RIO METRO
REGIONAL TRANSIT DISTRICT

BOARD OF DIRECTORS
MEETING
Friday, February 21, 2020
12:00 p.m.
809 Copper Ave. N.W., Albuquerque, NM 87102

AGENDA

Call to Order
The presence of a quorum will be noted.

Approval of the February 21, 2020 Agenda

Tab 1 **Approval of the August 30, 2019 Action Summary**

PUBLIC COMMENT

Tab 2 Anyone who wishes to address the RMRTD Board must register with the Secretary of the Board

FINAL ACTION ITEMS

Tab 3
R-20-01 RMRTD **Approving Participation in the Capital Outlay Program Administered by the New Mexico Department of Transportation**

Tab 4
R-20-02 RMRTD **Approving Participation in the Local Government Transportation Project Fund Administered by the New Mexico Department of Transportation**

Tab 5
R-20-03 RMRTD **Authorizing an amendment to the Positive Train Control Implementation Contract to upgrade the NMRX Wi-Fi system**

DISCUSSION / INFORMATIONAL ITEMS

Tab 6 **RMRTD Financial Update**

Tab 7 **PTC Update**

Tab 8 **Staff Reports**

OTHER BUSINESS AND NOTES

Next Meeting: Friday, March 20, 2020 at 12:00 p.m.

Anyone requiring special accommodations is requested to notify Barbara Thomas at (505) 247-1750 or bthomas@mrcog-nm.gov at least three days prior to the meeting.

RIO METRO
REGIONAL TRANSIT DISTRICT

TAB 3

STAFF ANALYSIS OF R-20-01 RMRTD

Requested Action

Approve R-20-01 RMRTD - APPROVING PARTICIPATION IN THE CAPITAL OUTLAY PROGRAM ADMINISTERED BY THE NEW MEXICO DEPARTMENT OF TRANSPORTATION

Reason for Request

The New Mexico Department of Transportation requires the governing body pass a resolution approving the participation in the Capital Outlay Program for the specific project as listed in the State Capital Outlay Bill

Analysis

The RMRTD is to enter into Cooperative Agreement Control Number C3193377 with NMDOT for Capital Outlay (Laws of 2019) to plan, design, construct, equip and install an extension of Main Track 2, operated by and within the control of the RMRTD in Bernalillo, Santa Fe, Sandoval and Valencia counties. The Cooperative Agreement terminates on June 30, 2023 (for Laws of 2019).

the total cost of the project will be $100,000 to be funded by the parties hereto as follows:

a. NMDOT's share shall be 100% or $100,000; and
b. RMRTD's share shall be 0% or $0; and
c. The total project cost is $100,000.
d. RMRTD shall pay all costs that exceed the total amount of $100,000.

These funds will be used to plan and design locations for Main Track 2 / passing track locations necessary to facilitate train meets for mid to long range service improvements.

RIO METRO
REGIONAL TRANSIT DISTRICT

R-20-01 RMRTD

APPROVING PARTICIPATION IN THE CAPITAL OUTLAY PROGRAM ADMINISTERED BY THE NEW MEXICO DEPARTMENT OF TRANSPORTATION

WHEREAS, the RMRTD and the New Mexico Department of Transportation (NMDOT) desire to enter into Cooperative Agreement C3193377; and

WHEREAS, the total cost of the project will be $100,000 to be funded by the parties hereto as follows:

a. NMDOT's share shall be 100% or $100,000; and

b. RMRTD's share shall be 0% or $0; and

c. The total project cost is $100,000.

d. RMRTD shall pay all costs that exceed the total amount of $100,000.

NOW, THEREFORE, BE IT RESOLVED BY THE RIO METRO REGIONAL TRANSIT DISTRICT BOARD OF DIRECTORS THAT:

a. The RMRTD is to enter into Cooperative Agreement Control Number C3193377 with NMDOT for Capital Outlay (Laws of 2019) to plan, design, construct, equip and install an extension of Main Track 2, operated by and within the control of the RMRTD in Bernalillo, Santa Fe, Sandoval and Valencia counties. The Cooperative Agreement terminates on June 30, 2023 (for Laws of 2019).

b. The RMRTD incorporates all the agreements, covenants, and understandings between the parties hereto concerning the subject matter hereof, and all such covenants, agreements and understandings have been merged into the written agreement.

c. The project for this Cooperative Agreement is adopted and is an agency priority.

PASSED, ADOPTED, AND APPROVED this 21st day of February 2020 by the Board of Directors of the Rio Metro Regional Transit District.

_____
Diane Gibson
Chair
RMRTD Board of Directors

ATTEST:

_____
Dewey V. Cave
Chief Executive Officer

RIO METRO
REGIONAL TRANSIT DISTRICT

TAB 4

STAFF ANALYSIS OF
R-20-02 RMRTD

Requested Action

Approve R-20-02 RMRTD - Approving Participation in the Local Government Transportation Project Fund Administered by the New Mexico Department of Transportation

Reason for Request

The New Mexico Department of Transportation requires the governing body pass a resolution approving the participation in the Local Government Transportation Project Fund

Analysis

The RMRTD is to enter into Cooperative Agreement Control Number LP30006 with NMDOT for Local Government Transportation Project Funds (Laws of 2019) for Rail Runner station parking lot pavement rehabilitation that may include, overlay, full depth reconstruction, sealing and restriping operated by and within the control of the RMRTD in Bernalillo, Santa Fe, Sandoval and Valencia counties. The Cooperative Agreement terminates on June 30, 2022 (for Laws of 2019).

the total cost of the project will be $537,000 to be funded by the parties hereto as follows:

a. NMDOT's share shall be 95% or $510,150; and
b. RMRTD's share shall be 5% or $26,850; and
c. The total project cost is $537,000.
d. RMRTD shall pay all costs that exceed the total amount of $537,000.

These funds will be used to rehabilitate Rail Runner Station Parking Lots

RIO METRO
REGIONAL TRANSIT DISTRICT

R-20-02 RMRTD

APPROVING PARTICIPATION IN THE LOCAL GOVERNMENT TRANSPORTATION PROJECT FUND ADMINISTERED BY THE NEW MEXICO DEPARTMENT OF TRANSPORTATION

WHEREAS, the RMRTD and the New Mexico Department of Transportation (NMDOT) desire to enter into Cooperative Agreement LP30006; and

WHEREAS, the total cost of the project will be $537,000 to be funded by the parties hereto as follows:

a. NMDOT's share shall be 95% or $510,150; and

b. RMRTD's share shall be 5% or $26,850; and

c. The total project cost is $537,000.

d. RMRTD shall pay all costs that exceed the total amount of $537,000.

NOW, THEREFORE, BE IT RESOLVED BY THE RIO METRO REGIONAL TRANSIT DISTRICT BOARD OF DIRECTORS THAT:

a. The RMRTD is to enter into Cooperative Agreement Control Number LP30006 with NMDOT for Local Government Transportation Project Funds (Laws of 2019) for Rail Runner station parking lot pavement rehabilitation that may include, overlay, full depth reconstruction, sealing and restriping operated by and within the control of the RMRTD in Bernalillo, Santa Fe, Sandoval and Valencia counties. The Cooperative Agreement terminates on June 30, 2022 (for Laws of 2019).

b. The RMRTD incorporates all the agreements, covenants, and understandings between the parties hereto concerning the subject matter hereof, and all

such covenants, agreements and understandings have been merged into the written agreement.

c. The project for this Cooperative Agreement is adopted and is an agency priority.

PASSED, ADOPTED, AND APPROVED this 21th day of February 2020 by the Board of Directors of the Rio Metro Regional Transit District.

_____
Diane Gibson
Chair
RMRTD Board of Directors

ATTEST:

_____
Dewey V. Cave
Chief Executive Officer

RIO METRO
REGIONAL TRANSIT DISTRICT

TAB 5

STAFF ANALYSIS OF
R-20-03 RMRTD

Requested Action

Approve R-20-03 RMRTD - AUTHORIZING AN AMENDMENT TO THE POSTIVE TRAIN CONTROL IMPLEMENTATION CONTRACT TO UPGRADE THE NMRX WI-FI SYSTEM

Reason for Request

The existing NMRX WiMAX system is obsolete, the company that provided the equipment no longer exists, and RMRTD is unable to procure equipment necessary to maintain the system

Analysis

RMRTD released a request for proposal (RFP) for Positive Train Control (PTC) Implementation on the NMRX on January 29, 2018, RMRTD procurement No. 2018-03

the RMRTD Board of Directors approved RMRTD R-18-10, Approving the Award of the NRMX PTC Implementation Contract, RMRTD Procurement No. 2018-03 to XORAIL at their meeting on June 15, 2018

RMRTD entered into a contract with XORAIL for PTC Implementation RFP No. 2018-03 on April 17, 2019

RFP No. 2018-03 and the resulting PTC Implementation Contract with XORAIL contemplated specific additional services in Appendix 4 which in part reads:

> "2. Redundant PTC Communication – The Contractor may be asked to design, permit, implement and upgrade the existing NMRX Wi-Fi System as follows:
> 2.1. Upgrade the existing Alvarion Wi-Max passenger Wi-Fi System… that will provide a secure and redundant communications path for PTC communication on the NMRX in addition to the public facing passenger Wi-Fi System and non-PTC NMRX Operations VPNs."; and

RMRTD has negotiated with XORAIL to upgrade the NMRX passenger facing Wi-Fi System for use by NMRX passengers, and to provide a redundant communications path for PTC communications at a total cost of $5,298,788; and

The FY2019-2020 RMRTD Budget approved by the RMRTD Board of Directors at their May 17, 2019 included sufficient funds to fund the Wi-Fi upgrades as part of the PTC Implementation Project (including a $2.5M Grant Award under the FY2018 Consolidated Rail Infrastructure and Safety Improvement Program administered by the Federal Railroad Administration specifically for upgrading the Wi-Fi system and a combination of state, district and federal funding)

RMRTD would like to add the scope of work to upgrade the existing NMRX Wi-Fi system consistent with Wabtec's Technical Proposal NMRX Wi-Fi v2.7 dated August 19, 2019 and Wabtec's NMRX Passenger Wi-Fi Updated Proposal letter dated February 4, 2020, both attached hereto, and to increase the contract amount by $5,298,788

RIO METRO
REGIONAL TRANSIT DISTRICT

R-20-03 RMRTD

AUTHORIZING AN AMENDMENT TO THE POSTIVE TRAIN CONTROL IMPLEMENTATION CONTRACT TO UPGRADE THE NMRX WI-FI SYSTEM

WHEREAS, The NMRX WiMAX system was installed by NMDOT as part of the original NMRX implementation; and

WHEREAS, The NMRX WiMAX system is obsolete, the company that provided the WiMAX equipment no longer exists, and RMRTD is unable to procure equipment necessary to maintain the system; and

WHEREAS, RMRTD released a request for proposal (RFP) for Positive Train Control (PTC) Implementation on the NMRX on January 29, 2018, RMRTD procurement No. 2018-03; and

WHEREAS, the RMRTD Board of Directors approved RMRTD R-18-10, Approving the Award of the NRMX PTC Implementation Contract, RMRTD Procurement No. 2018-03 to XORAIL at their meeting on June 15, 2018; and

WHEREAS, RMRTD entered into a contract with XORAIL for PTC Implementation RFP No. 2018-03 on April 17, 2019; and

WHEREAS, RFP No. 2018-03 and the resulting PTC Implementation Contract with XORAIL contemplated specific additional services in Appendix 4 which in part reads:

"2. Redundant PTC Communication – The Contractor may be asked to design, permit, implement and upgrade the existing NMRX Wi-Fi System as follows:

2.1. Upgrade the existing Alvarion Wi-Max passenger Wi-Fi System… that will provide a secure and redundant communications path for PTC communication on the NMRX in addition to the public facing passenger Wi-Fi System and non-PTC NMRX Operations VPNs.”; and

WHEREAS, RMRTD has negotiated with XORAIL to upgrade the NMRX passenger facing Wi-Fi System for use by NMRX passengers, and to provide a redundant communications path for PTC communications at a total cost of $5,298,788; and

WHEREAS, the FY2019-2020 RMRTD Budget approved by the RMRTD Board of Directors at their May 17, 2019 included sufficient funds to fund the Wi-Fi upgrades as part of the PTC Implementation Project (including a $2.5M Grant Award under the FY2018 Consolidated Rail Infrastructure and Safety Improvement Program administered by the Federal Railroad Administration specifically for upgrading the Wi-Fi system and a combination of state, district and federal funding)

NOW, THEREFORE, BE IT RESOLVED BY THE RIO METRO REGIONAL TRANSIT DISTRICT BOARD OF DIRECTORS THAT:

The RMRTD is authorized to complete negotiations with XORAIL and to amend the PTC Implementation Contract (RMRTD Contract 2018-03) to add the scope of work to upgrade the existing NMRX Wi-Fi consistent with Wabtec’s Technical Proposal NMRX Wi-Fi v2.7 dated August 19, 2019 and Wabtec’s NMRX Passenger Wi-Fi Updated Proposal letter dated February 4, 2020, both attached hereto, and to increase the contract amount by $5,298,788

PASSED, ADOPTED, AND APPROVED this 21th day of February 2020 by the Board of Directors of the Rio Metro Regional Transit District.

_____
Diane Gibson
Chair
RMRTD Board of Directors

ATTEST:

_____
Dewey V. Cave
Chief Executive Officer

Wabtec's Technical Proposal for NMRX Passenger Wi-Fi

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1. Executive Summary

NMRX has identified a need to replace the existing passenger Wi-Fi system because the existing Wi-Fi system is no longer in operation and many of the components are no longer functioning or have become obsolete.

As part of the installation and implementation of the NMRX PTC initiative Wabtec identified a need to upgrade the communications infrastructure backbone to support the 220 MHz PTC data radio network. The PTC system upgrade consists of installing 32 towers and PTC220 radios along the right of way. As currently designed these new radio sites will serve to communicate PTC information to trains transiting the territory.

This presents a unique opportunity for NMRX to leverage the installation of the PTC infrastructure and at the same time design and install a state-of-the-art Wi-Fi system.

Cellular provides another path to support passenger Wi-Fi service. However, coverage is not available in parts of the network, and NMRX has expressed concern with cellular messaging costs. Therefore, the proposed system is designed to primarily use new NMRX communications infrastructure, with cellular provided as back-up and to supplement bandwidth if needed. Cellular bandwidth will be bonded with bandwidth from the NMRX infrastructure to provide seamless Wi-Fi connectivity to passengers.

This proposal focuses on the design of a robust RF core network that will extend the entire length of the territory from Belen station to Santa Fe station. The initial design is to support the passenger Wi-Fi system however once the core RF network is installed and proven to be reliable it could be used to connect the PTC base stations to the back office where WSRS (Wayside Status Relay Service) could be installed and serve to route PTC messages to designated base stations which would then be repeated and delivered to trains traversing the territory.

Passenger Wi-Fi will be provided based upon IEEE 802.11ac standards, using both 2.4 and 5 GHz communications. Wi-Fi services will be managed by a NMRX “splash page”, coupled with restrictions on use (no adult content, etc.) and bandwidth limits to be set by NMRX. The design approach is to support passengers starting Wi-Fi use at station platforms, with the ability to move on-board without need for new log-ins.

The big advantage for NMRX owning their own RF network is they could significantly eliminate cellular costs

2. Proposal Outline

Wabtec has provided a technical description of the proposed scope and solution offering in section 4.

Accordingly, this proposal is organized as follows:

- Executive Summary
- About Wabtec
- Wabtec's Technical Solution
- Project Delivery & Methodology
- Commercial Terms

3. About Us

Wabtec is a public company, traded on the New York stock exchange as "WAB". Public financial information is available on: www.wabtec.com. Wabtec is headquartered in Pittsburgh, PA.

With roots to 1869, Wabtec Corporation has established a long track record of performance. The current company was formed in 1999 when Westinghouse Air Brake Company (WABCO) merged with MotivePower Industries, Inc.

George Westinghouse founded the original Westinghouse Air Brake in 1869, shortly after he successfully demonstrated the first straight air brake systems to the railroad industry. Three years later, Westinghouse developed the first automatic air brake system, which had a built-in safeguard whereby the brakes on the entire train would apply automatically if the train should separate or if air pressure should escape due to leakage in the system. Throughout the past 150 years, Westinghouse Air Brake maintained worldwide leadership in rail equipment technologies designed to improve the safety and productivity of customers in the transportation industries. In 1990, the company's assets and the WABCO name were purchased in a management buyout, and a new WABCO was created that went public in 1995.

Many companies were acquired by WABCO, starting in the mid-1990's, which expanded beyond the traditional air brake business, but maintained the primary focus on the rail industry. Two of the larger acquisitions was Motive Power Industries (locomotives) and Standard Car Truck. This led to changing names to Wabtec in 1998.

Wabtec acquisitions included building electronics and train control capabilities with a series of acquisitions which included Pulse Electronics, Rockwell Railway Electronics, Bach-Simpson, Q-Tron, and Xorail in North America, with additional international groups. This has led to Wabtec taking a leadership position in the supply of U.S. Positive Train Control systems, based upon our I-ETMS group of products. Wabtec has also taken the North American leadership position in supply of computer aided dispatch offices, with our TMDS product, with addition of PTC Back Office Server (BOS) products.

One of the larger acquisitions was Faiveley Transport, based in Paris, which is now the headquarters for the Wabtec Transit group of companies, with expanded global operations, centered in Europe.

In 2019, Wabtec acquired GE Transportation, which is the largest diesel electric locomotive supplier in the Americas. The GE Transportation group also adds a wide range of digital products and services which complements the previous Wabtec electronics and train control offerings.

Wabtec is now a "Fortune 300" company, with annual revenues of about $8 billion, operations in 50 countries, and 27,000 employees.

Wabtec Annual Reports going back 16 years can be found at https://www.wabtec.com/annual-report.

4. Wabtec's Technical Solution

The following sections describes the technical aspects of the overall solution. It describes the challenges, benefits and proposed components used to build out the NMRX core backhaul network and Wi-Fi system.

4.1 Proposed System Overview

Introduction

Wabtec proposes to provide an upgraded data communications system for NMRX to meet the following main objectives:

1. Provide passenger WI-FI services on trains, replacing the previous WiMAX based system which is no longer supported.

2. Upgrade tower backbone communications infrastructure as needed to support the 220 MHz PTC data radio network and data links to signal locations. The current plan has been to apply MCC 220 MHz data radios at each of the signal locations.

3. Leverage the current NMRX project to provide fiber optics links to stations, coupled with passenger Wi-Fi access points at stations.

4. Support most passenger Wi-Fi train-ground communications links over a private network, with use of cellular mainly to provide back-up data paths in event of failures is portions of the private ground network.

5. Provide a solution which can be supported and maintained at a reasonable cost for at least the next 10 years.

   The proposed system is based upon two main elements:

   1. Rajant Kinetic Mesh Network: Apply unlicensed frequencies in the 900 MHz, 4.9 GHz and 5 GHz range to support a kinetic mesh mobile network which links stations, towers, and trains. This includes mesh networking between cars on the train, with an option to also extend to locomotives. This network replaces functions previously provided by 3.6 GHz WiMAX for tower to train communications, and 5 GHz point-to-point links between towers and between cars within each train.

   2. LTE Cellular Passenger Car Communications, WAAV Mobile Router: Application of two cellular modems (with options to increase to four) per passenger car, with bonding cellular networks to the Rajant network to provide increased bandwidth and back-up to the Rajant kinetic mesh network when needed.

Mesh networking between cars of the train will be used to help maintain continuous service in areas where part of the train may be out of coverage. A typical example of this is for roadway underpasses, where an individual car may lose coverage, but can link to other cars which are able to maintain coverage. The Rajant kinetic mesh network provides unique capabilities to dynamically reconfigure network connections without losing connectivity.

Trackside Infrastructure Plans

Rajant kinetic mesh "Breadcrumb" LX5 units with four (4) RF modules are planned at each trackside location. The main RF links being planned for trackside to train communications are 900 MHz and 4.9 GHz. These will have directional antennas to focus RF up and down track. Two additional 5 GHz RF links are planned for links between trackside locations, with directional antennas focused on the adjacent tower or station locations. The photo on the right shows a typical LX5 mast installation, which minimizes the RF antenna cable lengths.

Existing locations are expected to provide full coverage in the 900 MHz band, but only partial coverage for 4.9 GHz. While 900 MHz will provide full coverage, the bandwidth provided is a maximum of 54 Mbps. The 4.9 and 5 GHz RF links provide higher bandwidth, up to 300 Mbps. Therefore, the plan is to add tower locations where needed to maintain continuous 4.9 GHz ground to train coverage. This leads to needing tower spacing of around 1.5 miles.

The existing towers configuration plan is illustrated as follows:

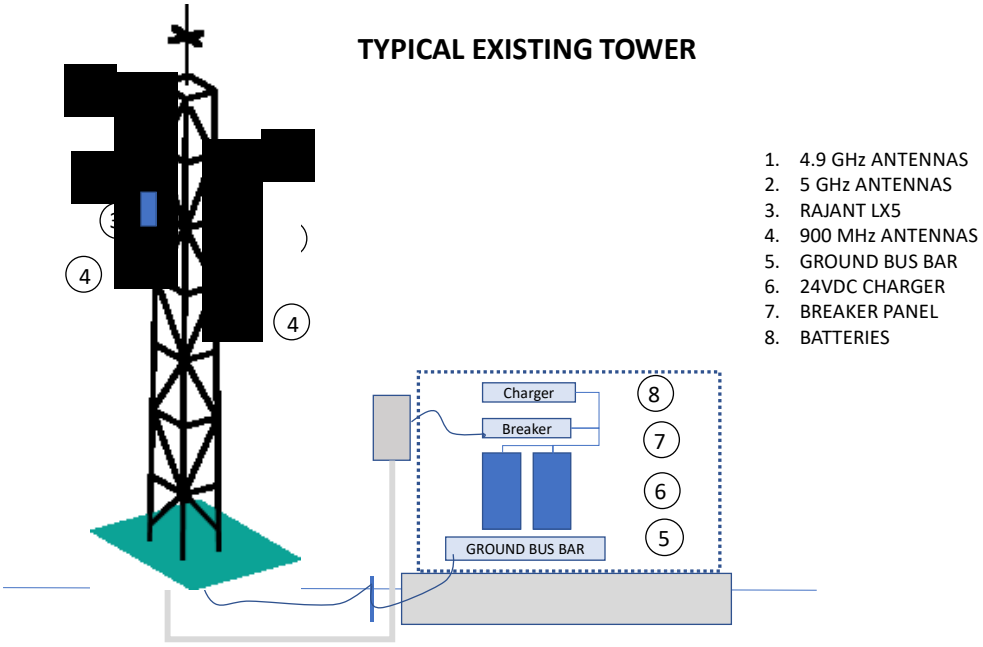

Figure 1 – TYPICAL EXISTING WiMAX COMMUNICATIONS TOWER

All new towers are planned as 20 ft. height, to be on the railroad right-of-way, to minimize licensing and site approval issues and time. This will be swing type towers to support maintenance without requiring ladders or lift equipment. The new towers configuration plan is illustrated as follows:

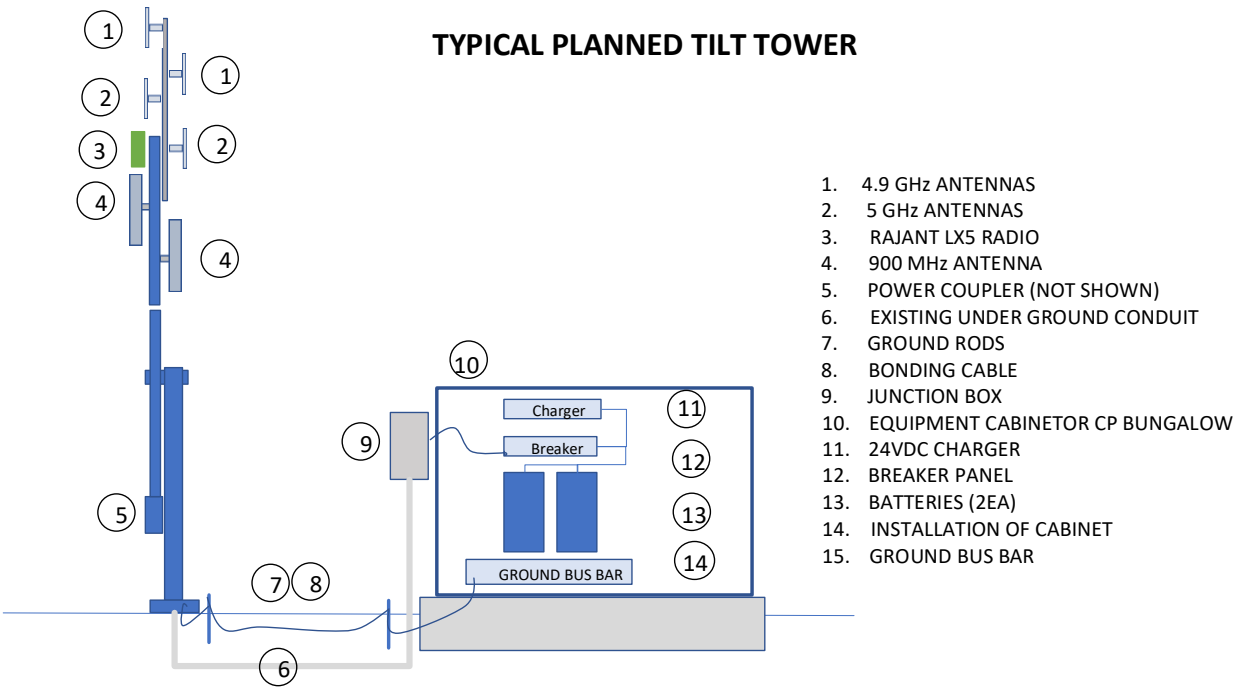

Figure 2 – TYPICAL TILT TOWER

Each of the 15 stations will be equipped with a Rajant LX5, coupled with a WAAV Wi-Fi access point, and fiber-based network link. This will allow passengers to start Wi-Fi sessions (NMRX splash page and log-in), and to continue on the train without needing a separate log-in.

Towers are planned to be added near the 14 stations which do not have existing towers, with the station and tower configuration planned as follows:

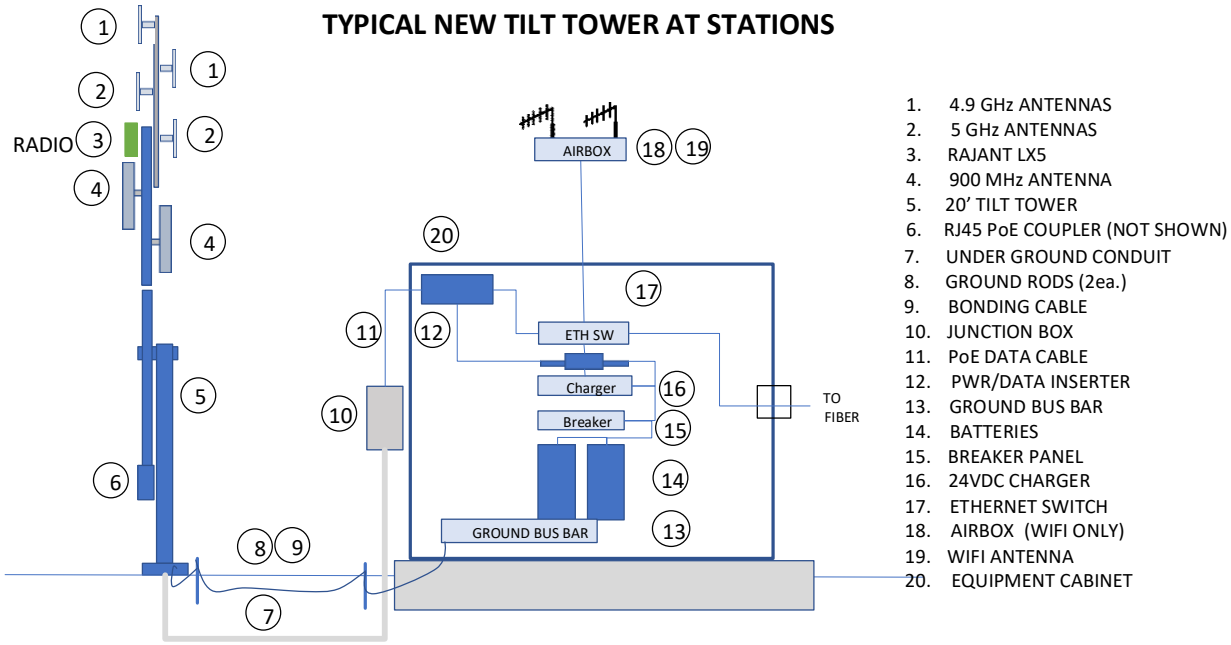

Figure 3 – TYPICAL TILT TOWER AT STATIONS

4.2 Inventory of Towers

Below is a summary of the towers that are proposed to support the Rajant network. This list includes new towers at all NMRX stations (15), new planned towers that are part of the PTC project, existing WIMAX towers that are no longer needed and existing control point towers that could possibly be used.

Figure 4 – BELEN STA TO ISLETA PUEBLO STA

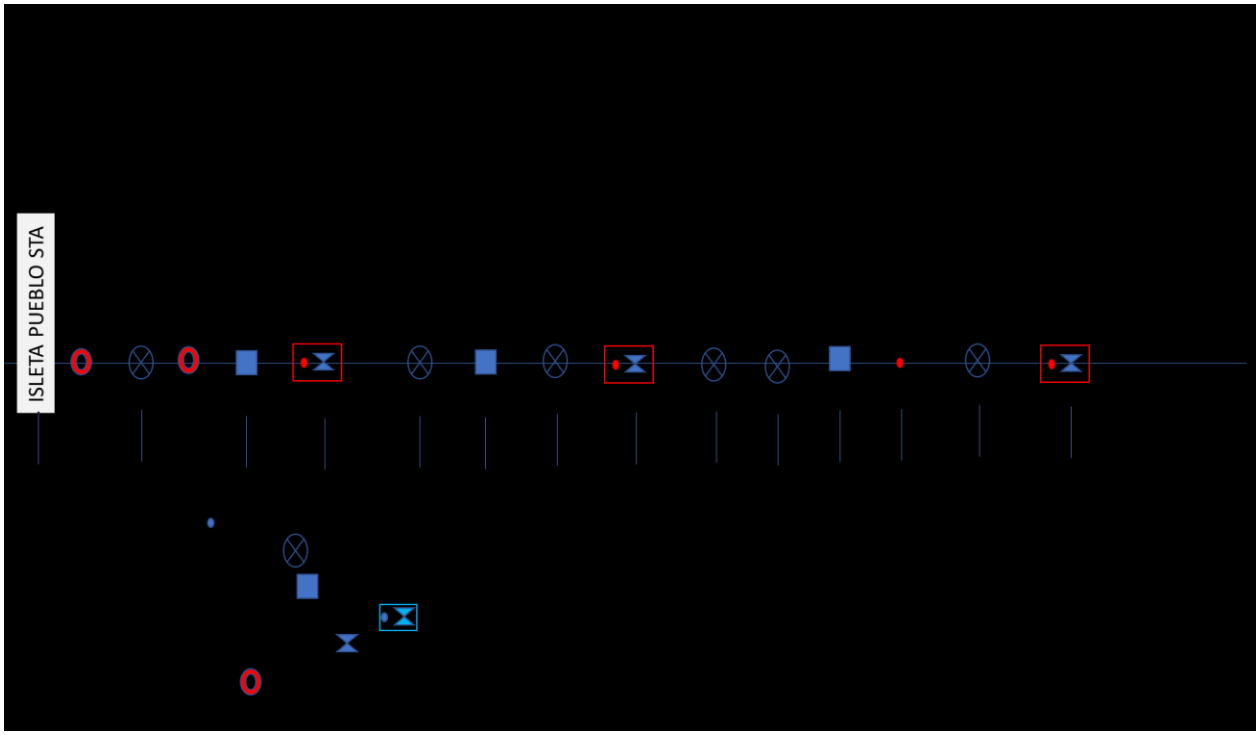

Figure 5 – TOWERS - ISLETA STA TO LOS RANCHOS STA

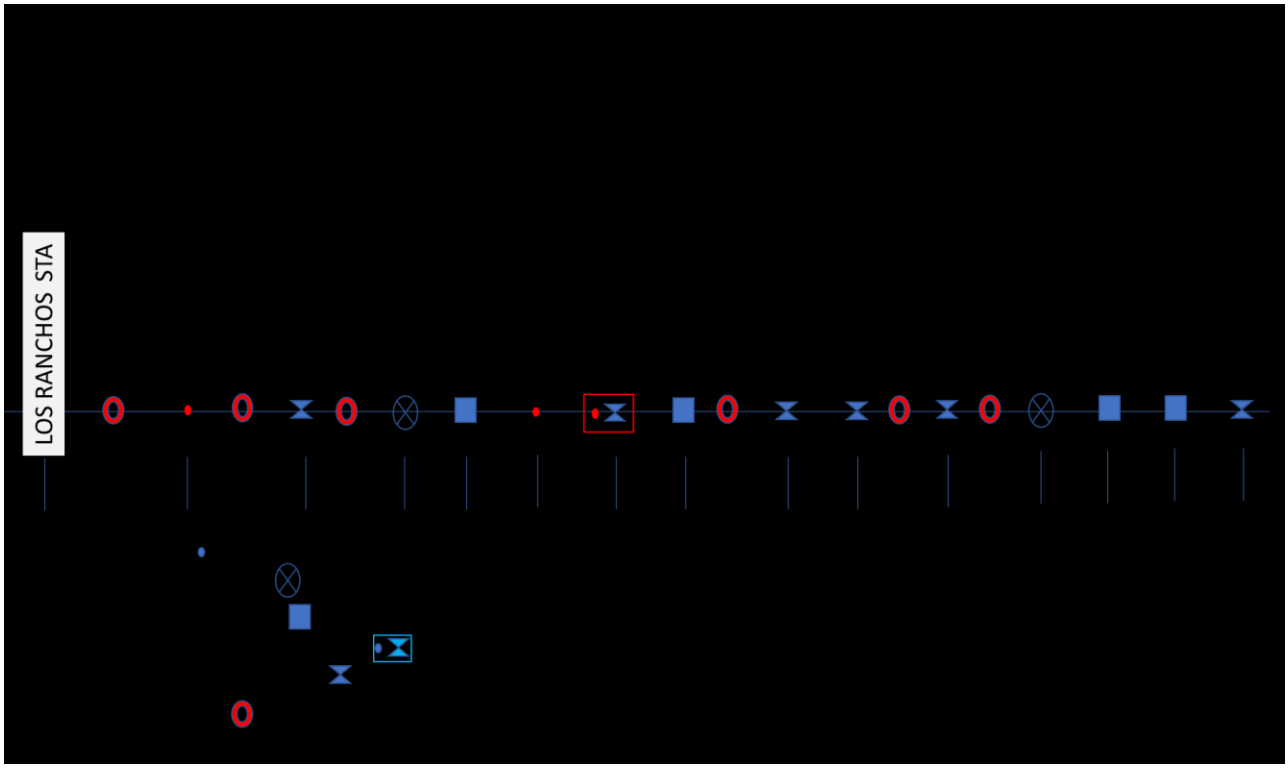

Figure 6 – LOS RANCHOS STA TO SAN FELIPE WIMAX

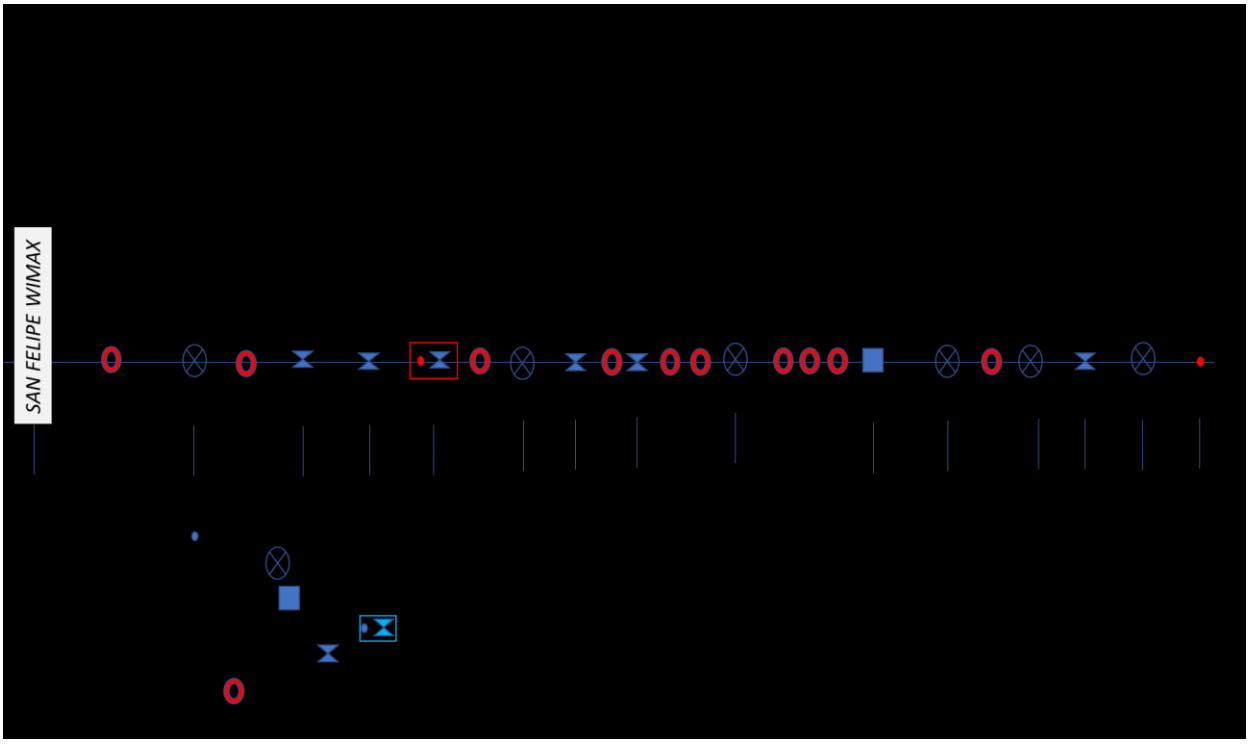

Figure 7 – SAN FELIPE WIMAX TO SANTA FE 599 STA

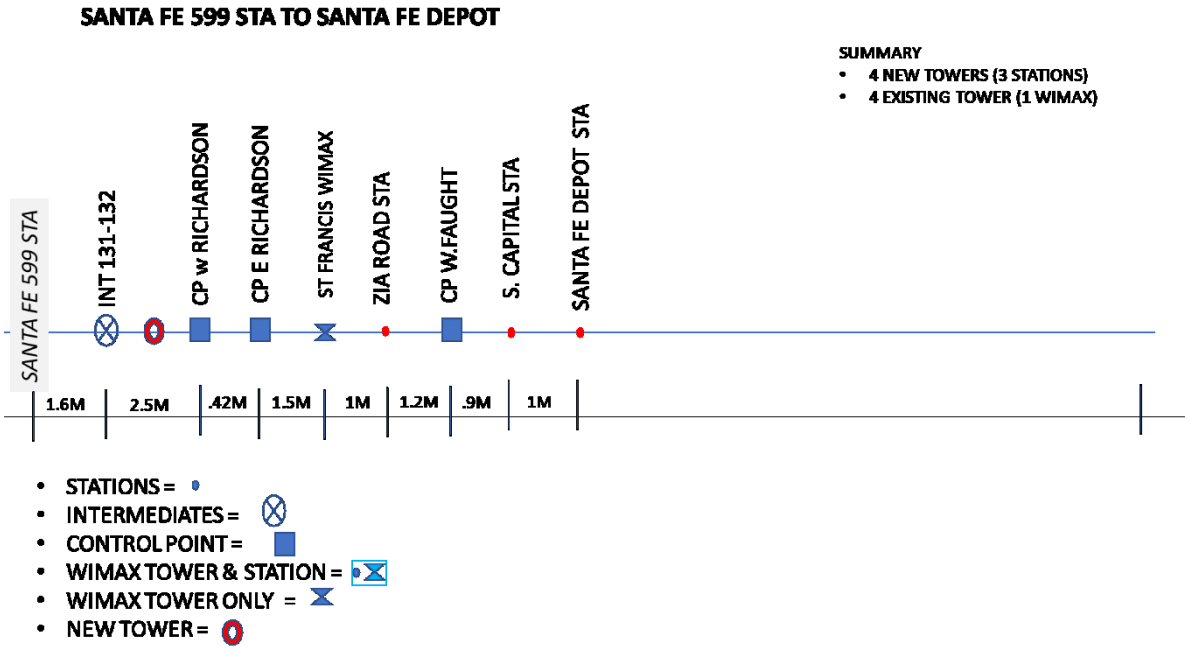

Figure 8 – SANTA FE 599 STA TO SANTA FE DEPOT STA

The trackside locations as planned are summarized as follows:

- Existing WiMAX Communication Towers: 12 of 22 existing.
- Existing Stations which include fiber links, with RF Towers to be added: 15 (count reduced by 8 if its determined towers are not needed following site survey).
- Intermediate Signal Locations, with new towers planned for PTC: 20 of 32 planned or existing.
- Control Point Locations with existing towers: 15 of 25 existing.
- New Solar Powered Tower Locations: TBD following detailed site survey estimate: 25

This results in a maximum total of 40 new 20' towers to be installed. It should be noted that of the 40 new towers the towers co-located with WiMAX communication towers can potentially be eliminated bringing the count to 32. This will need to be verified during the detailed site survey.

This plan will need to be updated following field RF testing at the start of the project. The overall goal is to co-locate new towers near existing power access locations. However, solar power can also be planned where it is not economical to access commercial power. In this case, it is estimated a single 250 W solar panel can provide sufficient power, and the size of battery requirements will need to be estimated as part of the site assessment.

4.3 Passenger Car Configuration

The base passenger car configuration is shown below.

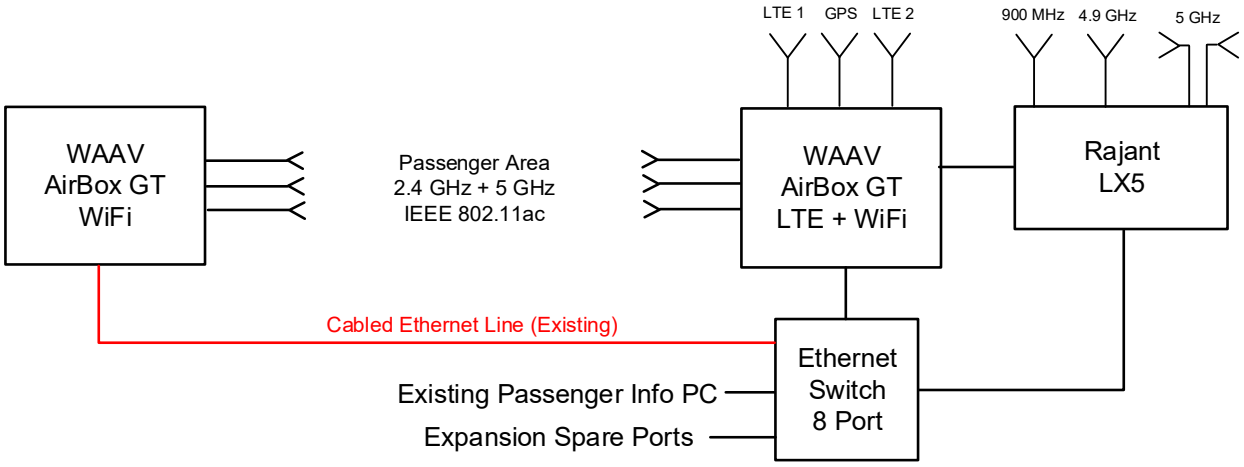

Figure 9 – TYPICAL ONBOARD INSTALLATION

Notes on the car configuration and retrofit plans:

1. All equipment will be on each end of the car, in the area between the passenger ceiling and roof, generally in the sloped roof area, replacing the existing WiMAX based system.

2. The Rajant "BreadCrumb" LX5 is planned to be equipped at one end of each car, with 4 RF modules: 900 MHz and 4.9 GHz for trackside links, and two separate 5 GHz links for car-to-car communications within each train. In some cases, these 5 GHz links will also be able to mesh with the 5 GHz trackside to trackside location links as well, which will add to available bandwidth.

3. The WAAV AirBox GX Cellular Router (photo on right) is proposed with two cellular modems and a GPS receiver. The AirBox also include the IEEE 802.11ac access points (2.4 and 5 GHz). This can be expanded to include two additional cellular modems as an option, for additional capacity and support of up to four separate carriers. The AirBox bonds bandwidth from the available cellular services with the Rajant network to provide increased continuous bandwidth for Wi-Fi users. This unit also manages the Wi-Fi interfaces, including a customized NMRX splash page, log-ins, and user restrictions. Up to 1 TB of memory can also be added to support on-board information content. Refer to the separate WAAV AirBox GX data sheet.

4. A second WAAV AirBox GX Router is provided at the opposite end of each car, which is the same hardware without cellular modems or antennas. The existing Ethernet cable links both AirBox units to share the same off-train bandwidth (Rajant + cellular).

5. An 8 port Ethernet Switch (similar to photo on right) is planned on the same end of the car as the cellular and Rajant units. This provides the data link between all units, and also supports interface to the existing passenger display computer. Spare ports can support future interfaces.

6. A 72 to 12 VDC converter will connect to the car 72 VDC power, with nominal 12 VDC to power all of the new hardware. A 12 VDC battery is planned to provide continuous operation in event of intermittent losses of 72 VDC power.

7. Rajant 5 GHz antennas will be mounted to extend above the highest part of the roof, in the same position as the current 5 GHz car to car antennas. These will be planned as directional antennas, related to car-to-car links. The 900 MHz and 4.9 GHz antennas will be omni-directional for trackside communications. The plan will be to keep the RF antenna cables to the Rajant LX5 as short as practical to minimize signal loss.

8. Two sets of LTE antennas and the GPS antenna will be mounted on the roof on the same end of the car as the WAAV AirBox cellular router. This will minimize RF cable lengths.

9. To simplify the onboard installation all existing antennas inside the passenger compartments will be replaced with new antennas of the same type and model number and placed in the same exact location.

10. The Rajant radios will be installed as close to the antennas as possible to minimize signal loss.

11. The existing Ethernet cable connecting both ends of the car will be used.

4.4 Existing Control Points & PTC Towers

Rajant repeater nodes may be installed at existing control point sites. These installations will require a detailed survey and approval from NMRX. This type of installation if used will utilize the existing infrastructure as much as possible. The existing tower structure will be used to mount the radio and the existing bungalow or equipment case will be used to mount the charger and battery system. As part of Phase 1, our equipment selection and installation of additional towers may need to be altered following the findings of our inspections.

If 24VDC is available at the signal location the Rajant node can be powered by available 24VDC signal battery however since its unlikely to be available this proposal will assume that the installation of a free-standing equipment cabinet will be installed adjacent to existing signal equipment. This type of installation is identical to that of a NEW tilt tower install (section 4.5) with the exception that the tower will not need to be installed.

Both NMRX and BNSF use ATCS throughout the territory. NMRX uses channel 2 (935.9375 and 896.9375) and BNSF uses ATCS channel 4 (936.8875MHz and 897.8875MHz) these frequencies are sufficiently apart from the Rajant 900 MHz frequencies planned (902 – 928 MHz) to avoid cross system interference issues.

4.5 Cellular and Rajant Communications Service and Bonding

The proposed configuration is based upon providing the NMRX private network based upon the Rajant mesh network, supplemented by commercial cellular with two different commercial cellular providers. This requires bonding of both cellular carriers and the Rajant network to provide combined bandwidth to support multiple passenger Wi-Fi services. The bonding solution is provided by the WAAV Airbox units both on-board and at stations, combined with a cloud based service for bonding the Internet services. The cellular bonding is illustrated below, which will be supplemented by addition of bonding for the Rajant network.

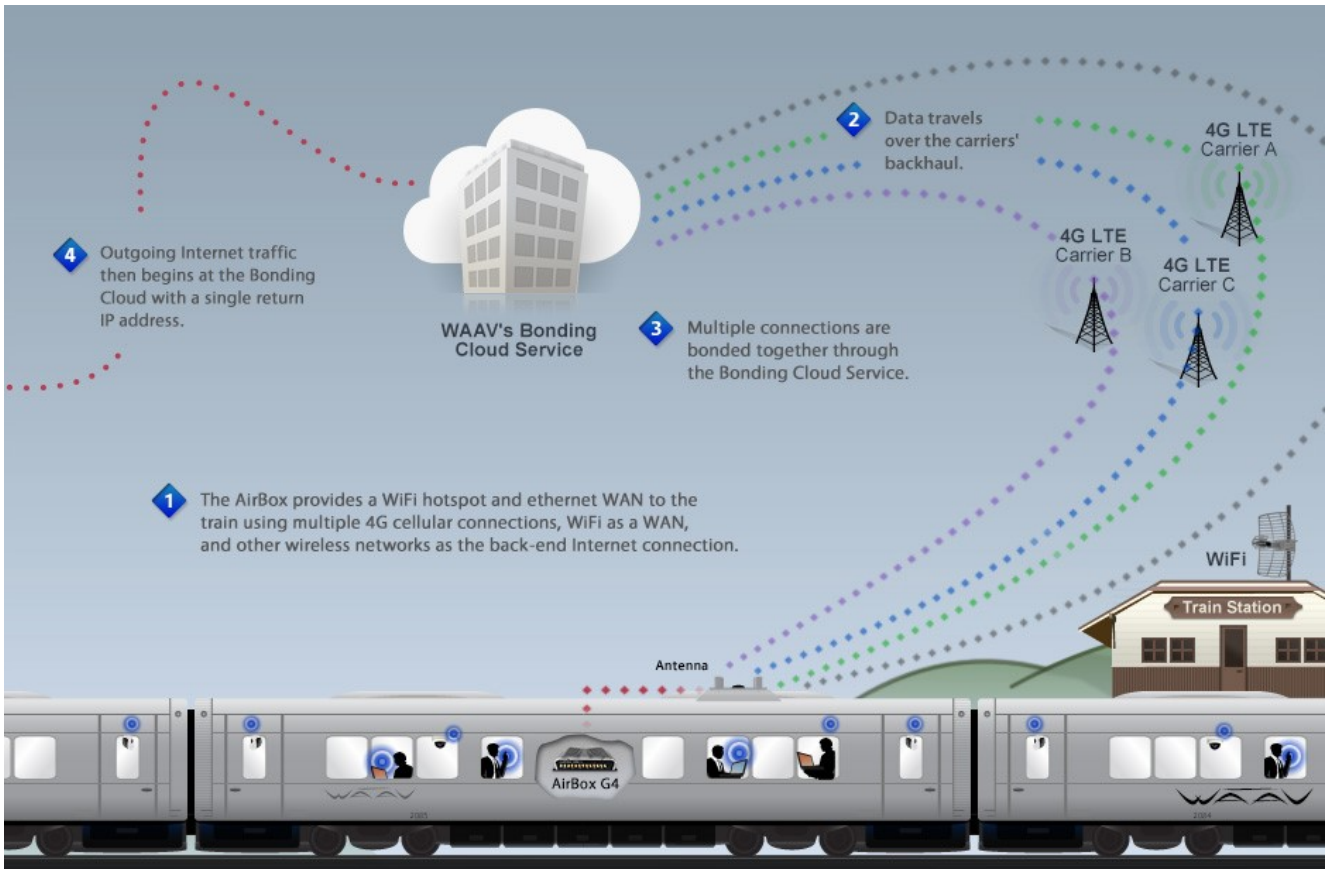

Figure 10 – BONDING OVERVIEW

The WAAV cloud-based service includes monitoring and data collection tools, outlined as follows:

1. Proportional Bandwidth Quality of Service (QoS): This prevents individual users from using too much bandwidth and provides proportional bandwidth QoS to all Wi-Fi users.

2. Custom Splash Page: A unique splash page will be created, with the user to accept terms and conditions as a condition to using the connection.

3. Content Filtering: Keep the train family friendly, with filtering of adult content.

4. Wi-Fi User Limit: If desired, the total number of users allowed on line at the same time can be set.

5. GPS Fleet Management: Operators can track coach cars in real time on a map, including zooming to specific trains to view details of speed, number of Wi-Fi users and other parameters.

6. Real Time Video Monitoring: Options can be provided to allow real time viewing of selected passenger CCTV cameras over the cellular or Rajant infrastructure. This would normally be done on an exception basis in event of an emergency or problem report.

7. Cybersecurity and Identity Access Management: Security provisions are a key part of the cloud design, which need to be coupled with management of user ID's.

Wabtec can also provide NMRX with different cellular services to be considered, which may be lower cost than the New Mexico state cellular services as negotiated with Verizon.

Note that Sprint has been the only cellular carrier to offer unlimited data service plans, but it is not known if this will be continued following their planned merger with T-Mobile.

4.6 System Design and Engineering

The labor associated with this design will include:

- Detailed onsite site survey
- Cellular coverage survey
- Conduct RF Propagation and Coverage Analysis using RF modeling tools
- Conduct an RF site survey to validate RF modeling results.
- Establish a set of Design Requirements – Customer approved.
- Provide a preliminary design to include theory of operation and general framework
- Provide a detailed design of the system and each sub system
- Provide CAD drawings of each site-specific installation including onboard.
- Provide a detailed BOM for each site.
- Provide project schedule
- Provide a resource and implementation plan
- Provide System Test Procedures and Test Report

5. Project Delivery

Wabtec is confident that we can provide a comprehensive Passenger Wi-Fi solution within a relatively short time period. To accomplish this, Wabtec is proposing a phased approach which covers the following:

Phase 1

- Conduct Detailed Site Survey to identify available infrastructure facilities (towers, bungalows, etc.)
- Conduct RF Propagation and Link study
- Conduct Cellular coverage tests
- Conduct RF coverage tests to validate RF modeling predictions (2ea. passenger cars, Rajant nodes on temporary tower sites).

Phase 2

- System Design at 30% and 90% levels.
- No PE Stamp included.
- Hardware procurement.
- Infrastructure Installation
- Onboard Installation
- Cutover & Performance testing

Phase 3

- As installed documentation
- Customer Training

The details of each phase are iterated in the Deliverables section 5.2. A final schedule will be developed upon completion of phase 1.

5.1 Project Delivery Team

Wabtec's proposal includes the allocation of Subject Matter Experts from each of the segments represented within this technical proposal. The resources assigned will work at the direction of the Program Manager who will coordinate all activities with NMRX and ensure the proper reviews and approvals are obtained before work commences. The Program Manager will be responsible for managing and updating the project schedule and holding regular meetings with NMRX to communicate statuses. Resourcing will be done in conjunction with PTC project.

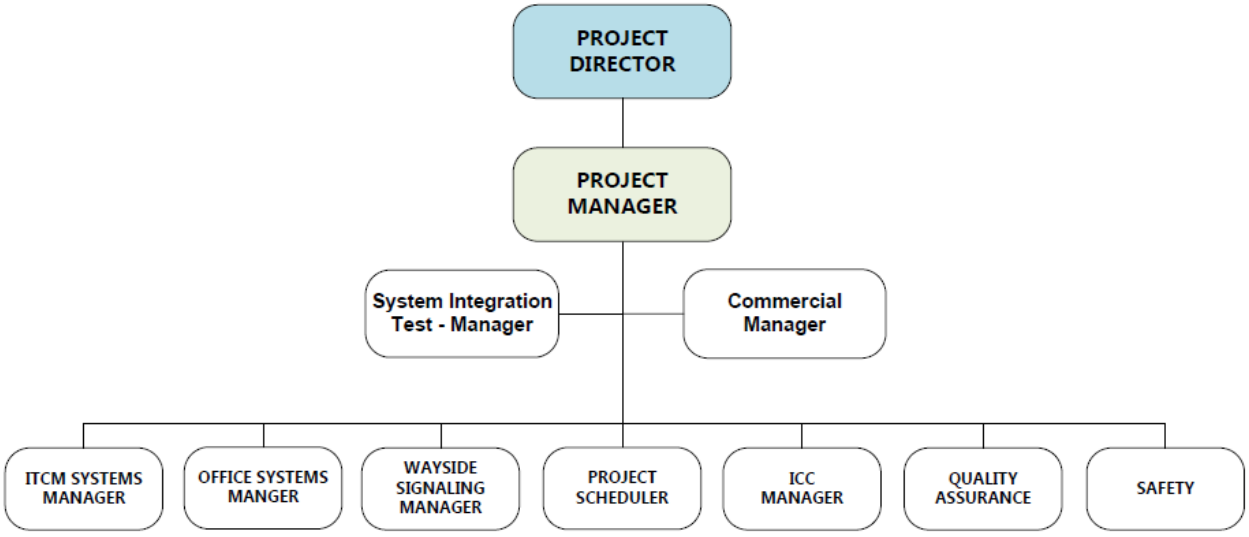

Figure 11 – PROJECT DELIVERY TEAM

5.2 Project Deliverables

5.2.1 NMRX Wi-Fi Project Deliverables

The following items are the envisioned deliverables necessary to provide the system and components described in section 4. This list is provided as a reference and is subject to revision if warranted in the Statement of Work.

Phase 1 - Planning	
Identification of Stakeholders and Customer Subject Matter Experts	The goal is to identify all project team members and stakeholder from Wabtec and Customer
Definition of System Interfaces - (APDI)	Define all application interfaces with reference to the ICD, method of communication and technology.
Site Survey	Identify locations for installed equipment, discuss interfaces to 3rd party systems and ensure all parties are aligned and understand their responsibility for the integration of the new infrastructure. Identify any space, power, handling and other logistic issues. Identify location and placement of Towers, Equipment cabinets and Solar locations.
Resulting Outputs from the Analysis Phase:	
Site Survey Report	The actions, high level summary and pictures of the working space, installation location and outstanding issues which resulted from the site survey.

Work Break Down Structure (WBS)	Identify key tasks and dependencies allotted to functional teams. Update PTC Project documentation.
Program Management Plan (PMP)	Define the engagement model of the project team, regular communication and status reporting. Update to PTC Project PMP.
Detailed Project Schedule	An accurate representation of each activity with duration, dependencies and resources. Updates included as separate section of PTC project documentation.
Configuration Management Plan (CMP)	Describes the methodology for version control and tracking of project related artifacts and deliverables and ties-in to the software release workflow to ensure release readiness and quality assurance has been performed. Update to PTC Project documentation.
Key activities:	
System Pilot Testing	The preliminary design for pilot test components and their connections.
Coverage testing	Conduct a series of coverage tests to validate both cellular and RF coverage and identify problem areas.
RF coverage modeling	EDX RF planning software will be used to identify locations and placement of towers and cabinets and calculate RF fade margins.
Phase 2 – Design	
Bill Of Materials	The line item listing of each hardware components and 3rd party software license which must be acquired.
Infrastructure Diagrams	The 90% design drawing in PDF format.
Hardware Installation Plan	The line item steps for accomplishing the physical and logical installation of the infrastructure components and the necessary interfaces with existing systems.
Infrastructure Certification Plan	The specific scenarios and tests performed to confirm the goodness of the installed equipment and verify the vendor provided materials are in working condition and configured correctly.
Infrastructure Test Outline & Test Cases	The documentation of the use cases identifying the possible failures in the system and the specific steps which must be performed to restore system operation.
Phase 3 - Implementation	
Hardware Acquisition	The placement of the infrastructure Bill of Materials order, tracking to delivery and inventory of infrastructure components.
Infrastructure Installation & Configuration	The physical rack mount installation, wiring and configuration of the hardware.
Infrastructure Testing	The implementation of the production system infrastructure.

Resulting Outputs from the Design Phase (Wabtec Internal):	
As-built infrastructure diagrams	Final infrastructure diagrams reflecting any variances which were necessary during installation.
Test results from infrastructure testing activities	The documented results of the performance tests provided as artifacts.
100% System Test & performance monitoring.	The documented results of the performance tests provided as artifacts.
Training Manual / Training Presentation	The training materials, classroom attendance list, test results (if applicable) and course materials are provided as artifacts.

5.2.2 Wi-Fi System Deliverables

The following items are the envisioned deliverables necessary to provide the system and components described in section 4. This list is provided as a reference and is subject to revision if warranted in the Statement of Work.

Item	Definition
Site Survey / Report	Conduct site survey and inspection of NMRX alignment and submit list of sites to be used to NMRX for approval.
Design / Report	Submit design detailing integration of Rajant Kinetic mesh network into existing NMRX existing systems.
Install & configure RF core network.	Install and configure 2 passenger cars and test wayside RF coverage using 2 temporary trailer mounted towers (Rajant nodes).
Cutover plans	Provide Cutover plans and Site-Specific Work Plans (SSWP) as required.
Documentation / Training	Provide documentation and training to designated NMRX personnel to perform maintenance and troubleshooting and testing.
As-built	Provide System level as-built drawings.

5.3 Proposed Testing & Verification Plan

The testing of all configurations changes and new software deployments will be closely coordinated with NMRX and led by a test lead. As required by NMRX, Wabtec's processes will include a configuration management plan, design documents, test plans and implementation plans. Wabtec's Program Manager will develop a detailed project schedule which incorporates all activities including the testing and verification of the proposed solution.

5.4 Sample Project Schedule (High Level)

Wabtec proposes a start date of October 1, 2019.

5.5 Training Provided

Wabtec will provide product training materials which consist of a course outline and instructor led classroom training using either power point or word document reference materials. The training courses will be designed so that attendees understand the configuration of the system, what happens when a component fails, any necessary human interaction and how to restore the system.

Training - 3 sessions on Tuesday, Wednesday, and Thursday, 8 AM to 5 PM.

5-10 students per training, not to exceed 10 students.

Structure sessions as follows:

Session 1 – IT administrator

Session 2-3 – Wayside Technicians & Onboard

6. COMMERCIAL TERMS

This project is proposed to be a change order to the existing Contract between Wabtec and Rio Metro Regional Transit District ("RMRTD") PTC Contract No 2018-03, with application of the same commercial terms.

6.1 Scope Summary

6.1.1 NMRX Wi-Fi - SOW

Scope ID	Description
1	Wabtec will provide new Rajant LX5 transceivers at all RF Core network nodes and onboard 22 passenger cars.
2	Wabtec will provide network engineering to enable communication from the NMRX provided ISP to the onboard access points located at stations and onboard.
3	Wabtec will provide 1 year of support and defect warranty to correct items which have been identified to fail in conformance to the approved test plan artifacts provided no configuration changes have been performed by NMRX or 3rd parties which could negate the approved configuration.
4	Wabtec will submit design detailing integration of the Core Network system to MRCOG ISP.
5	Wabtec will provide specification submittals of all hardware limited to the proposed Core RF network and WI-FI system.
4	Install and configure LX5 radios and WAAV Airbox onboard, towers and stations.
6	Provide Cutover plans and site-specific Work Plans as required
7	WI-FI System Test Plan. a. Validate Cellular coverage. b. Validate RF coverage. c. Validate throughput.
8	Wabtec will provide documentation and training to designated NMRX personnel to perform system maintenance, troubleshooting and testing
9	Provide System level AS BUILT drawings (server and workstation connection).
10	Phase 1 of the project will include a detailed site survey and feasibility study that will consist of the following: Inspect and inventory all sites to develop a comprehensive list of useable equipment and infrastructure.
11	Recommended Spare Parts List

6.2 NMRX PUBLIC Wi-Fi SYSTEM

6.2.1 ASSUMPTIONS

ID	Description
1	This work is not subject to liquidated damages.
2	Phase 1 of the project Wabtec will conduct a detailed site survey of all the new proposed and existing locations to determine suitability. The survey will include the following: • Commercial AC available. • Space for mounting antennas on existing towers. • Space for equipment in existing bungalows or equipment cases. • Inspect condition of existing towers, cabinets, and equipment cases. • Inspect grounding of existing towers, cabinets and equipment cases. • Provide NMRX with a detailed report of findings. • Document throughput onboard and at stations. • Submit report of findings (Minimum expected throughput 10MBs)
3	Phase 1 of the project Wabtec will perform an RF coverage study using EDX modeling software and will submit a report of the findings to NMRX.
4	Phase 1 of the project Wabtec will conduct cellular drive tests to validate cellular coverage.
5	Phase 1 of the project Wabtec will conduct RF coverage tests along the right of way to validate RF model coverage predictions, throughput and handoff.
6	Wabtec assumes that all stations have conduit that runs from the station to the fiber demarcation point but no conduit to any collocated WIMAX towers. This means that every station will require the installation of a new 20' tower and equipment cabinet since the existing demarcation points do not have any existing structure(s) available to support the equipment needed for the Rajant network.
7	Existing WI-FI AP (access point) at the stations is located in a small box underneath the station canopy. This AP will be replaced with an Airbox (WI-FI Only) unit and the existing NEMA enclosure will be re-used.
8	The existing Ethernet switch located at the station will be replaced and no router is needed or will be installed at the stations.
9	All external Wi-Fi antennas and RF jumpers at stations and onboard passenger cars will be replaced with antennas and jumpers of the same type and same physical footprint to simplify installation.
10	Existing cabinets at the stations will share rack space with station electronics (message board and train detection equipment. Wabtec assumes there is minimum 2RU of available space in the existing cabinet.
11	Wabtec assumes that installation of new tower and equipment cabinets will be located adjacent to existing cabinet at fiber demarcation point.
12	Wabtec assumes existing and planned infrastructure to be used will consist of the following: 15 existing control points 15 Stations (new towers) 32 new planned PTC sites 22 existing WIMAX sites

13	Wabtec assumes that 15 existing control point towers and bungalows along the right of way will be used as part of the Rajant core network provided sufficient space is available and there is no negative impact to existing systems. If the existing the control point towers or bungalows cannot be used additional new towers will need to be installed and should be considered new and extra work. The exact number of new towers needed if any will be determined at the completion of phase1.
14	20' tilt towers with screw in foundations will be used for all new tower installations. This type of tower has a reduced environmental impact and will eliminate the need for local permitting requirements. NMRX will be responsible for permitting fees if required.
15	Where possible existing towers and cabinets will be re-purposed.
16	All equipment installed in the field will conform to -40 to +60 C operating temperature.
17	NMRX wants to leverage the WI-FI project to expand and build a core RF network that can eventually be used for PTC functionality in the future.
18	22 passenger cars will be modified to support passenger WI-FI. Locomotive cars are not currently included in the initial proposal but can be added in the future.
19	Passenger cars have 2 LANs available; one LAN is for ticket taker functions and the other is for customer WI-FI. NMRX has stated that the use of cellular for the customer WI-FI system should only be used if the RF core network fails. NMRX wants to limit cellular usage to the ticket taker functions as much as possible.
20	Existing ethernet cables onboard each cab car will be used to link the Airbox access ports at each end of the passenger cars.
21	The onboard equipment proposed will utilize a cached server and will present NMRX riders with a customizable splash page that will require users to log on to the WI-FI network.
22	Existing WiMAX equipment onboard the locomotive will be removed, and the existing mounting rails will be re-purposed.
23	All Stations except those designated by NMRX will be upgraded from copper to fiber connectivity which will provide 60-100Mbps. This is assumed to be complete before testing begins.
24	NMRX is responsible for providing the ISP routers and fiber or copper backbone at stations.
25	Where equipment is to be installed at existing control points Wabtec will submit detailed plan set detailing the scope of work and ensure that existing systems are not negatively affected. Once NMRX approves plan sets Wabtec will submit a work plan to NMRX for approval.
26	All Rajant installation sites will be powered from 24VDC using either commercial AC or Solar power. Battery backup will be provided and capable of keeping the site operational for a period of 48 hours following an AC power loss event.
27	All proposed radio frequencies are non-licensed frequencies however as a public agency NMRX qualifies to use the 4.9GHz frequency which is only available for public safety users. NMRX will be the responsible to obtain authorization to use these channels which will require coordination with the other public safety users in the area. Wabtec will support NMRX in this effort.
28	A splash screen will be presented to passenger at session initialization with basic information on Railrunner wireless and basic terms and conditions. Basic content filtering will be applied to public internet browsing to block potentially offensive sites from being accessible.

29	All existing equipment, cabling and wiring will be removed and disposed of at the direction of NMRX.
30	NMRX is responsible for all fee's associated with the disposal of existing batteries and equipment.
31	NMRX will be responsible for infrastructure or site improvements needed to prevent theft or vandalism. This would include fencing, locks, intrusion alarms, etc.
32	NMRX will provide necessary physical and remote access to NMRX server rooms, station equipment cases, control point bungalows, equipment cabinets along the right of way and onboard passenger cars at mutually agreed installation, testing and commissioning times as defined by approved work plans.
33	NMRX will provide local electrician to provision and manage commercial AC to equipment cabinets. Sites where commercial AC is not readily available will be configured for solar power operation. The exact number of solar installations will be determined at the conclusion of Phase 1 (site survey).
34	NMRX is responsible for the cost of monthly cellular service.
35	NMRX is responsible for the cost of monthly bonding service.
36	NMRX will provide personnel with the necessary authority to review and approve all documentation within 30 days from submittal.
37	NMRX will provide the proper personnel for the necessary time period for training to be completed.
38	NMRX will provision all network connections and routing to enable communication paths necessary for the required functionality up to the Wabtec defined demarcation point.
39	NMRX will provide a master clock for synchronizing time between all systems if needed.
40	NMRX will provide a public facing internet port to the office routers with internet speed at least 10mb up/down for maintenance and support purposes
41	NMRX will provide internet access via the MRCOG ISP.
42	NMRX will provide VPN connectivity to the data centers.
43	NMRX will provide access to the Wayside network at the Data Center(s) allowing communication to the stations and onboard WI-FI systems.
44	NMRX will perform all modifications to their existing network equipment to enable it to interface with Wabtec installed network equipment.
45	Wabtec provides no additional hardware warranty for COTS hardware beyond the manufacturer's warranty included with the purchase of the equipment.
46	Wabtec assumes that Extra Work services will be considered on mutually agreed change orders.
47	Wabtec assumes it can proceed with the same Categorical Exclusion as allowed for under the PTC Contract.
48	Wabtec assumes all reporting for WI-FI change order work will be combined with PTC project reporting information.
49	Wabtec assumes partial payment schedule as submitted with bid will be combined with PTC project PPS and can be invoiced together.
50	Wabtec assumes same Terms and Conditions as PTC Project contract
51	Wabtec assumes NTP by 10/1/2019 and completion date no later than September 30, 2021. Project Schedule will provide full detail for project.
52	Wabtec assumes PTC project overhead to support WI-FI program and any stop in work for PTC would impact overhead of WI-FI project.

53	WAAV will use private network as much as possible as long as fast latency exists and suitable bandwidth is available however as bandwidth gets swamped because of high demand due to high volume of users the WAAV box will be capable of using cellular. To control cellular costs NMRX will have the ability to limit user bandwidth at both the WIFI and carrier level.
54	User bandwidth can be limited to about 300KB per user however this can be adjusted up or down as needed.
55	Bonding technology will be used to bond private Rajant network to cellular carrier service however cellular usage will be used as little as possible.

6.3 Warranty, License and Terms

Wabtec will resolve issues discovered in the operation of the NMRX WI-FI system, provided the installed configuration as delivered by Wabtec has not been modified by NMRX or any 3rd party, for a period of 1 year from the date of successful cutover of the systems and solution contained in this proposal.

6.4 Proposal Validity

This proposal is valid for 30 calendar days from August 31, 2019.

6.5 Terms and Conditions and Reservation of Rights

Wabtec's bid and pricing are based the terms and conditions of Contract No. 2018-03.

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Suite 440
Englewood, Colorado 80112
(303) 290-8383
www.wabtec.com

February 4, 2020

Attn: Terry Doyle
Director
Rio Metro Regional Transit District
809 Copper Avenue NW
Albuquerque, NM 87102

Contract No. 2018-03

Subject: NMRX Passenger WiFi Updated Proposal

Dear Mr. Doyle,

In our meeting with you on Nov. 5, 2019, we were requested to provide an updated proposal and information based upon the following scope revisions for the subject project:

1. Reduce the number of cellular modems per train, based upon providing two cellular modems in only the nine (9) cab cars. This eliminates the cellular modems on the thirteen (13) non-cab passenger coach cars. However, the ability to support future addition of up to four (4) cellular modems per passenger car is retained. If additional cellular modems are to be planned, it is suggested to start the additions to the cab cars. The non-cab cars will be connected via the Rajant mesh network. The main focus of this change is to reduce the monthly charges related to the number of cellular modems to be activated. The operating objective remains to maximize use of the private Rajant network, with use of cellular for back-up and additional bandwidth as needed.

2. In cases of limited bandwidth, such as operating on the cellular networks only, a means to provide priority use of New Mexico government employees for access to their work email accounts is needed. There are multiple ways this can be done, and the specific approach to be taken will be decided in consultation with your team during the Phase 1 part of the project.

3. Increase the new radio tower heights from 20 ft. to 40 ft.: The plans to use the Rajant network as part of the PTC solution will provide a means to support increasing the new tower heights to 40 ft. This has been estimated based upon the same initial estimate of 22 new tower locations. As the RF survey and analysis as planned in Phase 1 is completed, there may be an opportunity to reduce this tower count. A budget price reduction per tower is provided as additional information.

4. After further reviewing the coverage area, it was concluded that the number of the reused WiMax towers as compared to the original count was underestimated. In the latest revision of the proposal, we have increased the number of reused WiMax towers from 12 to 19 locations.

The base system as previously proposed, with scope adjustments as discussed will not result in any price increase from Wabtec. The offer remains at **$5,298,788**.

In terms of budget price reductions related to reducing the need for new towers: The main focus will be on eliminating the need for new standalone tower locations, separate from the existing signaling infrastructure. In this case, each tower which can be eliminated will save about **$25,000**.

We also discussed options to support hosting of media content which could be accessed by passengers at both stations and in the passenger cars. This provides a path to provide future infotainment services, without adding mobile bandwidth demand. This can be supported by adding a 1 TB solid state drive (SSD) in each of the 59 WAAV Airbox units (two per passenger car, and one per station). The cost for this option is **$49,170.** Note that this does not include supply of media content, but we can work with NMRX to develop future options. As an example, if there is a desire to provide steaming of local morning TV news shows, these could be downloaded over the Rajant network in the yards, before trains depart.

Monthly operating cost estimates:

Wabtec can work with NMRX to decide which cellular services to use, as part of the Phase 1 work, after surveying detailed coverage of available networks. It is noted that Sprint currently offers unlimited data plans which could be attractive, depending upon coverage. However, it is not clear if these offers will change after the merger with T-Mobile is complete. T-Mobile is in the process of introducing their new 600 MHz based 5G system which can also be considered, depending upon coverage and pricing. AT&T also currently has an "unlimited" plan as a reasonable monthly rate, but data rates are throttled after 22 GB per month. Verizon is expected to have good coverage, but also with higher data rates. Based upon current estimates, Wabtec believes the use of two cellular modems per cab car will have budget costs to NMRX of about **$3,250** per month for the fleet (13 cab cars). This is based upon selecting plans from Sprint, T-Mobile, and/or AT&T. It is suggested to select two different carriers to provide greater combined coverage and to protect from loss if any single network.

There are also monthly support costs related to the following services:

1. Cloud based Cellular Bonding Service: Aggregation of multiple cellular services with the Rajant mesh network.
2. Cloud based Local Content to SSD Reporting, Synchronization, Management and Monitoring.
3. Monitor and display status of AirBoxes
4. Graphs of bandwidth and use of each cellular modem
5. Real time GPS based location on a Web based map
6. Router software and firmware updates
7. Airbox extended warranty, with hardware repair
8. Email and phone support

The price for these services is **$12,250** per month, covering all trains and stations. There are some options for reduced services, or transfer of some of these costs into the base contract which can be discussed.

Note that the base price has included lifetime software updates for the Rajant breadcrumbs. These can be delivered over the Rajant network, without need for physical access. There are typically an average of three software updates per year, and customers can decide what updates to apply.

Phase 4

We are also working to provide requirements for two main options which can leverage the Rajant communications network to increase the reliability of the PTC system, with back-ups to the MCC 220 MHz data radios. The scope of these options is summarized as follows:

1. On-Board: Use the Rajant network as a back-up path for PTC communications. This will require adding a Rajant radio in the locomotive, with Ethernet interface to the I-ETMS TMC, and also providing the Ethernet interface between the cab car Rajant radio and its TMC.

2. Wayside: Most of the wayside Rajant radios are co-located with the signal system. In this case, the Rajant radio will add an Ethernet interface to the WIU, to provide an additional data path for signal data. If there is a desire to back-up all of the 220 MHz radios, Rajant radios and antennas would also need to be added to 22 signal locations.

In both cases, we also need to add WSRS software in the office to provide the alternative EMP message routing. The highest level of back-up can be provided by deploying both the on-board and wayside Rajant extensions. However, either can also be considered. Pricing for these options will be based on the requirements negotiated for the level of PTC integration agreed upon. The schedule for the PTC/Rajant integration will begin after the PTC Final Acceptance and WiFi Final Acceptance.

Payment terms
Partial Payment Schedule including mobilization and milestones for billing to be provided prior to execution.

Our proposal is valid until March 27, 2020. Taxes are excluded from our pricing. This proposal is based upon terms and conditions of Contract No. 2018-03 between Rio Metro Regional Transit District and Xorail, Inc. effective April 17, 2019.

Once RMRTD agrees to this Change Request the Partial Payment Schedule will be changed to include this additional cost and the invoices will be sent in accordance with the Partial Payment Schedule and updated Project Schedule as milestones are completed. All changes on the Partial Payment Schedule will be discussed with NMRX for approval.

Should you have any questions or concerns, please contact me.

Regards,

Andrew Kasper

RIO METRO
REGIONAL TRANSIT DISTRICT

FY 2019-2020

Financial Status Report

(unaudited) based on Modified Accrual Basis

For the Period: 07/01/2019 - 12/31/2019

	RAIL OPERATIONS		TRANSIT OPERATIONS	
	BUDGET	ACTUALS	BUDGET	ACTUALS
REVENUES:	FY19-20	12/31/2019	FY19-20	12/31/2019
Operating & Capital Revenues				
Federal & State	$50,271,563	$5,481,431	$8,755,535	$1,945,678
BNSF | Amtrak	2,200,000	1,095,224	0	0
County Regional Transit GRT / Other Local	22,665,971	8,422,152	15,071,880	6,982,491
Farebox	2,000,000	967,210	0	27,680
PTC Grant	35,985,246	17,367,551	0	0
SIB	10,900,000	6,558,112	0	0
Bond Proceeds	0	0	0	0
TOTAL REVENUES	**$124,022,780**	**$39,891,680**	**$23,827,415**	**$8,955,849**

	BUDGET	ACTUALS	BUDGET	ACTUALS
EXPENDITURES:	FY19-20	12/31/2019	FY19-20	12/31/2019
Operations and Maintenance				
Herzog Transit Service, Inc. Contract	$18,028,000	$9,363,513	$0	$0
Operating	9,181,000	6,876,819	17,277,115	6,121,060
Total Operations & Maintenance	**$27,209,000**	**$16,240,332**	**$17,277,115**	**$6,121,060**
Capital				
Bonds Principal & Interest	$0	$0	$0	$0
SIB	54,052	19,710	0	0
Capital	45,437,047	21,734,554	0	0
Vehicle Purchase	0	0	0	0
Building Acquition for Valencia	0	0	0	0
Los Ranchos Park and Ride	0	0	1,053,371	0
Total Capital	**$45,491,099**	**$21,754,264**	**$1,053,371**	**$0**
TOTAL EXPENDITURES	**$72,700,099**	**$37,994,596**	**$18,330,486**	**$6,121,060**

BALANCE REMAINING	**$51,322,681**	**$1,897,085**	**$5,496,929**	**$2,834,789**

Performance Report

December 2019 Data

RIO METRO REGIONAL TRANSIT DISTRICT

BOARD OF DIRECTORS MEETING

FEBRUARY 21, 2020

Performance Snapshot: December 2019

Mode	Monthly Ridership	Avg. Weekday Ridership	Avg. Saturday Ridership	Avg. Sunday Ridership	ADA Ridership (%)	Passenger Miles Traveled	Avg. Passenger Trip Length	Passenger Trips per Vehicle Revenue Hour
NMRX	52,958	2,119	1,015	671	n/a	2,456,507	46.4	17.5
Demand Response	4,855	231	n/a	n/a	18.0%	38,004	7.8	2.4
Rio Rancho	1,889	90	n/a	n/a	23.1%	11,694	6.2	2.1
Valencia County	2,966	141	n/a	n/a	14.7%	26,310	8.9	2.8
Fixed Route Bus	4,818	229	n/a	n/a	n/a	90,286	18.7	2.9
Sandoval County	3,355	160	n/a	n/a	n/a	73,436	21.9	3.9
Valencia County	1,463	70	n/a	n/a	n/a	16,850	11.5	1.8
Job Access (Demand Taxi)	728	23	n/a	n/a	1%	3,879	5.3	5.2
Total	**63,359**	**2,603**	**1,015**	**671**	**n/a**	**2,588,676**	**40.9**	**9.3**

Performance Snapshot: NMRX

NMRX Ridership Measures	December 2019
Monthly Ridership	52,958
Avg. Weekday Ridership	2,119
Avg. Saturday Ridership	1,015
Avg. Sunday Ridership	671
Passenger Miles Traveled	2,456,507
Avg. Passenger Trip Length	46.4
Passenger Trips per VRH	17.5

NMRX Environmental Measures	December 2019
Passenger Miles Traveled	2,456,507
Percentage of Regional PMT	58.8%
Vehicle Miles Traveled Saved	2,233,188
Passenger Fuel Savings	
Gallons	89,686
Cost	$201,435
CO2 Reduction (Tons)	879

NMRX Service Quality Measures	December 2019
On-Time Performance	
% On-Time Trains (Contractual)	99.3%
% of Passengers Affected by Delays	0.8%
# of Trains by Arrival Times	
≤5 Minutes or Less (On Time)	537
6 to 10 Minutes Late	-
11 to 14 Minutes Late	-
15 to 19 Minutes Late	2
> 19 Minutes Late	2
% Track Miles Under Speed Restrictions	0.3%

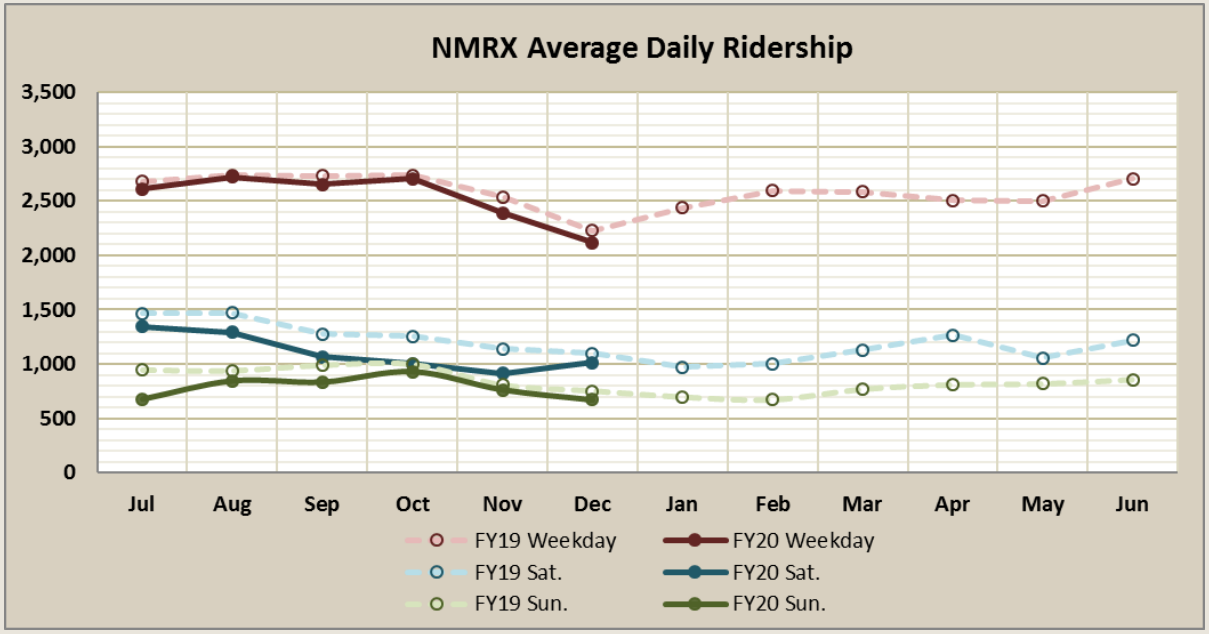
Performance Snapshot: Transit

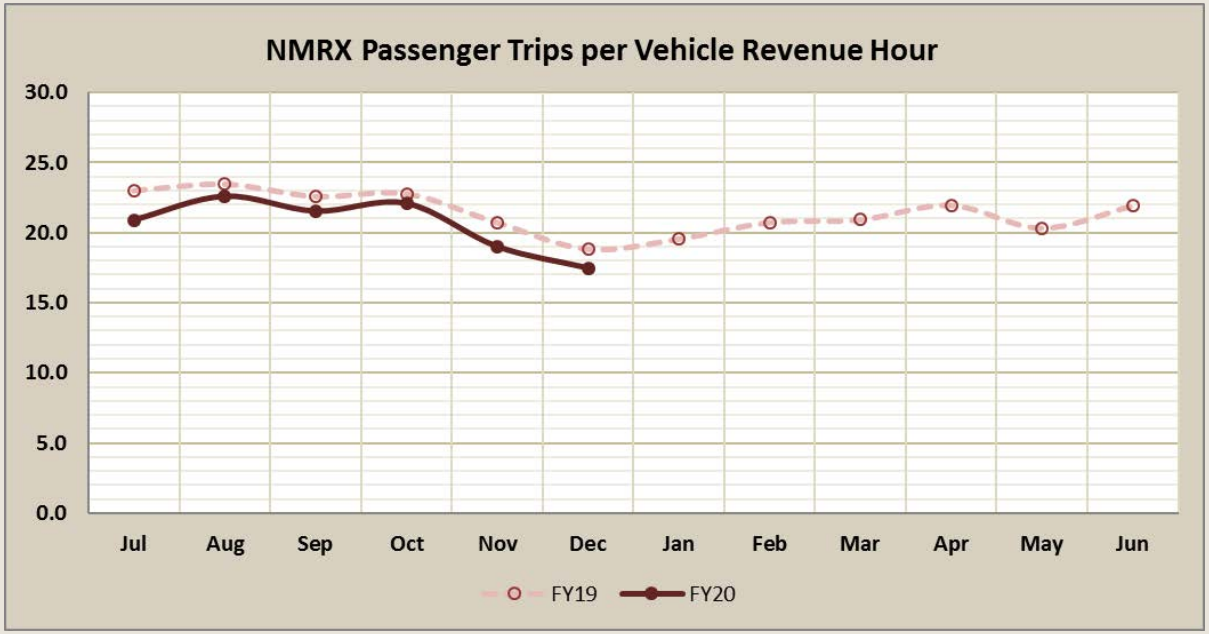
Mode	Measure	December 2019
Demand Response	Monthly Ridership	4,855
	Rio Rancho	1,889
	Valencia County	2,966
	Avg. Weekday Ridership	231
	Rio Rancho	90
	Valencia County	141
	ADA Ridership	18.0%
	Passenger Miles Traveled	38,004
	Avg. Passenger Trip Length	7.8
	Passenger Trips per VRH	2.4

Mode	Measure	December 2019
Fixed Route Bus	Monthly Ridership	4,818
	Sandoval County	3,355
	Valencia County	1,463
	Avg. Weekday Ridership	229
	Sandoval County	160
	Valencia County	70
	Passenger Miles Traveled	90,286
	Avg. Passenger Trip Length	18.7
	Passenger Trips per VRH	2.9
Job Access Taxi	Monthly Ridership	728
	Avg. Daily Ridership	23
	ADA Ridership	1.4%
	Passenger Miles Traveled	3,879
	Avg. Passenger Trip Length	5.3
	Passenger Trips per VRH	5.2

NMRX Ridership and Productivity

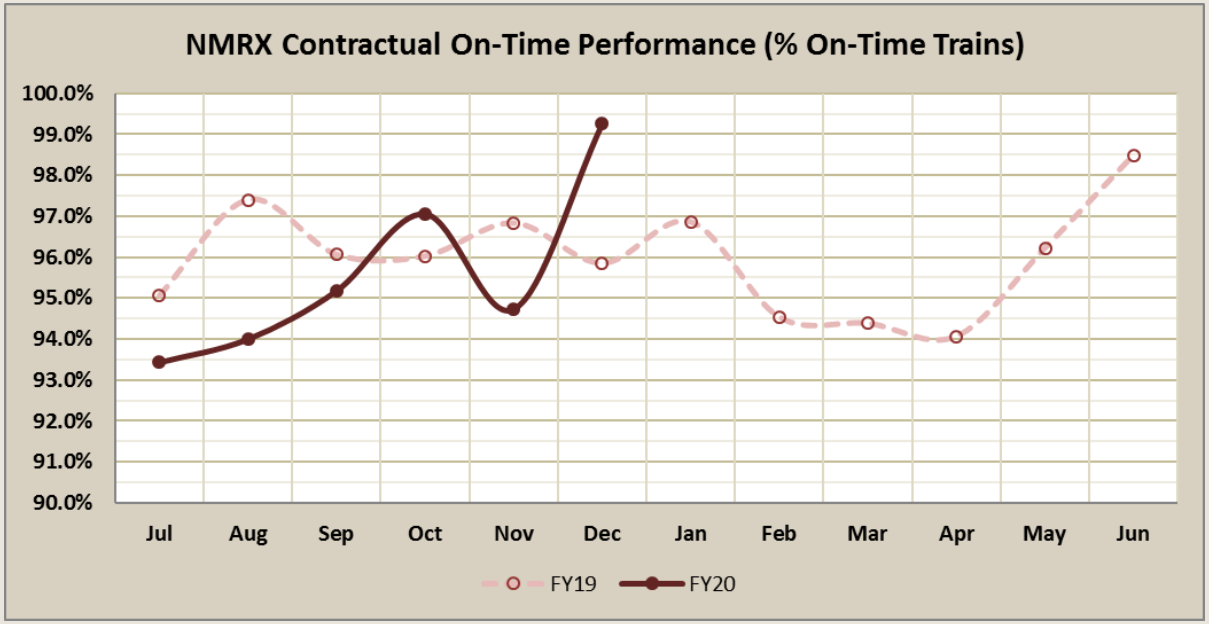
- Ridership is also referred to as boardings or passenger trips
- Vehicle Revenue Hours (VRH) are the number of hours that vehicles are scheduled to or actually travel while in revenue service
- Productivity is commonly measured in passenger trips per vehicle revenue hour, or, stated differently, the average number of passengers boarding a vehicle per hour of service
- Each NMRX cab and coach car in a train or "consist" counts as a vehicle. Locomotives do not, as they carry no passengers.
- For the NMRX, passenger trips per VRH can be influenced by the number of cars in a consist. For example, reducing the number of cars in a consist increases productivity (more passengers in fewer cars), but may negatively impact seating availability and customer satisfaction.

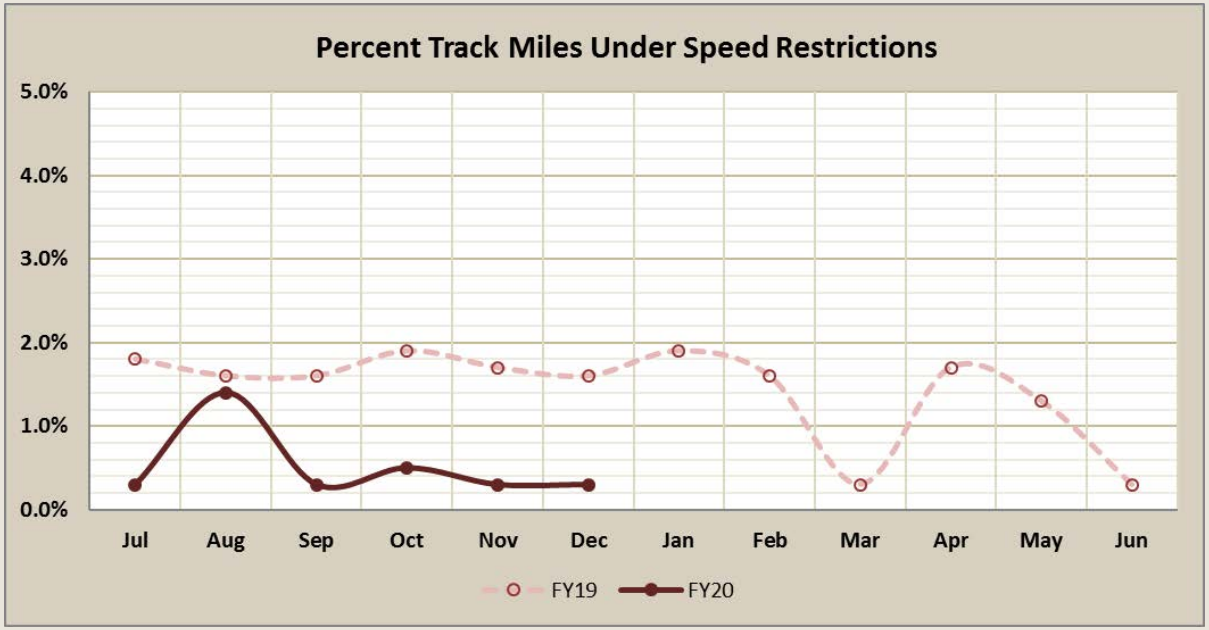




NMRX On-Time Performance

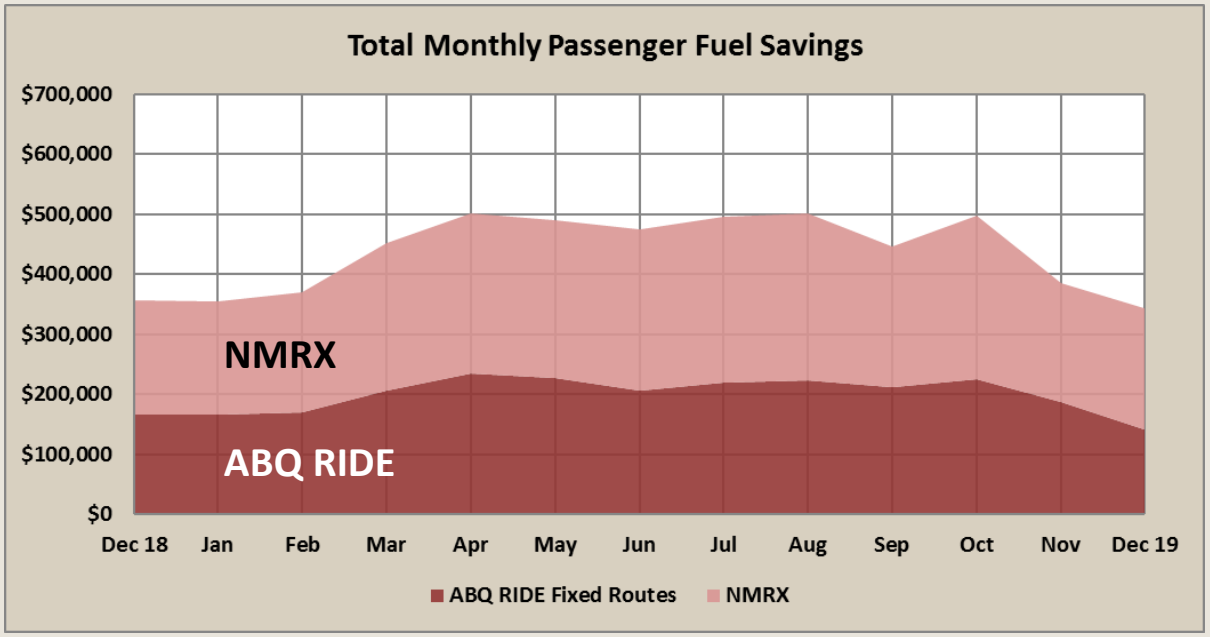
- Per Rio Metro's contract with Herzog, a train is considered "on time" if it arrives within five minutes of its scheduled time at the terminal (last) station
- Percent track miles under speed restrictions is based on one of FTA's Transit Asset Management performance measures
- Speed restrictions are sampled on the first Wednesday of the month
- The dramatic reduction in speed restrictions following July 2017 is the result of completing the jointed rail project

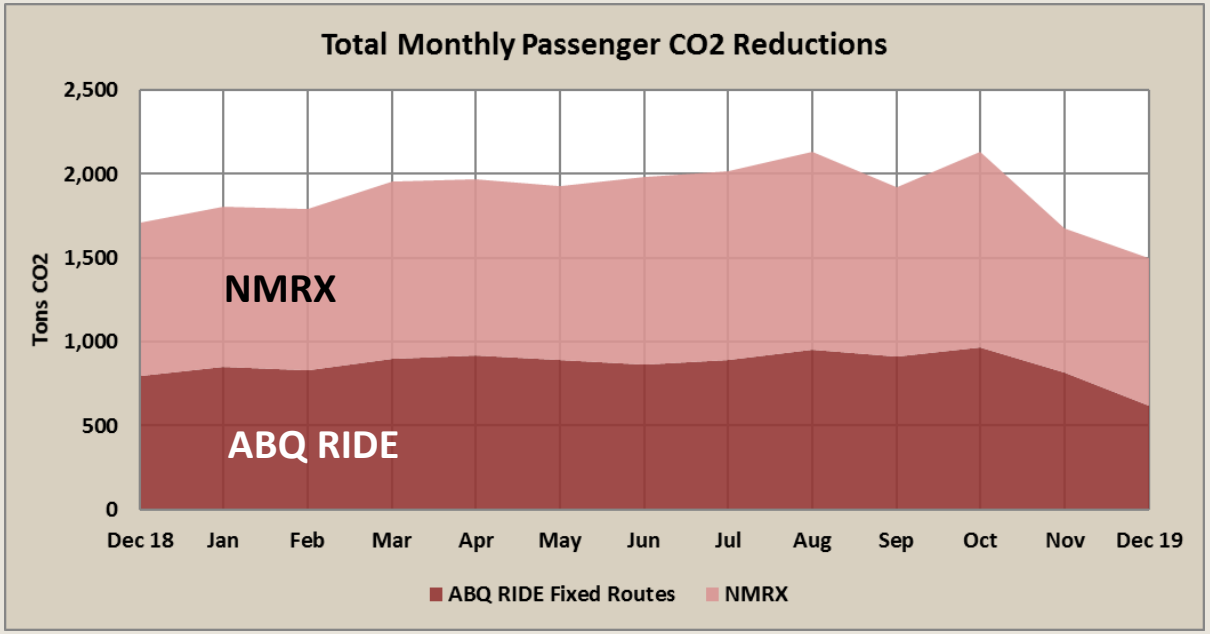




NMRX Fuel Savings and CO_2 Reduction

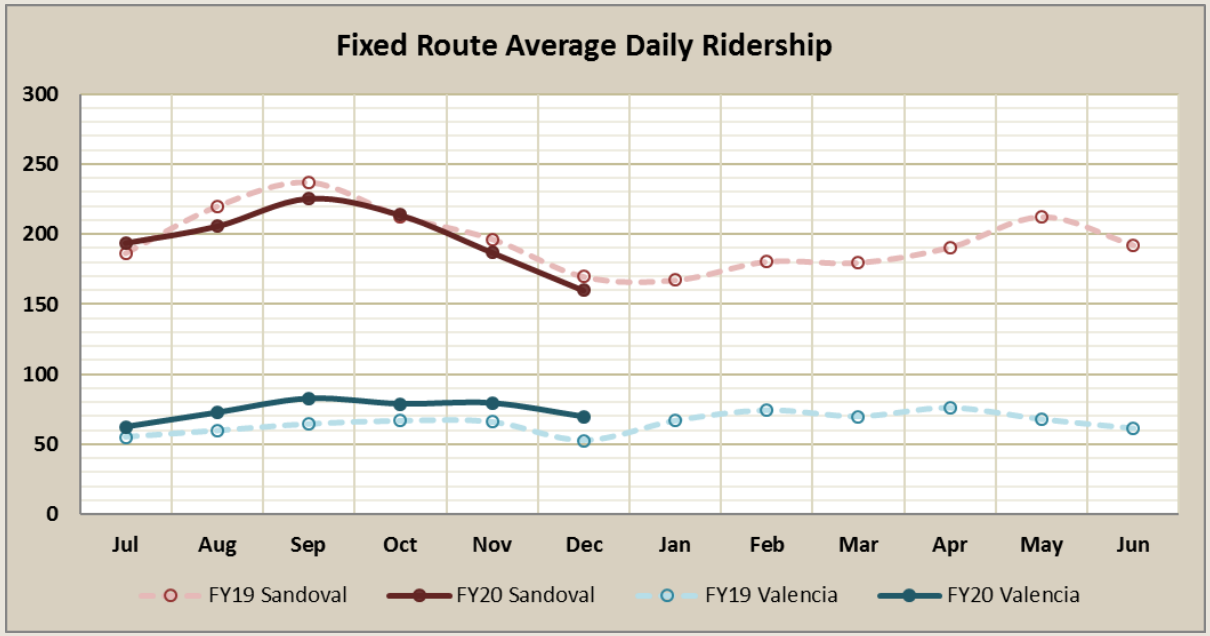
- Fuel savings are based on an average vehicle occupancy of 1.1, 2017 model year average fuel economy of 24.9 miles per gallon, and EIA Gulf Coast regular conventional retail gasoline prices
- Total CO_2 reductions are based on 2017 model year average emissions of 357 grams per mile
- The fuel savings and CO_2 data in this report are not offset by NMRX locomotive fuel consumption and carbon emissions

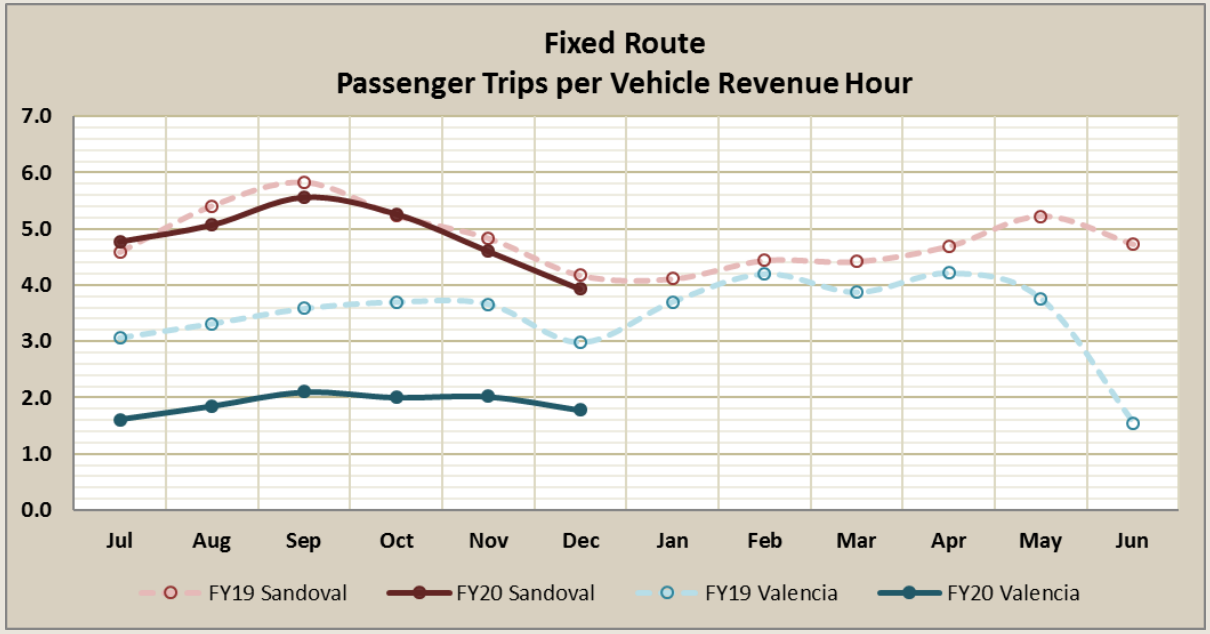




Fixed Route Ridership and Productivity

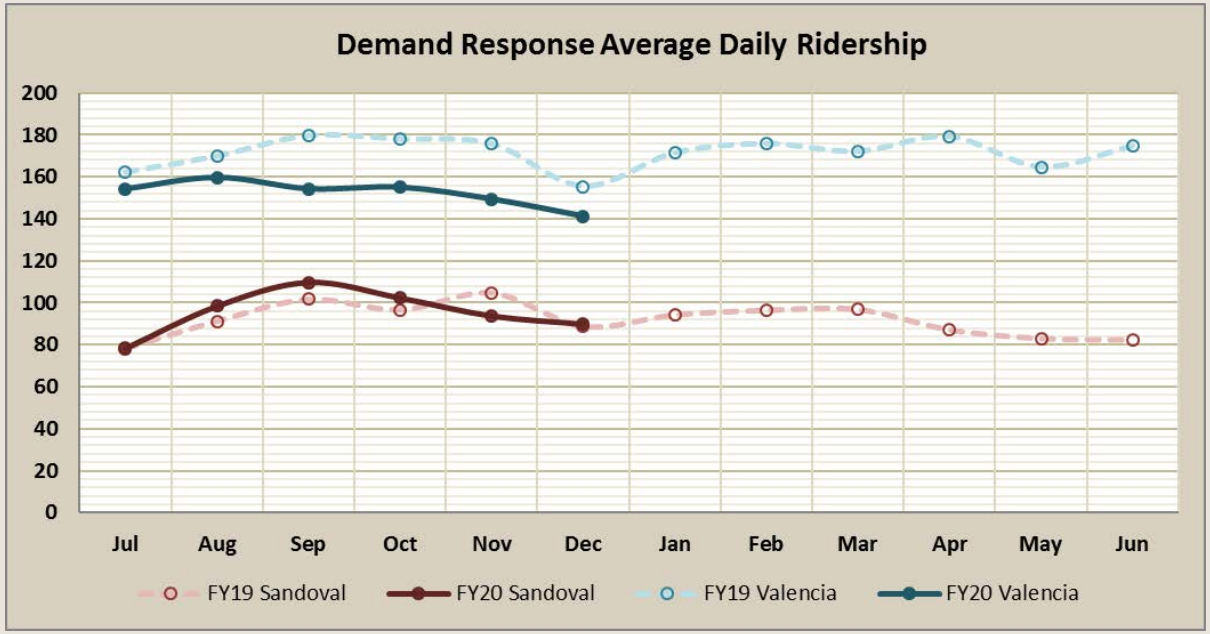
- Fixed routes are bus routes that follow a regular schedule and serve designated stops
- Sandoval County fixed routes are contract-operated by All Aboard America:
  - Route 8 (Cuba, Rio Rancho)
  - Route 201 (Bernalillo, Rio Rancho)
  - Route 202 (Cochiti Lake, Cochiti Pueblo, Kewa Pueblo)
  - Route 204 (Jemez Springs, Jemez Pueblo, Zia Pueblo)
  - Route 366 (Central/Unser Transit Center to Route 66 Casino)
  - Route 505 (US 550 Station to Dtwn. Albuquerque Station)
- Valencia County fixed routes are directly operated by Rio Metro:
  - Route 206 (Belen Station)
  - Route 208 (Belen to Dtwn. ABQ)
  - Route 209 (UNM Valencia)
  - Route 210 (Los Lunas Main St.)

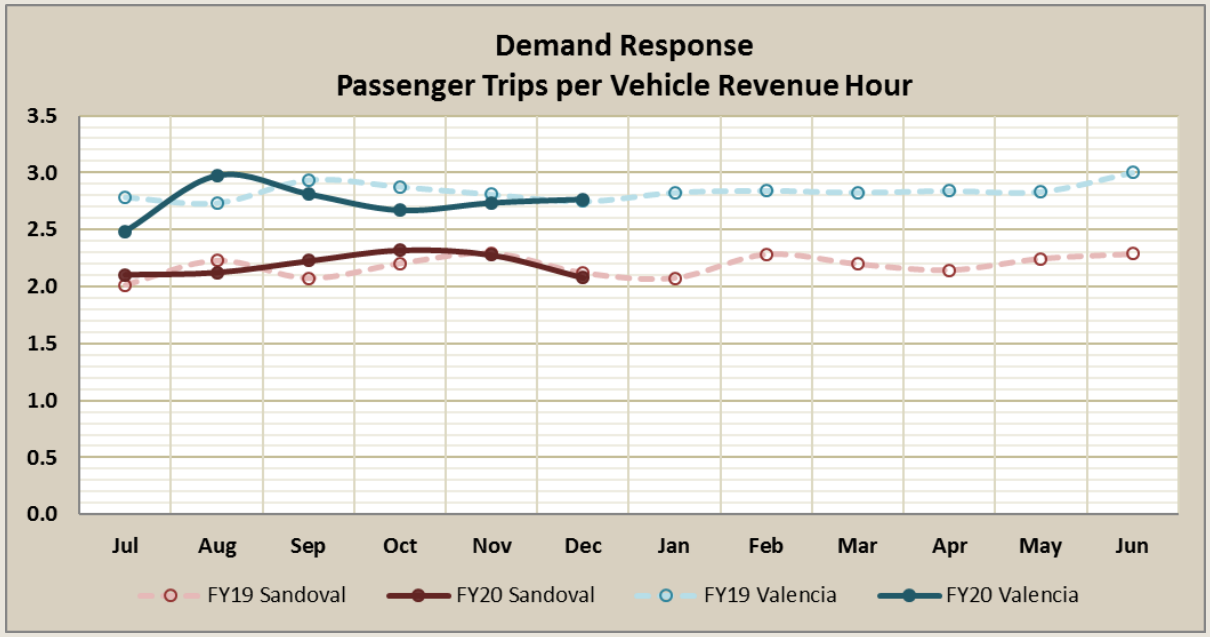




Demand Response Ridership and Productivity

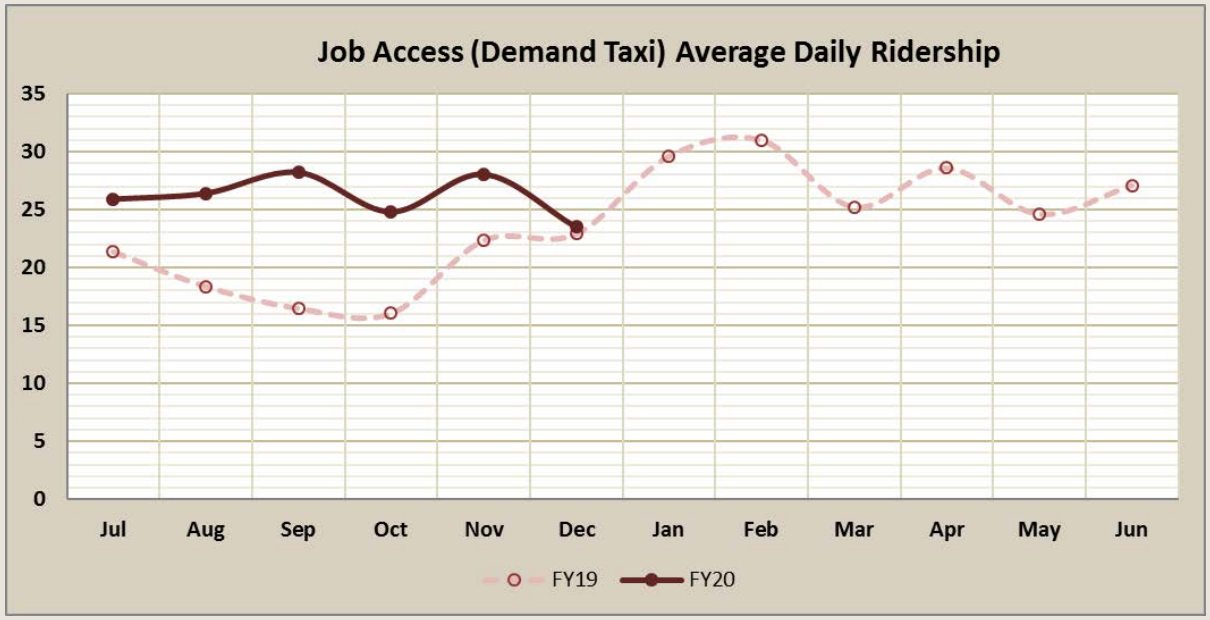
- Demand response or "Dial-a-Ride" services require passengers to request their trip one business day in advance. The bus then takes the passenger from their origin to destination, although trips are commonly shared with other passengers.
- The Rio Rancho Dial-a-Ride is available to residents age 62+ and persons with disabilities age 18+
- The Valencia County Dial-a-Ride is available to residents of Valencia County regardless of age or ability

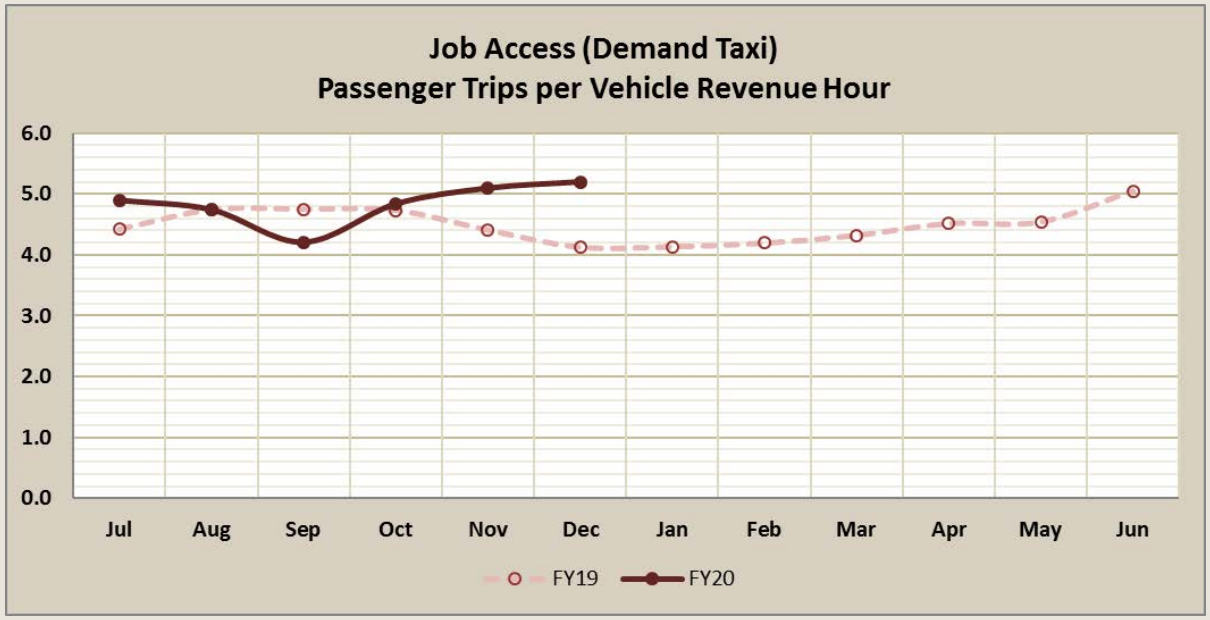




Job Access (Demand Taxi) Ridership and Productivity

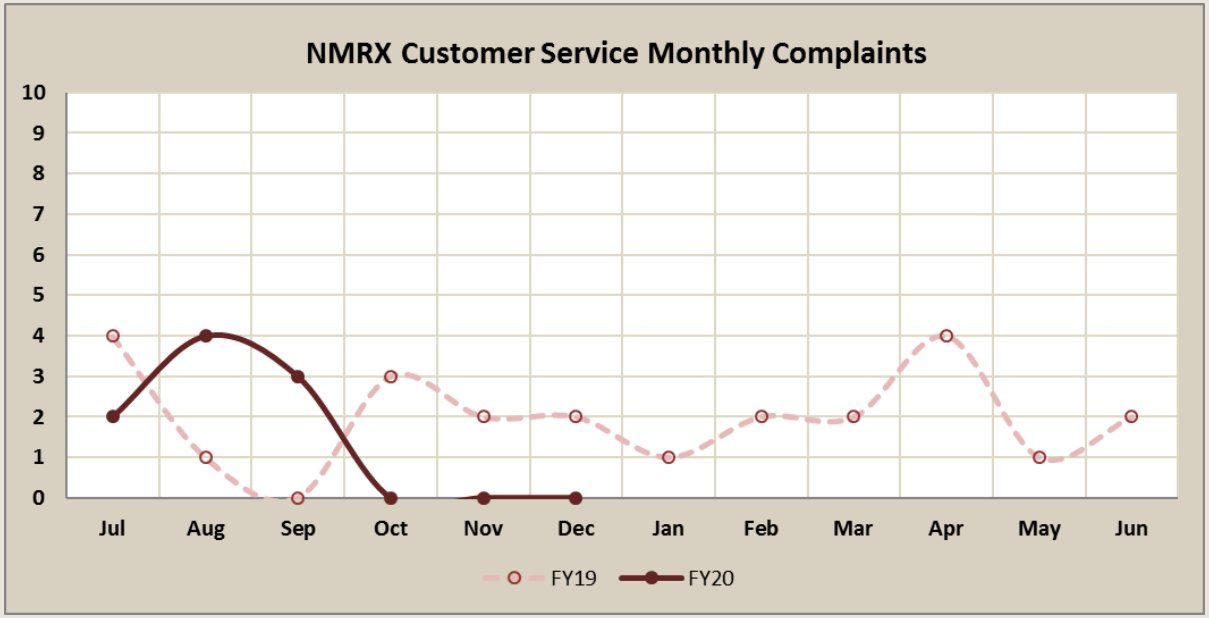
- The Job Access program is available to residents of Bernalillo County for up to one year for transportation to work, work-related training, or work-related child care
- To qualify, applicants must be receiving Temporary Assistance for Needy Families (TANF) or have a household income within 150% of the federal poverty level
- Generally, applicants are only allowed to use the Job Access program if public transit is not available for their trip

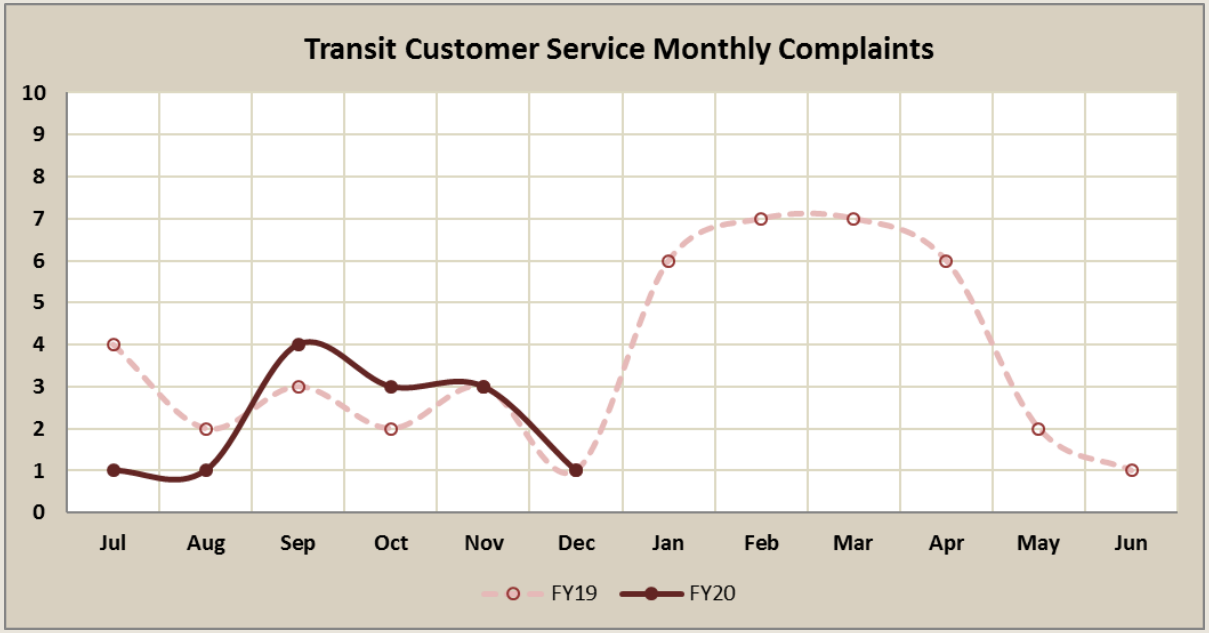




Customer Service Complaints

- To be classified as a complaint, a passenger must contact customer service to file a formal complaint





Reported Incidents

- Incidents are reported in writing to management by Rio Metro and contractor staff. The tables on this slide briefly summarize the content of those reports.
- When applicable, management may revise standard operating procedures, issue reminders or specific directives to staff, seek medical attention for staff and/or passengers, etc.

NMRX Incidents

Date	Train	Description
12/4	516	Passenger removed for intoxication and failure to pay fare. Punches/spits on train as it departs.
12/4	516	Train strikes cow near Algodones. No damage.
12/8	706	Train strikes elk near Isleta Pueblo. Damages ditch light.
12/9	516	Passenger confronts security guard and is asked to leave train. Breaks window on train door.
12/15	705	Passenger passes out and oversleeps stop. Confrontational after waking and removed from train.
12/16	521	Two windows shot out of train in motion in Santa Fe. No harm to crew or passengers.
12/18	518	Passenger removed for intoxication and failure to pay fare.
12/19	516	Passenger removed for intoxication and threatening staff.
12/30	517	Passenger CT'd and removed for refusal to pay fare and panhandling.
12/30	519	Passenger removed for failure to pay fare and improper conduct toward other passengers.

*CT'd = Issued criminal trespass citation prohibiting use of NMRX service or property.

Sandoval County Transit Incidents

Date	Route	Description
12/10	DR	Passenger falls to knees exiting bus, but is unharmed.
12/13	DR	Passenger stumbles forward entering bus, but is unharmed.
12/16	DR	Bus gets flat tire. Passenger transferred to another bus and bus towed.
12/19	DR	Bus loses electrical power and stops running. Passenger transferred to another bus and bus towed.

Valencia County Transit Incidents

Date	Route	Description
12/13	??	Bus bumps another vehicle, resulting in a scratch to the bus's bike rack.
12/16	??	Passenger harasses driver and another passenger. Police dispatched, but passenger leaves scene.
12/20	??	Bus and vehicle hit each other while both changing lanes, scratching bus. Vehicle leaves scene.
12/26	??	Bus hits and kills dog that ran out into street.