FINAL PROJECT ASSESSMENT

FOR

19th AVE & MCDOWELL ROAD BNSF RAILROAD CROSSING

City of Phoenix Project Number: ST85100439

JUNE 2020

Prepared For and Approved By:

Prepared By:

T·Y·LIN INTERNATIONAL

Table of Contents

List of Appendices

1.0 INTRODUCTION

1.1 Project Overview

The City of Phoenix (City) is evaluating the impacts associated with the widening of McDowell Road, which includes the installation of a new raised median at the railroad crossing south of the intersection with Grand Avenue and 19th Avenue. The new raised median will allow for the installation of new gate arms (eastbound and westbound) at the existing railroad crossing.

1.2 Project Purpose and Need

The primary purpose of this Project Assessment (PA) is to establish a preferred alternative for the widening of McDowell Road to accommodate the installation of a raised median and allow for new gate arms at the existing railroad crossing. A project scope, schedule and budget will be developed based on the preferred alternative selected by the project team. In general, this PA was written with the assumption that federal funds will be used for construction of this project.

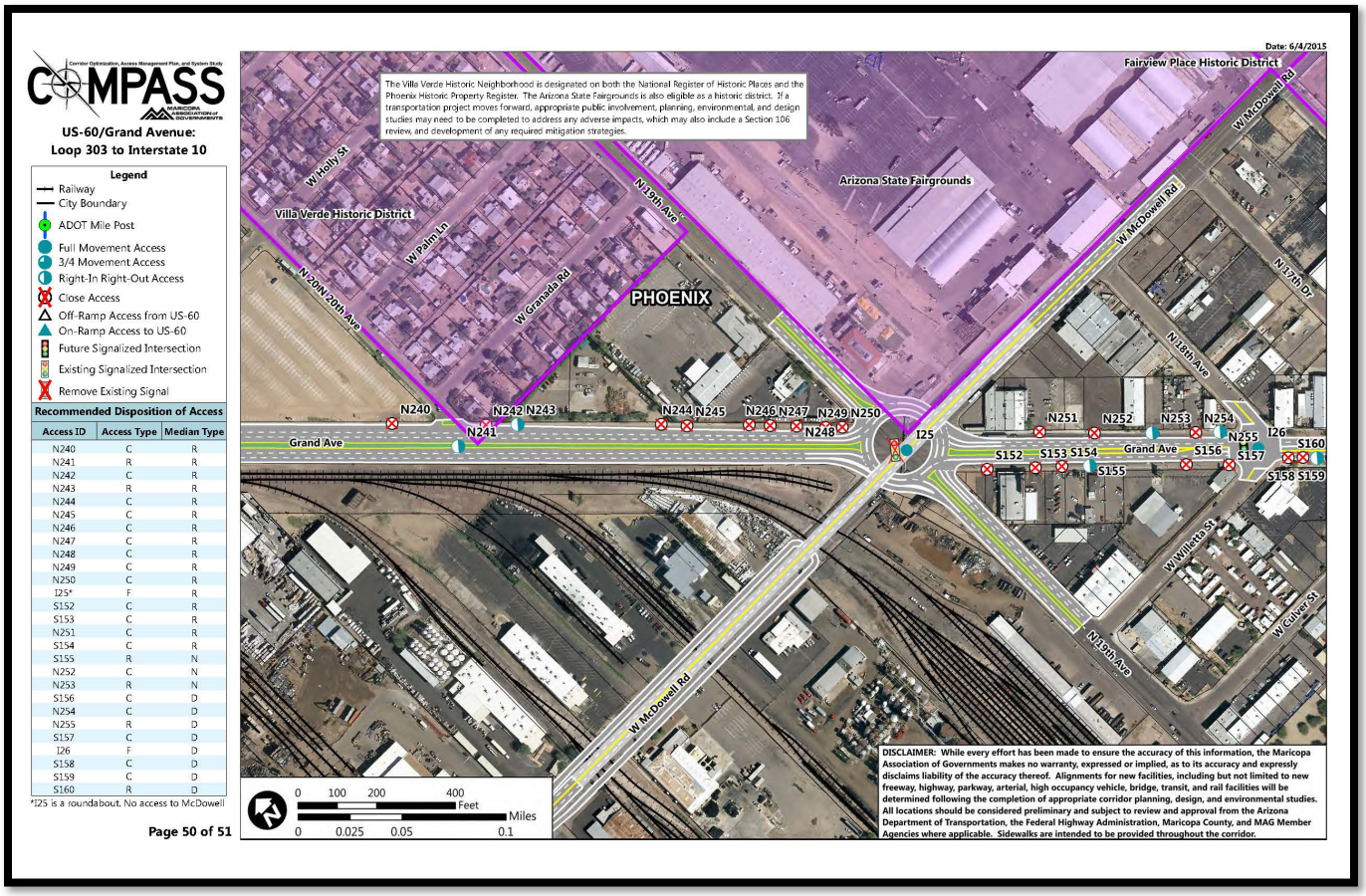
1.3 Project Goals and Objectives

The primary goal of this PA is to provide the City with a recommended alternative which establishes roadway geometrics, design parameters, anticipated construction cost and identifies ultimate right-of-way requirements for the McDowell Road railroad crossing west of 19th Avenue. The project team developed the following list of goals and objectives:

- Document existing project features, such as a current aerial photography, existing utilities, and property ownership throughout the project limits;
- Develop and evaluate conceptual alternatives for the widening of McDowell Road at the railroad crossing to allow for the installation of a new raised median with gate arms;
- Coordinate the proposed improvements with BNSF and the Arizona Corporation Commission (ACC);
- Prepare 15% conceptual design plans for the proposed improvements;
- Prepare a draft scope of work, preliminary project schedule and preliminary opinion of probably cost;
- Identify and describe the railroad equipment required for this project.

1.4 Other Studies in the Area

MAG US-60/Grand Avenue Corridor Optimization, Access Management Plan, and System Study (COMPASS) – June 2015. The study area is bound by SR-303L traffic interchange in Surprise and the Willetta Street intersection in Phoenix. The COMPASS recommended a multi-lane roundabout at Grand Avenue and 19th Avenue with a flyover for McDowell Road, thus removing any access from McDowell Road to 19th Avenue and Grand Avenue (see map below).



2.0 PROJECT DESCRIPTION

2.1 Project Location

The project study area is along McDowell Road, at the BNSF railroad crossing west of the Grand Avenue and 19th Avenue intersection.

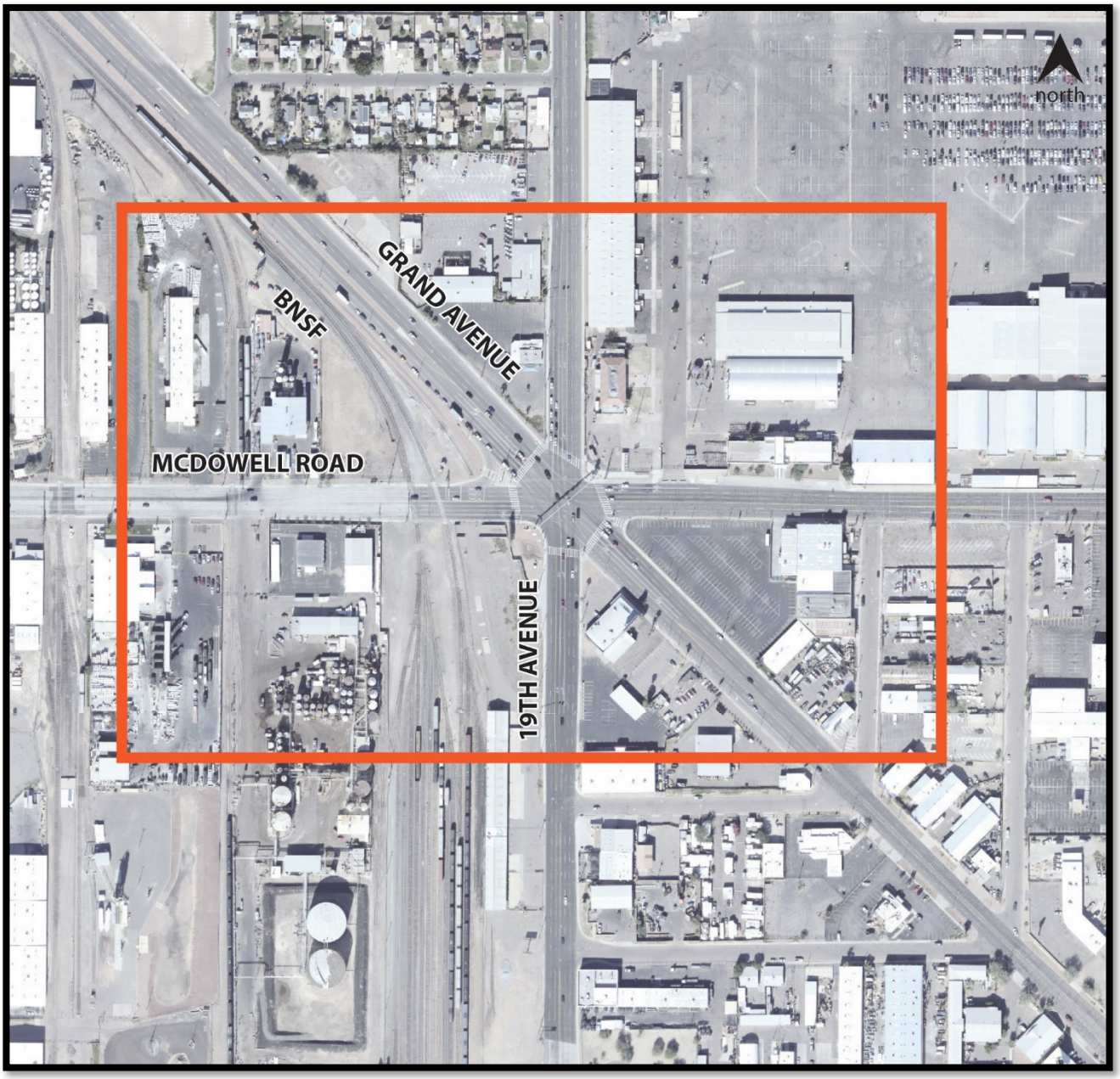


Figure 1 – Project Location

2.2 Existing Conditions

A) Existing Improvements

The existing roadway configuration along McDowell Road includes 3 eastbound lanes and 3 westbound lanes with 1 dedicated EB to SB right turn lane at the intersection with 19th Avenue and Grand Avenue. There is attached sidewalk on both sides of the road. This segment of McDowell Road does not include any bike lanes.

Figure 2 – McDowell Road (looking east)

Figure 3 – McDowell Road (looking west)

B) Existing Topography

The high point is located at the railroad crossing at an approximate elevation of 1,083 feet above sea level. The road slopes to both east and west at an approximate slope of 1.00% and no the north at an approximate slope of 0.80%.

C) Existing Right-of-Way and Adjacent Ownership

The existing right-of-way varies throughout the project and was determined using the Maricopa County Assessor's Map and the City's Quarter Section Maps as shown below.

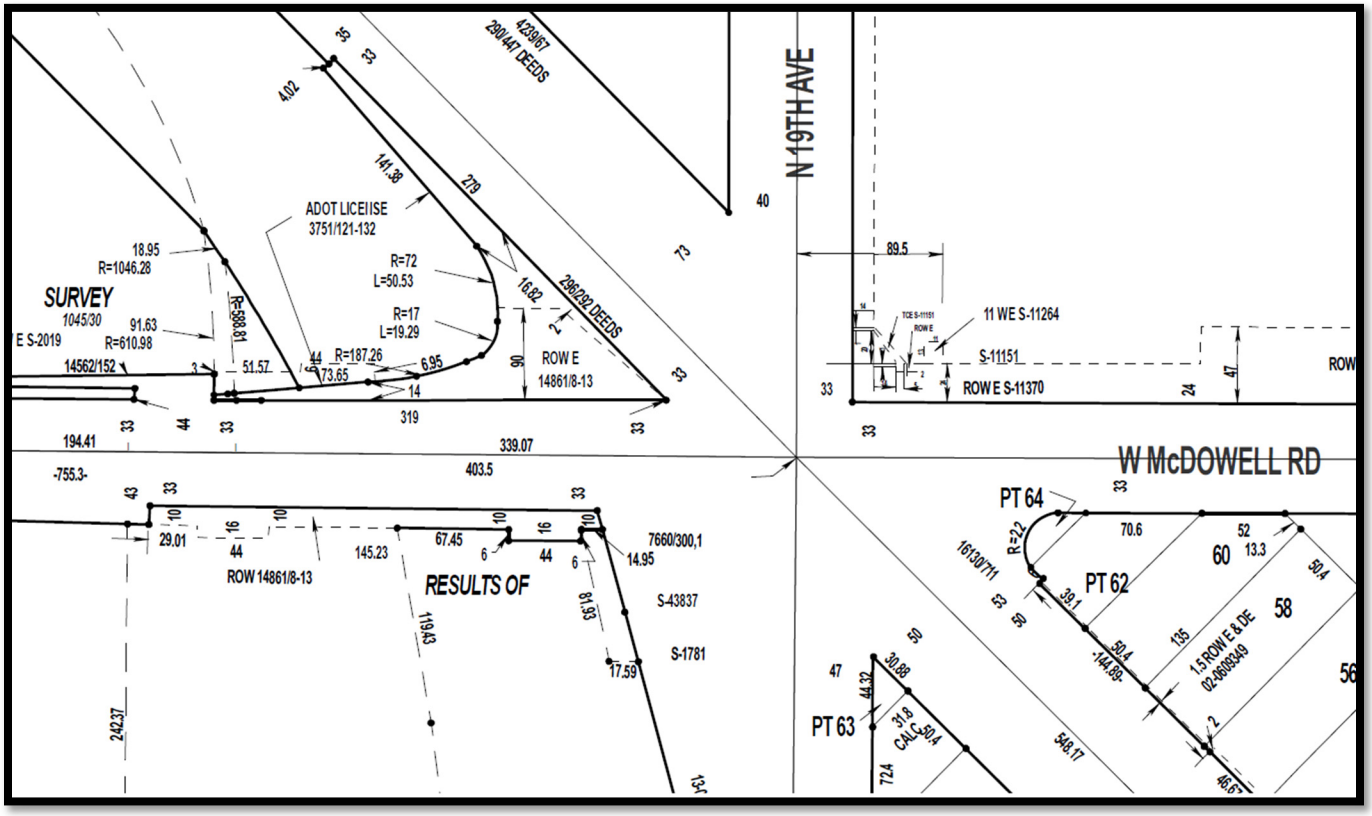


Figure 4 – Existing Right at McDowell Road

There are several property owners located along this segment of McDowell Road. The following is a list of all the property owners at the intersection:

NORTH SIDE	SOUTH SIDE
APN 110-56-010 A T&S F R/R	APN 109-01-019G Asphalt Terminals LLC
APN 110-56-005A Ernest F Mariani Co	APN 109-01-026C Burlington Northern & Santa Fe RR Co
APN 110-56-006 Ernest F Mariani Co	APN 109-01-026E BNSF Railway Company
APN 110-56-012A A T&S F R/R	APN 109-01-021B AT & SF RY Company
APN 110-56-013D A T&S F R/R	APN 111-15-019, 018, 017 Select 4 LLC
APN 110-55-057 1620 N 19th Ave LLC	APN 111-15-040B, 039A, 020, 021B Woodward Family LLC
APN 111-05-001A State of Arizona	APN 111-15-021A Nihao Feng LLC

Furthermore, it appears that a portion of the project lies within Arizona State Land Department (ASLD) Trust Land as shown on the map below. Additional information will be required in order to confirm the accuracy of the map (http://gis.azland.gov/webapps/parcel/).

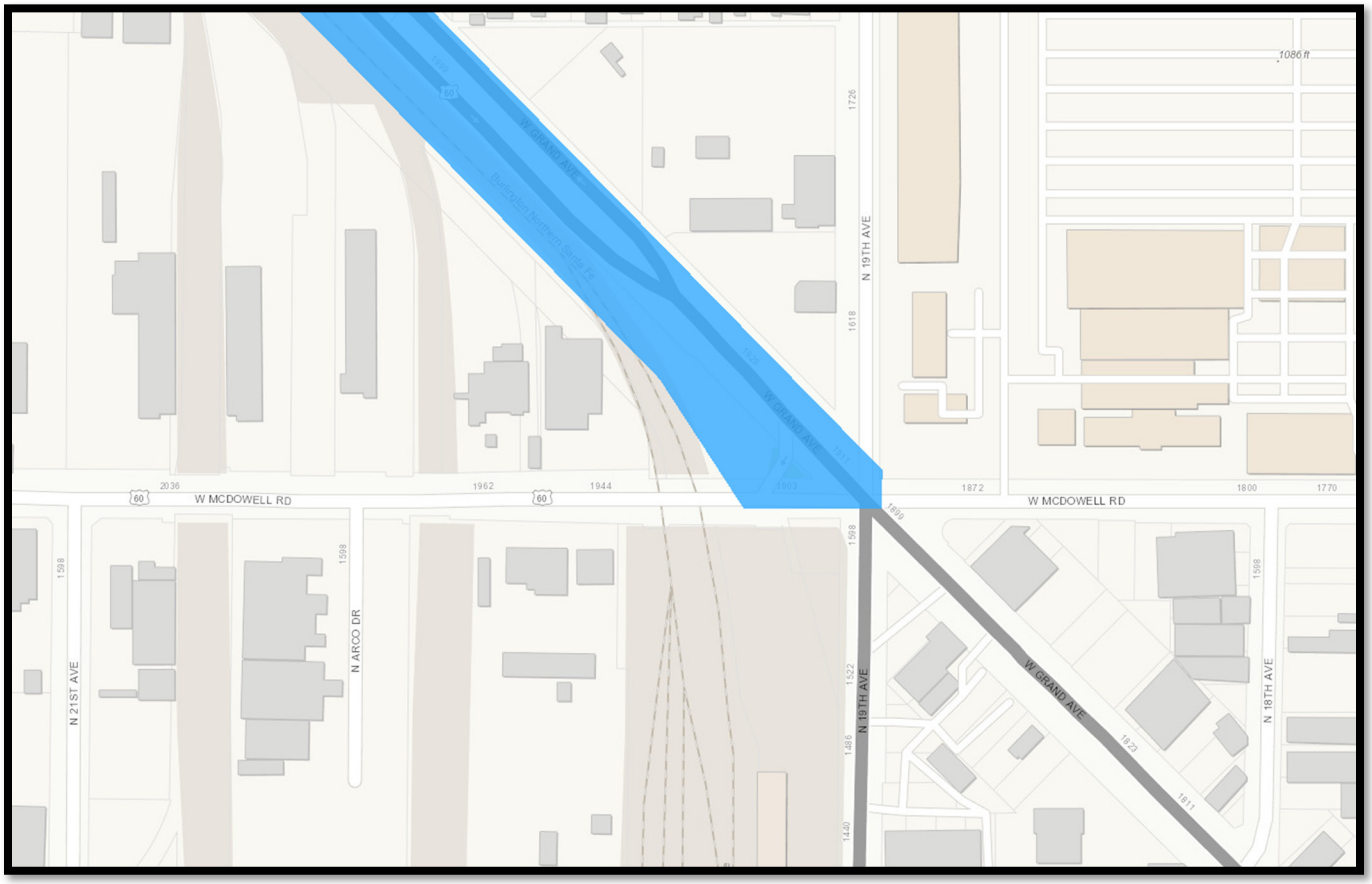


Figure 5 – Arizona State Land Department Trust Land Map

D) Existing Utilities

The following table is a list of existing utility companies with facilities located within the project area.

Utility Company	Type	Description
APS	Electric	Overhead and Underground
CenturyLink	Fiber Optic	UG Conduits
City of Phoenix	Storm Drain	30” and 36” RCP
City of Phoenix	Water	8”, 12”, 16” Pipe
City of Phoenix	Sewer	10” and 15” Pipe
Cox	Fiber Optic	UG Conduits
MCI	Telecommunications	Fiber Optics
SRP	Irrigation	
Southwest Gas	Gas	2.5” and 4” Steel
Zayo	Fiber Optic	UG Conduits
Burlington Northern Santa Fe	Railroad	RR Equipment

E) FEMA Special Flood Hazard Areas (SFHA’s)

The entire project limits lie outside any special flood hazard areas. Figure 6 below identifies the extent and FEMA designation. Zone X is defined as “0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile”.

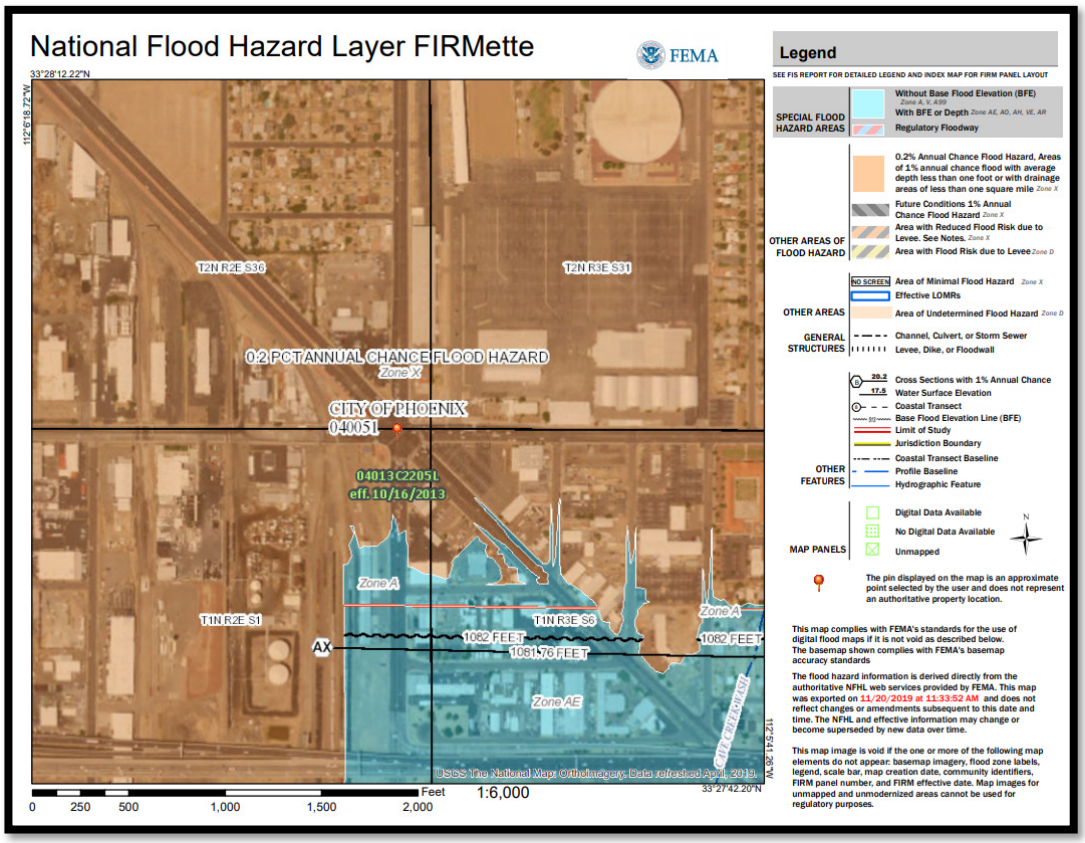


Figure 6 – FEMA Flood Insurance Rate Map

F) Record Drawings

The following record drawings were reviewed during the preparation of this PA:

- P-942227 – Grand Avenue McDowell to Van Buren Street
- ST89310063 – Grand Avenue / McDowell Road Intersection Improvements
- P-779330 – McDowell Road Railroad Crossings 23rd Avenue to 19th Avenue
- P-75060.00 – 19th Avenue Van Buren St. to McDowell Road
- P-770032 – W. McDowell Road 27th Avenue to 19th Avenue

Electronic files were provided by the City of Phoenix, which contained PDF files associated with the above project.

2.3 Existing Improvements at Railroad Crossing

The existing railroad crossing at McDowell Road includes cantilevers on both directions. For eastbound traffic, the cantilever includes three sets of flashing lights for a total of four traffic lanes (2 thru lanes, 1 thru-right lane and 1 dedicated right turn lane).

Figure 7 – Railroad Warning Devices at McDowell Road (looking east)

For westbound traffic, the cantilever includes three sets of flashing lights for a total of three traffic lanes (all thru lanes).

Figure 8 – Railroad Warning Devices at McDowell Road (looking west)

19th Avenue includes three northbound lanes, two southbound lanes and dual left turn lanes (into Grand Avenue and McDowell Road). The existing traffic signal (tubular overhead spanning entire intersection) includes a "train activated sign" for the NB to WB left turn movements into McDowell Road.

Grand Avenue includes three thru lanes in each direction and dual left turn lanes (into McDowell Road and 19th Avenue). The "train activated" sign on the existing traffic signal can also be seen along Grand Avenue for the NB to WB left turn movements into McDowell Road. Furthermore, there is a dedicated right turn lane via median island for the SB to WB movement into McDowell Road. There is an existing "train activated sign" on the side of the road along Grand Avenue (southbound) for this movement (See Figure 9 on the following page).

Figure 9 – Railroad Warning Devices at Grand Avenue (looking south)

2.4 Crash Data

Based on information provided by the ACC, there have been a total of 2 railroad incidents at this intersection since 2013 (no fatalities). A summary of the incidents can be found on the following table:

19th Avenue and McDowell Road					
DOT Crossing ID No. 025436X					
Incident No.	**Fatalities**	**Injuries**	**Date**	**Time of Call**	**Description**
RR20130188	0	0	7/9/2013	12:25:00 PM	TRAIN CLIPPED VEHICLE - DRIVER WAS CITED BY POLICE DEPARTMENT, TRAIN WAS SHOVING CARS. POSSIBLE CAUSE: VEHICLE ON TRAIN TRACK.
VG-RR20180018.1	0	0	8/1/2018	1:26:00 PM	YARDJOB CREW WORKING IN YARD.CAR CAME THROUGH TRYING TO BEAT THE TRAIN AND WAS CLIPPED ON THE PASSANGER SIDE OF THE VEHICLE. (DARK MINI-VAN). VEHICLE DID NOT STOP AND KEPT DRIVING. UNIDENTIFIED. FEMALE DRIVER.

The Federal Railroad Administration (FRA) records show that there has been a total of 44 incidents at this intersection since 1975. According to their records, there has been a total of 3 incidents since 2013 (See Appendix F).

3. PROJECT SCOPE

The project includes widening of McDowell Road starting approximately 200-ft east of 20th Avenue and terminating at the intersection of 19th Avenue and Grand Avenue. Roadway improvements, including curb & gutter, single curb, concrete sidewalk, concrete driveways and sidewalk ramps will extend along the project limits. The proposed widening will allow for the installation of new gate arms and signals to be located in a new raised median and behind the proposed curb & gutter for both directions. As part of this widening, the existing lane configuration will remain unchanged. Based on feedback received from RailPros and BNSF at the Diagnostic Meeting held on March 4th, 2020, a pre-signal (EB direction) may be warranted at this location and should be included in the scope of work so that it can be evaluated in detail during final design.

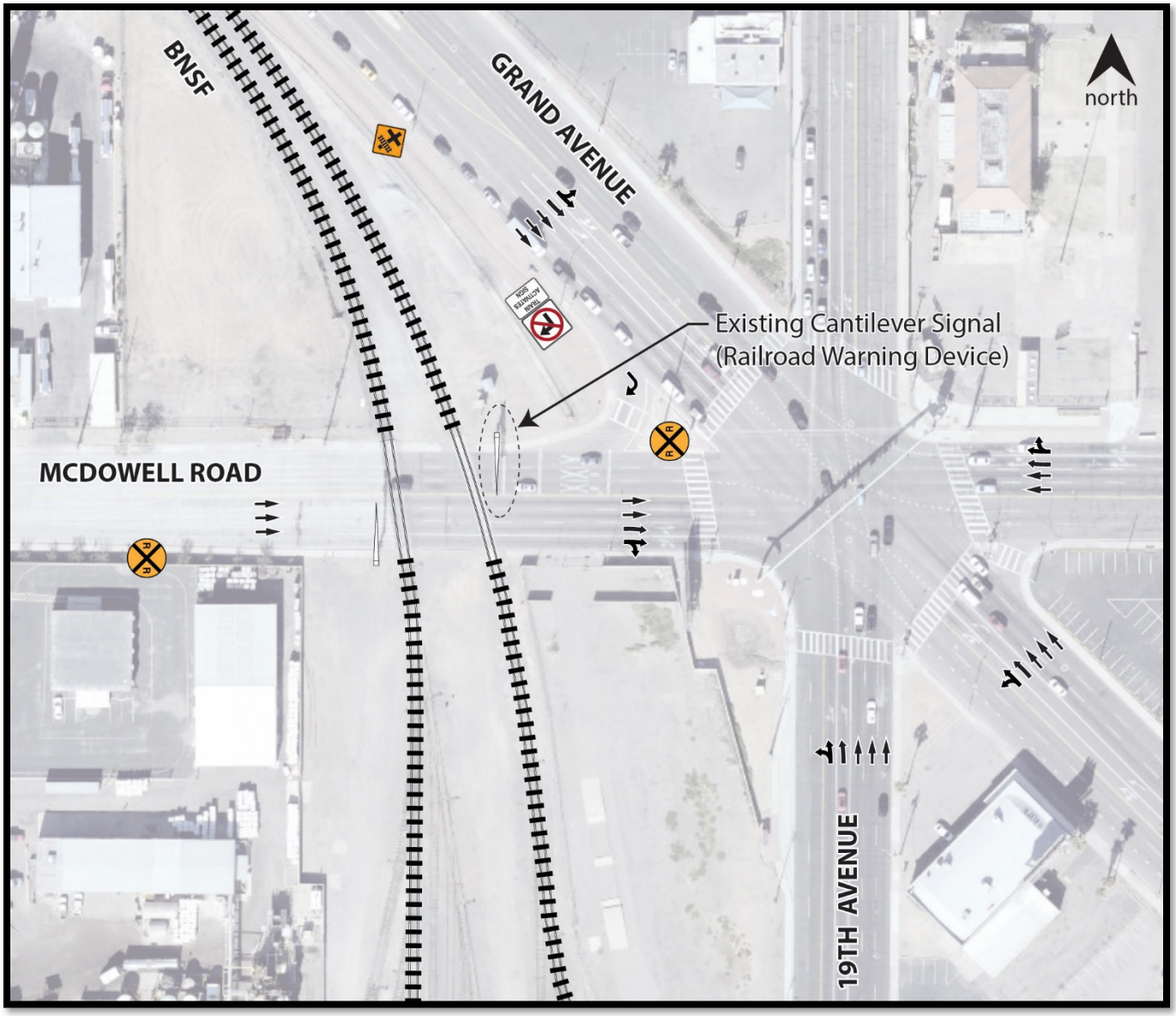


Figure 10 – Existing Conditions

4.0 PROJECT CONSIDERATIONS

4.1 Design Criteria

The criteria used in the preliminary geometric layout was established using the American Association of State Highway and Transportation Officials (AASHTO), Manual of Uniform Traffic Control Devices (MUTCD), City of Phoenix Guidelines and BNSF Design Guidelines.

A) Roadway Classification: Arterial Street (Cross Section D)

B) Posted Speed: 40 mph

C) Design Speed: 50 mph

D) Taper Length = $WS^2/60$

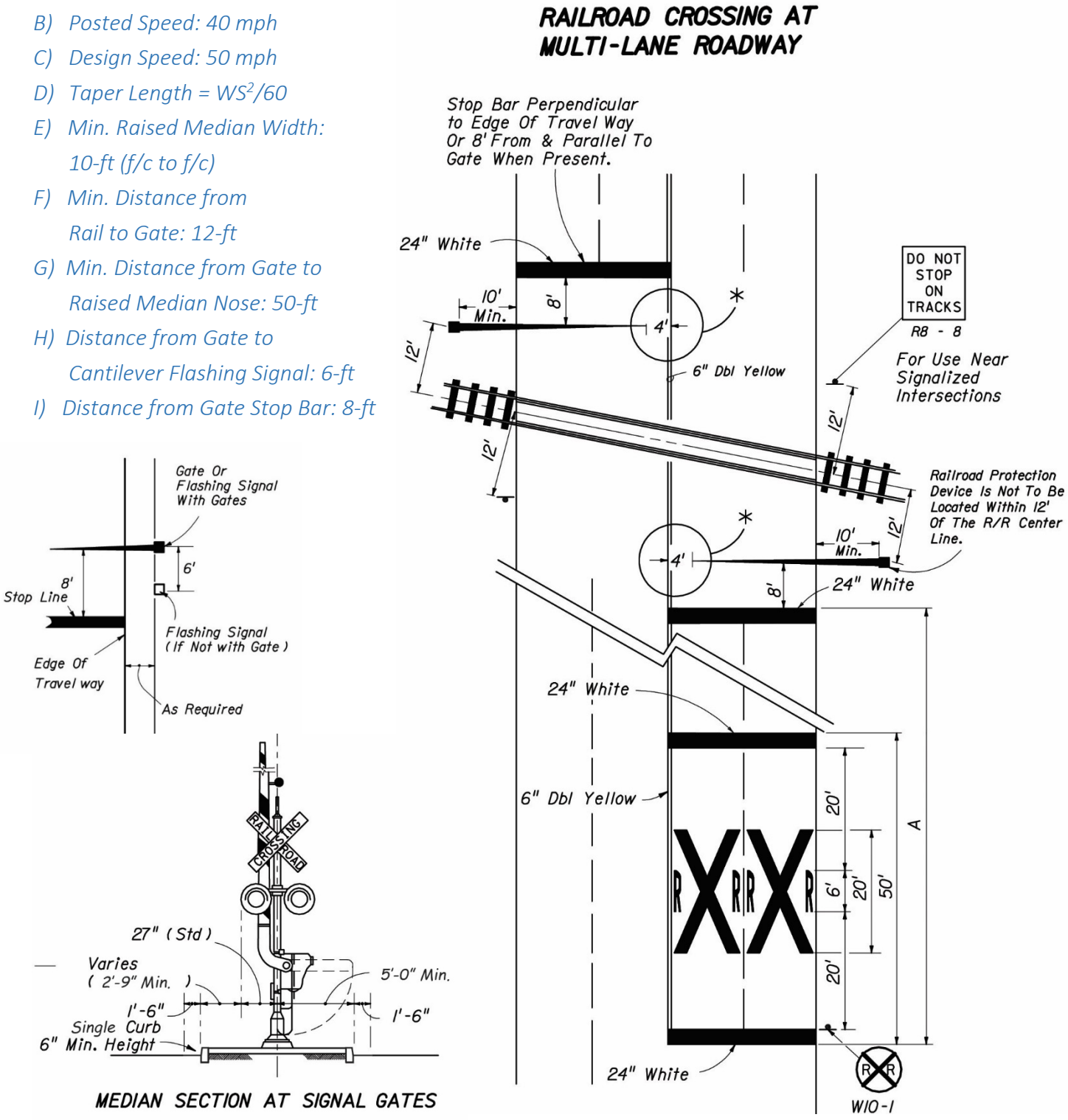
E) Min. Raised Median Width: 10-ft (f/c to f/c)

F) Min. Distance from Rail to Gate: 12-ft

G) Min. Distance from Gate to Raised Median Nose: 50-ft

H) Distance from Gate to Cantilever Flashing Signal: 6-ft

I) Distance from Gate Stop Bar: 8-ft



4.2 Initial Alternatives

Three alternatives were initially explored: 1) Widening to the north, 2) Widening to the south, and 3) Symmetrical widening. The first two alternatives (widening to the north and south) were ruled out due to high impacts to adjacent properties and the intersection. Asymmetric widening greatly increases the project limits and requires realignment across an already complex intersection.

Alternative #3 which shows a symmetrical widening for the construction of the raised median was presented to the City and was chosen to be fully explored. The following typical sections show the proposed widening improvements for each direction of travel.

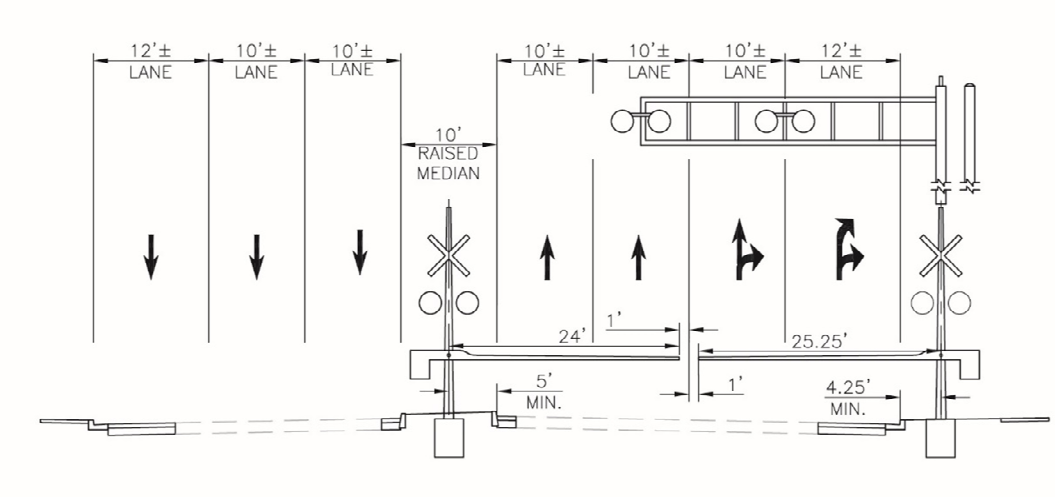


Figure 11 – Selected Alternative Typical Section (EB)

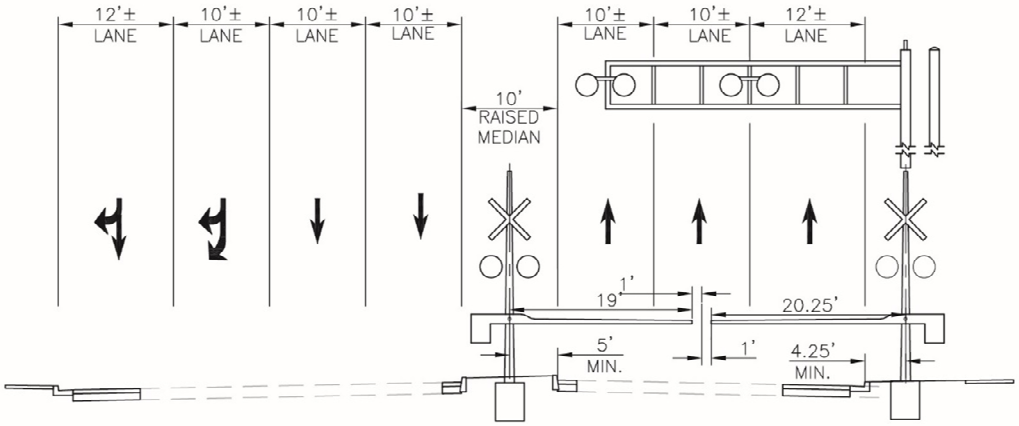


Figure 12 – Selected Alternative Typical Section (WB)

Additional information is shown on the preliminary layout plans of the proposed improvements, which are included in Appendix A.

In addition to the proposed improvements to allow the installation of a raised median and gate arms along McDowell Road, the City wanted to explore the feasibility of widening 19th Avenue to allow for an additional left turn lane. The existing lane configuration includes two left turn lanes which allow for left turn movements from 19th Avenue onto Grande Avenue which also shares a left turn movement from 19th Avenue onto McDowell Road. The City wanted to explore the feasibility to split the movements into three lanes (2 left turn lanes onto Grand Avenue and 1 left turn lane onto McDowell Road) and separate the turning movements so that a train would not prohibit all cars from turning onto Grand Avenue (only the turning movement onto McDowell Road would be prohibited).

Preliminary geometric investigation found that there is enough room on the south side of the intersection to shift all lanes to the east (curb, gutter and sidewalk), but unfortunately the north side is obstructed by an existing building.

Figure 13 – 19th Avenue Widening

Another option that was explored included shifting NB traffic across the intersection, but this movement is not ideal and with the already 6 sets of pavement markings in the intersection, the skip lines would become very confusing to follow.

4.3 Impacts to Existing Utilities

The proposed widening improvements to the west of 19th Avenue will have an impact on existing utilities in the area. The following is a brief summary of anticipated impacts:

APS 12kV Overhead Facilities: The widening will require the relocation of existing APS overhead electric facilities, including 1 power pole.

Street Lights: One street light will require relocation in addition to the luminary attached to the power pole being relocated. All of the associated underground facilities will need to be relocated as well.

16" CIP Water: Based on the City's quarter section maps, there is an existing 16" CIP waterline that runs along McDowell Road approximately 10' north of the section line. It appears that the waterline is currently encased for a segment under the railroad tracks. Realignment of this waterline may be required for the installation of the gate arms in the new raised median.

In addition to the above-mentioned facilities, other utilities such as water meters, water valve and manhole adjustments, pedestrian push button signal and telecommunications infrastructure will also be impacted by the proposed roadway improvements.

Figure 14 – Existing Utilities in the Area

The proposed improvements will also require the relocation of an existing traffic signal pole: Type A Pole – Pedestrian Push Button located near the corner of the existing intersection radii (see picture below). The existing tubular overhead signal structure spanning the entire intersection will remain in place.

Figure 15 – Existing Traffic Signal Poles to be Relocated

4.4 Other Considerations

This intersection is very busy on a typical rush hour traffic day, but the crowds explode during the AZ State Fair which is typically held for most of the month of October. The state fair brings a crowd of approximately 1 million people throughout the month in addition to the people that must use the road on a regular basis and not including the movement of equipment and workers at the fair. When the train causes delays during the state fair, it also delays pedestrian signals that would not interfere with the tracks. This can cause safety concerns as crowds enter and exit the fair. Pedestrians have been observed to feel impatient that they're being forced to wait and begin jaywalking when they feel like they have found a gap. During especially long delays, the crowd can balloon to a point where people cannot exit the fair and begin pushing against others making an unsafe situation for those stuck along the edges of the street.

This dangerous pedestrian situation could be relieved with additional signal phases. Currently the signal boxes at this intersection are maxed out.

5.0 COORDINATION WITH BNSF

A diagnostic meeting was held at the project site on March 4th, 2020 (meeting minutes provided in Appendix E). BNSF staff and their Consultant (RailPros) provided feedback on the project. BNSF approves the installation of new gate arms at this location and requested the addition of a pre-signal for EB traffic so that it would be evaluated during final design. RailPros provided additional information regarding pre-signal design which can be found in Appendix H.

6.0 COORDINATION WITH THE ARIZONA CORPORATION COMISSION (ACC)

A diagnostic meeting was held at the project site on March 4th, 2020. The ACC is in support of this project and approved the installation of new gate arms at this location. Jason Pike with the ACC provided specific feedback to the DRAFT PA and the comments can be found in Appendix I.

7.0 PRELIMINARY PROJECT SCHEDULE

Below is a preliminary project schedule, which outlines the major project tasks associated with the final design of this project.

Consultant Procurement (On-Call)	Month #1
Design Notice to Proceed **Design contract shall include a sub-consultant for the preemption review and calculations (from BNSF's pre-approved signal design consultant list)*	Month #3
Diagnostic Meeting with BNSF	Month #4
Field Survey & Data Collection **A Temporary Occupancy Permit will be required by BNSF. The application shall be submitted to JLL, Inc. along with the application fee ($800) and a set of drawings. The permit may take up to 10-15 days for approval.*	Month #5
Geotechnical Investigation **Borings should be planned outside of BNSF right-of-way*	Month #6
40% Submittal **Preemption calculations shall be included on this submittal. Plans should clearly show location of proposed railroad improvements (gates, concrete panels, cantilevers, etc.).*	Month #7
City & BNSF Review **BNSF to provide review comments within 30 days. All of BNSF's comments/concerns need to be resolved prior to the preparation of a C&M Agreement.*	Month #9
Public Meeting	Month #13
70% Submittal	Month #14

City, BNSF & Utility Review **BNSF to provide review comments within 30 days. All of BNSF's comments/concerns need to be resolved prior to the preparation of a C&M Agreement.*	Month #17
BNSF C&M Agreement **BNSF to provide Construction and Maintenance Agreement to the City for review & approval*	Month #17
Environmental Clearance	Month #18
100% Submittal	Month #20
City, BNSF & Utility Review	Month #22
Final Sealed Submittal	Month #24
Right of Way Acquisition Completed	Month #24
BNSF C&M Agreement **C&M Agreement between BNSF and the City finalized.*	Month #24
Utility Relocation Completed	Month #25
Bid Advertisement	Month #26
Construction Notice to Proceed	Month #32

In general, completion of final design of this project should be accomplished within approximately **974 calendar days** of receiving a Notice to Proceed

8.0 PRELIMINARY ESTIMATE OF PROJECT COST

An evaluation of preliminary project costs was performed during the preparation of this document for two different scenarios (Federal Aid and Non-Federal Aid). Below is a summary on the anticipated project costs for each scenario followed by a brief explanation for each item:

PRELIMINARY ESTIMATE FOR NON-FEDERAL AID PROJECT

Item	Description	Amount
1	Design	$166,850
2	Right of Way	$440,000
3	Construction	$959,419
4	BNSF	$1,845,000
5	Design Soft Costs	$35,000
6	Street Lights/Traffic Signals/Pavement Markings	$100,000
7	Utilities	$500,000
8	Environmental Clearance	$10,000
9	DCM Construction Administration	$80,000
10	Testing and Materials	$5,000
Total Project Cost for ST85100439 (Non-Federal Aid)		**$4,141,269**

For Non-Federal Aid Project, the City would be required to fund 100% of the project costs.

Item 1 Design

Engineering Consulting services are anticipated to include the following: street improvements, railroad crossing improvements, signing and marking, obtaining project approval from BNSF, drainage memorandum, utility coordination, geotechnical engineering, public outreach, street lighting and pre-emption calculations and design.

Item 2 Right of Way

For budgetary purposes, the price per square foot for right of way acquisition was set to $20 and temporary construction easements was set to $10. In addition, this item includes the cost associated for City staff Real Estate Department for the coordination with Project Manager, Consultant, Utility Owners, Property Owners, ADOT and BNSF.

Item 3 Construction

An itemized Preliminary Opinion of Probable Construction Cost is attached on Appendix B. The cost associated with this item include the roadway widening portion of the project.

Item 4 BNSF

The following items were used to determine the cost associated with BNSF improvements at the railroad crossing:

1.	New Gate Arms (2 gates for EB traffic)	$500,000
2.	New Gate Arm (2 gates for WB traffic)	$500,000
3.	New Cantilever Signal (3 lane road)	$350,000
4.	New Cantilever Signal (4 lane road)	$300,000
5.	Concrete Panels	$150,000
6.	Flagging (30 days)	$45,000
	TOTAL	**$1,845,000**

Item 5 Design Soft Costs

The cost associate with this item includes the time associated with City staff throughout the life of the project, with the exception of staff from the real estate department (this cost is shown under Item 2 - Right of Way.

Item 6 Street Lights/Traffic Signals/Pavement Marking

This item includes the time associated with City staff throughout the life of the project to support construction and the time and effort associated with the connection of gates and cantilever flashers to the traffic signal system.

Item 7 Utilities

Based on the preliminary concept design, it is anticipated that the proposed improvements will have some impacts on existing utilities. A major anticipated conflict includes existing APS transmission power poles and overhead power lines. One of the existing poles will need to be relocated further north and both poles on either side may need to be replaced to steel poles in order to handle the new pole alignment (nontangential). It is important to note that at this time, status of prior right determination if unknown.

Any other costs associated with utilities crossing BNSF's right of way is included as part of this item. Other minor conflicts include the possible relocation of telecommunication lines and traffic signal conduits and pull boxes.

Item 8 Environmental Clearance

A budget of $10,000 has been established for internal INCRA review.

Item 9 DCM Construction Administration

A budget of $80,000 has been established for the time associated with City staff to provide Construction Administration services during construction of this project.

Item 10 Testing and Materials

A budget of $5,000 has been established for the time associated with City staff to provide Quality Assurance and Materials Testing services during construction of this project.

PRELIMINARY ESTIMATE FOR FEDERAL AID PROJECT

Item	Description	Amount
1	Design	$192,600
2	Right of Way*	$440,000
3	Construction	$1,121,776
4	BNSF*	$1,845,000
5	Design Soft Costs	$55,000
6	Street Lights/Traffic Signals/Pavement Markings*	$100,000
7	Utilities*	$500,000
8	Environmental Clearance	$50,000
9	DCM Construction Administration*	$80,000
10	Testing and Materials*	$5,000
Total Project Cost for ST85100289-2 (Non-Federal Aid)		**$4,389,376**

**Costs typically not impacted by the use of Federal Funds.*

Item 1 Design (Federal Aid)

In general, design costs for federally funded projects are typically more expensive due to the extended project schedules and additional design requirements and approval processes. The project plans will also need to clearly show the extents of the area that is to be paid for with federal funds.

Item 2 Right of Way (Federal Aid)

Right-of-way costs are typically not impacted by the use of Federal Funds.

Item 3 Construction (Federal Aid)

In general, construction costs for federally funded projects are typically more expensive for several reasons. Below are some of the major impacts to construction costs:

- Davis-Bacon Laws: The Davis-Bacon Act mandates that laborers for federal public works projects receive local prevailing wages. It is estimated that prevailing wages are 20% above BLS (Bureau of Labor Statistics) figures.
- 'Buy America' Provisions: This provision requires that federal tax dollars used to purchase steel, iron, and manufactured goods used in a transit project are produced domestically in the United States. This provisions limits the ability for contractors, therefore increasing the overall project cost.

Item 4 BNSF (Federal Aid)

BNSF costs are typically not impacted by the use of Federal Funds.

Item 5 Design Soft Costs (Federal Aid)

In general, design soft costs for federally funded projects are typically more expensive due to the extended project schedules and additional design requirements and approval processes. In addition, City staff will need to get involved earlier in the process to apply for federal funds.

Item 6 Street Lights/Traffic Signals/Pavement Marking (Federal Aid)

The cost for City staff to perform this work is typically not impacted by the use of Federal Funds.

Item 7 Utilities (Federal Aid)

The cost to relocate utilities is typically not impacted by the use of Federal Funds.

Item 8 Environmental Clearance (Federal Aid)

In the event that the City receives federal funds for the construction of this project, an Environmental Clearance will be required. A budget of $50,000 has been established for the preparation of the documents required in order to obtain Environmental Clearance for this project.

Item 9 DCM Construction Administration (Federal Aid)

The cost for City staff to perform this work is typically not impacted by the use of Federal Funds.

Item 10 Testing and Materials (Federal Aid)

The cost for City staff to perform this work is typically not impacted by the use of Federal Funds.

9.0 FEDERAL AID CONSIDERATIONS

The project team has identified at least two federal funding sources that this project could potentially apply for. Below is a brief summary of each program:

Railway-Highway Crossing (Section 130 Program) - the following is a list of general items to be considered by the project team:

- Need time for an IGA with ADOT to apply for Section 130 funds prior to design;
- Environmental Clearance will require compliance with NEPA Act. Additional efforts will be needed besides regular INCRA process;
- Section 130 funds will only cover cost related to safety improvements, and civil work within 10 ft of the railroad tracks. An application to MAG can also be considered to supplement Section 130 funds with other available Federal Aid funds;
- If there is more than one funding source, the work for each source must be separated out in the estimates and measurable and clearly identifiable on the plans. It is important to note that the other funding sources cannot be used to cover the 10% local match that is required for Section 130.
- Timeline for delivery of project will increase;
- Anticipated Federal Aid Reimbursement for Section 130 project is 90%/10%. If other Federal Aid funding sources are available, the anticipate split will be 94.3%/5.7%.
- Per diagnostic meeting held on 3/4/20, ADOT will add this project to the current list of projects on deck for the use of Section 130 funding.
- ADOT stated that based on current workload, the earliest ADOT could start looking at this project is 2024. Once ADOT starts the process, it may be 2 to 3 years until the start of construction (earliest is 2026).
- ADOT received $2.3M per year for Section 130 which needs to be distributed amongst all projects in Arizona.

Consolidated Rail Infrastructure and Safety Improvements (CRISI Program) - the following is a list of general items to be considered by the project team:

- On August 2019, the FRA announced $244 Million in Grant Availability for projects that improve safety, efficiency and reliability of intercity passenger and freight rail. The deadline for applications was October 2019 - approximately 60 days after Notice of Funding Opportunity (NOFO).

- On April 2020, the FRA announced $311 Million in Grant Availability for projects that improve safety, efficiency and reliability of intercity passenger and freight rail. The deadline for applications was June 2020 - approximately 60 days after Notice of Funding Opportunity (NOFO).

- To be considered, project should look to focus on congestion reduction, highway-rail grade crossing improvements, upgrades to freight infrastructure, intercity passenger rail operation enhancements and advancements in safety technology, such as positive train control (PTC) and rail integrity inspection systems.

- The program has multiple project tracks from which projects can seek funding:
  - Track 1 – Planning
  - Track 2 – PE / NEPA
  - Track 3 – Final Design / Construction

- Only Tracks 2 and 3 provide funding for construction. The projects must be at least at a 30% stage and NEPA process started at the time of application.

- Key factors in receiving a grant are:
  - A letter from BNSF supporting this project.
  - Benefit-Cost Analysis
  - Political Support

- For the application, the City needs to show that the project is at least 80% funded. The project needs to be listed in the City's Capital Improvement Projects Program.

- The City would have two years to obligate the funds.

10.0 PROJECT CONTACTS

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APPENDICES

Appendix A – 15% Conceptual Plans

Appendix B – Preliminary Opinion of Probable Construction Cost

Appendix C – Project Schedule (Bar Timeline) – Non Federal Aid

Appendix D – Programming Schedule (Non Federal Aid and Federal Aid)

Appendix E – Meeting Minutes

Appendix F – Federal Railroad Administration Accident Reports

Appendix G – DRAFT Project Scope of Work

Appendix H – Pre-Signal Documentation

Appendix I – Response to Comments Form

Appendix A – 15% Conceptual Plans

19TH AVENUE
& MCDOWELL RRXING
PROJECT ASSESSMENT

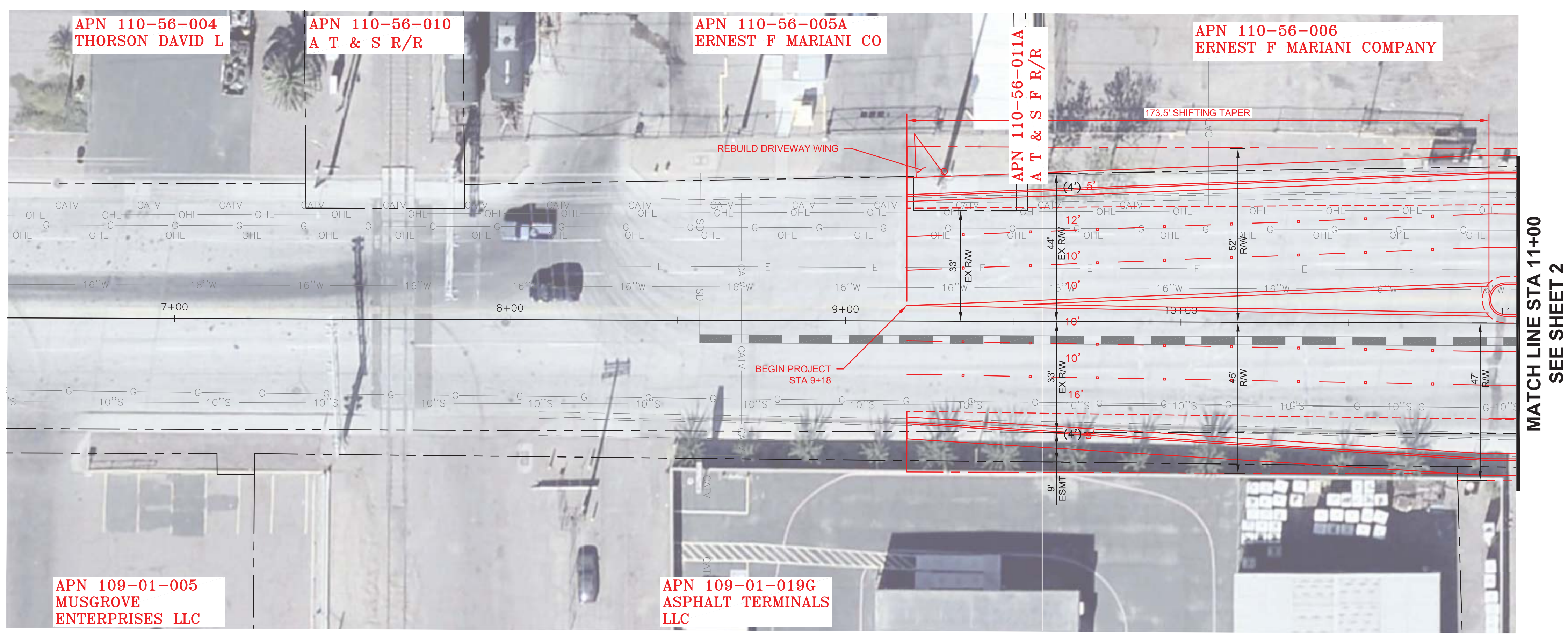
F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ.	ST85100289-2		.	.

T.Y.LIN INTERNATIONAL
CONSULTING ENGINEER

DES: CSS | DR: AKS | CK: CSS | DATE: 10/19

NO.	DESCRIPTION	REV BY	CKD BY	DATE

REVISION BY CITY OF PHOENIX



MCDOWELL ROAD
PREFERRED ALTERNATIVE

Call at least two full working days before you begin excavation.
ARIZONA811
Arizona Blue Stake, Inc.
Dial 8-1-1 or 1-800-STAKE-IT (782-5348)
In Maricopa County: (602) 263-1100

20 0 20 40 60
SCALE: 1" = 20'

CONTRACTOR IS RESPONSIBLE FOR LOCATING AND VERIFYING ELEVATIONS FOR ALL UNDERGROUND UTILITIES WITHIN THE PROJECT LIMITS.

"PER CITY OF PHOENIX CITY CODE CHAPTER 2, SECTION 2-28, THESE PLANS ARE FOR OFFICIAL USE ONLY AND MAY NOT BE SHARED WITH OTHERS EXCEPT AS REQUIRED TO FULFILL THE OBLIGATIONS OF THE CONTRACTOR'S CONTRACT WITH THE CITY OF PHOENIX."

CITY OF PHOENIX, ARIZONA
STREET TRANSPORTATION DEPARTMENT

19TH AVE & MCDOWELL RD
RRXING
ST85100439

DR: AKS DATE: 10/19	DES: CSS DATE: 10/19	CK: CSS DATE: 10/19	SHEET NO:	TOTAL SHEETS	AS BUILT
SCALE: 1" = 20'			1	3	.

19TH AVENUE
& MCDOWELL RRXING
PROJECT ASSESSMENT

NO.	REVISION BY CITY OF PHOENIX DESCRIPTION	REV BY	CKD BY	DATE

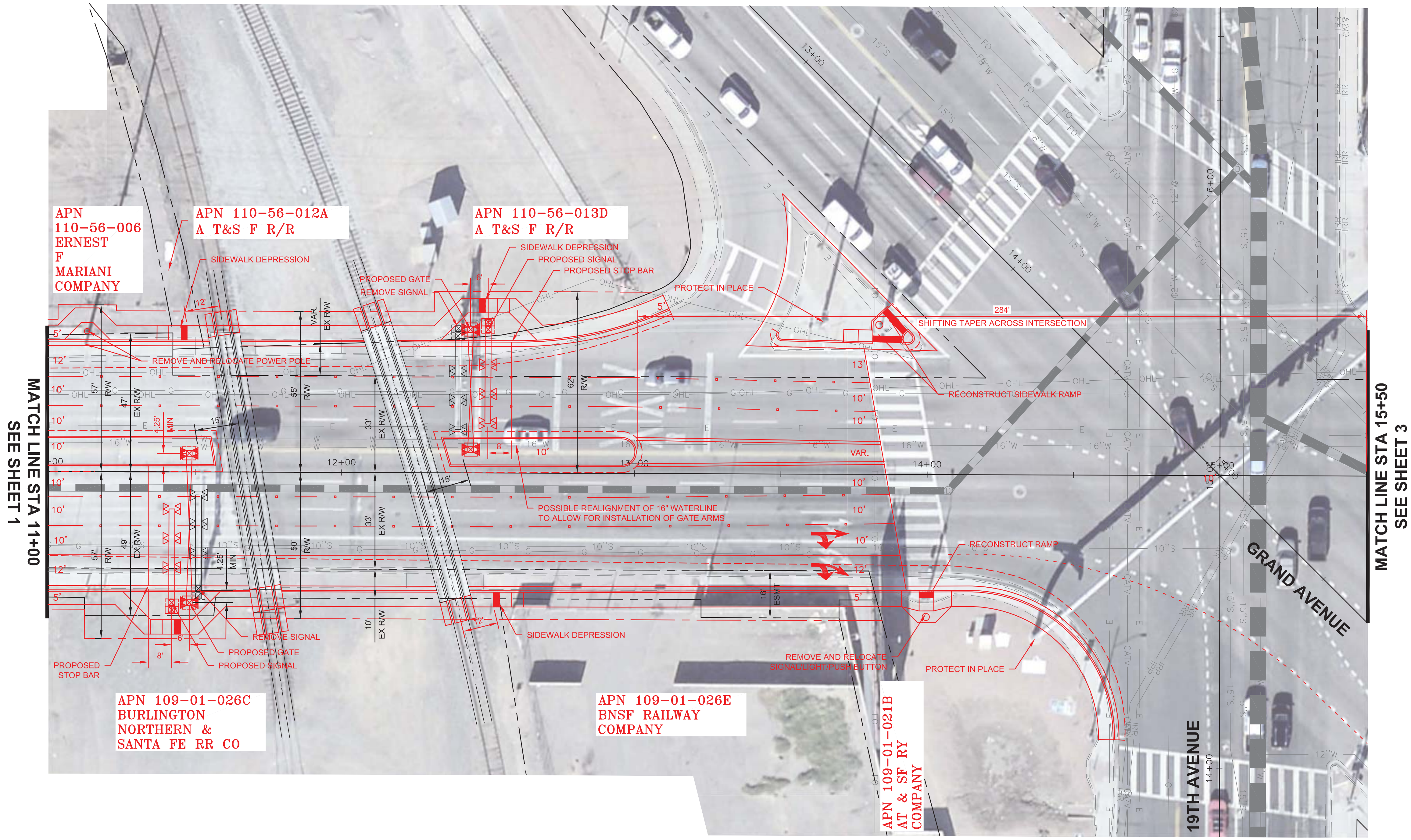
NO.	REVISION BY CITY OF PHOENIX DESCRIPTION	REV BY	CKD BY	DATE

NO.	REVISION BY CITY OF PHOENIX DESCRIPTION	REV BY	CKD BY	DATE

F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ.	ST85100289-2		.	.

T.Y.LIN INTERNATIONAL
CONSULTING ENGINEER

DES: CSS	DR: AKS	CK: CSS	DATE: 10/19



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CITY OF PHOENIX, ARIZONA
STREET TRANSPORTATION DEPARTMENT

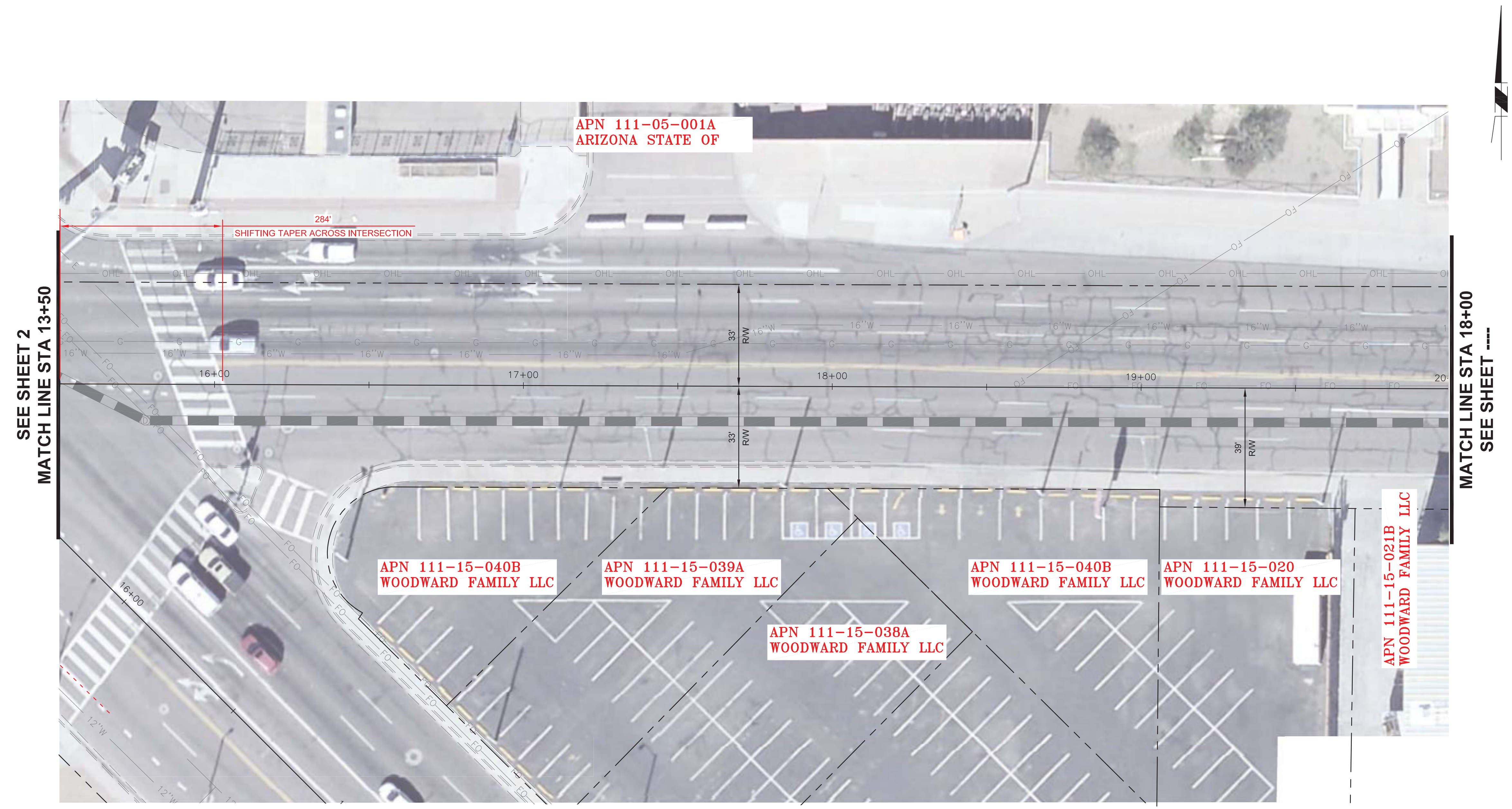
19TH AVE & MCDOWELL RD
RRXING
ST85100439

DR: AKS DATE: 10/19	DES: CSS DATE: 10/19	CK: CSS DATE: 10/19	SHEET NO:	TOTAL SHEETS	AS BUILT
SCALE: 1" = 20'			2	3	.

19TH AVENUE
& MCDOWELL RRXING
PROJECT ASSESSMENT

F.H.W.A. REGION	STATE	PROJ. NO.	NO.	TOTAL	AS BUILT
9	ARIZ.	ST85100289-2	.	.	.

T.Y.LIN INTERNATIONAL
CONSULTING ENGINEER
DES: CSS | DR: AKS | CK: CSS | DATE: 10/19



MCDOWELL ROAD
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CITY OF PHOENIX, ARIZONA
STREET TRANSPORTATION DEPARTMENT

19TH AVE & MCDOWELL RD
RRXING
ST85100439

DR: AKS DATE: 10/19	DES: CSS DATE: 10/19	CK: CSS DATE: 10/19	SHEET NO:	TOTAL SHEETS	AS BUILT
SCALE: 1" = 20'			3	3	.

REVISION BY CITY OF PHOENIX

NO.	DESCRIPTION	REV BY	CKD BY	DATE

Appendix B – Preliminary Opinion of Probable Construction Cost

CITY OF PHOENIX STREET TRANSPORTATION DEPARTMENT
PROGRAMMING AND PROJECT DELIVERY DIVISION
19TH AVENUE & MCDOWELL ROAD RR XING- ST85100439
PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST (NON FA)
DATE: JUNE 1, 2020

	Item No.	Description	Unit	Quantity	Unit Cost	Total
1	M1042005	Allowance for Extra Work	JOB	**1**	$25,000.00	$25,000.00
2	M1042007	Allowance for Extra Landscape Work	JOB	**1**	$20,000.00	$20,000.00
3	E6992000	Allowance for Storm Water Pollution Prevention Best Management Practice	JOB	**1**	$7,500.00	$7,500.00
4	M1058000	Construction Survey and Layout	JOB	**1**	$15,000.00	$15,000.00
5	M3010001	Subgrade Preparation	SY	**1,712**	$40.00	$68,480.00
6	M3210130	Asphalt Concrete Surface Course, Type D 1/2, 3" Thick	TON	**76**	$125.00	$9,500.00
7	M3210340	Asphalt Concrete Base Course, Type A 1-1/2, 4" Thick	TON	**101**	$125.00	$12,625.00
8	M3240090	Portland Cement Concrete Pavement, Class A, 9" Thick	SY	**350**	$120.00	$42,000.00
9	M3290100	Emulsified Asphalt For Tack Coat, Type SS-1h	TON	**1.0**	$1,000.00	$1,000.00
10	M3304100	Power Broom	HOUR	**8.0**	$91.00	$728.00
11	M3400400	Concrete Sidewalk, Std. Detail P-1230	SF	**971.0**	$10.00	$9,710.00
12	M3400415	Truncated Domes for Sidewalk Ramps, Std. Detail P-1232	SF	**90.0**	$50.00	$4,500.00
13	M3400490	Concrete Sidewalk Ramp, Std. Detail P-1236	SF	**101.5**	$8.00	$812.00
14	M3400485	Concrete Sidewalk Ramp, Std. Detail P-1241, 6" Thick	SF	**255.0**	$8.00	$2,040.00
15	M3402201	Combined Concrete Curb and Gutter, Std. Detail 220, Type "A", H=6"	LF	**911.0**	$23.00	$20,953.00
16	M3402221	Concrete Single Curb, Std. Detail 222, Type "A"	LF	**351**	$45.00	$15,795.00
17	M3500010	Remove Portland Cement Concrete Single Curb, Curb and Gutter, Header Curb or Embankment Curb	LF	**891**	$10.00	$8,910.00

CITY OF PHOENIX STREET TRANSPORTATION DEPARTMENT
PROGRAMMING AND PROJECT DELIVERY DIVISION
19TH AVENUE & MCDOWELL ROAD RR XING- ST85100439
PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST (NON FA)
DATE: JUNE 1, 2020

	Item No.		Description	Unit	Quantity	Unit Cost	Total
18	M3500020	Remove Portland Cement Concrete Sidewalk, Driveway, Valley Gutter & Slab	SF	**4,130**	$8.00	$33,040.00
19	M3500300	Miscellaneous Removal and Other Work	JOB	**1**	$25,000.00	$25,000.00
20	M3505040	Remove 10-inch White Thermoplastic Traffic Stripe	LF	**635**	$1.00	$635.00
21	M3505041	Remove 4-inch Yellow Thermoplastic Traffic Stripe	LF	**830**	$1.00	$830.00
22	M3505043	10-inch White Thermoplastic Traffic Stripe	LF	**635**	$2.00	$1,270.00
23	M3505044	4-inch Yellow Thermoplastic Traffic Stripe	LF	**770**	$2.00	$1,540.00
24	M4004007	Pavement Marker, Raised, Type G, Clear One-Sided (Reflective)	EA	**42**	$5.00	$210.00
25	M4304000	Decomposed Granite, 3/4" Minus For General Landscape	CY	**384**	$6.00	$2,304.00
26	M4012000	Traffic Control Devices	JOB	**1**	$75,000.00	$75,000.00
27	M4013000	Allowance for Uniformed, Off-duty Law Enforcement Officer	JOB	**1**	$25,000.00	$25,000.00
28		BNSF Flagger Allowance	JOB	**1**	$25,000.00	$25,000.00
29		Traffic Signal Upgrades & Pre-Signal	JOB	**1**	$250,000.00	$250,000.00
30	3362100	Microseal Coat	SY	**4,204**	$8.00	$33,632.00
					SUB-TOTAL CONSTRUCTION	***$738,014.00***
					CONTINGENCY (30%)	***$221,404.20***
					TOTAL CONSTRUCTION (NON FA) FOR PROJECT ST85100439	***$959,419.00***

CITY OF PHOENIX STREET TRANSPORTATION DEPARTMENT
PROGRAMMING AND PROJECT DELIVERY DIVISION
19TH AVENUE & MCDOWELL ROAD RR XING- ST85100439
PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST (FA)
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5	M3010001	Subgrade Preparation	SY	**1,712**	$55.00	$94,160.00
6	M3210130	Asphalt Concrete Surface Course, Type D 1/2, 3" Thick	TON	**76**	$140.00	$10,640.00
7	M3210340	Asphalt Concrete Base Course, Type A 1-1/2, 4" Thick	TON	**101**	$140.00	$14,140.00
8	M3240090	Portland Cement Concrete Pavement, Class A, 9" Thick	SY	**350**	$130.00	$45,500.00
9	M3290100	Emulsified Asphalt For Tack Coat, Type SS-1h	TON	**1.0**	$1,200.00	$1,200.00
10	M3304100	Power Broom	HOUR	**8.0**	$100.00	$800.00
11	M3400400	Concrete Sidewalk, Std. Detail P-1230	SF	**875.0**	$11.00	$9,625.00
12	M3400415	Truncated Domes for Sidewalk Ramps, Std. Detail P-1232	SF	**90.0**	$50.00	$4,500.00
13	M3400490	Concrete Sidewalk Ramp, Std. Detail P-1236	SF	**101.5**	$10.00	$1,015.00
14	M3400485	Concrete Sidewalk Ramp, Std. Detail P-1241, 6" Thick	SF	**255.0**	$10.00	$2,550.00
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16	M3402221	Concrete Single Curb, Std. Detail 222, Type "A"	LF	**351**	$45.00	$15,795.00
17	M3500010	Remove Portland Cement Concrete Single Curb, Curb and Gutter, Header Curb or Embankment Curb	LF	**891**	$9.00	$8,019.00

CITY OF PHOENIX STREET TRANSPORTATION DEPARTMENT
PROGRAMMING AND PROJECT DELIVERY DIVISION
19TH AVENUE & MCDOWELL ROAD RR XING- ST85100439
PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST (FA)
DATE: JUNE 1, 2020

	Item No.	Description	Unit	Quantity	Unit Cost	Total
18	M3500020	Remove Portland Cement Concrete Sidewalk, Driveway, Valley Gutter & Slab	SF	**4,130**	$6.00	$24,780.00
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21	M3505041	Remove 4-inch Yellow Thermoplastic Traffic Stripe	LF	**830**	$1.00	$830.00
22	M3505043	10-inch White Thermoplastic Traffic Stripe	LF	**635**	$2.00	$1,270.00
23	M3505044	4-inch Yellow Thermoplastic Traffic Stripe	LF	**770**	$2.00	$1,540.00
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25	M4304000	Decomposed Granite, 3/4" Minus For General Landscape	CY	**384**	$6.00	$2,304.00
26	M4012000	Traffic Control Devices	JOB	**1**	$85,000.00	$85,000.00
27	M4013000	Allowance for Uniformed, Off-duty Law Enforcement Officer	JOB	**1**	$25,000.00	$25,000.00
28		BNSF Flagger Allowance	JOB	**1**	$35,000.00	$35,000.00
29		Traffic Signal Upgrades & Pre-Signal	JOB	**1**	$300,000.00	$300,000.00
30	3362100	Microseal Coat	SY	**4,204**	$9.50	$39,938.00
					SUB-TOTAL CONSTRUCTION	***$862,904.00***
					CONTINGENCY (30%)	***$258,871.20***
					TOTAL CONSTRUCTION (FA) FOR PROJECT ST85100439	***$1,121,776.00***

Appendix C – Project Schedule (Bar Timeline) – Non Federal Aid

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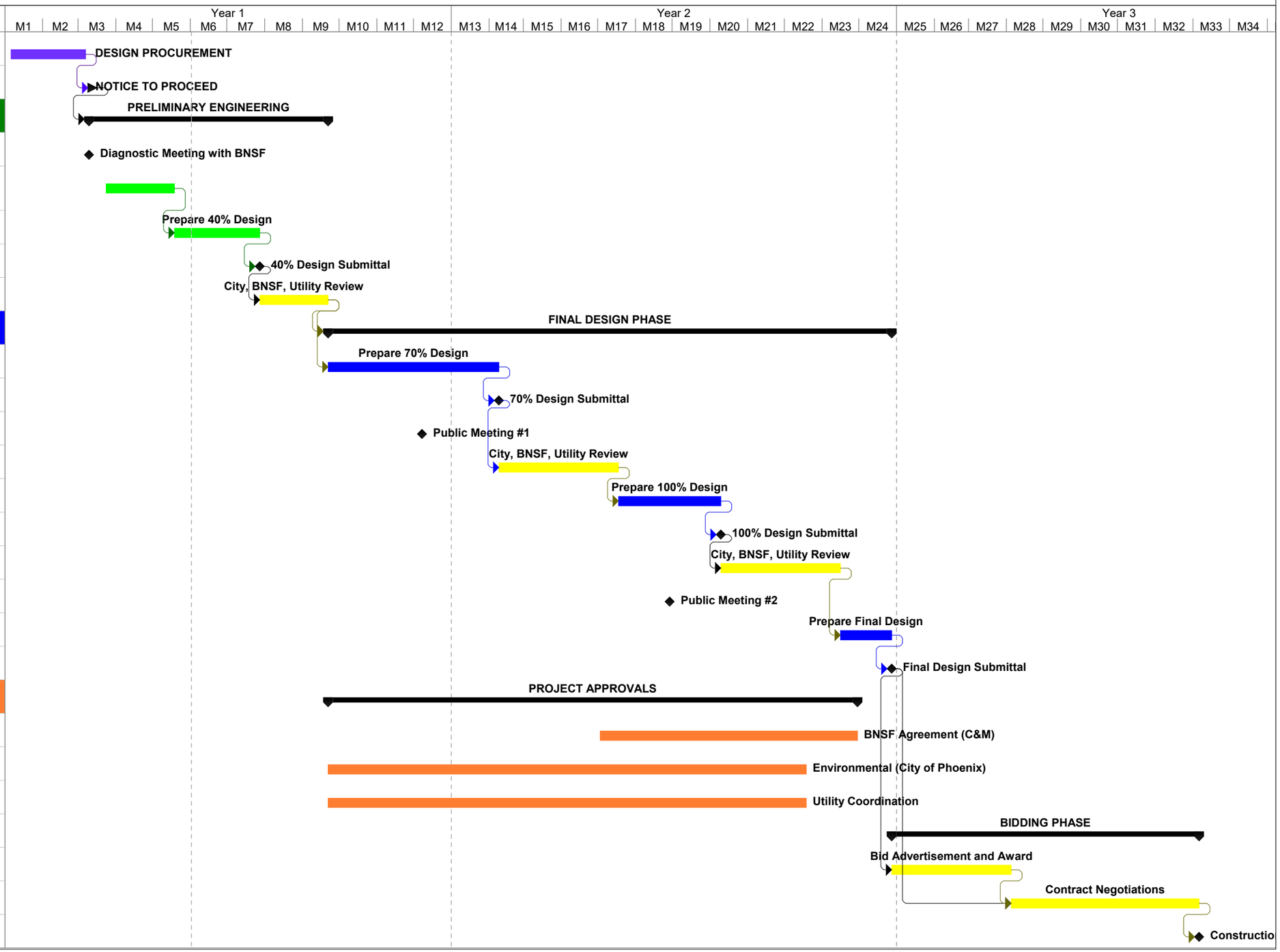
19TH AVE AND MCDOWELL ROAD RR XING ST85100439

PRELIMINARY PROJECT SCHEDULE (NON-FA)

BNSF Railroad Crossing FINAL Project Assessment

ID	Task Name
1	**DESIGN PROCUREMENT**
2	**NOTICE TO PROCEED**
3	**PRELIMINARY ENGINEERING**
4	**Diagnostic Meeting with BNSF**
5	Field Survey / Base Mapping / Utility Research
6	Prepare 40% Design
7	**40% Design Submittal**
8	City, BNSF, Utility Review
9	**FINAL DESIGN PHASE**
10	Prepare 70% Design
11	**70% Design Submittal**
12	Public Meeting #1
13	City, BNSF, Utility Review
14	Prepare 100% Design
15	**100% Design Submittal**
16	City, BNSF, Utility Review
17	Public Meeting #2
18	Prepare Final Design
19	**Final Design Submittal**
20	**PROJECT APPROVALS**
21	BNSF Agreement (C&M)
22	Environmental (City of Phoenix)
23	Utility Coordination
24	
25	Bid Advertisement and Award
26	Contract Negotiations
27	**Construction NTP**



Appendix D – Programming Schedule (Non-Federal Aid and Federal Aid)

PROGRAMMING SCHEDULE (NON FED AID)				
DESCRIPTION	**FISCAL YEAR 1**	**FISCAL YEAR 2**	**FISCAL YEAR 3**	**TOTAL COST**
1 DESIGN	$166,850.00			$166,850.00
2 RIGHT OF WAY		$440,000.00		$440,000.00
3 CONSTRUCTION			$959,419.00	$959,419.00
4 BNSF		$250,000.00	$1,595,000.00	$1,845,000.00
5 DESIGN SOFT COSTS	$17,500.00	$17,500.00		$35,000.00
6 STREET LIGHTS/TRAFFIC SIGNALS/PAVEMENT MARKING			$100,000.00	$100,000.00
7 UTILITIES	$125,000.00	$375,000.00		$500,000.00
8 ENVIRONMENTAL	$10,000.00			$10,000.00
10 DCM CONSTRUCTION ADMIN			$80,000.00	$80,000.00
11 TESTING AND MATERIALS			$5,000.00	$5,000.00
SUB-TOTAL PER FISCAL YEAR	$319,350.00	$1,082,500.00	$2,739,419.00	
			TOTAL FOR ST85100439	***$4,141,269.00***

PROGRAMMING SCHEDULE (FED AID)						
DESCRIPTION	**FISCAL YEAR 1**	**FISCAL YEAR 2**	**FISCAL YEAR 3**	**FISCAL YEAR 4**	**FISCAL YEAR 5**	**TOTAL COST**
1 DESIGN		$192,600.00				$192,600.00
2 RIGHT OF WAY				$440,000.00		$440,000.00
3 CONSTRUCTION* Only Safety Components qualify for Section130					$1,121,776.00	$1,121,776.00
4 BNSF			$250,000.00		$1,595,000.00	$1,845,000.00
5 DESIGN SOFT COSTS	$10,000.00	$15,000.00	$15,000.00	$15,000.00		$55,000.00
6 STREET LIGHTS/TRAFFIC SIGNALS/PAVEMENT MARKING					$100,000.00	$100,000.00
7 UTILITIES		$125,000.00		$375,000.00		$500,000.00
8 ENVIRONMENTAL		$50,000.00				$50,000.00
10 DCM CONSTRUCTION ADMIN					$80,000.00	$80,000.00
11 TESTING AND MATERIALS					$5,000.00	$5,000.00
SUB-TOTAL PER FISCAL YEAR	$10,000.00	$382,600.00	$265,000.00	$830,000.00	$2,901,776.00	
				TOTAL FOR ST85100439		***$4,389,376.00***

Appendix E – Meeting Minutes

TYLIN INTERNATIONAL
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MEETING TITLE	19th Ave & McDowell Road RR Xing (ST85100439)
DATE AND TIME	10/24/19, 11:00 am
ATTENDEES	Bruce Littleton, Leticia Vargas, Carlos Sanchez Soria and Allison Sadow
ORGANIZED BY	Leticia Vargas, City of Phoenix

MEETING DISCUSSIONS

A. McDowell Road (Eastbound)
- 2 thru lanes, 1 thru/slight right turn lane, and 1 slight right/full right turn lane
- Left turn movements are prohibited
- No existing raised median, a 10' median must be installed.
- Installation of new gate arms cannot be achieved without any street widening. Symmetric widening is the only option which will fit within existing right-of-way.
- Existing cantilever signal will need to be relocated in order to place new gate arms at the appropriate location
- Existing stop bar would need to move back based on standard distances to new railroad equipment
- Everyone agreed on the proposed improvements for this movement

B. McDowell Road (Westbound)
- 3 thru lanes and 1 dedicated right turn lane merge west of intersection
- Left turn movements are prohibited
- No existing raised median, a 10' median must be installed.
- Installation of new gate arms cannot be achieved without any street widening. Symmetric widening is the only option which will fit within existing right-of-way.
- Existing cantilever signal will need to be relocated in order to place new gate arms at the appropriate location
- Existing stop bar would need to move back based on standard distances to new railroad equipment
- Everyone agreed on the proposed improvements for this movement

C. 19th Avenue (Northbound)
- 3 thru lanes, 1 dedicated slight left turn lane and 1 slight left/left turn lane
- Does not cross tracks but left turn lanes back up due to the slight left/left movement being controlled by any trains
- TYLIN to investigate if a third left turn lane can be added to reduce stress during train movements.

D. Other Discussions
- The City stated that the roadway cannot lose any lanes when evaluating alternatives for new gate arms at this intersection
- The City will likely seek the use of federal funds for this project. The City asked Consultant to include information regarding the use of federal funds (specifically CRISI Grant)

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It was my intention that these notes reflect the general discussion during the meeting. Please contact me regarding any additions, deletions or changes to these notes.

Carlos Sanchez Soria, P.E.
Senior Associate/Senior Project Manager

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TYLIN INTERNATIONAL
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MEETING TITLE	19th Ave & McDowell Road RR Xing (ST85100439)
DATE AND TIME	3/4/20, 11:00 am
ATTENDEES	See Sign-in Sheet
ORGANIZED BY	Jason Pike, Arizona Corporation Commission (ACC)

MEETING DISCUSSIONS

A. Safety Briefing

- Kate went through the safety briefing with everybody on site.
- BNSF is now requiring everybody to wear safety glasses (in addition to vest, hard hat and steel toe boots).

B. Background

- The ACC/ADOT/BNSF/City of Phoenix have had several meetings in the past for this location.
- The project is located next to the yard and does not have any gates (cantilevers are in place).
- The Arizona State Fair is held throughout the month of October (northeast corner of 19th Ave & McDowell Road intersection).
- Due to the existing site conditions, cars can "creep up" onto the tracks and when the train arrives, cars have nowhere to go.

C. DRAFT Project Assessment (PA)

- The City and TYLIN have prepared a DRAFT PA for this intersection and would like to receive feedback from the ACC, ADOT and BNSF.
- Carlos stated that the purpose of the PA is to obtain approval of the proposed improvements at this crossing. This will allow the City to move forward with design and construction of the project without delays due to lack of agreement in the scope of work.
- Jason stated that this project is currently being evaluated to make it to the list of projects eligible for Section 130 federal funding.
- Jason asked if gates for the westbound (WB) direction where necessary. BNSF stated that they would like to see gates for both directions to maintain uniformity of railroad crossings.
- Joe asked about the adjacent crossing to the west (along McDowell Road), but Jason stated that the purpose of this project and diagnostics meeting was to focus on this crossing only.
- Kate asked if records of easements were available for this crossing. Does the City have an existing roadway easement in place? Need to confirm.
- Karen asked if a 'Pre-signal' option had been evaluated. Carlos stated that it was not part of the DRAFT PA, but that it could be an option that could be added for the FINAL PA.
- Karen identified some "temporary" improvements that could be done at the intersection. Joe will evaluate the possibility of taking care of some of these items after discussion with Streets Maintenance.
    - Improve existing pavement markings and signs, including modified W10-2 signs on Grand Avenue; R8-8 sign, potentially between in the tracks in the roadway easement; W10-1 sign for SB right-turns;
    - Dynamic Envelope Painting may be an option for this location;
    - Replace burnt out bulbs for the train activated "No right" sign for SB 19th Avenue to WB McDowell Road. City confirmed sign has been removed and replaced with a blank-out sign closer to the intersection
    - BNSF is currently evaluating options to adjust operations in the yard to avoid gate pumping.

D. Federal Funding (Section 130)

- Jane stated that ADOT has a list of projects on deck for the use of Section 130 funding – and this is not one of them. As Jason stated at the beginning of the meeting, the goal is to add this project to the list.
- Jane stated that based on the current workload, the earliest ADOT could start looking at this project is 2024. After that, it will probably be 2 to 3 years after that to start of construction.
- Jane stated that the state gets $2.34M per year, which needs to be distributed amongst all projects.
- Jane stated that the City needs to confirm that they can pay the 10% match required by Section 130.
- Carlos stated that the City is also looking for other funding sources, such as Consolidated Rail Infrastructure and Safety Improvements (CRISI) Program. Jane stated that funding may be able to be combined for one project. If funding is combined, then the work would need to be clearly defined on the project plans (Section 130, Local Funds, CRISI and other funding sources). Travis stated that this has been done in the state of Utah (mixing of funding sources).
- If there is more than one funding source, the other source cannot be used to cover the 10% local match that is required for Section 130.

E. Action Item Matrix

- Below is a list of action items that came out of the meeting:

No.	Action Item	Responsible	Due Date	Completed	Status/Comments
1	Add this project to the list of projects eligible for Section 130 Federal Funds	Jason Pike (ACC) and Jane Gauger (ADOT)	April 2020	Yes	The project has been added to the list per Jane's email on 4/16/20.
2	Find out if the City has an existing Roadway Easement over BNSF's property	Carlos Sanchez (TYLIN) and Joe Perez (City of Phoenix)	3/27/20	No	This will be completed during final design stage.
3	Temporary improvements – Fix sign activated by train for "No Right" on SB 19th Ave to WB McDowell Road	Joe Perez (City of Phoenix)	3/27/20	Yes	3/5: Email from City stating bulbs have been ordered and will be replaced. 3/11: Email from City stating that the old sign had been replaced in its place with a new one.
4	Temporary improvements – Replace existing striping near crossing (existing striping is fading away) and additional items mentioned above.	Joe Perez (City of Phoenix)	3/27/20	In progress.	

It was my intention that these notes reflect the general discussion during the meeting. Please contact me regarding any additions, deletions or changes to these notes.

Carlos Sanchez Soria, P.E.
Senior Associate/Senior Project Manager

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Appendix F – Federal Railroad Administration Accident Reports

DEPARTMENT OF TRANSPORTATION
FEDERAL RAILROAD ADMINISTRATION (FRA)

HIGHWAY-RAIL GRADE CROSSING ACCIDENT/INCIDENT REPORT

OMB Approval No. 2130-0500

1. Name of Reporting Railroad: **BNSF Railway Company [BNSF]**	1a. Alphabetic Code: **BNSF**	1b. Railroad Accident/Incident No.: **SW0918203**
2. Name of Other Railroad or Other Entity Filling for Equipment Involved in Train Accident/Incident	2a. Alphabetic Code	2b. Railroad Accident/Incident No.
3. Name of Railroad or Other Entity Responsible for Track Maintenance *(single entry)*: **BNSF Railway Company [BNSF]**	3a. Alphabetic Code: **BNSF**	3b. Railroad Accident/Incident No.: **SW0918203**
4. U.S. DOT Grade Crossing ID No.: **025436X**	5. Date of Accident/Incident (month/day/year): **09/30/2018**	6. Time of Accident/Incident: **5:25** AM ☑ PM ☐
7. Nearest Railroad Station: **PHOENIX**	8. Subdivision: **PHOENIX**	9. County: **MARICOPA**
10. State: Abbr. **AZ** Code **04**		
11. City *(if in a city)*: **PHOENIX**	12. Highway Name or No.: **MCDOWELL RD**	Public ☑ Private ☐

Highway User Involved

13. Type: **J** (A. Auto, B. Truck, C. Truck-trailer, D. Pick-up truck, E. Van, F. Bus, G. School Bus, H. Motorcycle, J. Other Motor Vehicle, K. Pedestrian, M. Other *(specify)*) — Code **A**

14. Vehicle Speed *(est. mph at impact)*: **8**

15. Direction *(geographical)* (1. North 2. South 3. East 4. West) — Code **3**

16. Position (1. Stalled or stuck on crossing 2. Stopped on Crossing 3. Moving over crossing 4. Trapped on crossing by traffic 5. Blocked on crossing by gates) — Code **3**

20a. Was the highway user and/or rail equipment involved in the impact transporting hazardous materials? (1. Highway User 2. Rail Equipment 3. Both 4. Neither) — Code **4**

Rail Equipment Involved

17. Equipment (1. Train *(units pulling)* 2. Train *(units pushing)* 3. Train *(standing)* 4. Car(s) *(moving)* 5. Car(s) *(standing)* 6. Light loco(s) *(moving)* 7. Light loco(s) *(standing)* 8. Other *(specify)*; A. Train pulling- RCL B. Train pushing- RCL C. Train standing- RCL D. EMU Locomotive(s) E. DMU Locomotive(s)) — Code **6**

18. Position of Car Unit in Train: **1**

19. Circumstance (1. Rail equipment struck highway user 2. Rail equipment struck by highway user) — Code **2**

20b. Was there a hazardous materials release by (1. Highway User 2. Rail Equipment 3. Both 4. Neither) — Code **4**

20c. State here the name and quantity of the hazardous material released, if any

21. Temperature *(specify if minus)*: **80** °F

22. Visibility *(single entry)* (1. Dawn 2. Day 3. Dusk 4. Dark) — Code **1**

23. Weather *(single entry)* (1. Clear 2. Cloudy 3. Rain 4. Fog 5. Sleet 6. Snow) — Code **1**

24. Type of Equipment Consist *(single entry)* (1. Freight Train 2. Passenger Train-Pulling 3. Commuter Train-Pulling 4. Work Train 5. Single Car 6. Cut of cars 7. Yard/Switching 8. Light loco(s) 9. Maint./inspect. car A. Spec. MoW Equip. B. Passenger Train-Pushing C. Commuter Train-Pushing D. EMU E. DMU) — Code **8**

25. Track Type Used by Rail Equipment Involved (1. Main 2. Yard 3. Siding 4. Industry) — Code **1**

26. Track Number or Name: **SINGLE MAIN TRACK**

27. FRA Track Class (1-9,X): **3**

28. Number of Locomotive Units: **6**

29. Number of Cars: **0**

30. Consist Speed *(Recorded speed if available)* R. Recorded E. Estimated: **4** mph — Code **R**

31. Time Table Direction (1. North 2. South 3. East 4. West) — Code **3**

32. Type of Crossing Warning (1. Gates 2. Cantilever FLS 3. Standard FLS 4. Wig wags 5. Hwy. traffic signals 6. Audible 7. Crossbucks 8. Stop signs 9. Watchman 10. Flagged by crew 11. Other *(specify)* 12. None)
Code(s): **02** **03** **05** **06** **07**

33. Signaled Crossing Warning (See reverse side for instructions and codes) — Code **1**

34. Roadway Conditions (A. Dry B. Wet C. Snow/Slush D. Ice E. Sand,Mud,Dirt,Oil,Gravel F. Water (Standing, Moving)) — Code **A**

35. Location of Warning (1. Both Sides 2. Side of Vehicle Approach 3. Opposite Side of Vehicle Approach) — Code **1**

36. Crossing Warning Interconnected with Highway Signals (1. Yes 2. No 3. Unknown) — Code **1**

37. Crossing Illuminated by Street Lights or Special Lights (1. Yes 2. No 3. Unknown) — Code **1**

38. Highway User's Age:

39. Highway User's Gender (1. Male 2. Female) — Code

40. Highway User Went Behind or in Front of Train and Struck or was Struck by Second Train (1. Yes 2. No 3. Unknown) — Code **2**

41. Highway User (1. Went around the gate 2. Stopped and then proceeded 3. Did not stop 4. Stopped on crossing 5. Other *(specify)* 6. Went around/thru temporary barricade (if yes, see instructions) 7. Went thru the gate 8. Suicide/Attempted suicide) — Code **3**

42. Driver Passed Standing Highway Vehicle (1. Yes 2. No 3. Unknown) — Code **2**

43. View of Track Obscured by *(primary obstruction)* (1. Permanent Structure 2. Standing railroad equipment 3. Passing Train 4. Topography 5. Vegetation 6. Highway Vehicles 7. Other (specify) 8. Not Obstructed) — Code **8**

Casualties to:	Killed	Injured
46. Highway-Rail Crossing Users	**0**	**1**
49. Railroad Employees	**0**	**0**
52. Passengers on Train	**0**	**0**

44. Driver was (1. Killed 2. Injured 3. Uninjured): **2**

45. Was Driver in the Vehicle? (1. Yes 2. No) — Code **1**

47. Highway Vehicle Property Damage *(est. dollar damage)*: **$1,000**

48. Total Number of Vehicle Occupants *(including driver)*: **1**

50. Total Number of People on Train *(include passengers and train crew)*: **2**

51. Is a Rail Equipment Accident / Incident Report Being Filed (1. Yes 2. No) — Code **2**

53a. Special Study Block — Video Taken? ☐ Yes ☑ No; Video Used? ☐ Yes ☑ No

53b. Special Study Block

54. Narrative Description *(Be specific, and continue on separate sheet if necessary)*

A VEHICLE DID NOT STOP AND STRUCK THE SIDE OF THE LEAD LOCOMOTIVE ON D PHXBEL1 29M, USER'S AGE UNKNOWN, USER'S GENDER UNKNOWN AS THEY LEFT THE SCENE. CREW WAS NOT DRUG/ALCOHOL TESTED.

55. Typed Name and Title | 56. Signature | 57. Date

NOTE: This report is part of the reporting railroad's accident report pursuant to the accident reports statute and, as such shall not "be admitted as evidence or used for any purpose in any suit or action for damages growing out of any matter mentioned in said report...." 49 U.S.C. 20903. See 49 C.F.R. 225.7 (b).

* NOTE THAT ALL CASUALTIES MUST BE REPORTED ON FORM FRA F 6180.55A

OMB approved 6/6/2018, Approval expires 6/30/2021

DEPARTMENT OF TRANSPORTATION
FEDERAL RAILROAD ADMINISTRATION (FRA)

HIGHWAY-RAIL GRADE CROSSING ACCIDENT/INCIDENT REPORT

OMB Approval No. 2130-0500

1. Name of Reporting Railroad: **BNSF Railway Company [BNSF]**	1a. Alphabetic Code: **BNSF**	1b. Railroad Accident/Incident No.: **SW0818201**
2. Name of Other Railroad or Other Entity Filling for Equipment Involved in Train Accident/Incident	2a. Alphabetic Code	2b. Railroad Accident/Incident No.
3. Name of Railroad or Other Entity Responsible for Track Maintenance *(single entry)*: **BNSF Railway Company [BNSF]**	3a. Alphabetic Code: **BNSF**	3b. Railroad Accident/Incident No.: **SW0818201**
4. U.S. DOT Grade Crossing ID No.: **025436X**	5. Date of Accident/Incident (month/day/year): **0 8 / 0 1 / 2018**	6. Time of Accident/Incident: **1:52** AM ☑ PM ☐
7. Nearest Railroad Station: **PHOENIX**	8. Subdivision: **PHOENIX**	9. County: **MARICOPA**
10. State Abbr.: **AZ** Code: **04**		
11. City *(if in a city)*: **PHOENIX**	12. Highway Name or No.: **MCDOWELL RD**	Public ☑ Private ☐

Highway User Involved

13. Type — C. Truck-trailer; F. Bus; J. Other Motor Vehicle; A. Auto; D. Pick-up truck; G. School Bus; K. Pedestrian; B. Truck; E. Van; H. Motorcycle; M. Other *(specify)*. Code: **E**

14. Vehicle Speed *(est. mph at impact)*: **25**

15. Direction *(geographical)* 1. North 2. South 3. East 4. West. Code: **3**

16. Position — 1. Stalled or stuck on crossing; 2. Stopped on Crossing; 3. Moving over crossing; 4. Trapped on crossing by traffic; 5. Blocked on crossing by gates. Code: **3**

20a. Was the highway user and/or rail equipment involved in the impact transporting hazardous materials? 1. Highway User 2. Rail Equipment 3. Both 4. Neither. Code: **4**

Rail Equipment Involved

17. Equipment — 1. Train *(units pulling)*; 2. Train *(units pushing)*; 3. Train *(standing)*; 4. Car(s) *(moving)*; 5. Car(s) *(standing)*; 6. Light loco(s) *(moving)*; 7. Light loco(s) *(standing)*; 8. Other *(specify)*; A. Train pulling- RCL; B. Train pushing- RCL; C. Train standing- RCL; D. EMU Locomotive(s); E. DMU Locomotive(s). Code: **6**

18. Position of Car Unit in Train: **1**

19. Circumstance — 1. Rail equipment struck highway user 2. Rail equipment struck by highway user. Code: **1**

20b. Was there a hazardous materials release by 1. Highway User 2. Rail Equipment 3. Both 4. Neither. Code: **4**

20c. State here the name and quantity of the hazardous material released, if any

21. Temperature *(specify if minus)*: **92** °F

22. Visibility *(single entry)* 1. Dawn 2. Day 3. Dusk 4. Dark. Code: **4**

23. Weather *(single entry)* 1. Clear 2. Cloudy 3. Rain 4. Fog 5. Sleet 6. Snow. Code: **1**

24. Type of Equipment Consist *(single entry)* — 1. Freight Train; 2. Passenger Train-Pulling; 3. Commuter Train-Pulling; 4. Work Train; 5. Single Car; 6. Cut of cars; 7. Yard/Switching; 8. Light loco(s); 9. Maint./inspect. car; A. Spec. MoW Equip.; B. Passenger Train-Pushing; C. Commuter Train-Pushing; D. EMU; E. DMU. Code: **8**

25. Track Type Used by Rail Equipment Involved 1. Main 2. Yard 3. Siding 4. Industry. Code: **2**

26. Track Number or Name: **501**

27. FRA Track Class (1-9,X): **1**

28. Number of Locomotive Units: **2**

29. Number of Cars: **0**

30. Consist Speed *(Recorded speed if available)* R. Recorded E. Estimated: **3** mph. Code: **E**

31. Time Table Direction 1. North 2. South 3. East 4. West. Code: **4**

32. Type of Crossing Warning — 1. Gates; 2. Cantilever FLS; 3. Standard FLS; 4. Wig wags; 5. Hwy. traffic signals; 6. Audible; 7. Crossbucks; 8. Stop signs; 9. Watchman; 10. Flagged by crew; 11. Other *(specify)*; 12. None. Code(s): **02 03 05 06 07**

33. Signaled Crossing Warning (See reverse side for instructions and codes). Code: **1**

34. Roadway Conditions — A. Drv; B. Wet; C.Snow/Slush; D.Ice; E. Sand,Mud,Dirt,Oil,Gravel; F.Water (Standing, Moving). Code: **A**

35. Location of Warning 1. Both Sides 2. Side of Vehicle Approach 3. Opposite Side of Vehicle Approach. Code: **1**

36. Crossing Warning Interconnected with Highway Signals 1. Yes 2. No 3. Unknown. Code: **1**

37. Crossing Illuminated by Street Lights or Special Lights 1. Yes 2. No 3. Unknown. Code: **1**

38. Highway User's Age:

39. Highway User's Gender 1. Male 2. Female. Code: **2**

40. Highway User Went Behind or in Front of Train and Struck or was Struck by Second Train 1. Yes 2. No 3. Unknown. Code: **2**

41. Highway User 1. Went around the gate; 2. Stopped and then proceeded; 3. Did not stop; 4. Stopped on crossing; 5. Other *(specify)*; 6. Went around/thru temporary barricade (if yes, see instructions); 7. Went thru the gate; 8. Suicide/Attempted suicide. Code: **3**

42. Driver Passed Standing Highway Vehicle 1. Yes 2. No 3. Unknown. Code: **2**

43. View of Track Obscured by *(primary obstruction)* 1. Permanent Structure; 2. Standing railroad equipment; 3. Passing Train; 4. Topography; 5. Vegetation; 6. Highway Vehicles; 7. Other (specify); 8. Not Obstructed. Code: **8**

Casualties to:	Killed	Injured
46. Highway-Rail Crossing Users	**0**	**0**
49. Railroad Employees	**0**	**0**
52. Passengers on Train	**0**	**0**

44. Driver was 1. Killed 2. Injured 3. Uninjured: **3**

45. Was Driver in the Vehicle? 1. Yes 2. No. Code: **1**

47. Highway Vehicle Property Damage *(est. dollar damage)*: **$2,000**

48. Total Number of Vehicle Occupants *(including driver)*: **1**

50. Total Number of People on Train *(include passengers and train crew)*: **3**

51. Is a Rail Equipment Accident / Incident Report Being Filed 1. Yes 2. No. Code: **2**

53a. Special Study Block — Video Taken? ☑ Yes ☐ No; Video Used? ☐ Yes ☑ No

53b. Special Study Block

54. Narrative Description *(Be specific, and continue on separate sheet if necessary)*

YPHX201 WAS SWITCHING ON THE EAST OF THE YARD. THE YPHX201 MADE A EASTWARD MOVE ACROSS MCDOWELL ROAD TO PLACE THEIR LOCOMOTIVES ON THE ENGINE LEAD. AS THEY OCCUPIED THE CROSSING ON MCDOWELL THE HELPER LINED THE SWITCH AND THEN CLIMBED THE LOCOMOTIVE TO RIDE THE FRONT STEP INTO THE ROUND HOUSE. AS THEY WERE PULLING INTO THE YARD A VEHICLE SWERVED INTO THE YARD AND WAS STRUCK AND FLED THE AREA. USER'S AGE UNKNOWN. CREW WAS NOT DRUG/ALCOHOL TESTED.

55. Typed Name and Title | 56. Signature | 57. Date

NOTE: This report is part of the reporting railroad's accident report pursuant to the accident reports statute and, as such shall not "be admitted as evidence or used for any purpose in any suit or action for damages growing out of any matter mentioned in said report...." 49 U.S.C. 20903. See 49 C.F.R. 225.7 (b).

* NOTE THAT ALL CASUALTIES MUST BE REPORTED ON FORM FRA F 6180.55A

OMB approved 6/6/2018, Approval expires 6/30/2021

DEPARTMENT OF TRANSPORTATION
FEDERAL RAILROAD ADMINISTRATION (FRA)

HIGHWAY-RAIL GRADE CROSSING ACCIDENT/INCIDENT REPORT

OMB Approval No. 2130-0500

1. Name of Reporting Railroad: **BNSF Railway Company [BNSF]**	1a. Alphabetic Code: **BNSF**	1b. Railroad Accident/Incident No.: **SW0713200**
2. Name of Other Railroad or Other Entity Filling for Equipment Involved in Train Accident/Incident	2a. Alphabetic Code	2b. Railroad Accident/Incident No.
3. Name of Railroad or Other Entity Responsible for Track Maintenance *(single entry)*: **BNSF Railway Company [BNSF]**	3a. Alphabetic Code: **BNSF**	3b. Railroad Accident/Incident No.: **SW0713200**
4. U.S. DOT Grade Crossing ID No.: **025436X**	5. Date of Accident/Incident (month/day/year): **0 7 / 0 9 / 2013**	6. Time of Accident/Incident: **10:25** AM ☑ PM ☐
7. Nearest Railroad Station: **PHOENIX**	8. Subdivision: **PHOENIX**	9. County: **MARICOPA**
10. State Abbr.: **AZ** Code: **04**		
11. City *(if in a city)*: **PHOENIX**	12. Highway Name or No.: **MCDOWELL RD**	Public ☑ Private ☐

Highway User Involved

13. Type: A. Auto; B. Truck; C. Truck-trailer; D. Pick-up truck; E. Van; F. Bus; G. School Bus; H. Motorcycle; J. Other Motor Vehicle; K. Pedestrian; M. Other *(specify)* — Code: **J**

14. Vehicle Speed *(est. mph at impact)*:

15. Direction *(geographical)* 1. North 2. South 3. East 4. West — Code: **3**

16. Position: 1. Stalled or stuck on crossing; 2. Stopped on Crossing; 3. Moving over crossing; 4. Trapped on crossing by traffic; 5. Blocked on crossing by gates — Code: **4**

20a. Was the highway user and/or rail equipment involved in the impact transporting hazardous materials? 1. Highway User 2. Rail Equipment 3. Both 4. Neither — Code: **2**

Rail Equipment Involved

17. Equipment: 1. Train *(units pulling)*; 2. Train *(units pushing)*; 3. Train *(standing)*; 4. Car(s) *(moving)*; 5. Car(s) *(standing)*; 6. Light loco(s) *(moving)*; 7. Light loco(s) *(standing)*; 8. Other *(specify)*; A. Train pulling- RCL; B. Train pushing- RCL; C. Train standing- RCL; D. EMU Locomotive(s); E. DMU Locomotive(s) — Code: **2**

18. Position of Car Unit in Train: **1**

19. Circumstance: 1. Rail equipment struck highway user 2. Rail equipment struck by highway user — Code: **1**

20b. Was there a hazardous materials release by: 1. Highway User 2. Rail Equipment 3. Both 4. Neither — Code: **4**

20c. State here the name and quantity of the hazardous material released, if any

21. Temperature *(specify if minus)*: **96** °F	22. Visibility *(single entry)*: 1. Dawn 2. Day 3. Dusk 4. Dark — Code: **2**	23. Weather *(single entry)*: 1. Clear 2. Cloudy 3. Rain 4. Fog 5. Sleet 6. Snow — Code: **1**	
24. Type of Equipment Consist *(single entry)*: 1. Freight Train; 2. Passenger Train-Pulling; 3. Commuter Train-Pulling; 4. Work Train; 5. Single Car; 6. Cut of cars; 7. Yard/Switching; 8. Light loco(s); 9. Maint./inspect. car; A. Spec. MoW Equip.; B. Passenger Train-Pushing; C. Commuter Train-Pushing; D. EMU; E. DMU — Code: **7**	25. Track Type Used by Rail Equipment Involved: 1. Main 2. Yard 3. Siding 4. Industry — Code: **1**	26. Track Number or Name: **SINGLE MAIN**	
27. FRA Track Class (1-9,X): **2**	28. Number of Locomotive Units: **1**	29. Number of Cars: **11**	30. Consist Speed *(Recorded speed if available)*: R. Recorded; E. Estimated: **6** mph — Code: **R**
31. Time Table Direction: 1. North 2. South 3. East 4. West — Code: **4**			

32. Type of Crossing Warning: 1. Gates; 2. Cantilever FLS; 3. Standard FLS; 4. Wig wags; 5. Hwy. traffic signals; 6. Audible; 7. Crossbucks; 8. Stop signs; 9. Watchman; 10. Flagged by crew; 11. Other *(specify)*; 12. None — Code(s): **03** **06**

33. Signaled Crossing Warning (See reverse side for instructions and codes) — Code: **1**

34. Roadway Conditions: A. Drv; B. Wet; C.Snow/Slush; D.Ice; E. Sand,Mud,Dirt,Oil,Gravel; F.Water (Standing, Moving) — Code: **A**

35. Location of Warning: 1. Both Sides; 2. Side of Vehicle Approach; 3. Opposite Side of Vehicle Approach — Code: **1**

36. Crossing Warning Interconnected with Highway Signals: 1. Yes 2. No 3. Unknown — Code: **1**

37. Crossing Illuminated by Street Lights or Special Lights: 1. Yes 2. No 3. Unknown — Code: **2**

38. Highway User's Age: **86**

39. Highway User's Gender: 1. Male 2. Female — Code: **2**

40. Highway User Went Behind or in Front of Train and Struck or was Struck by Second Train: 1. Yes 2. No 3. Unknown — Code: **2**

41. Highway User: 1. Went around the gate; 2. Stopped and then proceeded; 3. Did not stop; 4. Stopped on crossing; 5. Other *(specify)*; 6. Went around/thru temporary barricade (if yes, see instructions); 7. Went thru the gate; 8. Suicide/Attempted suicide — Code: **4**

42. Driver Passed Standing Highway Vehicle: 1. Yes 2. No 3. Unknown — Code: **2**

43. View of Track Obscured by *(primary obstruction)*: 1. Permanent Structure; 2. Standing railroad equipment; 3. Passing Train; 4. Topography; 5. Vegetation; 6. Highway Vehicles; 7. Other (specify); 8. Not Obstructed — Code: **8**

Casualties to:	Killed	Injured
46. Highway-Rail Crossing Users	**0**	**0**
49. Railroad Employees	**0**	**0**
52. Passengers on Train	**0**	**0**

44. Driver was: 1. Killed 2. Injured 3. Uninjured — **3**

45. Was Driver in the Vehicle? 1. Yes 2. No — Code: **1**

47. Highway Vehicle Property Damage *(est. dollar damage)*: **$1,000**

48. Total Number of Vehicle Occupants *(including driver)*: **1**

50. Total Number of People on Train *(include passengers and train crew)*: **3**

51. Is a Rail Equipment Accident / Incident Report Being Filed 1. Yes 2. No — Code: **2**

53a. Special Study Block — Video Taken? ☐ Yes ☑ No; Video Used? ☐ Yes ☑ No

53b. Special Study Block

54. Narrative Description *(Be specific, and continue on separate sheet if necessary)*

55. Typed Name and Title | 56. Signature | 57. Date

NOTE: This report is part of the reporting railroad's accident report pursuant to the accident reports statute and, as such shall not "be admitted as evidence or used for any purpose in any suit or action for damages growing out of any matter mentioned in said report...." 49 U.S.C. 20903. See 49 C.F.R. 225.7 (b).

* NOTE THAT ALL CASUALTIES MUST BE REPORTED ON FORM FRA F 6180.55A

OMB approved 6/6/2018, Approval expires 6/30/2021

Appendix G – DRAFT Project Scope of Work

The following is a DRAFT Scope of Work to be used for final design of this project. The DRAFT Scope of Work addresses the general tasks associated with the design of the project and identifies coordination efforts that will be required during the final design of this project.

Task 1 – Project Management, Meetings and Coordination

Consultant shall provide project management and coordination services required to complete the scope of work and coordinate the project with the City and stakeholders. The following is a list of anticipated activities:

- Project coordination with City staff;
- Supervise execution of work;
- Coordinate quality control reviews of project activities, deliverables and reports;
- Coordinate and monitor sub-consultant activities;
- Prepare for, attend and document all project meetings (see below for further explanation);
- Prepare monthly invoices and progress reports;
- Prepare and update project schedule on a monthly basis and monitor progress.

Consultant anticipates coordinating with the following project stakeholders:

- City of Phoenix
    - Street Transportation Department
    - Real Estate Department
    - Water Services Department
    - Transit Department
- Arizona Department of Transportation (ADOT)
- Arizona Corporation Commission (ACC)
- Burlington Northern Santa Fe Railway (BNSF)
- Numerous Adjacent Property/Business Owners

Consultant shall meet bi-monthly (10 meetings anticipated for 20 month project schedule) with City Staff to present and discuss progress to date and to resolve any outstanding comments/issues that arise during the course of design review. In addition to meeting with City staff, Consultant has also budgeted two (2) additional meetings with various stakeholders and affected business over the project's duration. The Consultant shall prepare the meeting agendas, sign-in sheets, handout materials and shall distribute meeting minutes to the meeting attendees within five (5) business days of any meeting.

Project management and coordination hours are assumed for the design duration (20 months).

Task 2 – Site Visit / Data Acquisition

A site visit will be conducted by the Consultant and City staff (if desired) to identify key areas of concern and engineering challenges that might have an impact on the project design. The site visit will familiarize us with the following:

- General topography
- Existing utilities
- General drainage conditions
- Existing features such as gates, fences, walls, structures, access locations, etc.
- Other site features not shown on as-built maps and/or aerial mapping;

As part of this task, Consultant shall obtain any available as as-built maps from the City. It is assumed that the City will provide quarter section maps for existing right-of-way, storm drain, sewer and water near the project area as well as for any other utilities within the project limits.

Task 3 – Field Survey and Utility Research/Mapping

Consultant shall complete topographic design survey of the project area in accordance with the City of Phoenix Administrative Procedure No. 155. The work limits shall begin approximately 500-ft west of 19th Avenue and extend to include the entire McDowell Road/Grand Avenue intersection. Survey along the tracks will be obtained at 50-ft intervals along BNSF right-of-way. A Temporary Occupancy Permit and BNSF flagger will most likely be required. The costs associated with these items shall be included as part of this task.

Task 4 – Utility Coordination

Utility coordination will be required with several utility companies located throughout the project limits. As part of this task, Consultant shall identify all utility owners within the project limits. The Consultant shall coordinate with utility owners in conjunction with the City's Utility Coordinator. The following tasks are associated with these efforts:

Utility Coordination Meetings
Consultant shall assist the City's Utility Coordinator in arranging/conducting utility coordination meetings to facilitate identification and resolution of utility conflicts throughout the project. The Consultant shall be responsible for preparing any exhibits that would be required for the meeting. For budgetary purposes, a total of four (4) utility meetings are anticipated as part of this task.

Utility Conflicts
Consultant shall identify potential conflicts between the existing utilities and the proposed project improvements. Consultant shall coordinate with the utility companies to mitigate conflicts. If feasible, Consultant shall adjust proposed improvements to avoid utility conflicts without jeopardizing the project's purpose and goals.

Provide Information to Utility Companies

Consultant shall provide CAD files in AutoCAD format and project plans in PDF format to utility companies upon request.

Identification of Potholes

Between the 40% submittal and 70% submittal, Consultant shall identify the needs for utility potholing throughout the project. Consultant shall request potholes through the City's Utility Coordinator. Consultant shall prepare a comprehensive list of all required utility potholes (using City standard format) and shall include locations on the project plans. In addition, Consultant shall include the following information in the City's standard table:

Pothole # (TBD)
Sheet # (TBD)
Station/Offset
Utility Name and Size

Once the pothole results are received, Consultant shall update the horizontal location of utilities as necessary and distribute revised CAD files/pothole results to each of the utility owners. Based on the information obtained from the potholes, Consultant shall identify all utility conflicts that will require adjustment/relocation. Consultant shall add pothole data information received to the roadway and connector pipe profiles included as part of the 70% submittal.

Utility Relocation

Where utility relocations are required, the City's Utility Coordinator shall work with the utility companies to determine if the relocation of the facilities are to be included as part of the project (by the City's contractor) or prior to construction. Where the utility relocation is to be included as part of the project, the City's Utility Coordinator shall coordinate design details and develop design/construction costs associated with the relocation work. Construction costs for any new utilities shall be provided to Consultant for inclusion in the final cost estimate and bid schedule prepared for the project.

Review of Utility Relocation Design Plans

The City's Utility coordinator and Consultant shall review all utility relocation plans to ensure compatibility with the proposed design plans. If the utility relocation work is to be performed by the utility companies prior to the construction of the City's project, Consultant shall include the proposed alignment of the relocated facility in the final construction plans.

Task 5 – BNSF (Railroad) Coordination

Consultant shall work very closely with the City Project Manager and BNSF staff to coordinate all project challenges and address BNSF concerns to allow for the construction of the proposed improvements at the existing railroad crossing.

Consultant shall provide coordination with the City, BNSF and the ACC to coordinate the proposed improvements at the existing crossings. Included as part of this coordination effort is preparation of exhibits depicting the crossing and land ownership in the immediate vicinity as well as detailed coordination of responsibility by each agency for all activities planned in the immediate area.

We anticipate coordination with BNSF to extend throughout the project schedule (20 months). This task includes all of the work required to obtain BNSF approval of the project and coordination of BNSF improvements on the civil plans. The following is a list of anticipated coordination for each of the submittal stages:

Pre-40% Submittal:

- Site meeting with BNSF and ACC at the existing railroad crossing
- Obtain Temporary Occupancy Permit for Surveying near railroad tracks

40% Submittal:

- Develop improvements for each crossing based on BNSF/ACC requirements for safety

Post-40% Submittal:

- City/BNSF to enter into agreement for BNSF to provide design review services (agreement is anticipated to be directly between the City and BNSF)
- Obtain temporary occupancy permit for any geotechnical work within BNSF right-of-way (Fees associated with this permit are included in this proposal)

70% Submittal:

- Improvements shall be finalized (gate arms, signals, raised medians, etc)
- Any new Right of Way and Easements shall be identified

Pre-100% Submittal:

- Jones Lang Lasalle (BNSF) to prepare legal descriptions and ROW/Easement Agreements for any necessary acquisitions. Consultant will work very closely with Jones Lang Lasalle to ensure timely preparation of legal descriptions and ROW/Easement agreements
- BNSF to provide draft construction and maintenance agreements for City review
- ACC to provide formal data request for the existing crossing and schedule administrative law judge hearing
- Administrative law judge hearing with ACC and BNSF for approval of crossing improvements

100% Submittal

- BNSF to provide final construction and maintenance agreements including estimate for any work within BNSF ROW to be completed by unionized labor forces

Sealed Submittal:

- City to sign construction and maintenance agreements and approve estimated costs

Consultant shall work very closely with the City's Project Manager to prepare and provide all information requested by the ACC for the procedural hearing and Administrative Law Judge hearing regarding each of the crossings. It is anticipated that Consultant shall provide the following information to the City (Information shall be obtained by the Consultant from various sources including, Census data, Google Earth/Maricopa Assessor Map measurements, BNSF staff, etc.)

- Traffic/Crash Data;
- Population Information;
- Log of existing warning/safety equipment located at crossing;
- Proximity to additional crossings and distinction if grade separated or not;
- Background and supporting information (costs/right-of-way impacts/coordination history) on why this crossing not proposed as grade separated;
- Adjacent area zoning description;
- Existing track usage metrics;
- Adjacent school (including bus route) and hospital information;
- Hazardous material assessment for area including any vehicles likely transporting hazardous materials across tracks;

Included in the effort as part of this task are a total of six (6) railroad coordination meetings in order to facilitate final approval of the railroad crossings.

Task 6 – Drainage Memorandum

A roadway drainage analysis will need to be performed per the latest edition of the City of Phoenix Storm Water Policies and Standards, and Drainage Design Manuals for Maricopa County (Hydrology and Hydraulics), Arizona. Consultant shall prepare a drainage memorandum to summarize the impacts of the proposed widening improvements on the existing drainage infrastructure. Based on the preliminary conceptual design, it is not anticipated that additional catch basins will be required as part of this project.

Task 7 – 40% Plans and Cost Estimate

Consultant shall prepare a base map depicting all existing features, utilities, right-of-way and easements. The proposed grade and alignment for major design elements such as roadways and drainage features shall be shown in sufficient detail to clearly portray any possible conflicts with existing facilities.

The plans shall include all existing topography, underground utilities, existing right-of-way and the recommended grade and alignment. As part of this submittal, the following plan sheets will be provided to a preliminary (40%) completion level (anticipated number of sheets shown in parenthesis):

Cover Sheet (1)
Legend and Notes Sheet (1)
Key Map Sheet (1)
Roadway Quantity Summary Sheet (1)
Geometric Control Sheet (1)
Quantity Summary Sheet (1)
Typical Sections Sheet (2)
Paving Plans and Profile Sheets (3)

In total, it is anticipated that ten (10) plan sheets will be submitted as part of this task.

Consultant shall also prepare a 40% bid schedule and opinion of probable cost for the proposed improvements. A 25% contingency will be utilized at this stage of the project to account for any possible unknown construction items. The project bid schedule will be prepared using standard City bid items. The opinion of probable cost will contain unit pricing based on recently bid projects in the areas as well as historical pricing available from the Consultant's representative project database.

Task 8 – 70% Plans and Opinion of Probable Cost

Consultant shall prepare 70% plans showing all design features after the Consultant has properly addressed all comments, corrections and revisions to the 40% submittal. Detailed construction notes and quantities for all project construction items shall be shown on the plans.

In addition to the plans developed during the 40% submittal for the project, the following additional plan sheets will be developed as part of this task:

Special Detail Sheets (3)
Driveway Profile Sheets (1)
Signing and Pavement Marking Sheets (2)
Street Lighting Plan Sheets (2)
Traffic Signal Sheets (3)

In total, eleven (11) new sheets will be created as part of this task, making the total anticipated number of sheets for the project to be twenty-one (21). Project cross sections shall also be completed for proposed roadway improvements at this stage of the project. Cross sections will be annotated with centerline, right-of-way and any easement limit as well as roadway cross slope and grades proposed to daylight into the adjacent topography. Finally, as part of this task, Consultant shall also update the opinion of probable cost to a 70% stage to include any new bid items introduced between the 40% and 70% plan submittal stages. At this stage of the project, a 15% contingency will be utilized to account for any possible unknown construction items.

Task 9 – 100% Plans, Special Provisions and Opinion of Probable Cost

Consultant shall prepare 100% plans showing all design features after the Consultant has properly addressed all comments, corrections and revisions to the 70% submittal. Revised roadway cross-sections at 50-foot spacing shall also be provided. An estimate of the earthwork shall be provided using the triangulation method.

Special provisions will be developed for any non-City standard specification items included as part of the project design. Consultant shall work directly with the City's Project Manager in the development of special Provisions and shall incorporate any standards and requirements associated with BNSF (i.e. traffic control and occupancy permit requirements). An opinion of probable cost will also be submitted as part of this task. At this stage of the project, a 5% contingency will be utilized to account for any possible unknown construction items.

Task 10 – Final Sealed Plans, Special Provisions and Opinion of Probable Cost

Consultant will address any final comments received on the 100% plans, special provisions and opinion of probable cost and will submit final signed/sealed versions of the project plans, special provisions and estimate. It is anticipated that Consultant will not include any contingency percentage in the opinion of probable cost.

ALLOWANCES

All sub-consultant services required shall be compensated under the following allowances items. An allowance is also included to cover all reimbursable expenses associated with this project.

Task 11 – Public Meetings

Task 12 – Pre-Emption Calculations and Design

Task 13 – Pre-Signal Warrant Analysis and Design

Task 14 – Environmental Clearance Documents (if federally funded)

Task 15 – Reimbursable Expenses

Appendix H – Pre-Signal Documentation

Section 8C.09 Traffic Control Signals at or Near Highway-Rail Grade Crossings

Guidance:

04 *If a highway-rail grade crossing is equipped with a flashing-light signal system and is located within 200 feet of an intersection or midblock location controlled by a traffic control signal, the traffic control signal should be provided with preemption in accordance with Section 4D.27.*

05 *Coordination with the flashing-light signal system, queue detection, or other alternatives should be considered for traffic control signals located farther than 200 feet from the highway-rail grade crossing. Factors to be considered should include traffic volumes, highway vehicle mix, highway vehicle and train approach speeds, frequency of trains, and queue lengths.*

06 *The highway agency or authority with jurisdiction and the regulatory agency with statutory authority, if applicable, should jointly determine the preemption operation and the timing of traffic control signals interconnected with highway-rail grade crossings adjacent to signalized highway intersections.*

Support:

07 Section 4D.27 includes a recommendation that traffic control signals that are adjacent to highway-rail grade crossings and that are coordinated with the flashing-light signals or that include railroad preemption features be provided with a back-up power supply.

Standard:

08 **Information regarding the type of preemption and any related timing parameters shall be provided to the railroad company so that they can design the appropriate train detection circuitry.**

09 **If preemption is provided, the normal sequence of traffic control signal indications shall be preempted upon the approach of trains to avoid entrapment of highway vehicles on the highway-rail grade crossing.**

10 **This preemption feature shall have an electrical circuit of the closed-circuit principle, or a supervised communication circuit between the control circuits of the highway-rail grade crossing warning system and the traffic control signal controller. The traffic control signal controller preemptor shall be activated via the supervised communication circuit or the electrical circuit that is normally energized by the control circuits of the highway-rail grade crossing warning system. The approach of a train to a highway-rail grade crossing shall de-energize the electrical circuit or activate the supervised communication circuit, which in turn shall activate the traffic control signal controller preemptor. This shall establish and maintain the preemption condition during the time the highway-rail grade crossing warning system is activated, except that when crossing gates exist, the preemption condition shall be maintained until the crossing gates are energized to start their upward movement. When multiple or successive preemptions occur, train activation shall receive first priority.**

Guidance:

11 *If a highway-rail grade crossing is located within 50 feet (or within 75 feet for a highway that is regularly used by multi-unit highway vehicles) of an intersection controlled by a traffic control signal, the use of pre-signals to control traffic approaching the grade crossing should be considered.*

Standard:

12 **If used, the pre-signals shall display a steady red signal indication during the track clearance portion of a signal preemption sequence to prohibit additional highway vehicles from crossing the railroad track.**

Guidance:

13 *Consideration should be given to using visibility-limited signal faces (see definition in Section 1A.13) at the intersection for the downstream signal faces that control the approach that is equipped with pre-signals.*

Option:

14 The pre-signal phase sequencing may be timed with an offset from the downstream signalized intersection such that the railroad track area and the area between the railroad track and the downstream signalized intersection is generally kept clear of stopped highway vehicles.

Standard:

15 **If a pre-signal is installed at an interconnected highway-rail grade crossing near a signalized intersection, a STOP HERE ON RED (R10-6) sign shall be installed near the pre-signal or at the stop line if used. If there is a nearby signalized intersection with insufficient clear storage distance for a design vehicle, or the highway-rail grade crossing does not have gates, a No Turn on Red (R10-11, R10-11a, or R10-11b) sign (see Section 2B.53) shall be installed for the approach that crosses the railroad track, if applicable.**

Preemption of Traffic Signals Near Railroad Crossings

A Recommended Practice of the Institute of Transportation Engineers

Prepared by the Joint Rail Grade Crossing Committee
of the Traffic Engineering Council

ite
A Community of Transportation Professionals

2.2.9 ADA Considerations

Title II of the Americans with Disabilities Act of 1990 requires that all services, programs, and activities provided to the public by State and local governments be accessible. Title III of the ADA prohibits discrimination on the basis of disability in "places of public accommodation" and "commercial facilities." Unlike previous legislation, such as the Rehabilitation Act of 1973, the ADA is not limited to programs, services, or facilities receiving federal funds. A railroad crossing can involve ADA obligations on the part of the public agency and of the railroad. If a crossing is being altered, then the features of the modified portion of the facility must meet ADA Accessibility Guidelines.

The MUTCD states that the shortening or omission of any pedestrian walk interval and/or pedestrian change interval is permitted. But low-vision pedestrians, pedestrians in wheelchairs, and disabled pedestrians with very low walking speeds may present special concerns, particularly where accessible pedestrian signals and detectors have been provided. One option for accommodating disabled pedestrians is to provide some or all of the pedestrian change interval during the preemption process. Oregon, for example, has a policy of providing the entire pedestrian change interval at all preempted traffic signals. See Section 2.4.5 - Pedestrian Signal Indications for further information. Also see Section 4E.06 of the 2009 MUTCD regarding walking speeds for slow walkers or wheelchair users.

Providing the full pedestrian change interval can result in long track circuits which can extend into switching tracks, industrial facilities, or yard tracks, and can be complex, expensive, and potentially less reliable.

In some cases, the additional time needed to provide a pedestrian change interval may require additional train-detection equipment to be installed, in addition to constant warning time devices. Motion-sensing devices have been used to provide the required additional time to complete any pedestrian change intervals and inhibit the display of any additional pedestrian walk intervals.

Future technologies, possibly based on GPS capabilities, may improve the ability to provide train detection at greater distances from the crossing.

Advance pedestrian preemption (see 2.4.1, Warning Device Timing) can be provided to eliminate the need to consider pedestrian clearance in the prescribed warning time (sometimes referred to as minimum warning time.)

2.3 Queue Management

2.3.1 Pre-Signals

Pre-signals can be used to stop vehicular traffic before the railroad crossing in cases where the clear storage distance (CSD, measured between 6 ft. (2 m) from the rail nearest the intersection to the intersection stop line or the normal stopping point on the highway) is 50 ft. (15 m) or less. The intent is to prevent any vehicles from stopping between the crossing and the intersection. At approaches with moderate percentages of multi-unit trucks, the distance should be increased to

75 ft. (25 m). A vehicle classification study should be conducted to determine the types of vehicles using the crossing.

Pre-signals can also be used where the CSD is as much as 200 to 250 ft. (60 to 75 m), depending on vehicle lengths. In this case, it is not expected that all vehicles will be cleared from the CSD; only from the MTCD.

The need for a pre-signal should be carefully evaluated. When a pre-signal is used, right turns on red at the intersection must be prohibited since passing a red pre-signal is a traffic violation.

A pre-signal is a primary signal and not a supplemental intersection signal. There are time periods (such as track clearance) when the pre-signal indication is red while the downstream intersection signal indication is green.

While some states (including Illinois, Michigan, and South Carolina) consider pre-signals to be a standard treatment for railroad crossings located near traffic signals, some states do not use them at all. The diagnostic team should carefully consider all aspects of pre-signal usage before recommending a pre-signal, and it may be necessary to conduct an engineering study prior to finalizing the diagnostic team recommendations.

The pre-signal timing plan should provide a green clearance interval to the downstream signalized intersection such that the MTCD is generally kept clear of downstream vehicles. Adequate clearance time and vehicle detection should be included to account for heavy vehicles as well as vehicles that are required to make a mandatory stop (e.g., school buses, vehicles hauling hazardous materials, etc.). Where permitted by law, it is desirable to exempt vehicles from mandatory stopping requirements where pre-signals are present.

Where pre-signals are used with a long CSD (more than 50 to 75 ft. [15 to 25 m], depending on vehicle lengths), it may not be practicable to clear all vehicles through the downstream intersection; instead, the timing plan should provide enough clearance so that the queue which remains within the CSD does not extend into the MTCD. Where the CSD exceeds 200 to 250 ft. (60 to 75 m), vehicle detection can be used to extend the green clearance interval to verify no queue remains within the MTCD while holding vehicles at the pre-signal after the intersection signal turns green and the queue dissipates. Pre-signals may also be used where the CSD is between 200 and 400 to 450 ft. (60 and 120 to 140 m) and they are operated in a hybrid mode as a combination pre-signal and queue-cutter signal. If the CSD exceeds 450 to 500 ft. (140 to 150 m), any traffic signal located at the railroad crossing should be considered to be a queue-cutter signal and not a pre-signal.

Pre-signals or queue-cutter signals should also be used wherever traffic could queue across the tracks and where railroad warning devices consist only of flashing-light signals. However, this can result in conflicting signal indications between the flashing red lights at the crossing and a display of track clearance green beyond the crossing. The installation of gates can resolve this conflict by preventing drivers from violating the crossing signals. In addition, traffic signal indications at downstream intersections with pre-signals should be visibility-limited from the railroad crossing stop line so no conflicting signal indications exist for motorists.

Other queue prevention strategies are discussed in the Preemption of Traffic Signals section of the FHWA's 2019 *Highway-Rail Crossing Handbook*, Third Edition.

Pre-Signal Location

Pre-signal mast arm poles can be located upstream or downstream from the railroad crossing as needed to provide the most effective display to road users approaching the crossing. Downstream pre-signal locations are sometimes preferable, since the MTCD is shortened. A shorter MTCD may result in significantly less MPT. In all cases, pre-signal equipment must be located to maintain visibility of the railroad flashing lights.

If there is a railroad cantilever and upstream pre-signals are used, the signal heads may be mounted on the cantilever if permitted by the railroad or regulatory agency. If the heads are on a separate mount, they must be located to avoid blockage or interference with the visibility of the railroad flashing lights. Railroad flashing lights should be located as specified in Chapter 8C of the 2009 MUTCD. Refer also to AREMA, Parts 3.1.36 and 3.1.37, for additional guidance regarding the location of railroad warning devices.

To comply with the MUTCD, there should be a minimum of two pre-signal faces at the crossing and the pre-signal stop line must be a minimum of 40 ft. (12 m) in advance of the pre-signal faces. One of the pre-signal faces should be located on the right side of the road. A pre-signal located in the roadway median is mounted at a minimum of 4 ft. 6 in. (1.4 m) above the median island grade. Pre-signal faces should be located so that they have adequate visibility and are not blocked by railroad equipment.

Downstream Signal Visibility

The downstream traffic signal faces at the roadway intersection that control the same approach as the pre-signal should be equipped with visibility-limited signal faces as appropriate for the location. The purpose of the visibility-limited signal faces is to limit visibility of the downstream signal faces to the area from the intersection stop line to the grade crossing. Motorists upstream of the crossing should only be able to see the pre-signal vehicle head indications. This is to prevent vehicles stopped at the railroad crossing stop line from seeing the distant green signal indication during the preemption clearance interval. An engineering study should be conducted to review the specific site conditions, including the eye heights of drivers of vehicles likely to use the crossing, and to establish the final design necessary to meet the visibility requirements.

Pre-Signal and Downstream Signal Operation

Pre-signals display a steady red signal indication during the track clearance portion of the downstream signal preemption sequence to prohibit additional vehicles from entering the MTCD. Pre-signal faces should not display green indications when the grade crossing flashing-light signal system is displaying flashing red indications. The pre-signal yellow and red intervals should be progressively timed with the downstream signal intervals to provide adequate time to clear vehicles from the track area and the downstream intersection, but the green intervals may

begin simultaneously. Vehicles that are required to stop before crossing, such as school buses and vehicles hauling hazardous materials, should be considered when determining the progressive timing to ensure that they will not be stopped within the MTCD. Where the CSD is inadequate to store a vehicle used for the basis of design clear of the MTCD and crossing gates are present, one should consider installation of vehicle detection within the CSD to prevent vehicles from being trapped within the MTCD by extending the preemption clearance interval.

MUTCD requirements for pre-signals are found in Section 8C.09 of the 2009 MUTCD. An illustrative example of a pre-signal installation is shown in Figure 11-12 of the *Traffic Control Devices Handbook* (TCDH 2013). The figure includes diagonal exclusion zone striping, which is optional.

Where a pre-signal is used, a leading protected/permissive mode (see 2009 MUTCD Section 4D.20) left-turn movement with circular green or flashing yellow arrow indications should not be used. Instead, either a protected only mode (see 2009 MUTCD Section 4D.19) left turn or a lagging permissive/protected mode left turn should be used in order to minimize the likelihood of a road user being stopped within the MTCD.

The storage area for left-turn and right-turn lanes at signalized intersections that are downstream from grade crossings sometimes extend from the signalized intersection back to and across the grade crossing. In such cases, drivers that are in the turn lane are required to make a straight-through movement when they cross the track(s) and then are required to make a turn when they reach the downstream signalized intersection.

A separate signal face for the left-turn lane and/or right-turn lane should be provided as a part of the pre-signal in addition to the signal faces provided for the through movement where both of the following conditions are met: (1) the storage area for the turn lane extends from the signalized intersection back to and across the grade crossing, and (2) the green interval for the turning movement and the downstream intersection does not always begin and end simultaneously with the green interval for the adjacent through movement.

All of the signal faces at a pre-signal should be capable of displaying the following signal indications: circular red, circular yellow, and straight-through green arrow. Left-turn green arrow, right-turn green arrow, and circular green indications should not be used in signal faces at a pre-signal to reduce the likelihood that a vehicle will inadvertently turn onto the tracks.

If a separate signal face is provided at a pre-signal for a left-turn or right-turn lane that extends from the signalized intersection back to and across the grade crossing, the separate signal face should be devoted exclusively to controlling traffic in the turn lane and (1) should be visibility-limited from the adjacent through movement, or (2) a LEFT LANE SIGNAL sign or RIGHT LANE SIGNAL sign should be mounted adjacent to the separate signal face controlling traffic in a single turn lane or in the turn lane that is farthest from the adjacent through lane(s) when multiple turn lanes are present for a particular turning movement, and a LEFT TURN LANE SIGNAL sign or RIGHT TURN LANE SIGNAL sign should be mounted adjacent to the separate signal face controlling traffic in the other turn lanes if multiple turn lanes are present for

a particular turning movement. These signal faces should display a circular red, circular yellow, or straight-through green arrow indication.

The provisions in 2009 MUTCD Section 4D.13 regarding the lateral positioning of separate turn signal faces are applicable to the separate signal faces that are provided at pre-signals for a turn lane that extends from the signalized intersection back to and across the grade crossing.

It should be noted that the installation of a pre-signal represents an additional stopping point on the roadway in addition to the intersection stop line. This must be evaluated when determining the suitability of a pre-signal because the right-turn-on-red move must be prohibited at all times. In addition, it may be necessary to work with law enforcement agencies in order to provide heightened enforcement of pre-signal locations. Where a pre-signal is determined to be necessary and right-turn volumes dictate, a separate right-turn signal face may be provided at the downstream signal to permit the right-turn movement when there are no conflicting movements. Additional information and examples of pre-signals are in Appendix B.

APPENDIX B: PRE-SIGNAL OPERATION

B.1 Pre-Signal Design

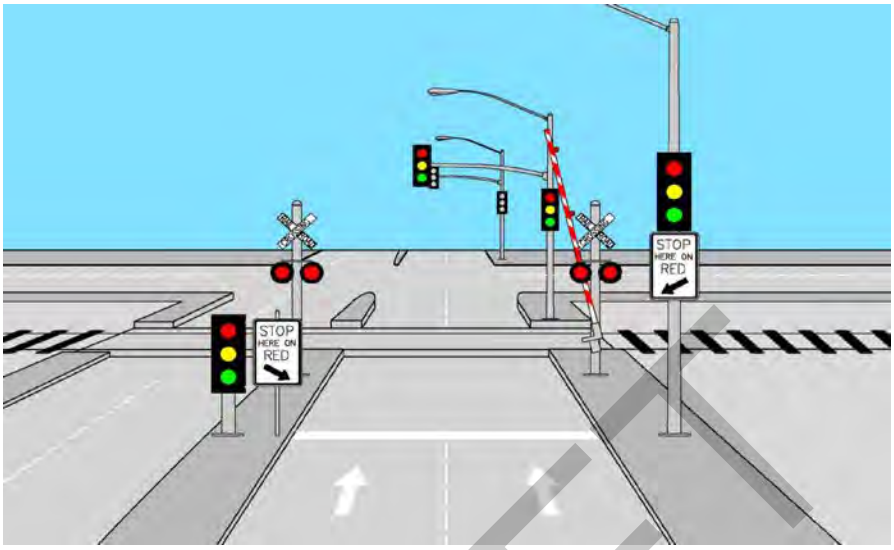
Pre-signal faces may be located either upstream or downstream from the grade crossing as needed to provide the most effective display to road users approaching the crossing. Downstream locations are preferred, if possible, since the MTCD is shortened. Figure B.1 illustrates a typical pre-signal equipment layout.

Downstream traffic signal heads should be equipped with visibility-limited heads to limit visibility from the pre-signal limit line. This is to prevent vehicles stopped at the railroad crossing stop line from seeing the distant green signal indication during the preemption clearance. An engineering study should be conducted to review the specific site conditions, including the eye heights of drivers of vehicles likely to use the crossing, and establish the final design necessary to meet the visibility requirements.

Figure B.1. Typical Pre-Signal Equipment Layout

Source: RailPros

Figure B.2. Pre-Signal STOP HERE ON RED Sign Layout



Source: Rail Pros

B.2 Pre-Signal Examples

To illustrate the general decision process behind the installation of a pre-signal, the La Zanja Street crossing in San Juan Capistrano, California, provides a case study example. As shown in Figure B.3, the La Zanja St crossing is located adjacent to the signalized intersection at Camino Capistrano (85 ft. [25 m] to the east). Existing conditions during the design phase revealed that there were issues with eastbound vehicles queuing back to and on the tracks while waiting at the traffic signal.

Because of the short storage distance between the intersection and the adjacent grade crossing, it was determined that a queue prevention strategy should be implemented to prevent vehicles from stopping on the tracks while waiting for the traffic signal green interval. Advance preemption time was provided by the railroad to allow for vehicles and pedestrians to complete any conflicting moves before the traffic signal transition to the preemption clearance interval. During normal traffic signal operations, the pre-signal is coordinated with the downstream signal to provide adequate time to clear vehicles from the crossing every cycle.

Figure B.3. Aerial Photo of La Zanja Street Crossing, San Juan Captistrano, CA

Source: Google (http://bit.ly/2XjQYQo) annotated by the Technical Committee

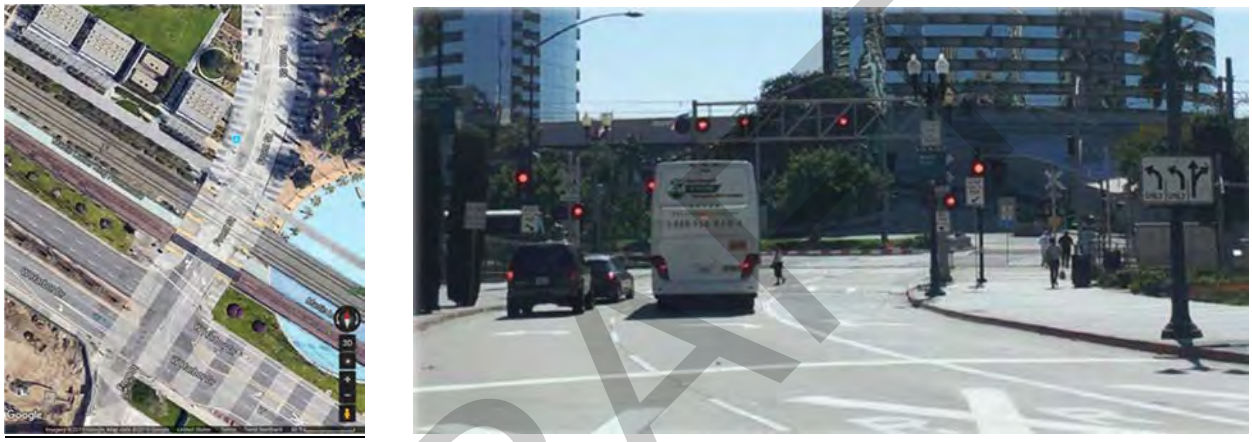
Figure B.4. Eastbound La Zanja Street Approaching Crossing San Juan Captistrano, CA

Source: RailPros
Image on left is before pre-signal installation, image on the right is after installation (annotated by the Technical Committee).

Pre-signals have been installed at many grade crossings throughout the United States. While design consistency is important for motorist compliance, each grade crossing has its own unique elements that need to be accounted for during the design process. For this reason, the design of each pre-signal is slightly different.

Following are some examples of existing pre-signal installations. At all of these locations, driver compliance with the pre-signal is high because the signing (STOP HERE ON RED), pavement markings, device visibility on the approaches to and at the crossing, and the effective shielding of the downstream intersection traffic signal faces combine to provide a clear message to road users.

Figure B.5. Front Street Crossing of BNSF, San Diego, CA



Source: Google (http://bit.ly/2V4f98e) and RailPros

Figure B.6. Palm Avenue Crossing of SCRRA and Parking Lot Drive, Orange, CA

Source: RailPros

Figure B.7. Meats Avenue at Orange-Olive Road, Orange, CA

Source: RailPros

Appendix I – Response to Comments Form

19TH AVENUE AND MCDOWELL ROAD BNSF RR XING
DRAFT PROJECT ASSESSMENT
SUMMARY OF REVIEW COMMENTS & ACTIONS

June 1, 2020

No.	Page No.	Reviewer	Comment	Initial Resp	Response Clarification	Final Resp
		Jose Rodriguez (City of Phoenix)				
1.	7		Check copy and paste mistakes	A	Fixed. This was the only one.	A
2.	10		The list should probably include all the properties at the intersection	A	Added remaining properties near intersection	A
3.	13		Need to also describe facilities on Grand Avenue	A	Added description of facilities along 19th Ave and Grand Avenue.	A
4.	16		Provide more in depth narrative based on the diagnostics meeting held. Was this the only option looked at, or where other technologies considered.	A	The only request made by RailPros/BNSF was the inclusion of a pre-signal for EB traffic. Due to the existing site conditions, they feel it a pre-signal may be warranted and should be included as part of this PA to be further evaluated during final design.	A
5.	17		Check Table 3.1 of Street Planning and Design guidelines for design speed and other criteria.	A	Revised to 50mph (design speed) per Cross Section D	
6.	20		Looks like on the south side, we will be affecting a transmission, a distribution, and a signal circuits. ROW needs to account for this.	A	Added	A
7.	21		Refer to it as tubular overhead signal structure.	A	Revised	A
8.	25		There are multiple driveways that will require a TCE. Make sure those are included.	A	Added TCE at $10/SF	A
9.	25		Cost are currently at $20/Sq Ft	A	Revised	A
10.	33 / Plans		Improvements should be shown on aerial picture.	A	Added aerial picture	A

A. Add or Correct
B. Clarify or Evaluate
C. Additional Information Needed
D. Consultant Recommends No Further Action

No.	Page No.	Reviewer	Comment	Initial Resp	Response Clarification	Final Resp
11.	33 / Plans		Show exiting features past the proposed improvements.	A	Added aerial picture	A
12.	33 / Plans		Need to consider ROW for relocated poles	A		A
13.	34 / Plans		Looks like there is a 16" waterline running 10 ft north of ML. Consider noting the need for a horizontal realignment to maintain ft clearance.	A	Added note and update write-up	A
14.	34 / Plans		Show additional panel past sidewalk edge	A	Added	A
15.	37 / Estimate		Make it at least $20K	A	Revised	A
16.	37 / Estimate		Replacement of concrete will be to nearest joint. Qty does not seem to reflect this.	A	The quantity shown is for the new concrete required to widen the road.	A
17.	38 / Plans		Missing coat for signal work.	A	Added bid item for Traffic Signal Upgrades	A
		Brandy Ruark (City of Phoenix)				
18.	4		BNSF RR Crossing all sheets	A	Revised	A
19.	4		Describe all RR equipment needed for the improvement	A	Added	A
20.	5		Make text easier to read	D	This is an image from a different report and cannot be modified. The intent is just a quick visual. Additional information can be found in the COMPASS report.	D
21.	6		Add BNSF	A	Added	A
22.	7		List all pertinent properties	A	Added remaining properties near intersection	A

A. Add or Correct
B. Clarify or Evaluate
C. Additional Information Needed
D. Consultant Recommends No Further Action

No.	Page No.	Reviewer	Comment	Initial Resp	Response Clarification	Final Resp
23.	7		Page 10	D	This is Page 7 – the cover sheet, table of contents and list of appendices do not count.	D
24.	10		More description of existing site features on Grand Avenue	A	Added description of facilities along 19th Ave and Grand Avenue.	A
25.	33 / Plans		Provide station where improvements begin	A	Added station to plans	A
26.	37-38 / Estimate		Some bid item numbers were crossed out (last few digits)	A	Made revisions with the exception of: M1042008 – The bid item shown (M1042007) is correct per the M Bid Item list. M4011900 – the units for this item is "Miles" and we are showing "Job" M4012000 is correct.	A
27.	39 - 40		Replace bid items numbers (same as previous comment)	A	Made revisions with the exception of: M1042008 – The bid item shown (M1042007) is correct per the M Bid Item list. M4011900 – the units for this item is "Miles" and we are showing "Job" M4012000 is correct.	A
		Jason Pike (Arizona Corporation Commission)				
28.	1		APS 12Kv Overhead Facilities Relocation: this work is very expensive and may not be eligible for Sec 130. Are there design options that would avoid this relocate?	D	We evaluated three different alternatives and the alternative selected (symmetrical) minimized impacts to adjacent property owners and allowed for the improvements to stop at the intersection (other	D

A. Add or Correct
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No.	Page No.	Reviewer	Comment	Initial Resp	Response Clarification	Final Resp
					alternatives required reconstruction of improvements east of the intersection).	
29.	2	BNSF Cantilever Signals: It's not obvious to me why BNSF can't re-use these cantilever signals.		D	This is a requirement by BNSF and we need to comply. The entire system works best when all equipment meets current standards/technology. BNSF does not want to interconnect old equipment with new equipment.	D
30.	3	Median and Paving in between tracks: state regulations make the portion in between tracks BNSF maintenance responsibility. I think it's unnecessary and will be difficult for City to maintain.		A	The raised median has been removed in between the two tracks.	A
31.	4	Civil work away from the crossing: Civil work that's too far from the crossing will likely not be eligible for Sec 130.		A	Understood, but this work is required in order to shift traffic back to it's current location.	A

A. Add or Correct
B. Clarify or Evaluate
C. Additional Information Needed
D. Consultant Recommends No Further Action