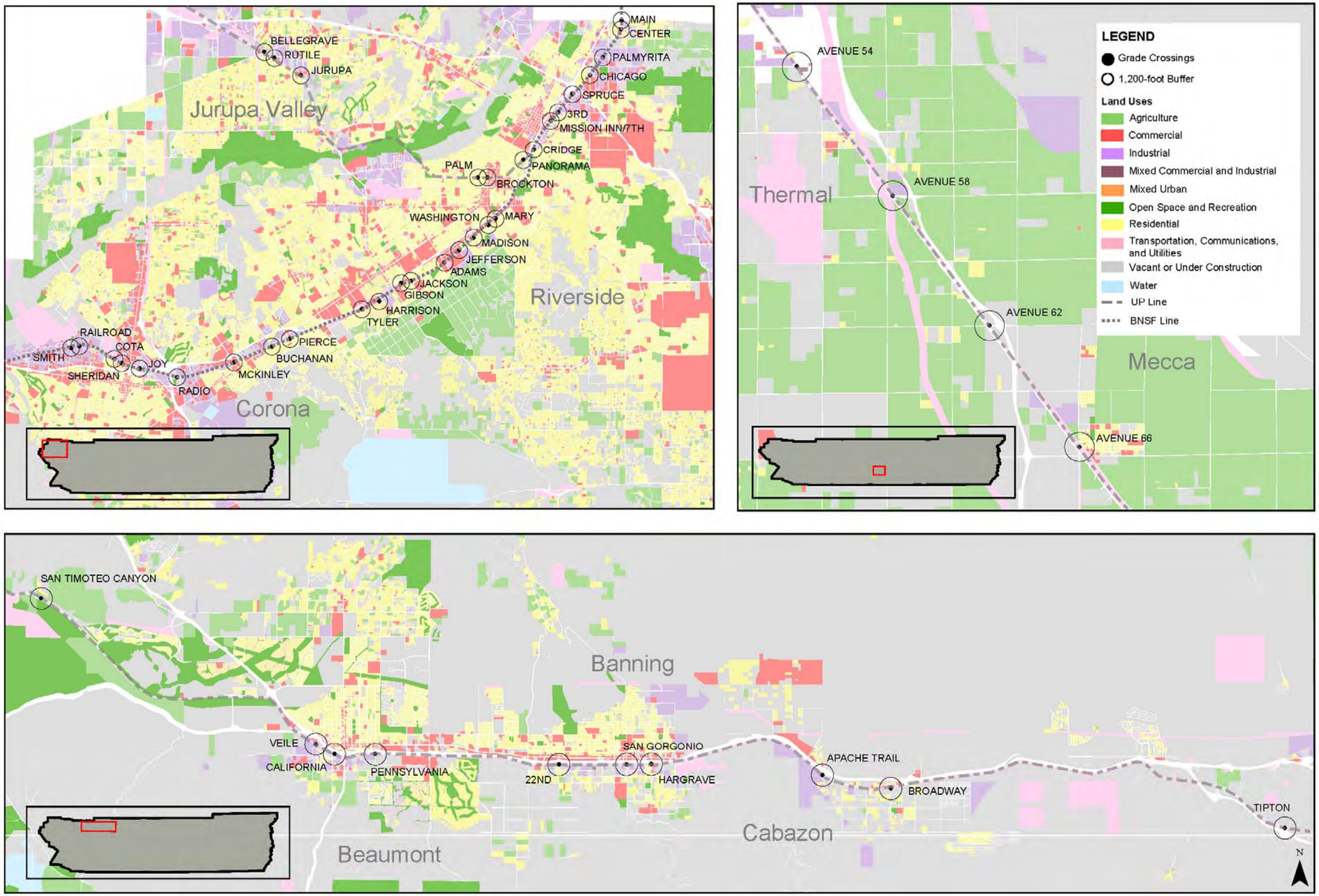
The following 11 locations are part of QZ being implemented by the City of Riverside (all locations are on the BNSF San Bernardino Subdivision):

- Buchanan Street
- Pierce Street
- Tyler Street
- Harrison Street
- Gibson Street
- Jackson Street
- Adams Street
- Jefferson Street
- Madison Street
- Washington Street
- Mary Street

The following locations are either in the design stage and/or contain wayside horns:

- In the City of Riverside, Brockton Avenue, Palm Avenue, and Panorama Road on the UP Los Angeles Subdivision contain wayside horns and are also currently in the QZ design phase;
- In the City of Riverside, Cridge Street on the BNSF & UP Riverside Subdivision is currently in the QZ design phase

Figure 3.1: Locations and Land Use around 46 At-Grade Crossings Considered for Quiet Zone Analysis



Source: HDR

For the QZ analysis, the remaining 27 at-grade crossings were grouped into 11 potential QZ corridors based on jurisdiction and railroad company ownership, and are presented in Table 3.1.

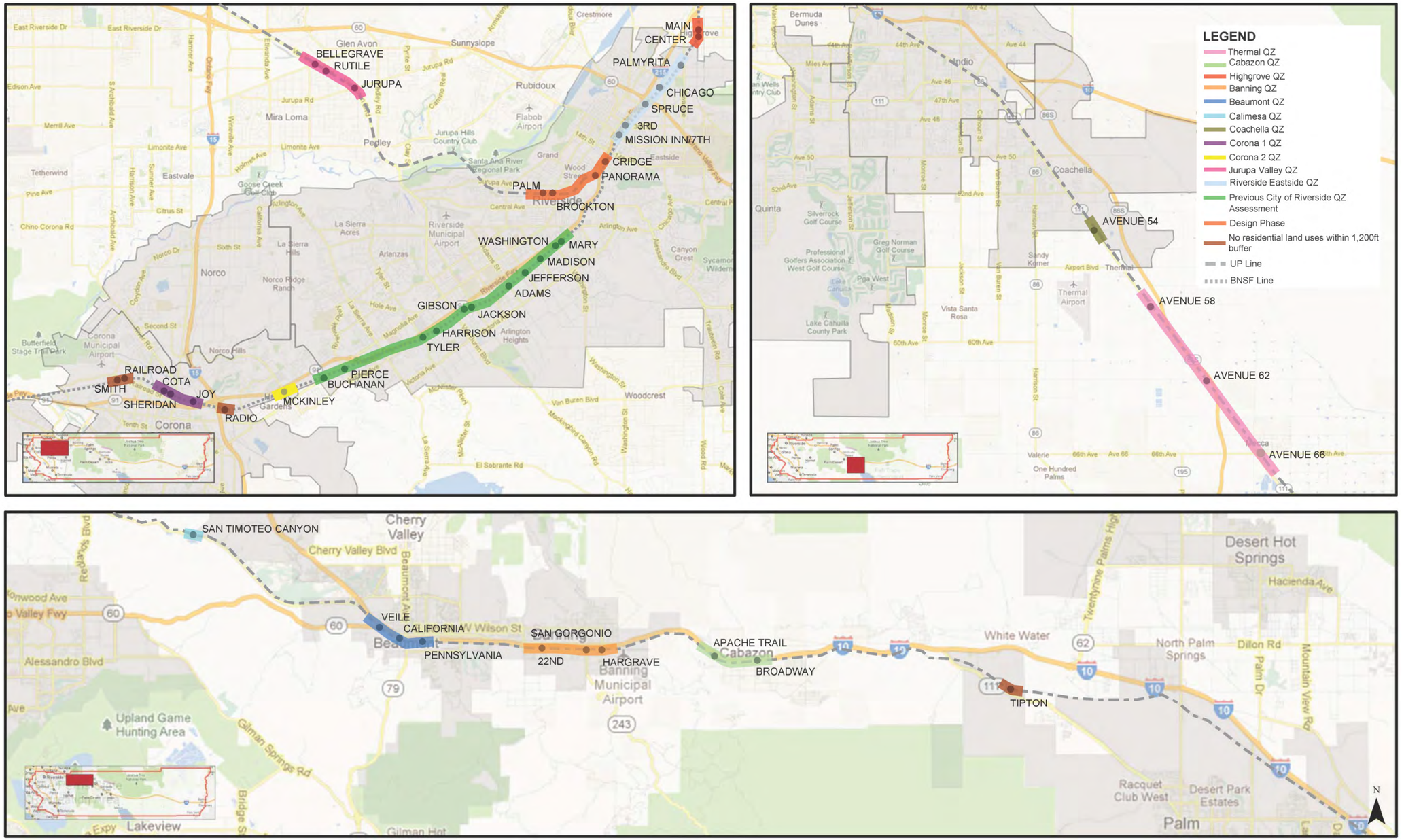
Table 3.1: List of At-Grade Crossings Considered for Quiet Zone Analysis

Jurisdiction	Rail Line	QZ Corridor	Cross Street Location
Riverside County	UP (YUMA MAIN)	Thermal QZ	Avenue 58
			Avenue 62
			Avenue 66 (4th Street)
Riverside County	UP (YUMA MAIN)	Cabazon QZ	Apache Trail
			Broadway Street
Riverside County	BNSF & UP (SB SUB)	Highgrove QZ	Center Street
			Main Street
Banning	UP (YUMA MAIN)	Banning QZ	22nd Street
			San Gorgonio Avenue
			Hargrave Street
Beaumont	UP (YUMA MAIN)	Beaumont QZ	Veile Avenue
			California Avenue
			Pennsylvania Avenue
Calimesa	UP (YUMA MAIN)	Calimesa QZ	San Timoteo Canyon Road
Coachella	UP (YUMA MAIN)	Coachella QZ	Avenue 54
Corona	BNSF (SB SUB)	Corona 1 QZ	Cota Street
			Sheridan Street
			Joy Street
Corona	BNSF (SB SUB)	Corona 2 QZ	McKinley Street
Jurupa Valley	UP (LA SUB)	Jurupa Valley QZ	Bellegrave Avenue
			Jurupa Road
			Rutile Street
Riverside	BNSF & UP (SB SUB)	Riverside Eastside QZ	Mission Inn (7th Street)
			3rd Street
			Spruce Street
			Chicago Avenue
			Palmyrita Avenue

Source: HDR

Figure 3.2 shows how the at-grade crossings were grouped for the QZ analysis.

Figure 3.2: Status and Corridors for Quiet Zones Analysis



Source: HDR

3.2 QZ Analysis Overview

This QZ evaluation addresses four mainline freight rail lines in Riverside County, owned by private freight operators BNSF and UP:

- UP (Yuma Subdivision)
- BNSF and UP (San Bernardino Subdivision)
- BNSF (San Bernardino Subdivision)
- UP (Los Angeles Subdivision)

These rail lines accommodate freight service in addition to passenger service (Metrolink commuter rail service and limited Amtrak long-distance service). In 2005, the FRA adopted the Final Rule on the use of train horns at public at-grade crossings. The rule states that all trains must sound their horns at all public crossings; however, the rule also includes provisions for communities to establish QZs wherein locomotive horns are not sounded. QZs are established based on either Public Authority Designation or Public Authority Application to FRA. Details on background, overview, approval process and the methods of establishing a QZ are presented in Appendix B-1.

The determination of the feasibility of a proposed QZ relies on two basic parameters: Risk Index and Safety Measures. Risk Indices measure predicted cost to society of casualties that are expected to result from collisions at an individual railroad at-grade crossing. These indices are measured as the following:

- Nationwide Significant Risk Threshold (NSRT)
- Risk Index With Horns (RIWH)
- Quiet Zone Risk Index (QZRI)

Safety Measures are improvements that are installed at QZs to maximize safety benefits and minimize risks, in the absence of train horns. The FRA Rule categorizes Safety Measures as being either:

- Supplemental Safety Measures (SSM), or
- Alternative Safety Measures (ASM)

Details of Risk Index and Safety Measures are discussed in Appendix B-2.

3.3 QZ Findings

The analysis was based on FRA's established online Quiet Zone Calculator for evaluating the feasibility of implementing a QZ. Inputs into the online FRA QZ calculator determine the risk at a particular crossing or within a corridor containing several crossings, and indicate whether or not a QZ is feasible. Details of data needs for this calculator are presented in Appendix C-1. In addition, since cities are responsible for all costs for implementation of safety measures in order to implement a QZ, a rough order-of-magnitude of cost was developed for each analyzed location; the cost estimates are also presented in Appendix C-1.

Based on the results from the FRA Quiet Zone Calculator, there are 11 potential QZ corridors in the study area, which incorporate 27 at-grade crossings. Table 3.2 presents a summary of the 11 potential QZ corridors, including: (1) identification of the crossings that are included in each QZ corridor, (2) the safety measures that would be most appropriate or feasible at each crossing, (3) the estimated cost of the safety measures, (4) total estimated cost of implementing all safety measures in the corridor, (5) the risk analysis results for each QZ corridor when equipped with

safety measures, and (6) whether or not the QZ qualifies for implementation considering the risk analysis. Copies of the FRA calculator worksheets for each location are included in Appendix C-2.

A QZ qualifies for implementation if one of the following conditions is met:

- The QZRI is less than or equal to the NSRT (with or without SSMs or ASMs)
- The QZRI is less than or equal to the RIWH (with SSMs or ASMs)
- SSMs will be installed at every crossing

A next step for local jurisdictions that are interested in implementing QZs is to work with the CPUC and the railroad company that owns the track to initiate the QZ establishment process. Both FRA and SCRRA have guidelines and procedures for QZ implementation. Figure 3.3 is a flowchart from the FRA that outlines the QZ creation process. The SCRRA's QZ Implementation Guidelines provide information that is applicable to some of the aforementioned QZs. The following items are excerpted from both FRA and SCRRA documents and highlight some of the critical steps necessary to implement a QZ:

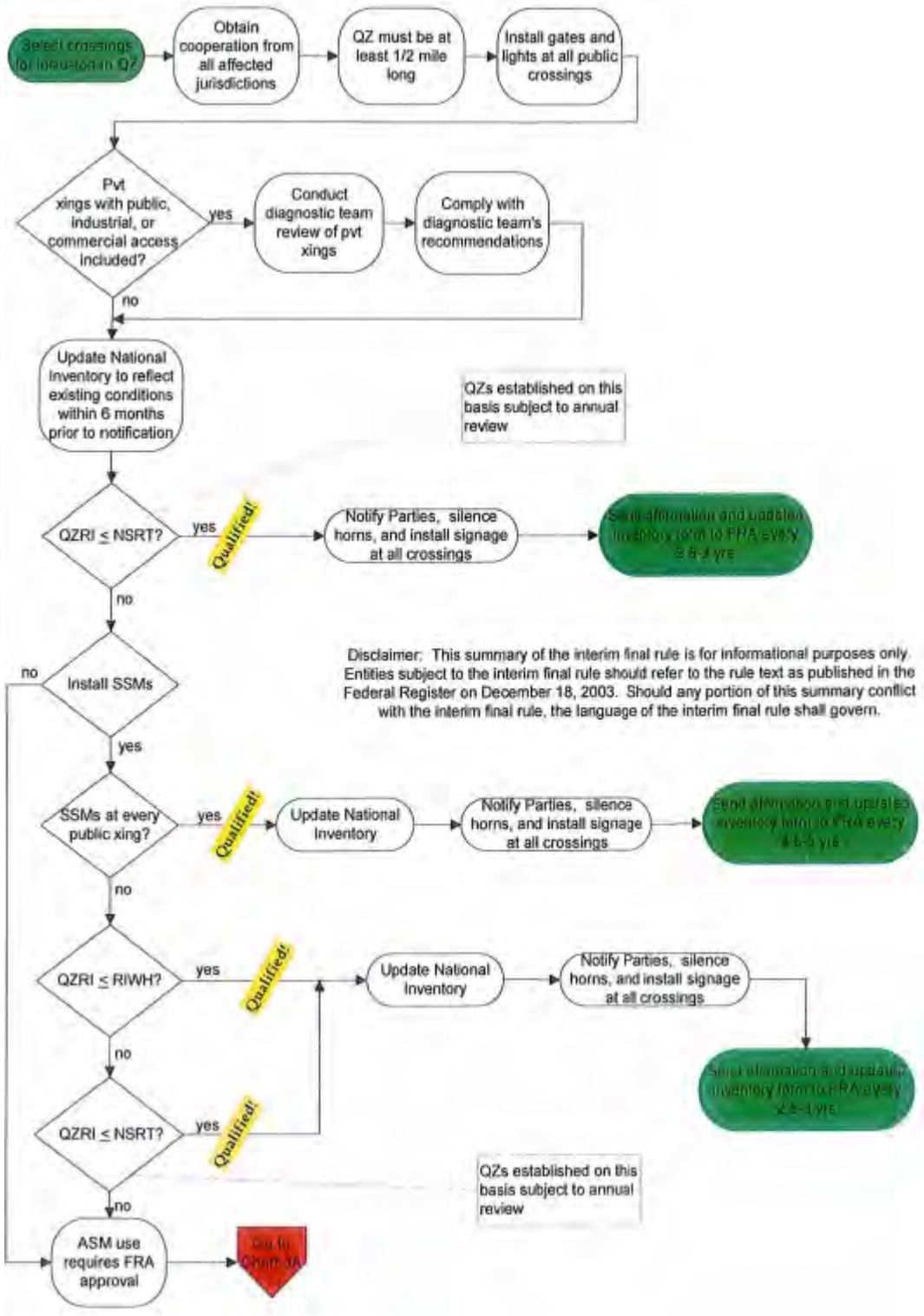
- Fund the project.
- City pays railroad stakeholder engineering costs up-front.
- Conduct a diagnostic team meeting with all stakeholders.
- Engineering design.
- Obtain CPUC approval and submit CPUC GO 88-B applications.
- City executes a Construction and Maintenance Agreement, at which time the City pays the full cost of the project.
- Submit a Notice of Intent to Create a Quiet Zone to the affected parties. Parties will have 60 days to comment.
- Construct crossing improvements.
- City obtains Railroad Liability Insurance (if deemed necessary).
- City updates the FRA Crossings Inventory.
- City provides Notice of Quiet Zone Establishment to affected parties in accordance with FRA Rule Section 222.43.
- City installs required signage at each crossing in accordance with FRA Rule Sections 222.25, 222.27, and 222.35.

Table 3.2: Summary of Quiet Zone Analysis

Jurisdiction	Potential QZ Corridor	Crossing Location	SSM Category	Estimated Cost for each SSM	Estimated Total Cost	Nationwide Significant Risk Threshold (NSRT)	Risk Index with Horns (RIWH)	Quiet Zone Risk Index (QZRI)	Qualified based on QZRI, NSRT, and RIWH Conditions?	Possible Designation Options (refer to Table 2, in Appendix B-1)
Banning	Banning QZ	22nd Street	6	$1,440,000	$1,935,000	14,347.00	85,201.02	16,876.76	Yes. SSMs installed at every crossing ,and QZRI≤ RIWH	Option 2
		San Gorgonio Street	13	$480,000						
		Hargrave Street	12	$15,000						
Beaumont	Beaumont QZ	Veile Avenue	13	$0	$2,880,000	14,347.00	23,939.84	8,912.55	Yes. SSMs installed at every crossing, QZRI ≤ RIWH, and QZRI ≤ NSRT	Option 2
		California Avenue	6	$1,440,000						
		Pennsylvania Avenue	6	$1,440,000						
Calimesa	Calimesa QZ	San Timoteo Canyon Road	12	$15,000	$15,000	14,347.00	25,130.27	10,479.32	Yes. SSMs installed at every crossing, QZRI ≤ RIWH, and QZRI ≤ NSRT	Options 2 or 3
Coachella	Coachella QZ	Avenue 54	13	$480,000	$480,000	14,347.00	26,931.19	8,984.25	Yes. SSMs installed at every crossing, QZRI ≤ RIWH, and QZRI ≤ NSRT	Options 2 or 3
Corona	Corona 1 QZ	Cota Street	6	$1,440,000	$2,800,000	14,347.00	50,132.93	17,733.98	Yes. SSMs installed at every crossing ,and QZRI≤ RIWH	Option 2
		Sheridan Street	6	$1,440,000						
		Joy Street	13 (existing)	$0						
Corona	Corona 2 QZ	McKinley Street	6	$1,440,000	$1,440,000	14,347.00	109,001.57	41,817.36	Yes. SSMs installed at every crossing ,and QZRI≤ RIWH	Option 2
Jurupa Valley	Jurupa Valley QZ	Bellegrave Avenue	6	$1,440,000	$4,320,000	14,347.00	80,382.84	30,838.07	Yes. SSMs installed at every crossing ,and QZRI≤ RIWH	Option 2
		Rutile Avenue	6	$1,440,000						
		Jurupa Road	6	$1,440,000						
City of Riverside	Riverside Eastside QZ	Palmyrita Avenue	6	$1,440,000	$2,400,000	14,347.00	634,500.32	91,211.47	Yes. SSMs installed at every crossing ,and QZRI≤ RIWH	Option 2
		Chicago Avenue	13	$480,000						
		Spruce Street	13 (existing)	$0						
		3rd Street	13 (existing)	$0						
		Mission Inn/7th Street	13	$480,000						
Riverside County	Thermal QZ	Avenue 58	6	$1,440,000	$1,470,000	14,347.00	67,836.21	27,938.75	Yes. SSMs installed at every crossing ,and QZRI≤ RIWH	Options 2 or 3
		Avenue 62	12	$15,000						
		Avenue 66	12	$15,000						
	Cabazon QZ	Apache Trail	6	$1,440,000	$1,920,000	14,347.00	29,724.51	10,599.12	Yes. SSMs installed at every crossing, QZRI ≤ RIWH, and QZRI ≤ NSRT	Options 2 or 3
		Broadway	13	$480,000						
	Highgrove QZ	Main Street	13	$480,000	$1,920,000	14,347.00	30,885.97	11,087.09	Yes. SSMs installed at every crossing, QZRI ≤ RIWH, and QZRI ≤ NSRT	Options 2 or 3
		Center Street	6	$1,440,000						

Source: HDR

Figure 3.3: FRA Guidance on Creating a QZ



Source: FRA

4 Study Findings and Recommendations

This study has provided information to address the following questions:

- For which locations is a grade separation feasible to construct, and for which is it not feasible?
- For which locations are grade separations desirable in the near term (within the next 10 years)?
- For which locations are grade separations desirable in the longer-term future (more than 10 years)?
- Should any of the existing at-grade crossings be closed?
- Which locations could be candidates for quiet zone implementation in the near-term?

The following section summarizes the study findings in regard to these questions, with a summary of the findings for the overall corridor followed by findings by jurisdiction. Recommended actions for RCTC and the local jurisdictions are presented in Section 4.2.

4.1 Findings

4.1.1 Corridor Summary

Grade Separations Feasibility and Timing

At most of the remaining 46 at-grade crossings it is physically feasible to construct a grade separation – four locations have been deemed infeasible and four others require more study. The local agencies have identified 11 grade separations that are desired within the next ten years, and another 14 grade separations within the following ten years. Though the needs for grade separation continue, the means to build them are not currently available. Full funding has been identified for one location, and partial funding has been assembled for another; otherwise no funds have been identified for any of the other desired grade separations

The existing funding sources that offer specific application to grade separations may have limited potential. The CPUC provides funding for grade separation projects, but the funding is highly competitive and a grade separation can receive no more than $5 million from this source in a single year (up to $15 million distributed among three to four projects each fiscal year). The 2015 FAST Act established the Nationally Significant Freight and Highway Projects (NSFHP) program to provide financial assistance through competitive grants, known as FASTLANE grants, for goods movement projects including grade separations. The program is authorized to provide up to $4.5 billion for fiscal years 2016 to 2020, to nationally and regionally significant freight and highway projects[6]. Given that this amount is about $1 billion spread nationally for each fiscal year, it is uncertain whether Riverside County grade separation projects will be able to successfully compete for this funding. Currently, RCTC is working with the Southern California Association of Governments (SCAG) to prioritize critical urban freight corridors, which includes grade separations. Grade separations that have been identified thus far for these corridors in Riverside County include McKinley Road, Jurupa Road, and Third Street. Projects such as these may also be submitted for future funding opportunities such as the next round of U.S. Department of Transportation Nationally Significant Freight and Highway Projects (NSFHP) program grant application, due in December 2016. Funds generated by the Western Riverside County TUMF are eligible for spending on grade

[6] FASTLANE Grants: https://www.transportation.gov/buildamerica/FASTLANEgrants

separations for roadways on the TUMF network, but TUMF funding is uncertain because it depends on the amount of ongoing development activity.

Other existing programs/funding sources that RCTC and the local agencies may be able to tap into are:

- USDOT TIGER Discretionary Grants
- USDOT FASTLANE Discretionary Grants
- Congestion Mitigation & Air Quality (CMAQ)
- Transit and Intercity Rail Capital Program (TIRCP)[7]
- Proposition 1B Trade Corridors Improvement Fund (TCIF) Program[8]
- CPUC Highway-Rail Crossing Section 130 Program
- CPUC Grade Separation Section 190 Program
- Measure A Local Streets and Roads funding

Potential Closures

Full closure of low-volume at-grade crossings can reduce the potential for conflicts and thereby improve safety. Potential permanent closure of a grade crossing has been identified in three cities where nearby grade separations are available. Each city needs to evaluate the long-term adequacy of the local circulation system without the grade crossing before pursuing the closure.

Quiet Zone Feasibility

FRA train horn rules provide for communities to establish Quiet Zones wherein locomotive horns are not sounded when a train crosses a public at-grade crossing. QZs are implemented to eliminate horn noise where at-grade crossings are located near residential areas. The analysis used the FRA calculator to evaluate 11 potential QZs comprising a total of 27 at-grade crossings, and found that all 11 would be feasible QZs if implemented with Supplemental Safety Measures.

4.1.2 County of Riverside

There are seven at-grade crossings in the County's jurisdiction – two in the Pass Area, three in the Coachella Valley, and two in Northwest Riverside County. Of these, one location (Avenue 66) is fully funded for a grade separation, and the other six have been identified for potential grade separation in the 10-20 year timeframe. The three areas comprising the seven crossings would qualify for Quiet Zones with implementation of Supplemental Safety Measures.

[7] The unsuccessful FY 16 RCTC TIRCP grant application illustrated that standalone grade separation projects will likely not be competitive for TIRCP funds without accompanying track capacity and/or service increases, but some grade separation projects could possibly be funded in conjunction with a larger project (eg. Coachella Valley passenger rail)

[8] Bond proceeds are fully committed; continuation of TCIF program is contingent upon enactment of new funding source, as envisioned by SBX 1 (Beall – pending). SBX 1 (Beall) proposes a 30 cent increase in the diesel excise tax and would deposit the attributable revenues (approx. $750 million/year) into the TCIF created by Proposition 1B (2006). The bill would require revenues apportioned to the state from the NHFP established by the FAST Act to be allocated for trade corridor improvement projects approved pursuant to these provisions. The original TCIF program funded many grade separations. The bill would also expand eligible projects to include rail landside access improvements, landside freight access improvements to airports, and certain capital and operational improvements.

4.1.3 City of Banning

There are three at-grade crossings in the City of Banning. Grade separations for two locations are desired in the next ten years and within 20 years for the third. This area would quality for a Quiet Zone with implementation of Supplemental Safety Measures.

4.1.4 City of Beaumont

There are three at-grade crossings in the City of Beaumont. Grade separation of one location is desired in the 0-10 year timeframe and for a second location in the 10-20 year timeframe. The third crossing may be permanently closed if nearby planned circulation improvements are implemented. This area would quality for a Quiet Zone with implementation of Supplemental Safety Measures.

4.1.5 City of Calimesa

There is one at-grade crossing in the City of Calimesa in San Timoteo Canyon. This location could be a candidate for grade separation in the 10-20 year timeframe depending on the area's development and traffic growth at the crossing. This location would quality for a Quiet Zone with implementation of Supplemental Safety Measures.

4.1.6 City of Coachella

There is one remaining at-grade crossing in the City of Coachella. This location is a possible candidate for permanent closure if the nearby circulation system is adequate to serve planned development. This location would quality for a Quiet Zone with implementation of Supplemental Safety Measures.

4.1.7 City of Corona

There are seven remaining at-grade crossings in the City of Corona. Grade separation is desired for one of these in the 0-10 year timeframe (McKinley Street) and partial funding has been secured. Two locations are expected to need grade separation in the 10-20 year timeframe, and it would not be feasible to construct grade separations at the other four. The two areas identified as potential Quiet Zones would quality with implementation of Supplemental Safety Measures.

4.1.8 City of Jurupa Valley

There are three at-grade crossings in the City of Jurupa Valley. Grade separations are desired at two of these locations in the 0-10 year timeframe. The third location may be a candidate for permanent closure if the nearby circulation system is adequate to serve planned development. This area would quality for a Quiet Zone with implementation of Supplemental Safety Measures.

4.1.9 City of Palm Springs

There is one at-grade crossing in the City of Palm Springs. That location may be a candidate for grade separation in the 10-20 year timeframe if development occurs in the area and traffic volumes at the crossing increase.

4.1.10 City of Riverside

There are 20 at-grade crossings in the City of Riverside – three on the UP Los Angeles Sub and 17 on the BNSF San Bernardino Sub. Four locations are desired for grade separation in the 0-10 year timeframe. For the other 16 locations

the City is pursuing Quiet Zones. There is an active Quiet Zone project in design for the three crossings (Palm Avenue, Brockton Avenue, Panorama Avenue) on the UP line. A Quiet Zone is being established in 2016 that covers 11 crossings on the BNSF line (Buchanan Street, Pierce Street, Tyler Street, Harrison Street, Gibson Street, Jackson Street, Adams Street, Jefferson Street, Madison Street, Washington Street, and Mary Street) ; a Quiet Zone is planned for fiscal year 2020/21 for three crossings on the BNSF line (7th Street, 3rd Street, and Spruce Street); and a potential Quiet Zone has been identified for implementation in the next 5-10 years that covers the remaining two crossings on the BNSF line (Chicago Avenue, Palmyrita Avenue). The area comprising the five planned/potential crossings would qualify for a Quiet Zone with implementation of Supplemental Safety Measures.

Table 4.1 summarizes the study findings and presents the status of each of the remaining 46 at-grade crossings.

Table 4.1: Study Findings

Priority Ranking	Jurisdiction	Rail Line	Cross Street	Status
1: 9 Locations	Riverside	BNSF & UP (SB SUB)	Spruce Street	Top priority
	Corona	BNSF (SB SUB)	McKinley Street	Partial funding, desired within 10 years
	Riverside	BNSF & UP (SB SUB)	Chicago Avenue	Potential QZ in the next 5-10 years
	Banning	UP (YUMA MAIN)	Hargrave Street	Desired in the next 10 years
	Riverside	BNSF & UP (SB SUB)	3rd Street	Top priority
	Corona	BNSF (SB SUB)	Joy Street	Infeasible
	Riverside	BNSF (SB SUB)	Madison Street	Established QZ (November 2016)
	Riverside	BNSF (SB SUB)	Adams Street	Established QZ (November 2016)
	Riverside	BNSF (SB SUB)	Tyler Street	Established QZ (November 2016)
2: 9 Locations	Jurupa Valley	UP (LA SUB)	Bellegrave Avenue	Desired in the next 10 years
	Jurupa Valley	UP (LA SUB)	Jurupa Road	Desired in the next 10 years
	Banning	UP (YUMA MAIN)	22nd Street	Desired in the next 10 -20 years
	Beaumont	UP (YUMA MAIN)	Veile Avenue	Desired in the next 10 -20 years
	Banning	UP (YUMA MAIN)	San Gorgonio Avenue	Desired in the next 10 years
	Riverside County	UP (YUMA MAIN)	Avenue 62	Desired in the next 10 -20 years
	Riverside County	UP (YUMA MAIN)	Avenue 66	Fully funded, desired in next 10 years
	Riverside	BNSF (SB SUB)	Pierce Street	Established QZ (November 2016)
	Beaumont	UP (YUMA MAIN)	California Avenue	Possible candidate for full closure
3: 11 Locations	Corona	BNSF (SB SUB)	Sheridan Street	Infeasible
	Jurupa Valley	UP (LA SUB)	Rutile Street	Possible candidate for full closure
	Riverside	BNSF (SB SUB)	Mary Street	Top priority
	Riverside	BNSF (SB SUB)	Jackson Street	Top priority
	Corona	BNSF (SB SUB)	Smith Avenue	Desired in the next 10 -20 years

Table 4.1: Study Findings

Priority Ranking	Jurisdiction	Rail Line	Cross Street	Status
	Beaumont	UP (YUMA MAIN)	Pennsylvania Avenue	Desired in the next 10 years
	Riverside County	BNSF & UP (SB SUB)	Center Street	Desired in the next 10 -20 years
	Riverside	BNSF (SB SUB)	Washington Street	Established QZ (November 2016)
	Riverside	BNSF & UP (SB SUB)	7th Street	QZ planned for FY 2020/2021
	Riverside County	UP (YUMA MAIN)	Apache Trail	Desired in the next 10 -20 years
	Corona	BNSF (SB SUB)	Cota Street	Infeasible
4: 8 Locations	Riverside	BNSF (SB SUB)	Buchanan Street	Established QZ (November 2016)
	Riverside County	UP (YUMA MAIN)	Broadway	Desired in the next 10 -20 years
	Riverside	BNSF (SB SUB)	Jefferson Street	Established QZ (November 2016)
	Corona	BNSF (SB SUB)	Railroad Street	Desired in the next 10 -20 years
	Calimesa	UP (YUMA MAIN)	San Timoteo Canyon Road	Potential in the next 10 -20 years
	Riverside	BNSF & UP (SB SUB)	Palmyrita Av (UP)	Potential QZ in the next 5-10 years
	Coachella	UP (YUMA MAIN)	Avenue 54	Possible candidate for full closure
	Riverside	UP (LA SUB)	Brockton Avenue	Active QZ project in design
5: 9 Locations	Riverside	BNSF & UP (RIV)	Cridge Street	Active QZ project in design
	Riverside	UP (LA SUB)	Panorama Road	Active QZ project in design
	Palm Springs	UP (YUMA MAIN)	Tipton Road	Potential in the next 10 -20 years
	Riverside	BNSF (SB SUB)	Harrison Street	Established QZ (November 2016)
	Riverside	UP (LA SUB)	Palm Avenue	Active QZ project in design
	Corona	BNSF (SB SUB)	Radio Road	Infeasible
	Riverside County	BNSF & UP (SB SUB)	Main Street	Desired in the next 10 -20 years
	Riverside County	UP (YUMA MAIN)	Avenue 58	Desired in the next 10 -20 years
	Riverside	BNSF (SB SUB)	Gibson Street	Established QZ (November 2016)

Source: HDR

4.2 Recommendations and Next Steps

The local jurisdictions have identified 11 grade crossings as desirable for grade separation in the next ten years. These locations were all in the top three priority groups in the 2012 study – four were in priority ranking #1, four were in priority ranking #2, and the remaining three were in priority ranking #3 – so the current local priorities are generally consistent with the technical prioritization analysis of 2012. Therefore the recommended actions by RCTC and the local jurisdictions (see below) are focused on identifying and pursuing sources of funding for these 11 locations, which include:

- One in the County of Riverside
    - Avenue 66 (fully funded) – priority ranking #2 in 2012 Study
- One in the City of Corona
    - McKinley Street (partially funded) – priority ranking #1 in 2012 Study
- One in the City of Beaumont
    - Pennsylvania Avenue – priority ranking #3 in 2012 Study
- Two in the City of Banning
    - San Gorgonio Avenue – priority ranking #2 in 2012 Study
    - Hargrave Street – priority ranking #1 in 2012 Study
- Two in the City of Jurupa Valley
    - Bellegrave Avenue – priority ranking #2 in 2012 Study
    - Jurupa Road – priority ranking #2 in 2012 Study
- Four in the City of Riverside
    - Jackson Street – priority ranking #3 in 2012 Study
    - Mary Street – priority ranking #3 in 2012 Study
    - 3rd Street – priority ranking #1 in 2012 Study
    - Spruce Street – priority ranking #1 in 2012 Study

The study's recommendations are as follows:

- RCTC should explore the funding potential and process for obtaining grade separation funding through the National Highway Freight Program (NHFP) and other applicable federal and state funding sources, and work with regional and local partners to pursue those funds if the potential return appears promising and the opportunity is realistic.
- The local jurisdictions should collaborate with RCTC and pursue funding for their higher-priority grade separations through sources available to them, including the TUMF and the CPUC programs.
- The local jurisdictions that have identified needs for Quiet Zones should continue to pursue their implementation. The technical analysis included in this report justifies the establishment of QZ where the need has been identified by the local jurisdiction.

Appendix A: City of Riverside Council Action, 02.09.17

City of Arts & Innovation

Transportation Committee

TO: **TRANSPORTATION COMMITTEE MEMBERS** **DATE: FEBRUARY 9, 2017**

FROM: **PUBLIC WORKS DEPARTMENT** **WARDS: 1, 2, 3, 4, AND 5**

SUBJECT: **REVIEW AND PRIORITIZATION OF POTENTIAL RAILROAD GRADE SEPARATIONS ALONG THE BURLINGTON NORTHERN SANTA FE RAILROAD AT JACKSON STREET, MARY STREET, SPRUCE STREET, AND THIRD STREET - DIRECT SUBMITTAL**

ISSUES:

Review and prioritization of the concept designs for the Jackson Street, Mary Street, Spruce Street, and Third Streets railroad grade separations along the Burlington Northern Santa Fe (BNSF) line (Attachment 1).

RECOMMENDATIONS:

That the Transportation Committee recommend that City Council:

1. Approve the Third Street/BNSF as the top priority railroad grade separation;
2. Adopt a priority order for the three remaining grade separations; and
3. Direct the Public Works Department to issue a Request for Proposals (RFP) to complete the Project Approval and Environmental Document (PA&ED) phase of the Third Street grade separation.

BACKGROUND:

Transportation Committee

On June 12, 2014, the Transportation Committee received a report on the prioritization of grade separation projects and unanimously recommended that the City Council prioritize Madison Street, Third Street, Spruce Street, and Jackson Street rail crossings for conceptual grade separation design and future funding opportunities including providing alternative options for Madison Street and noting the importance of gathering input from all Councilmembers.

City Council

On March 17, 2015, the City Council received a report on the prioritization of grade separation projects and continued discussion of the Madison Street, Third Street, Spruce Street and Jackson Street rail crossings and requested staff return with data on all locations including

pedestrian, bicycle, and commercial traffic counts.

On May 5, 2015, the City Council received an updated report including the results of the vehicle classification, pedestrian, and bicycle counts and approved the Jackson Street, Mary Street, Spruce Street and Third Street rail crossings for conceptual grade separation design and future funding opportunities.

DISCUSSION:

Jackson Street/BNSF

Two alternatives are presented for a grade separation at Jackson Street (Attachments 2 and 3). Both alternatives are for an underpass and propose to lower Jackson Street below the railroad tracks. Alternative 1 maintains a straight alignment on Jackson Street (similar to the Streeter Avenue underpass), and Alternative 2 realigns Jackson Street to the south (similar to the Magnolia Avenue underpass). Both alternatives will be evaluated in detail during the next phase of engineering design, Project Approval and Environmental Documents (PA & ED). The estimated cost for a railroad grade separation at Jackson Street is $35 million.

Mary Street/BNSF

Two alternatives are presented for a grade separation at Mary Street (Attachments 4 and 5). Both alternatives are for an underpass and propose to lower Mary Street below the railroad tracks. Alternative 1 maintains a straight alignment whereas Alternative 2 will realign Mary Street to the north. Both alternatives will be evaluated in detail during a subsequent PA & ED phase. The estimated cost for a railroad grade separation at Mary Street is $35 million.

Spruce Street/BNSF

Two alternatives are presented for a grade separation at Spruce Street (Attachments 6 and 7). Alternative 1 is for a railroad overpass with Spruce Street being raised to go over the railroad tracks. Frontage roads (similar to Columbia Avenue overpass) will be required to maintain access to Kansas Avenue (east). Through traffic on E. La Cadena Drive and Kansas Ave. (west) will be maintained under the proposed overpass, however access to Spruce Street will be eliminated. Alternative 2 is for a railroad underpass with Spruce Street being lowered to go under the railroad tracks. Both alternatives will be evaluated in detail during a subsequent PA & ED phase. The estimated cost for a railroad grade separation at Spruce Street is $50 million.

Third Street/BNSF

In 2006, the Public Works Department began the preliminary engineering for the Third Street grade separation project. In 2007, the State allocated $17.5 million in Proposition 1B funding under the Trade Corridor Improvement Fund (TCIF) for the project. Also, in the same year, the City through Riverside County Transportation Commission (RCTC) secured $7 million in federal funds for the project.

By February of 2011, the design of the project had been narrowed to one alternative (Attachment 8). However, the project had become increasingly costly due to the railroad's need to maintain full track capacity during construction, impacts on adjacent properties and proximity to the Riverside Canal and 91 Freeway. Additionally, due to poor economic conditions, the

likelihood of securing the $15.7 million in unsecured funds to complete construction and meet the TCIF deadline of December 2013 had become extremely unlikely. Therefore, on February 15, 2011, the City Council approved placing the project on-hold and redirecting financial and personnel resources allocated to the Third Street grade separation to the BNSF quiet zone project.

Subsequently, RCTC reprogrammed the $7 million in federal funds for the Third Street grade separation project to the BNSF quiet zone. Additionally, RCTC reprogrammed $7.7 million in unused 1988 Measure A Highway and Commuter Rail funds from the La Sierra Avenue/SR 91 and Van Buren Boulevard/SR 91 Interchange projects to the BNSF quiet zone project, making the latter project fully funded.

The estimated cost for a railroad grade separation at Third Street is $45 million.

Crossing Data

Table 1 provides vehicular, pedestrian, and school and transit bus data as well as estimated cost for each project. Table 2 provides the current train data at each crossing, accident history, the RCTC priority ranking for each crossing and whether the crossing is in an active Quiet Zone.

As can be seen in Table 1, a large number of school buses cross the Third Street and Spruce Street rail crossings, due to the proximity of these crossings to the Student Transportation-America bus depot in the corner of Massachusetts and Kansas Avenues. Per discussions with transportation staff at the Riverside Unified School District (RUSD), a grade separation at either Third or Spruce Street will result in most, if not all, of these buses being rerouted through the separation.

Table 1

Location	Average Daily Traffic (2015)	School Bus Crossings (1)	RTA Bus Count (2)	Pedestrians	Bicycles	Freeway Connectivity	Cost ($MM)
Jackson St.	7,241	50	-	399	29	No	35
Mary St.	16,069	40	-	146	71	No	35
Spruce St.	14,613	550*	-	36	61	Yes	50
Third St.	11,472	400*	23/41	137	95	Yes	45

(1) Current school bus crossing data obtained from RUSD. Includes all large and small school buses as well as special need vehicles.

(2) RTA bus count – Lower bus count is for weekends. Higher bus count is for weekdays.

** - Approximately 180 of these school buses are empty, going to and coming from the Student Transportation-America bus depot at the north-east corner of Massachusetts and Kansas Avenues.*

Table 2						
Location	Average Daily Train Count	Gate Down Time - Minutes	Vehicles Queued behind Gates	Train Accidents: Fatal/Non-Fatal (Past 10 Years)	2012 RCTC Priority Group	Quiet Zone (3)
Jackson St.	107	166	625	1/0	3	Yes
Mary St.	107	161	766	1/0	2	Yes
Spruce St.	123	244	2196	1/2	1	No
Third St.	123	256	1339	0/1	1	No

(3) Spruce St. and Third St. rail crossings are included in a future Quiet Zone project, and are anticipated to be fully funded by FY2022/2023.

Evaluation Criteria

Each crossing was evaluated based on the following criteria (Table 3):

1. Train Count – 10 points assigned to the crossing with the highest train volume.

2. Train Noise – 10 points assigned to the crossing not in an existing Quiet Zone.

3. Average Daily Traffic (ADT) – 10 points assigned to the crossing with the highest number of vehicles.

4. Bus Count – 10 points assigned to the crossing with the highest volume of school plus transit buses.

5. Freeway Connectivity – 10 points assigned to the crossing with direct connection to the freeway.

6. Cost – 10 points assigned to the crossing with the lowest estimated cost for grade separation.

7. RCTC Priority Ranking – RCTC employs a grade separation ranking of 1 (highest priority) to 5 (lowest priority). 10 points assigned to the crossing with RCTC priority ranking 1.

8. TUMF Network – 15 points assigned to each crossing in the existing TUMF Network.

9. Accident History – 15 points assigned to the crossing with the highest number of accidents.

Table 3										
Location	(1) Train Count (10%)	(2) Train Noise (10%)	(3) ADT (10%)	(4) Bus Count (10%)	(5) Freeway Connectivity (10%)	(6) Cost (10%)	(7) RCTC Priority (10%)	(8) TUMF Network (15%)	(9) Accident History (15%)	Total (100%)
Jackson St.	8.7	0	4.5	0.9	0	10	6	0	5	35.1
Mary St.	8.7	0	10	0.7	0	10	8	0	5	42.4
Spruce St.	10	10	9	10	10	7	10	0	15	81.0
Third St.	10	10	7.1	8	10	7.8	10	15	5	82.9

All items are equally weighted except items 8 and 9, due to the significance of safety and project funding. Based on a review of past City Council actions and the scores in Table 3, the Third Street grade separation is the top ranked grade separation.

Funding

Although funding for additional grade separations is now very limited, it remains a top legislative priority for the City and RCTC. In April 2016, RCTC submitted an application to the California State Transportation Agency (CalSTA) Transit and Intercity Rail Capital Program (TIRCP) for Cap and Trade grant funding to implement RCTC's Metrolink and Amtrak Grade Separations project, which included the Third Street grade crossing. A total of 41 applications for funding from around the State were submitted for consideration. In August 2016, CalSTA announced 14 recipients for the TIRCP grants which did not include RCTC. Currently, RCTC is working with the Southern California Association of Governments (SCAG) to prioritize critical urban freight corridors, including grade separations. Priority projects that are identified, which includes Third Street, may be submitted for future funding opportunities such as the next round of U.S. Department of Transportation Nationally Significant Freight and Highway Projects (NSFHP) program grant application, due in early 2017.

Public Works Department staff recently met with staff and the Director of Transportation from Western Riverside Council of Governments (WRCOG) to discuss potential funding opportunities. Currently, WRCOG is in the process of updating the Transportation Uniform Mitigation Fee (TUMF) Nexus Study which is expected to be completed in early 2017. The TUMF Network (which is a component of the Nexus Study) includes the Adams Street, Madison Street, and Chicago Avenue grade separations. Per discussions with WRCOG if none of the aforementioned grade separations are top City priorities, they can be removed from the existing TUMF Network and replaced with other City top priorities provided they meet the inclusion criteria outlined in the TUMF Nexus Study. Currently, the Third Street rail crossing is the only location that meets this criteria since the rail crossing is located on an arterial road that is already in the existing TUMF Network. Public Works Department has requested WRCOG to replace the Chicago Avenue grade separation with the Third Street grade separation, due to completion of Columbia and Iowa Avenue grade separations in recent years, both of which provide direct freeway access. With the actual TUMF revenues being higher than projection, the likelihood of receiving some level of future TUMF funding has improved.

Since the great recession, much emphasis has been placed on funding projects that are "shovel ready". Although a significant investment in engineering design fees and right-of-way acquisition costs are required to make a project shovel ready, the City's strategy of prioritizing and designing projects has in the past proven effective in securing funding for these projects.

FISCAL IMPACT:

There is no impact to the General Fund associated with this report. The cost to complete the PA&ED phase of a railroad grade separation is approximately $750,000, depending on complexity. Sufficient funds are available in Account numbers 9586627-440223 (Miscellaneous Railroad Project Management - Gas Tax) and 9586630-440313 (Miscellaneous Railroad Project Management – 2009 Measure A) for the preliminary engineering of the top ranked grade separation.

Prepared by: Kris Martinez, Public Works Director
Certified as to
availability of funds: Scott G. Miller, PhD, Chief Financial Officer/City Treasurer
Approved by: Al Zelinka, FAICP, Assistant City Manager
Approved as to form: Gary G. Geuss, City Attorney

Attachments:

1. Grade Separation Map
2. Jackson Street/BNSF Alternative 1
3. Jackson Street/BNSF Alternative 2
4. Mary Street/BNSF Alternative 1
5. Mary Street/BNSF Alternative 2
6. Spruce Street/BNSF Alternative 1
7. Spruce Street/BNSF Alternative 2
8. Third Street/BNSF Preferred Alternative
9. Presentation

MINUTES

TRANSPORTATION COMMITTEE
City of Riverside
Thursday, February 9, 2017, 1 p.m.
Art Pick Council Chamber

PRESENT: Vice Chair Mac Arthur and Member Melendrez

ABSENT: Chair Davis

STAFF PRESENT: Dana Roa, Kristi Smith, Alex Nguyen, Chuck Conder, Carl Carey, Kris Martinez, Farshid Mohammedi, and others

ALSO PRESENT: Julianna Gonzalez Adams and R.A. Barney Barnett

Vice Chair Mac Arthur convened the meeting at 1 p.m.

RIVERSIDE MUNICIPAL AIRPORT UPDATE
Following discussion and without formal motion, the Committee unanimously received and order filed the biannual report on the operation and activities of Riverside Municipal Airport. Motion carried unanimously.

CONCEPT DESIGN AND PRIORITIZATION - THIRD STREET RAILROAD GRADE SEPARATION ALONG BURLINGTON NORTHERN SANTA FE LINE
Following discussion, motion was made by Member Melendrez and seconded by Vice Chair Mac Arthur recommending that City Council (1) approve Third Street along the Burlington Northern Santa Fe (BNSF) line as top priority railroad grade separation; (2) adopt a priority for the three remaining grade separations, Spruce Street, Mary Street, and Jackson Street; and (3) directed the Public Works Department to issue a Request for Proposals to complete the Project Approval and Environmental Document phase of the Third Street grade separation. Motion carried unanimously.

ORAL COMMUNICATIONS FROM THE AUDIENCE
R.A. Barney Barnett spoke regarding the Metrolink Station in Highgrove.

ITEMS FOR FUTURE TRANSPORTATION COMMITTEE CONSIDERATION AS REQUESTED BY MEMBERS OF THE COMMITTEE
There were no items requested for future Transportation Committee meetings.

The Transportation Committee adjourned at 2 p.m.

Respectfully submitted,

DANA ROA
Deputy City Clerk

Appendix B: Quiet Zone Analysis Background

B-1: Overview, Approval Process and Method of Establishing QZ

Definition and Background

Train horn rules are established by the FRA. In 2005, the FRA adopted the Final Rule on the use of train horns at public at-grade crossings. The rule states that all trains must sound their horns at all public crossings; however, the rule also includes provisions for communities to establish QZs wherein locomotive horns are not sounded. QZ refers to a segment of a railroad line that has one or more consecutive public highway-rail crossings at which locomotive horns are not routinely sounded. Under normal conditions within the QZ, train horns will not be used. However, when a locomotive engineer perceives a dangerous condition, such as trespassers on the railroad or a car stopped on the tracks, he or she can use the locomotive horn at their discretion. Additionally, railroad construction activities within a QZ require the locomotive engineer to sound the train horn as an added safety measure. The FRA Rule also allows for either 24-hour QZ or Partial QZ, which are in effect only during the evening or nighttime hours.

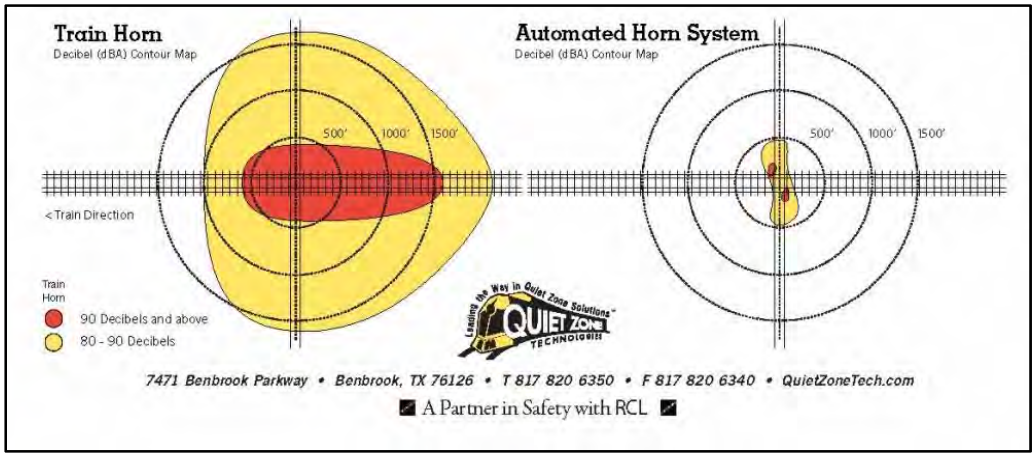
Wayside Horns

The FRA rule also allows cities to install Wayside Horns, which are stationary horns that emit a sound similar to a train horn, but directed perpendicular to the railroad right of way (ROW). The sound emanating from a Wayside Horn is aimed directly towards vehicles and pedestrians at the roadway thus minimizing and confining the "sound footprint" to a smaller area as compared to the sound footprint of a train horn.

A wayside horn, also known as an Automated Horn System (AHS), consists of a post-mounted, stationary horn located at a highway-rail grade crossing that is designed to provide audible warning to oncoming motorists when a train is approaching. A wayside horn is controlled by the same track circuitry that is configured to activate automatic warning devices at highway-rail grade crossings. The audible signal supplants the need for the routine sounding of locomotive horns at railroad crossings.

Figure 1 from an AHS vendor website (www.quietzonetech.com) shows the comparative sound-footprint of an AHS and a locomotive moving through a crossing. The figure indicates that at identical decibel levels, the "sound footprint" created by an AHS is significantly smaller than that from a train horn.

Figure 1: Wayside Horn (AHS) Sound Footprint



Source: www.quietzonetech.com

Quiet Zone Approval Process

Establishment of a QZ is a city-initiated process. Each city would need to obtain approval from the railroad stakeholder, the California Public Utilities Commission (CPUC) and the FRA. Table 1 provides a listing of the approving agency as well as its governing process and a contact person from each agency.

Table 1: Agency Contacts for Quiet Zone Establishment

Agency	Required Process, Procedure, or Guidelines	Contact Person
Caltrans	GO 88-B Concurrence and potentially an Encroachment Permit	David Buzon (909) 889-7867
CPUC	General Orders (GO) GO-26D GO-75 GO 88-B	Sergio Licon (213) 576-7085
FRA	49 CFR Parts 222 and 229 Use of Locomotive Horns at Highway-Rail Grade Crossings; Final Rule	LeeAnn Dickson leeann.dickson@dot.gov
BNSF	49 CFR 222.43(b) Notice of Intent 49 CFR 222.43(d) Notice of Quiet Zone Establishment GO 88-B	Jason L. Sanchez (909) 386-4474
UP	49 CFR 222.43(b) Notice of Intent 49 CFR 222.43(d) Notice of Quiet Zone Establishment GO 88-B	Daniel Z. Moreno (909) 685-2288
Southern California Regional Rail Authority (SCRRA)	SCRRA Quiet Zone Guidelines and Procedures and SCRRA Highway-Rail Grade Crossings Manual	Naresh Patel, PE (909) 392-8401

Source: HDR

Methods for Establishing a Quiet Zone

The FRA Rule describes two methods of establishing a QZ:

- Public Authority Designation; and
- Public Authority Application to FRA.

Public Authority Designation

With the Public Authority Designation method, a formal application to and approval by FRA is not required. A city, acting as the "public authority" must demonstrate that the implementation of SSM "reduces the risk index to a level that is equal to or less NSRT at gated crossings with horns, or the risk is reduced enough to compensate for the loss of the safety benefit afforded by a train sounding its horn."

Two basic prerequisites that must be met under the Public Authority Designation Method are:

- Each public crossing within a New QZ must at a minimum be equipped with gates and constant warning time devices.
- A QZ must be at least one half mile in length.

Table 2 presents details of the three options for a Public Authority Designation.

Table 2: Public Authority Designation Options

Option	Description	Reporting Requirements Periodic Update of Inventory Forms
Option 1	A QZ may be designated if the existing QZRI, is below the NSRT.	Every 2 ½ to 3 years
Option 2	A QZ may be designated if SSMs are applied to every public at-grade crossing within the QZ.	Every 4 ½ to 5 years
Option 3	A QZ may be designated if SSMs/ASMs are instituted and results in a reduction of the QZRI to a level below the NSRT, or to the risk level which would exist if locomotive horns sounded at all crossings within the zone.	Subject to Annual Review by the FRA Periodic updates required every 2 ½ to 3 years

Source: FRA

Public Authority Application to FRA

The Public Authority Application method, which would employ ASMs or Modified SSMs, is desirable only as a last resort if the requirements of the Public Authority Designation method cannot be met. ASMs require FRA approval for that specific safety measure before construction can begin.

B-2: Risk Index and Safety Measures

Determination of the feasibility of a proposed Quiet Zone relies on two basic parameters: Risk Index and Safety Measures, described below.

Risk Indices

The term "risk index" refers to the predicted cost to society of casualties that are expected to result from collisions at an individual railroad at-grade crossing. The two components of a risk index are predicted cost of fatalities; and predicted cost of injuries. These costs are based on a formula published by the United States Department of Transportation (USDOT). The USDOT prediction formula allow users to rank crossings for safety improvements by the probability of a collision occurring. Outputs of the USDOT prediction formula include predicted collisions, probability of a fatal collision, and the probability of a casualty collision (which includes both fatalities and injuries). The following terms used in the formula are referenced throughout this report:

- Nationwide Significant Risk Threshold (NSRT): The average Risk Index of all public gated highway-rail grade crossings in the nation at which train horns are routinely sounded.
- Risk Index With Horns (RIWH): A measure of risk to the motoring public when locomotive horns are routinely sounded at every public highway-rail grade crossing within a quiet zone.
- Quiet Zone Risk Index (QZRI): The average risk index for all public crossings in a proposed QZ, taking into consideration the increased risk caused by the absence of train horns and any decrease in risk attributable to the use of Supplemental Safety Measures (SSM) or Alternative Safety Measures (ASM).

Quiet Zone Safety Measures

The FRA rule describes two categories of safety measures that can be implemented to establish a QZ:

- SSM – Supplemental Safety Measures
- ASM – Alternative Safety Measures

Supplemental Safety Measures

SSM are infrastructure improvements, which when installed at highway-rail grade crossings within a QZ, would reduce the risk of a collision at the crossing. SSMs are installed to reduce the risk level either to the level that would have existed if the train horn were sounded (compensating for the lack of the train horn) or to a level below the NSRT. Approved SSMs include:

- Four quadrant gates
- Gates with medians or channelization devices

Alternative Safety Measures

ASM are safety systems or procedures provided by the appropriate traffic control authority which, after individual review and analysis, are determined by the FRA to be an effective substitute for the locomotive horn at specific highway-rail grade crossings. ASMs include:

- Modified Supplementary Safety Measures: An SSM that has in some way been adjusted to accommodate unique circumstances existing at a specific highway-rail grade crossing and no longer conforms to the SSM requirements. Modified SSMs are considered ASMs. An example of a modified SSM would be traffic

channelization devices that due to a nearby intersection are only 45 feet in length instead of the required minimum of 60 feet.

- Engineering Alternative Safety Measures: Engineering improvements other than modified SSMs include improvements that address underlying geometric conditions, including sight distance, that are a source of increased risk at the crossing.
- Non-engineering Alternative Safety Measures: Photo enforcement or a consistent and systematic program of traffic law enforcement, public education programs, or a combination thereof, that produces a measurable reduction of risk at designated QZ highway-rail grade crossings.

Appendix C: Quiet Zone Analysis and Calculations

C-1: QZ Analysis

Data Considered for Quiet Zone Analysis

The FRA has established an online calculator tool for evaluating the feasibility of implementing a QZ. Inputs into the online FRA QZ calculator determine the risk at a particular crossing or within a corridor containing several crossings, and indicates whether or not a QZ is feasible. The FRA calculator requires the following factors in order to determine risk:

Roadway factors for the arterial that crosses the at-grade crossing:

- Traffic volume
- Posted speed
- Number of traffic lanes
- Urban or rural location
- Paved or non-paved roadway approaches
- Accident history within the past 5 years

Railroad factors at the at-grade crossing:

- Maximum speed
- Number of tracks, both main tracks and non-main tracks
- Train counts: total trains, switching movements, through trains
- Daytime and nighttime train movements.
- Table 3 documents the existing conditions, roadway and railroad data for all 27 crossings that was input into the FRA QZ calculator to determine QZ feasibility. The 27 crossings have been grouped into ten potential QZ corridors based on jurisdiction and railroad ownership. The results of the FRA QZ calculator are presented in Appendix C-2

Table 3: Data Considered for Quiet Zone Analysis

Jurisdiction	Potential QZ Corridor	Crossing Location	DOT #	CPUC #	Existing Condition Data			Roadway Data (2016)						Railroad Data (2016)						
					# of Roadway Lanes	Surrounding Land Uses	Existing SSMs	Present Warning Devices*	Annual Average Daily Traffic	Highway Paved? 1= yes	Urban-Rural Location 0=rural 1=urban	Number of Accidents in the past 5 years		Total Number of Train Movements per Day	Total Number of Through Trains per Day	Total Number of Switch Trains per Day	Number of Main Tracks	Total Number of Tracks (Main and Other)	Number of Through Trains per Day During Daylight	Max. Time table Speed, MPH
												Total	Fatal							
Banning	Banning QZ	22ND STREET	760691G	095C-47.40	4	Residential	N/A	G	14,670	1	1	0	0	34	34	2	2	2	17	60
		HARGRAVE STREET	760695J	001B-568.80	2	Residential	N/A	G	17,756	1	1	0	0	34	34	2	2	2	17	60
		SAN GORGONIO AVENUE	760694C	001B-568.20	2	Industrial	N/A	G	12,783	1	1	1	1	34	34	2	2	2	17	60
Beaumont	Beaumont QZ	CALIFORNIA AVENUE	760686K	001B-562.20	2	Industrial	N/A	G	9,821	1	1	0	0	34	34	2	2	2	17	50
		PENNSYLVANIA AVENUE	760688Y	001B-563.10	2	Industrial	N/A	G	10,455	1	1	0	0	34	34	2	2	2	17	60
		VEILE AVENUE	760685D	001B-561.80	2	Industrial	Non-traversable Curb Median	G	2,261	1	1	0	0	34	34	2	2	5	17	50
Calimesa	Calimesa QZ	SAN TIMOTEO CANYON ROAD	760678T	001B-554.90	2	Residential	N/A	G	2,350	1	0	0	0	34	34	0	1	1	17	60
Coachella	Coachella QZ	AVENUE 54	912104B	001B-616.72	4	Commercial	N/A	G	2,418	1	1	0	0	32	32	2	1	1	16	79
Corona	Corona 1 QZ	COTA STREET	026527G	002B-24.50	2	Industrial	N/A	G	5,616	1	1	0	0	72	72	0	2	3	36	60
		JOY STREET	026524L	002B-23.83	4	Industrial	Non-traversable Curb Median	G	11,717	1	1	1	0	72	72	0	2	3	36	60
		SHERIDAN STREET	026526A	002B-24.34	2	Commercial	N/A	G	3,894	1	1	0	0	72	72	0	2	3	36	60
	Corona 2 QZ	MCKINLEY STREET	026519P	002B-21.20	4	Commercial	N/A	G	41,115	1	1	1	1	72	72	0	2	2	36	60
Jurupa Valley	Jurupa Valley QZ	BELLEGRAVE AVENUE	810977P	003-47.10	2	Industrial	N/A	G	12,225	1	1	0	0	40	40	2	1	1	20	70
		JURUPA ROAD	810979D	003-48.20	2	Industrial	N/A	G	13,972	1	1	2	0	40	40	2	1	1	20	70
		RUTILE STREET	810978W	003-47.30	2	Industrial	N/A	G	8,821	1	1	1	1	40	40	2	1	1	20	70
Riverside	Riverside Eastside QZ	3RD STREET	026480N	002B-9.50	4	Industrial	Non-traversable Curb Median	G	11,603	1	1	1	0	79	79	0	3	3	40	55
		CHICAGO AVENUE	026476Y	002B-8.10	4	Industrial	N/A	G	10,222	1	1	3	1	79	79	0	3	3	40	60
		MISSION INN (7TH STREET)	026485X	002B-9.75	4	Industrial	N/A	G	7,850	1	1	2	1	79	79	0	3	3	40	60
		PALMYRITA AVENUE	026474K	001BJ-543.20	2	Industrial	N/A	G	3,806	1	1	0	0	79	79	0	3	3	40	60
		SPRUCE STREET	026478M	002B-8.80	4	Industrial	Non-traversable Curb Median	G	19,010	1	1	1	0	79	79	0	3	3	40	60
Riverside County	Thermal QZ	4TH STREET (66TH AVENUE)	760732J	001B-623.90	2	Residential	Mountable Median	G	8,523	1	0	1	0	32	32	2	1	1	16	79
		AVENUE 58	760730V	001B-619.20	2	Industrial	N/A	G	1,943	1	0	0	0	32	32	2	2	2	16	79
		AVENUE 62	760731C	001B-621.60	2	Vacant	N/A	G	8,378	1	0	1	0	32	32	2	1	1	16	79
	Cabazon QZ	APACHE TRAIL	760696R	001B-572.60	2	Commercial	N/A	G	3,116	1	0	0	0	32	32	2	2	2	16	60
		BROADWAY STREET	760697X	001B-574.00	2	Commercial	N/A	G	6,191	1	0	0	0	32	32	0	2	2	16	60
	Highgrove QZ	CENTER STREET	026471P	002B-6.70	4	Residential	N/A	G	6,256	1	1	0	0	106	106	0	3	4	53	50
		MAIN STREET	026470H	002B-6.40	2	Industrial	N/A	G	2,456	1	1	0	0	106	106	0	3	3	53	60

Source: HDR

* Present Warning Devices: G = Gates, L = Lights, P = Passive

Conceptual Cost Estimate

Generally, cities are responsible for all costs for SSM implementation in order to obtain a QZ. Table 4 presents the estimated unit cost for the SSM categories.

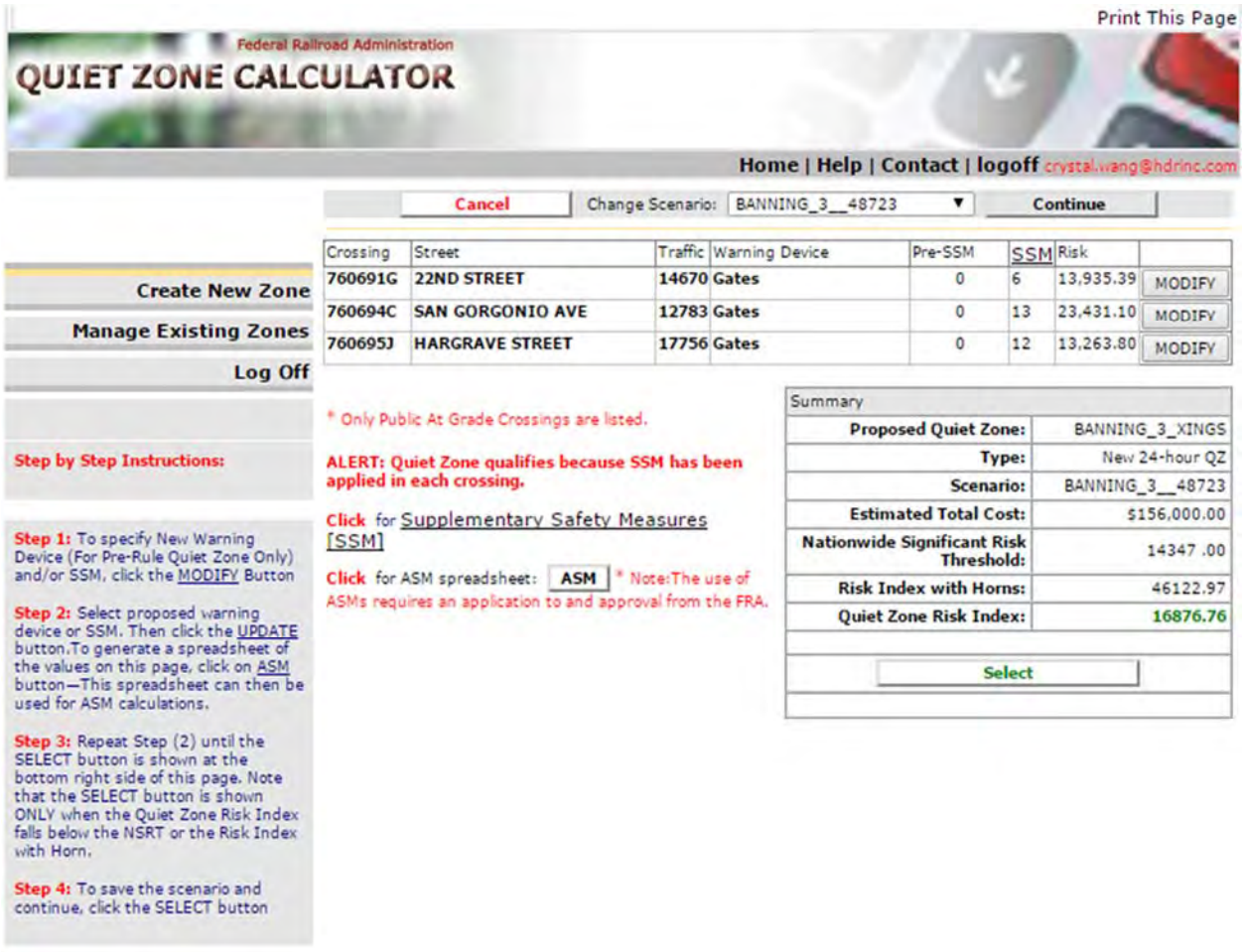
Table 4: Unit Cost for Grade Crossing based on SSM Categories

SSM Category	SSM Description	Estimated Cost
6	Four-Quadrant Gates Upgrade from Two-Quadrant Gates, with Vehicle Presence Detection, Presumes Pedestrian Gates Required	$1,440,000
12	Mountable Medians with Reflective Traffic Channelization Devices	$15,000
13	Non-Traversable Curb Medians with or without Channelization Devices, Presumes Pedestrian Gates Required	$480,000

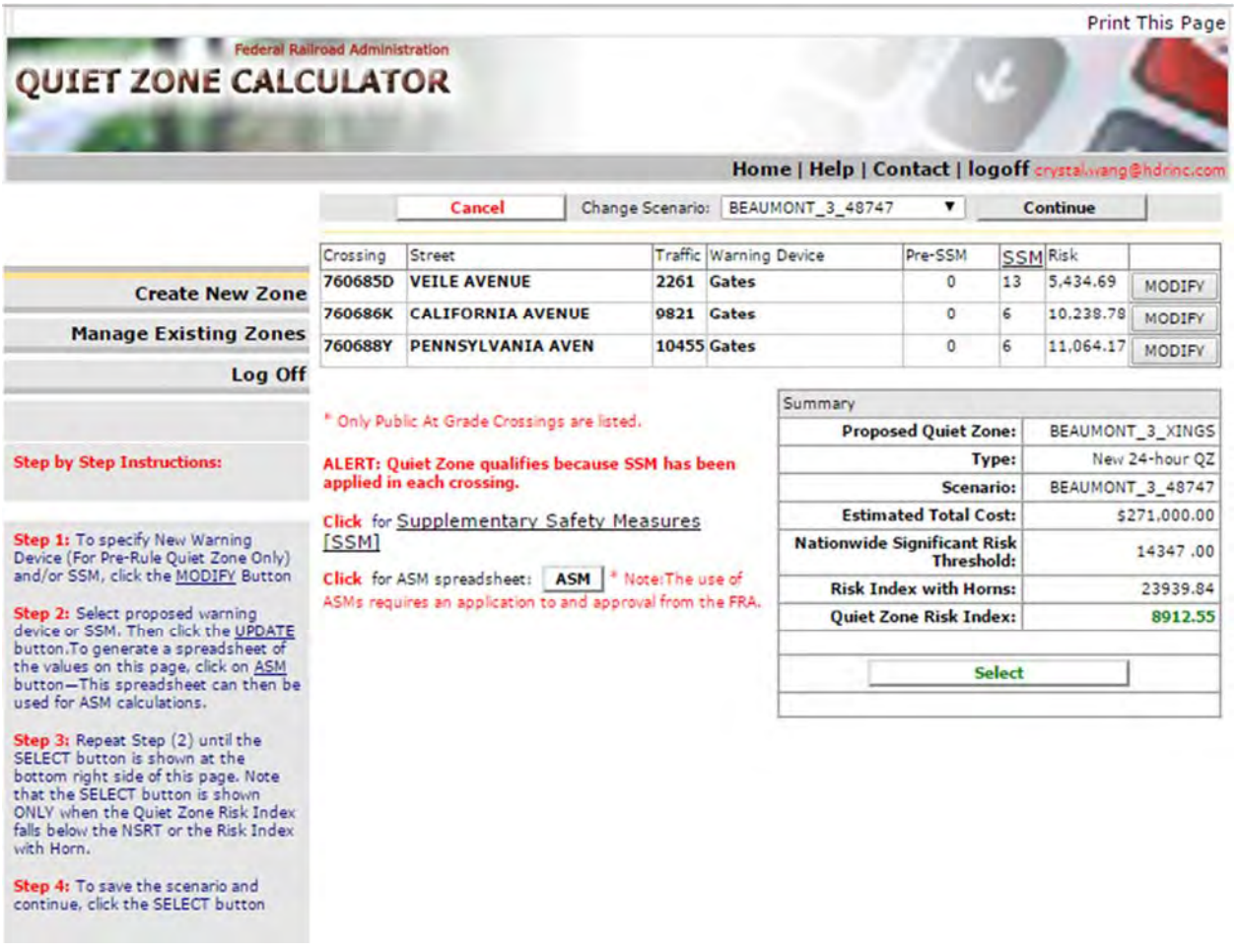
Source: Caltrans

C-2: QZ Calculation

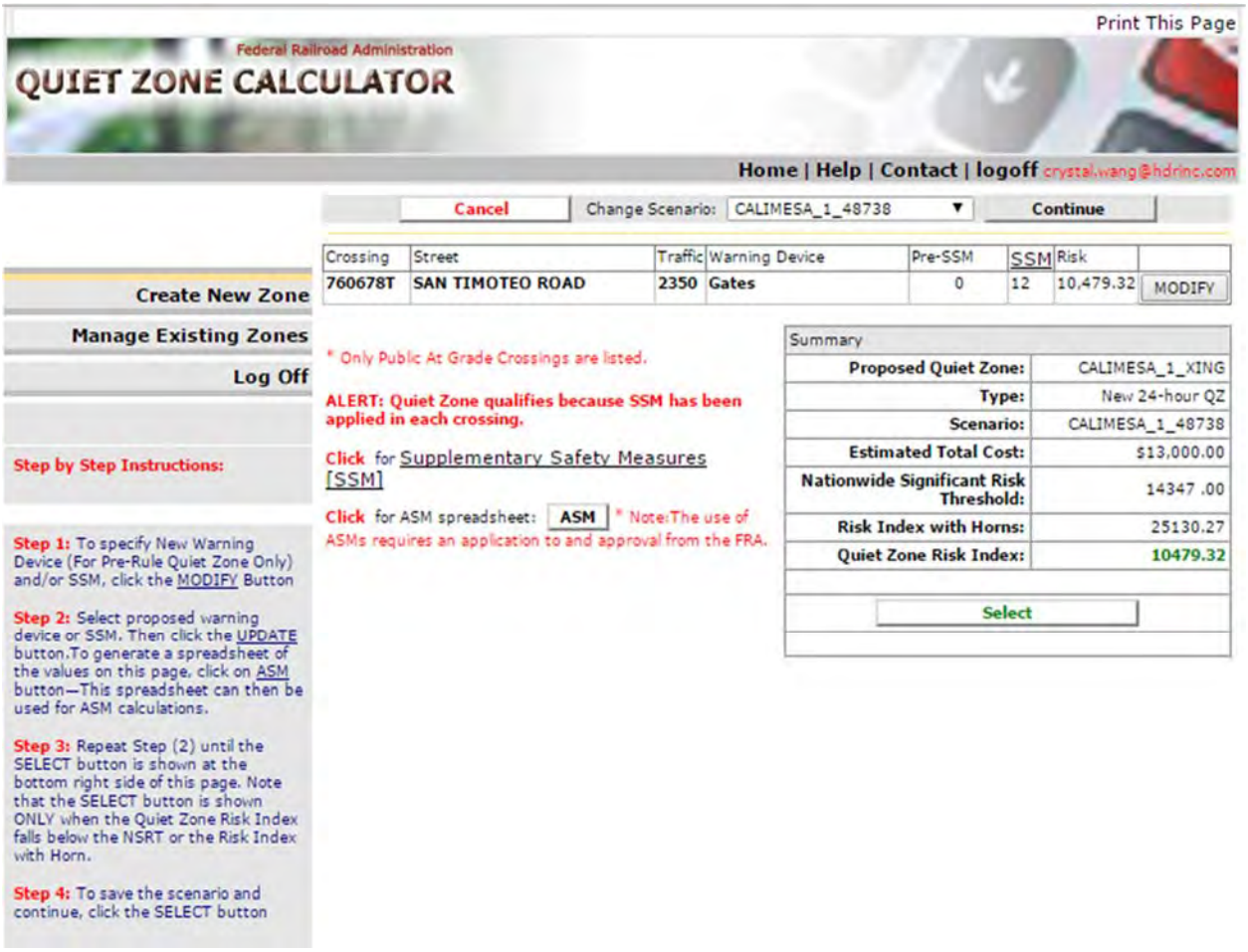
Quiet Zone Calculation for Banning QZ:



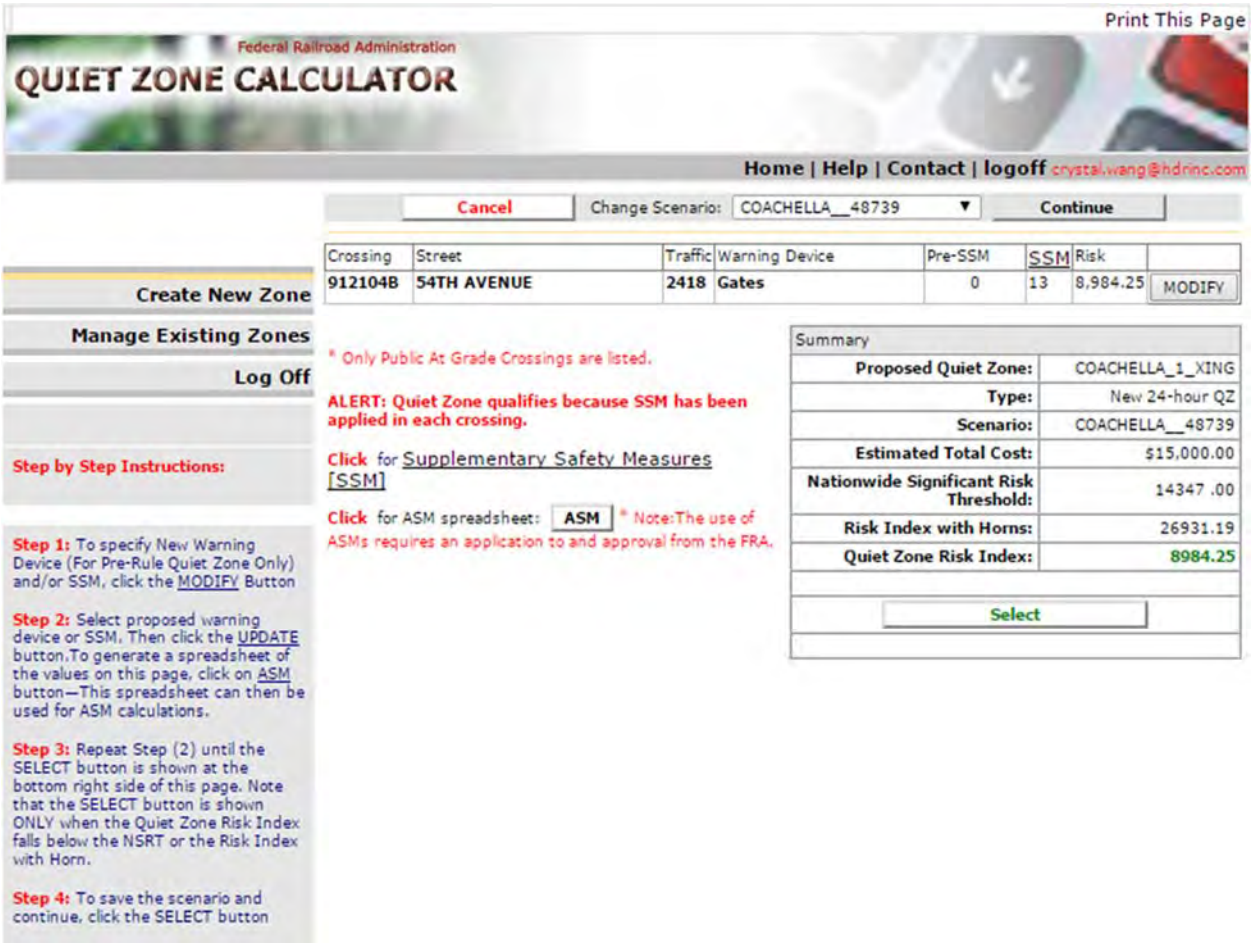
Quiet Zone Calculation for Beaumont QZ:



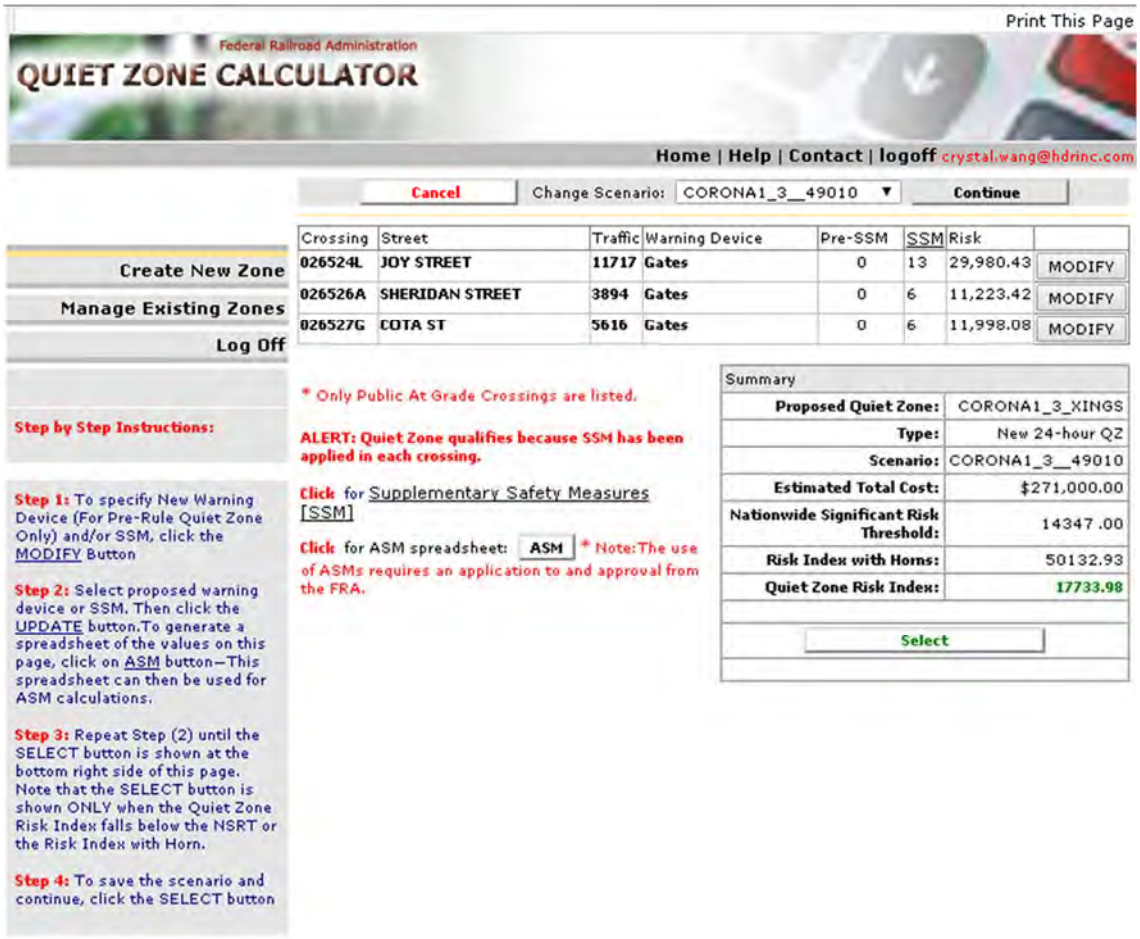
Quiet Zone Calculation for Calimesa QZ:



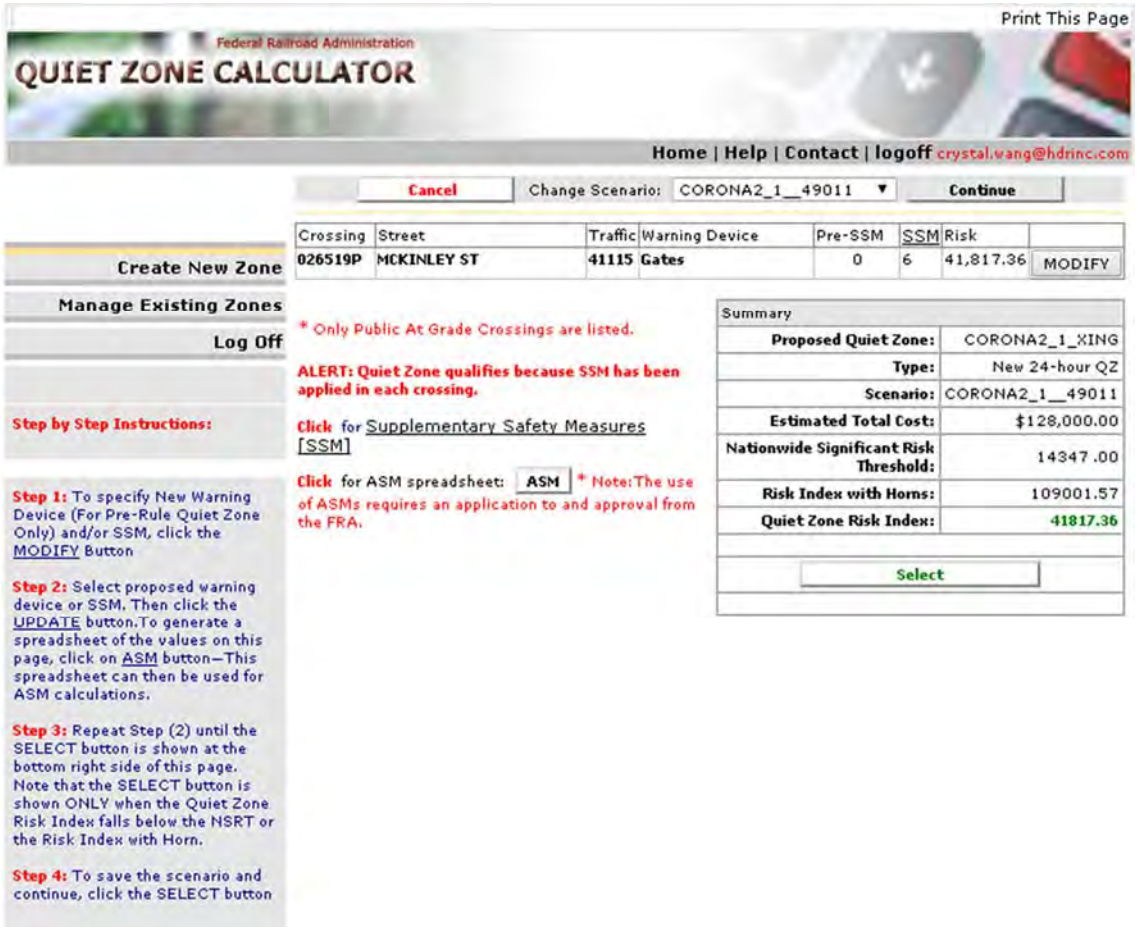
Quiet Zone Calculation for Coachella QZ:



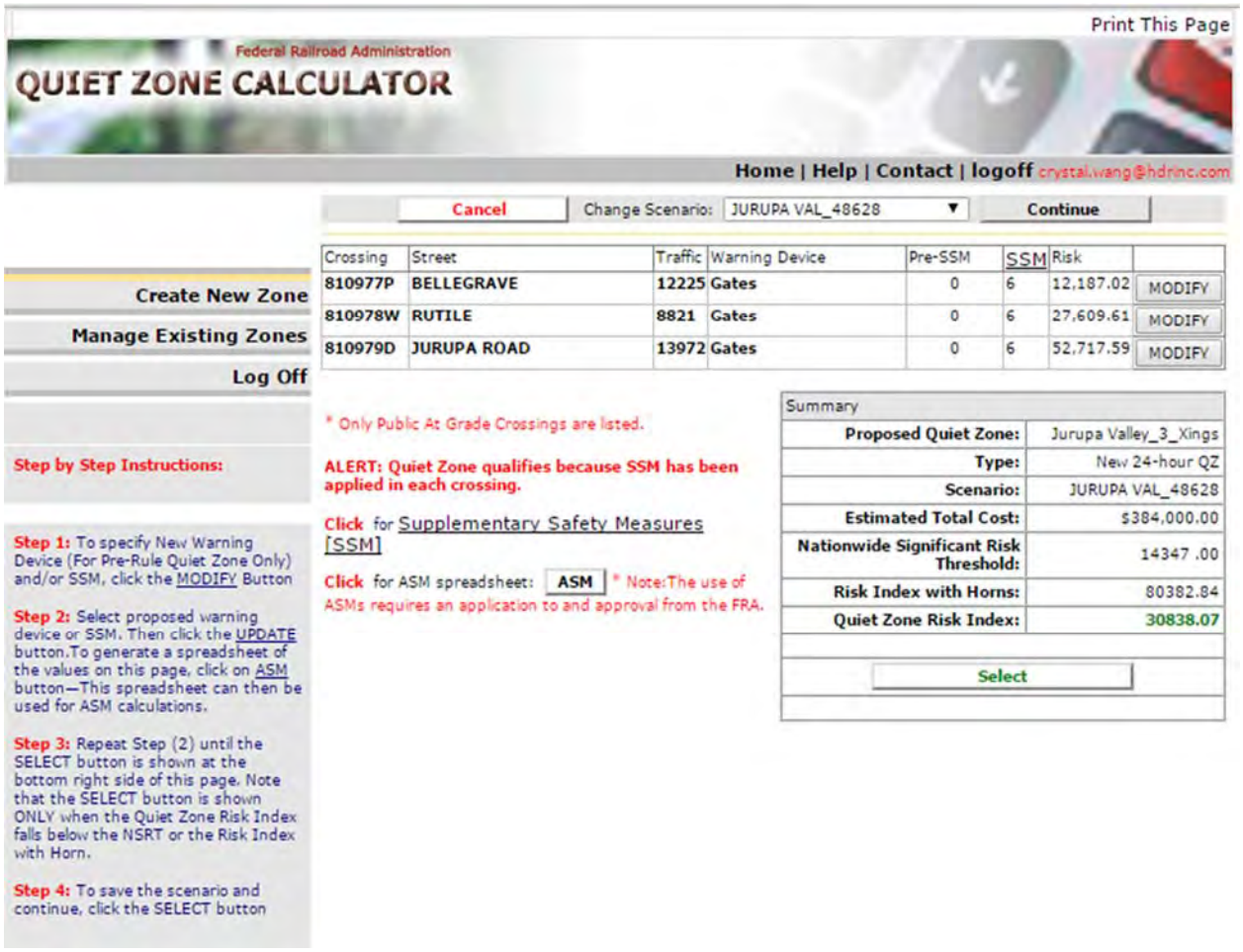
Quiet Zone Calculation for Corona 1 QZ:



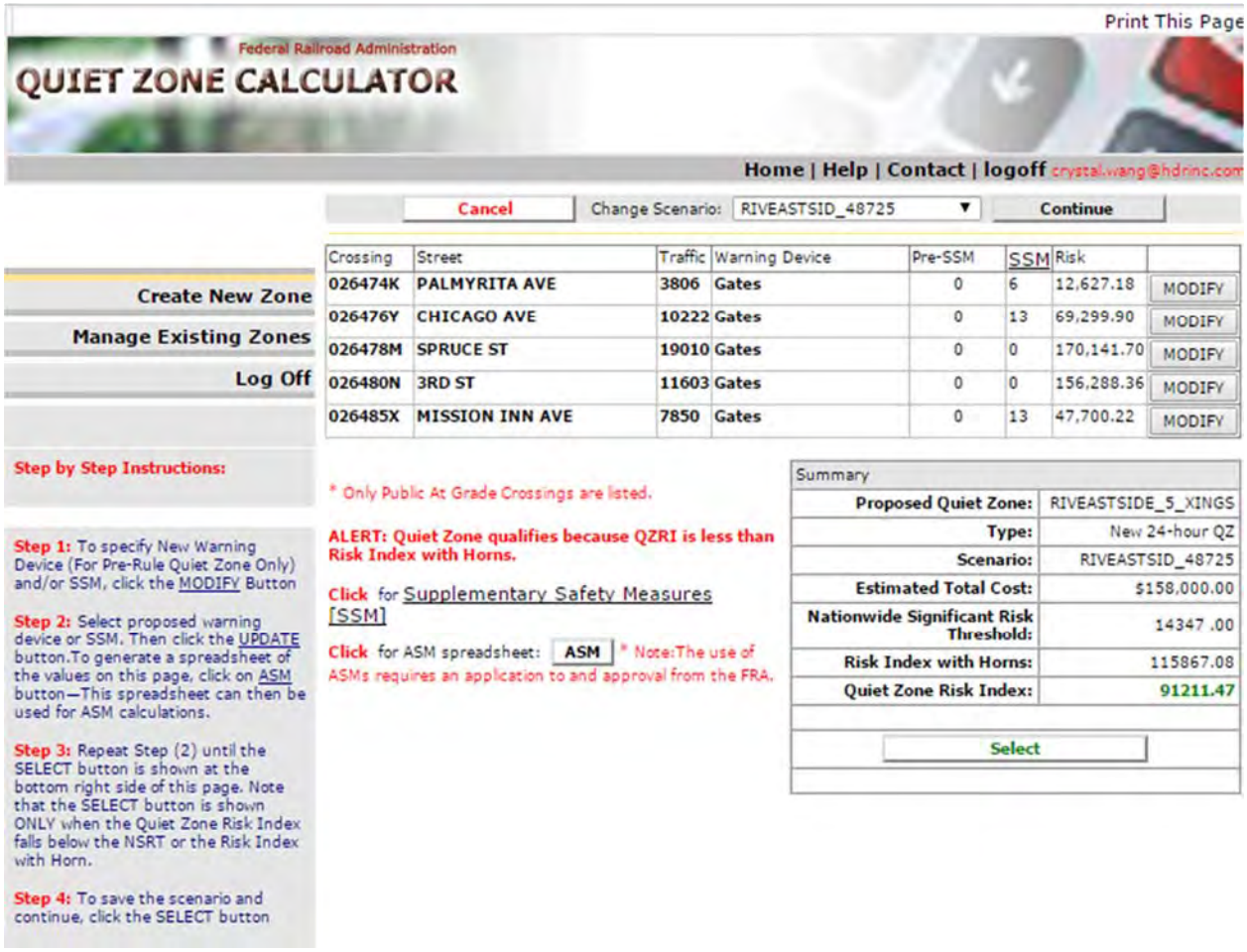
Quiet Zone Calculation for Corona 2 QZ:



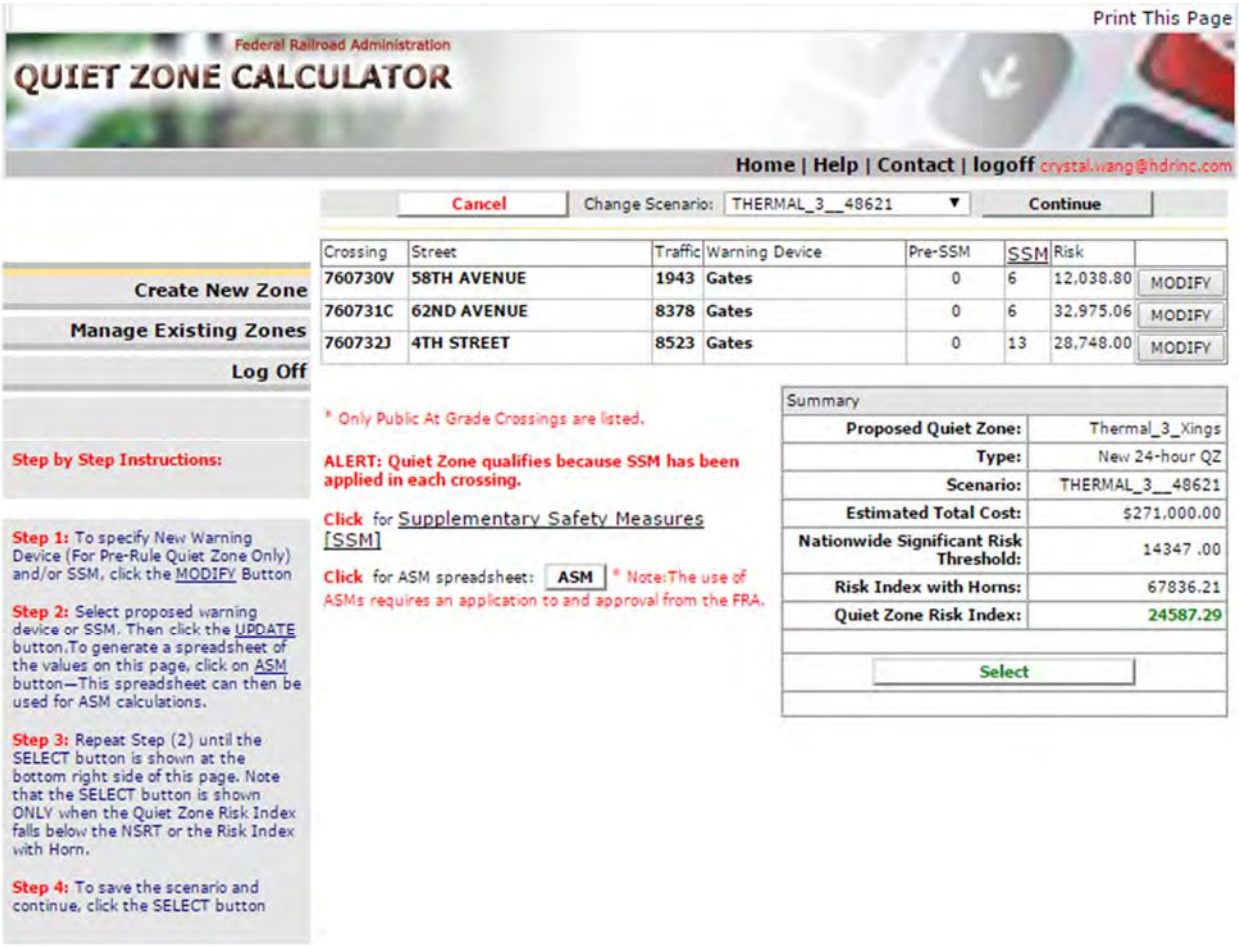
Quiet Zone Calculation for Jurupa Valley QZ:



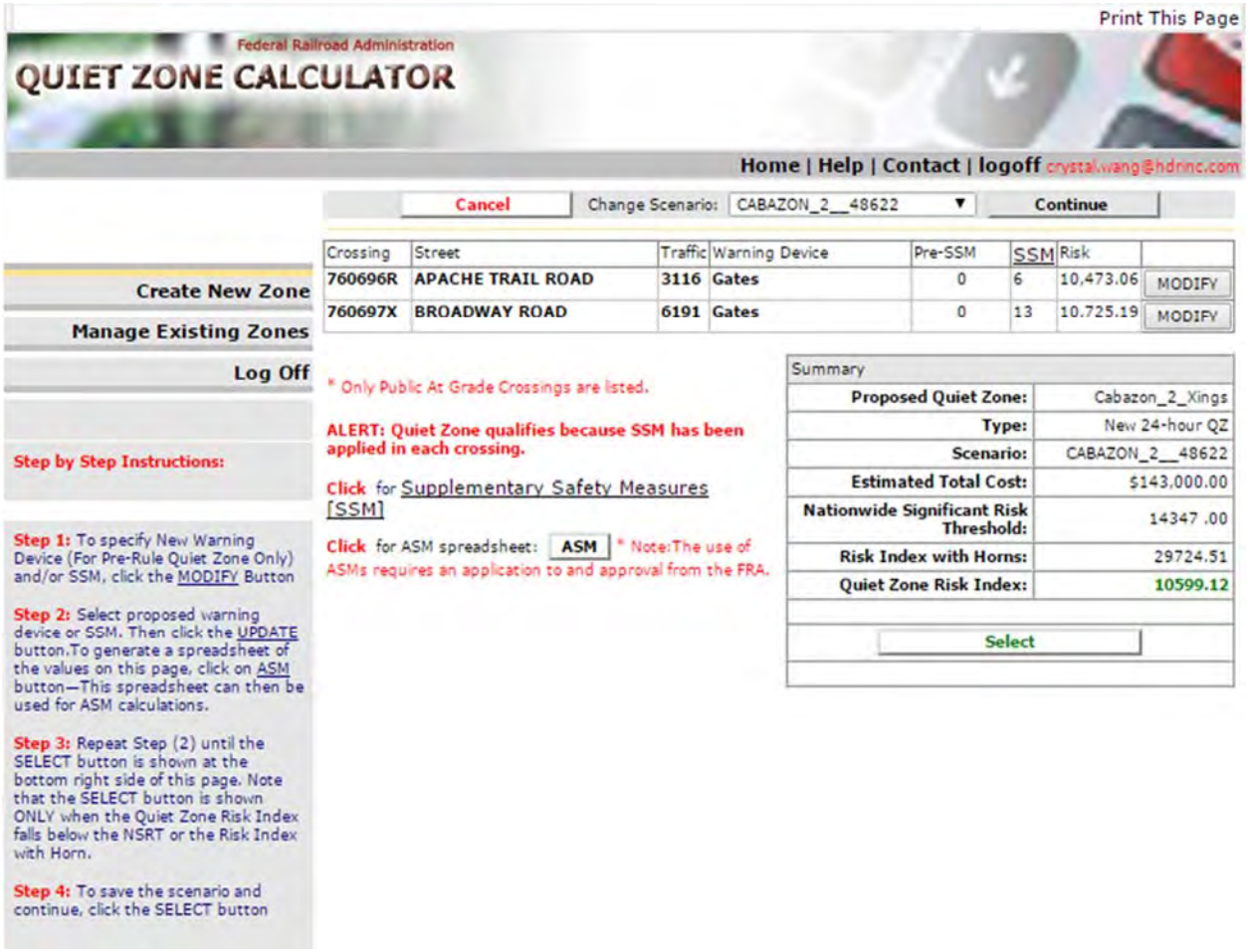
Quiet Zone Calculation for Riverside Eastside QZ:



Quiet Zone Calculation for Thermal QZ (Riverside County):



Quiet Zone Calculation for Cabazon QZ (Riverside County):



Quiet Zone Calculation for Highgrove QZ (Riverside County):