 of Transportation NM 264 Phase I and II Services Final Phase I-A/B Report


July 26, 2023

## Final Phase I-A/B Report

nM 264 From The Arizona/New Mexico State Line to Yah-Ta-Hey (MP 0 то MP 16, CN 6101220)

## Prepared for.



## New Mexico deparment of

TRANSPORTATION

## Prepared by



JuLy 26, 2023

Signature Acknowledging Approval


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1 EXECUTIVE SUMMARY

### 1.1 INTRODUCTION

The New Mexico Department of Transportation (NMDOT) in cooperation with Federal Highway Administration (FHWA) commissioned HDR to perform a comprehensive Phase I-A/B Corridor Study of New Mexico (NM) 264, extending west to east, from the Arizona/New Mexico state line milepost [MP] 0) to Yah-Ta-Hey, US 491 interchange (MP 16). The project is located in McKinley County in the western portion of the state and the surrounding area is either held in trust by the Navajo Nation, privately owned, managed by the New Mexico State Land Trust or the Bureau of Land Management. NM 264 is approximately 16 miles long and is classified as Principal Arterial Other.
This report identifies necessary improvements for the roadway and drainage for all segments and intersections to enhance the corridor's overall safety and mobility. To fulfill the department's goals, the study team performed the following:

- Review of existing conditions
- Traffic Operational Analysis, with existing and future conditions, for the roadway and two intersections (Alma Drive and P\&M Road)
- Access Management Analysis
- Speed Analysis
- Traffic Safety Analysis
- Alternatives Identification and Screening
- Public and Stakeholder Involvement
- Detailed Alternatives Analysis
- Identification of the Recommended Alternative to move forward to Phases I-C and I-D

To conduct these analyses, the corridor was divided into three distinct segments based on uniformity in roadway geometry, surrounding land uses, and operational condition:

- Segment 1 (MP 0 to MP 0.6) Arizona/New Mexico state line to Hilltop Road - This segment is 0.6 mile long and passes through the town of Tse Bonito, New Mexico. NM 264 is a fourlane roadway with a two-way left-turn lane (TWLTL) at the center. The travel lanes and the TWLTL are 12 feet wide. The posted speed limit of this segment is 45 miles per hour (mph). The roadway segment has curb and gutter, and a 5 -foot-wide sidewalk on both sides. The roadway grade is primarily flat. This segment is considered an urban section of NM 264, and, therefore, has multiple access points for businesses on the north and south sides of NM 264
- Segment 2 (MP 0.6 to MP 15.5) Hilltop Road to Cle Ki Drive - The longest of the three segments, it extends from Hilltop Road to the Cle Ki Drive intersection, covering approximately 14.9 miles. This segment is a divided roadway with two 12 -foot travel lanes in
each direction, raised medians in the middle, and paved shoulders with rumble strips in both directions. The paved shoulders are 10- to 15 -feet wide. The posted speed limit of this segment varies from 45 to 65 mph . There are two bridge structures in this segment at approximately MP 4. The roadway grade is primarily rolling.
- Segment 3 (MP 15.5 to MP 16) Cle Ki Drive to US 491 Interchange - This segment extends from the Cle Ki Drive intersection, through the community of Yah-Ta-Hey, to the US 491 Interchange for approximately 0.42 mile. The segment is a four-lane roadway with a TWLTL at the center. The travel lanes and the TWLTL are 12 feet wide. There are 10- to 12 -foot paved shoulders on both sides of the roadway. The driveway density is high, with frequent driveway access to adjacent developments. Three driveways exist along eastbound NM 264 and six driveways along westbound NM 264. The posted speed limit of this segment is 55 mph . The roadway grade is primarily flat.

The following sections describe the study findings and analyses. Based on the analyses, the team developed the recommendations summarized in Section 1.7, Recommended Alternatives to Proceed to Phases I-C and I-D.

### 1.2 PURPOSE AND NEED

The purpose of the study was to assess and make improvement recommendations for safety, multi-modal access, and operations within the NM 264 corridor. The study is needed because the existing pavement has deteriorated, creating a rough driving surface for vehicles. Additionally, existing drainage structures are in poor condition because of scour and/or sediment fill, roadway geometry and features are substandard, bicycle and pedestrian facilities and access management are lacking in the urban area, and the current barrier system (guardrail) does not comply with the American Association of State Highway and Transportation Officials (AASHTO) Manual for Assessing Safety Hardware (MASH)

### 1.3 EXISTING CONDITIONS

Segment 1 is primarily urban in nature and begins at the Arizona/New Mexico state line, at MP 0 , and continues to the east to Hilltop Road, at MP 0.6. This segment is approximately 0.6 mile long and passes through the town of Tse Bonito.

Segment 2 is primarily rural in nature and is the longest of the three segments. It extends from Hilltop Road, at MP 0.6, to the Cle Ki Drive intersection, at MP 15.5, and is approximately 14.9 miles long.

Segment 3 of the study area is rural/urban in nature and extends from the Cle Ki Drive intersection, at MP 15.5, through the community of Yah-Ta-Hey, to the US 491 interchange, at MP 16 , for approximately 0.42 mile.

### 1.4 SAFETY ANALYSIS

The study team performed a Traffic Safety Analysis for the NM 264 corridor, including a crash analysis, access management analysis, and speed analysis. The corridor was also analyzed for roadside obstructions within the roadway's clear zone.

### 1.5 TRAFFIC ANALYSIS

The traffic analysis was performed to determine the operating characteristics of NM 264 for existing and future conditions and to identify any deficiencies on the facility from an operational perspective. For any deficiencies identified, recommendations for improvements to geometrics and/or traffic control devices were made. The two primary elements identified and analyzed in this study were intersections and roadway segments.

### 1.6 PHASE I-A PRELIMINARY ALTERNATIVES AND SCREENING

Each alternative was evaluated based on the impact parameters including purpose and need, traffic operations (vehicular and multimodal), safety, existing access and land use, right-of-way (ROW) impacts, environmental impacts, and constructability. The alternatives were assigned a rating from 1 to 4 , with a rating of 4 being the highest. Based on these ratings, the following alternatives were recommended to be advanced to Phase I-B:

- Segment 1 Urban:
- Alternative 2-4 Lane Reconstruction with Raised Median and Bike Lanes
- Alternative 3-4 Lane Reconstruction with TWLTL and Bike Lanes
- Alternatives 6 - Traffic Recommendations and 7 - Drainage Recommendations to be combined and applied to Alternatives 2 and 3
- Segment 2 Rural:
- Alternative 2-4 Lane Reconstruction with Raised Median
- Alternative 4-4 Lane Reconstruction with Striped Median
- Alternatives 5 - Traffic Recommendations, 6 - Drainage Recommendations, and 7 - Bridge Recommendations, to be combined and applied to Alternatives 2 and 4
- Segment 3 Urban/Rural:
- Alternative 2-4 Lane Reconstruction with Raised Median
- Alternative 3-4 Lane Reconstruction with TWLTL
- Alternatives 6 - Traffic Recommendations and 7 - Drainage Recommendations, to be combined and applied to Alternatives 2 and 3

The No-Build Alternative was recommended to be advanced to Phase I-B for comparison purposes only.

### 1.7 PUBLIC INVOLVEMENT

As a part of the Phase I-A/B study and the public involvement process, the team, in collaboration with NMDOT, held three virtual meetings. The two initial meetings (the agency/stakeholder and the first public meeting) were held in August of 2022 and the second public meeting was held in May of 2023. These meetings allowed the study team to share information about the study process potential study considerations, and ultimately, recommended improvement alternatives, and solicited public comment. The major comment themes received from the public throughout the Phase I-A/B study included:

- Drainage/flooding concerns
- Pavement improvements
- Access management
- Corridor lighting
- Corridor congestion
- Corridor safety
- Project funding
1.8 RECOMMENDED ALTERNATIVES TO PROCEED TO PHASE I-C AND PHASE I-D

Each alternative was evaluated based on the impact parameters including purpose and need, traffic operations (vehicular and multimodal), safety, existing access and land use, ROW impacts, environmental impacts, constructability, and construction cost. The alternatives were assigned a rating from 1 to 4 , with a rating of 4 being the highest. Based on these ratings the following alternatives were recommended to be advanced into Phase I-C and Phase I-D:

- Segment 1 Urban:
- Recommended Alternative
- Alternative 3-4 Lane Reconstruction with TWLTL and Bike Lanes
- Alternative 6 - Traffic Recommendations
- Alternative 7 - Drainage Recommendations
- Engineer's Opinion of Possible Construction Cost Estimate: \$9,782,500
- Segment 2 Rural:
- Recommended Alternative
- Alternative 4-4 Lane Reconstruction with Striped Median
- Alternative 5 - Traffic Recommendations
- Alternative 6 - Drainage Recommendations
- Alternative 7 - Bridge Recommendations
- Engineer's Opinion of Possible Construction Cost Estimate: \$83,413,500
- Segment 3 Urban/Rural:
- Recommended Alternative
- Alternative 3-4 Lane Reconstruction with TWLTL
- Alternative 6 - Traffic Recommendations
- Alternative 7 - Drainage Recommendations
- Engineer's Opinion of Possible Construction Cost Estimate: $\$ 4,790,000$

The anticipated NEPA level of effort for forthcoming projects arising from this study will be an Environmental Assessment (prepared for FHWA and Bureau of Indian Affairs) if ROW is needed from Navajo Nation, and/or a FHWA Categorical Exclusion if ROW is not needed from Navajo Nation.

## 2 INTRODUCTION

The New Mexico Department of Transportation (NMDOT) is evaluating potential improvements to New Mexico (NM) 264 from the Arizona/New Mexico state line to Yah-Ta-Hey, at the trumpet interchange with US 491 (milepost [MP] 0 to MP 16). The corridor study has been assigned NMDOT Control Number (CN) 6101220.

The project area is located in McKinley County in the western portion of the state (Figure 1). The properties surrounding the project area are held in trust by the Navajo Nation, privately owned, or managed by the New Mexico State Land Trust or Bureau of Land Management, see Figure 2 for Land Ownership Map. As a four-lane divided highway, NM 264 extends west to east for 16 miles, from the Arizona/New Mexico state line to Yah-Ta-Hey in a rural part of the state (Figure 3) shows the project corridor map). NM 264 serves the Navajo Nation as a main corridor to the nation's capital in Window Rock, Arizona, which is 5 miles west of the state line.

For this study, the NM 264 corridor was broken into three segments, consisting of urban, rural, and urban/rural sections. Segment 1 starts in the town of Tse Bonito from the Arizona/New Mexico state line from MP 0.0 east to MP 0.6 and consists of urban conditions with two lanes in each direction, curb and gutter, and sidewalk on both sides. The intersection with Alma Drive is signalized (at MP 0.34). Several businesses and residences intersect the urban section of the corridor. Segment 2 continues from MP 0.6 east to MP 15.5 and consists of rural conditions with a divided highway with two lanes in each direction, multiple left-turn access points throughout, and infrequent right turns. The final segment of NM 264 is Segment 3, from MP 15.5 to MP 16 at the community of Yah-Ta-Hey and US 491 interchange, which consists of two lanes in each direction with a two-way-left-turn lane (TWLTL) in the center. See Figure 4 for the NM 264 corridor segment limits
In Segments 2 and 3, from MP 0.6 to MP 15.5, the corridor is two lanes in each direction with either a center turn lane or raised median. Numerous turnouts intersect the rural section that provide access to both Navajo- and non-Navajo-owned properties. NM 264 passes through the village of Yah-Ta-Hey immediately before it reaches its eastern terminus at a trumpet interchange with US 491.

Among the six major functional classes (Interstates, Other Freeways \& Expressways, Principal Arterials - Other, Minor Arterials, Major and Minor Collectors, and Local Roads), NM 264 is classified as Principal Arterial - Other, which serves major centers of metropolitan areas and provides a high degree of mobility; abutting land uses may be directly served by such arterials. Additionally, NM 264 is part of the Trail of the Ancients, a New Mexico State Scenic Byway.


Figure 1. Project Location Map - NM 264


Figure 2. NM 264 Land Ownership Map
Figure 3. Project Corridor Map - NM 264


Figure 4. NM 264 Segments

## 3 STUDY PROCESS

This report was prepared to document the Phase I-A/B study in accordance with the NMDOT Location Study Procedures: Update 2015 and Federal Highway Administration (FHWA) requirements. The study team includes NMDOT's Central Region Design, District 6, Environmental Bureau, Materials Bureau, Bridge Bureau, Drainage Bureau, Traffic Technical Support Bureau, and Hazardous Materials Investigations Bureau, and FHWA. The lead design consultant is HDR Engineering, Inc., with support from CobbFendley \& Associates, Terracon, Horrocks, NV5, and All Traffic Data Services, Inc. (ATD).

### 3.1 PREVIOUS DOCUMENTS

The study team used the following documents as reference for the Phase I-A/B study:

- CN 6101220 - NM 264 Scoping Report MP 10 to MP 14
- A scoping report was produced by HDR Engineering, Inc., and was completed in June 2021.
- CN 6101220 - NM 264 Draft Pavement Condition Assessment Report MP 10-14
- A draft pavement condition assessment report was produced by NMDOT's Pavement Management \& Design Bureau and was completed on March 8, 2021.
- Existing NMDOT Right-of-Way (ROW) Maps
- As-Built Documentation
- As-Built documents for the following projects were reviewed for this project:
- F-031-1(43), NM 264 MP 15.93 (Bridge 8703), July 9, 1988
- NMP ST-(F)-036-1 (201) and F-036-1 (3), NM 264 MP 0.0 to MP 5.722, May 25, 1990
- F-036-1(4), NM 264 MP 9.89 (Bridge 10016), December 27, 1990
- F-036-1(2), NM 264 MP 13.53 (Bridge 5381), December 12, 1991
- CN 6100430, NM 264 MP 10.60 to MP 13.10, July 23, 2010
- CN ES61340, NM 264 MP 13.10 to MP 15.10, July 23, 2010
- Inspection Reports for Bridge Nos. 8741 (MP 1.18), 10017 (MP 3.39), 8626 and 8627 (MP 4.2), MP 10016 (MP 9.89), 5381 (MP 13.53), and 8703 (MP 15.93)
- FEMA Flood Insurance Rate Map
- McKinley County Flood Insurance Study (effective date 2010)
- The report does not contain any specific information related to the project alignment or watersheds contributing to the region. It appears the effective Zone A watersheds were not studied with a detailed analysis. The report does not contain any further discussion on drainage or flooding characteristics in the region.


### 3.2 DESIGN DOCUMENTS

The project team used the following standards for design recommendations:

- NMDOT Location Study Procedures: Update 2015
- NMDOT State Access Management Manual (SAMM), 2001
- NMDOT Design Manual, October 2016
- NMDOT Drainage Design Manual (DDM), July 2018
- NMDOT Standard Drawings, 2019
- NMDOT Right of Way Handbook, January 2016
- American Association of State Highway and Transportation Officials (AASHTO) A Policy on Geometric Design of Highways and Streets, 2018 7th edition
- AASHTO Roadside Design Guide, 2011 4th edition
- AASHTO Highway Safety Manual (HSM)
- FHWA Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD) 2009 rev. 3 July 2022


### 3.3 INFORMATION GATHERING

The study team collected information from the as-built drawings, multiple field visits, agency scoping meetings, public meetings, aerial photography, field survey, and right-of-way (ROW) survey. The agency scoping meetings included the Northwest NM Council of Government, NM State Police, Navajo EPA Water Quality, Rock Springs Navajo Chapter House, Bureau of Land Management, and Bureau of Indian Affairs (BIA). The team also met with the NMDOT District 6 Maintenance crews in the field to review areas where the past year's monsoon season caused drainage issues.

### 3.4 DETAILED INVENTORY OF EXISTING CONDITIONS

The project team performed a detailed inventory of existing conditions and infrastructure for the project corridor. On June 16, July 20, and November 16, 2022, field reviews were conducted to assess existing drainage infrastructure, bridge structures, and roadway features including existing driveways, curb ramps, and turnouts

The existing horizontal and vertical roadway geometry was reviewed to identify any elements that are substandard, including cross slope, stopping sight distance, and longitudinal grade.

The existing drainage structures were inventoried using the NMDOT Culvert Asset Management Program (CAMP) format for inclusion in the NMDOT geographic information system (GIS) program. Each identified structure was reviewed to identify elements that are substandard in accordance with the NMDOT DDM criteria and to identify infrastructure that is susceptible to failure as a result of scour and erosion

### 3.5 SAFETY STUDY AND ANALYSIS

The project team performed a traffic safety analysis for the NM 264 corridor including a crash analysis, access management analysis, and speed analysis. The corridor was also analyzed for roadside obstructions within the roadway's clear zone.

### 3.6 ALTERNATIVE IMPROVEMENTS IDENTIFIED WITH COST ANALYSIS

Multiple alternatives were identified to address the purpose and need for the study. The study team developed conceptual cost estimates for each alternative to evaluate the cost and benefit for each alternative.

### 3.7 PUBLIC INVOLVEMENT

A Public Involvement Plan was created for this study (see Appendix A). The study team held an agency scoping meeting on August 17, 2022, and the first virtual public meeting was held on August 23, 2022. For the first public meeting, a public outreach summary was prepared and included the public comments received during the open comment timeframe (see Appendix A) The major comments received from the public addressed drainage concerns, pavemen improvements, corridor lighting, school bus access, and overall corridor safety. The study team met with the NMDOT District 6 maintenance crew to evaluate the areas of concern expressed by the public. The recommendations from this study will improve the overall corridor drainage and reduce the potential for flooding impacts. They will also address the pavement condition concerns throughout the entire corridor, with a full reconstruction to establish a longer pavement life ove rehabilitation. The study will address the lighting concerns with recommendations for additional lighting at specific locations throughout the corridor that could be subject to low-light safety concerns. Specific bus stop locations change over time and no location-specific improvements are included in the recommendations. The improved overall access to NM 264 will improve school bus access wherever bus stops are located in the future. These elements combined also address the corridor's overall safety

The second virtual public meeting was held on May 17, 2023, and it focused on presenting the various proposed alternatives, alternatives comparison, and proposed preferred alternatives. A public outreach summary was prepared and included the public comments received during the
open comment timeframe (see Appendix A). The major comments received from the public addressed highway safety, drainage, access management, lighting, congestion, and project funding. Additionally, the team received written comments during the comment period. These questions were primarily related to access management and lighting. Responses were provided by the project team to each of the comments, those responses can be found in the public outreach summary (see Appendix A).

Separate stakeholder meetings occurred during the Phase I-A/B study. Stakeholders were divided into three categories:

- Those directly affected by the proposed improvements, given their location adjacent to the study corridor or their frequent use of affected facilities as part of their travel routines.
- Those indirectly affected, such as the traveling public or other affected parties.
- Agencies with jurisdictional authority over the infrastructure or land use in the study area For the agency scoping meeting held on August 17, 2022, the following stakeholders attended: NMDOT, Navajo Rock Springs Chapter House, BIA, Navajo EPA Water Quality, Northwest New Mexico Council of Governments, and New Mexico State Police District 6 Gallup.


## 4 ESTABLISH PURPOSE AND NEED

The NMDOT Location Study Procedures considers the following factors in developing the purpose and need for study

- physical deficiencies
- safety
- travel demand and congestion
- access
- system connectivity
- economic development*
- legislative mandate
* factor not as common but still may be applicable, depending on the projec


### 4.1 PURPOSE AND NEED STATEMENT

The purpose of the NM 264 project is to improve the roadway's condition and life expectancy, improve drainage conditions, address substandard roadway geometry, add bicycle and pedestrian facilities, and improve overall safety. The project is needed because the existing pavement has
deteriorated, creating a rough driving surface for vehicles. Additionally, existing drainage structures are in poor condition as a result of scour and/or sediment fill, roadway geometry and features are substandard, bicycle and pedestrian facilities are lacking in an urban area, and the current barrier system (guardrail) does not comply with the AASHTO MASH requirements

### 4.2 ROADWAY DEFICIENCIES

The existing roadway geometry and roadside features were analyzed to determine any substandard items. The roadway geometry was analyzed based on the horizontal geometry, pavement cross-slope, vertical grades, curve grade K-value/stopping sight distance, and turnouts for sight distance. The roadway features analyzed were the MASH-compliant roadside barrier and Americans with Disabilities Act (ADA)/ Public Rights-of-Way Accessibility Guidelines (PROWAG) compliant sidewalks and curb ramps in the urban section.

Based on the field review and evaluation of the existing survey, the existing roadway geometry (both horizontally and vertically), roadway features, existing roadside barrier, and sidewalk/curb ramps are substandard in some locations. This shows that roadway deficiencies are a need to be addressed by the study

### 4.3 DRAINAGE DEFICIENCIES

The existing drainage infrastructure and roadside ditches were assessed in the field and further reviewed with a desktop analysis to determine any substandard items. The assessment included measurements of scour, conveyance capacity, sediment deposition, and hydraulic performance, given the noted field conditions. See Appendix C for the Drainage Report, which contains further discussion on the field review and hydraulic analysis.

Based on the evaluation, multiple existing drainage features are substandard. This shows drainage deficiencies are a need to be addressed by the study.

### 4.4 TRAVEL DEMAND AND CONGESTION

Existing 24-hour traffic volume, classification, and speed data were collected at several locations along the NM 264 corridor on Thursday, April 28, 2022. Existing turning movement counts (TMCs) were collected at two intersections (Alma Drive and P\&M/Tse Bonito Ridge Road) for both the morning (AM) and afternoon (PM) peak hours on the same day from 6 to 9 AM and 4 to 7 PM , respectively. The traffic volume data were reviewed and analyzed and the trend by time of day was identified.
The heavy vehicle percentages were identified from the classification data taken at the traffic data collection locations

- Segment $1-32 \%$ heavy vehicles
- Segment $2-36 \%$ heavy vehicles
- Segment $3-37 \%$ heavy vehicles

Historical traffic data were obtained from the NMDOT Transportation Data Management System (TDMS) (https://nmdot.public.ms2soft.com/tcds/tsearch.asp?loc=Nmdot). Table 1 shows the data used for growth factor estimations.

Table 1. Growth Factor Estimations

| Description | Year | Volume | Annual <br> Growth | Data Source |
| :---: | :---: | :---: | :---: | :---: |
| NM 264 west of Defiance <br> (MP 4.7) | 2011 | 10,191 | $1.8 \%$ | NMDOT MS2 Location ID 8244 |
|  | 2022 | 12,403 |  | Study team/all traffic data counts |

Table 2 shows the historic data trend from the TDMS data collection location ID 8244, which is located in the western part of Segment 2

Table 2. Historic Traffic Data Trend

| Year | $\mathbf{2 0 2 1}$ | $\mathbf{2 0 2 0}$ | $\mathbf{2 0 1 9}$ | $\mathbf{2 0 1 8}$ | $\mathbf{2 0 1 7}$ | $\mathbf{2 0 1 6}$ | Average |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Annual Growth | $\mathbf{4 2} \%$ | $-14 \%$ | $-2 \%$ | $\mathbf{1} \%$ | $\mathbf{4} \%$ | $0 \%$ |  |
| Year | $\mathbf{2 0 1 5}$ | $\mathbf{2 0 1 4}$ | $\mathbf{2 0 1 3}$ | $\mathbf{2 0 1 2}$ | $\mathbf{2 0 1 1}$ | $\mathbf{2 0 1 0}$ | $\%$ |
| Annual Growth | $5 \%$ | $3 \%$ | $2 \%$ | $\mathbf{2} \%$ | $-23 \%$ | $0 \%$ |  |

An annual growth factor of $2 \%$ for 20 years was used for projecting future year conditions. The same growth factor was used on all segments for average daily traffic (ADT), peak hour traffic, and turning movements at the intersections

- 2042 background traffic $=2022$ traffic $^{*}(1+2 \%)^{20}$

Signalized and unsignalized intersections were analyzed to determine the approach delay and capacity for existing and future conditions. The future conditions scenarios consider the projected peak hour volumes using existing and proposed roadway or intersection improvements. As traffic volumes along roadway segments continue to increase over time, the flow rate of the vehicles tends to also increase, causing the mean speed of vehicles to decrease. This ultimately causes delay along roadway segments. Figure 5 shows the TMCs for the existing year, that is, 2022, and future year, 2042, at the Alma Drive and NM 264 intersection, while Figure 6 shows the TMCs at the P\&M Road and NM 264 intersection. Existing and future traffic data at several locations along the NM 264 corridor are shown in Figure 7. The locations are marked with star symbol on the figure.

For detailed traffic information, refer to Transportation Needs Analysis (TNA) report in Appendix B.
The continual steady growth in traffic over time, along with the existing high heavy vehicle percentage, indicates a need to be addressed by the study.
4.5 SAFETY

The study team obtained six years of crash data (2015 to 2020) from NMDOT and reviewed them for this study. The team correlated the crash attributes with roadway geometry, operational condition, and other roadway features such as presence of streetlights.
Eighty crashes occurred on NM 264 during this 6 -year time frame in the project area. Figure 8 shows the crash locations on the corridor. Figure 9 shows the crash trend over the six years.


Figure 5. Turning Movement Counts at NM 264 and Alma Drive Intersection (MP 0.35)


Figure 6. Turning Movement Counts at NM 264 and P\&M Road/Tse Bonito Ridge Road Intersection (MP 1.5)


Figure 7. Traffic Volumes on NM 264 (2022 Existing and 2042 Forecast)


Figure 8. Crash Locations along NM 264


CRASHYEAR -
Figure 9. Crash Trend on NM 264
A relatively low number of crashes was observed in summer months compared to other months of the year (Figure 10). No particular trend was observed for days of the week (Figure 11), whereas the evening time-frame dominated in the time-of-day distribution (Figure 12).


Figure 10. Crash Distribution, by Month


Figure 11. Crash Distribution, by Day of Week


Figure 12. Crash Distribution, by Time of Day

### 4.5.1 Safety Analysis for Intersections and Highway Segments

Among the 80 crashes, there were four fatal and 25 injury crashes. Figure 13 shows the severity distribution. While multiple vehicle only crashes dominate on NM 264, vehicles hitting fixed objects or collisions with animals are also concerns in the study area. Refer to Figure 14 for the crash type distribution. With $15 \%$ of crashes involving animals, collisions with animals (mainly deer, cattle, and horses) were identified as a concern in this corridor. A GIS map showing animal-related crash locations has been included in Figure 18.


Figure 13. Crash Distribution, by Severity Level


Figure 14. Crash Distribution, by Type
There were 12 off-road crashes on NM 264. Most of the crashes occurred during clear weather conditions (Figure 15). Nighttime crashes and crashes in dark conditions are also a concern on

NM 264 (Figure 16). Crashes related to curvature in the roadway alignment are a major concern as well (Figure 17).


Figure 15. Crash Distribution, by Weather Conditions


Figure 16. Crash Distribution, by Lighting Conditions


## Figure 17. Crash Distribution, by Road Character

Based on a speed analysis performed for the project corridor, the study team found that speeding on the corridor is a concern.

Additionally, the turnouts/driveways along NM 264 were reviewed to determine whether the locations meet NMDOT's SAMM criteria. Upon review of existing driveway spacing and comparing it to SAMM criteria, it was found that driveways in Segments 1 and 3 are spaced much closer than recommended. This presents a safety concern as well.
Given large proportion of injury/fatal crashes; the existing driveway spacing not meeting the SAMM criteria; and the history of roadway curvature, lighting, and speed-related crashes, it is clear that safety is a major need to be addressed by the study.
In the AM peak period, no pedestrians were recorded crossing at the study intersections where pedestrian counts were collected. However, during the PM peak period, four pedestrians used the crosswalk at the Alma Drive and NM 264 intersection, which is generally considered to have a very low pedestrian volume. There were four pedestrian-related crashes in the study corridor during the study period. Three of the pedestrian-involved crashes occurred in segment 2 and one occurred near the northbound off-ramp of the US 491 and NM 264 interchange. One of the pedestrian-related crashes in segment 2 was fatal. Dynamic speed feedback signs, improved street lighting, and safety edge/shoulder improvements are measures that may reduce the severity and frequency of pedestrian-involved crashes in the future. Specific recommendations for each segment are discussed in later sections of this report.

Refer to Table 3 for an individual crash review and countermeasures.
For detailed safety information, refer to the TNA report in Appendix B.


Figure 18. GIS Map Showing Animal Crash Locations

CN6101220 NM 264 (Arizona/New Mexico State Line to Yah-Ta-Hey, MP 0 to MP 16

| Crash <br> Report No. | Primary Street | Secondary Street | Landmark/Location | Direction from Landmark | Crash Analysis | Lighting | Countermeasures |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 30123738 | NM 264 | - | - | - | Fixed Object - Sign or Sign Post (Commercial) | Daylight | Median improvements |
| 30129611 | NM 264 | LB | - | - | Animal - Cow/Cattle | Dark - Not Lighted | Lighting, advanced warning sign |
| 30149054 | NM 264 | NM 264 and Sage Brush Bar Entrance | NM 264 and entrance to Sage Brush Bar |  | Other Vehicle - One Vehicle/Leave Driveway Access | Dark - Not Lighted | Lighting |
| 30149105 | NM 264 across from Family Dollar | - | - | - | Non-Collision - Vehicle Downhill Into Canyon/Ravine | Dark - Lighted | Safety edge or shoulder improvement |
| 30149246 | NM 264 | South Cle Ki | - | - | Animal - Horse | Dark - Not Lighted | Lighting, advanced warning sign |
| 30194705 | NM 264 | Horseview Road | - | - | Animal - Deer | Dawn | Advanced warning sign |
| 30220705 | NM 264 | Tse Bonito Car Wash | - | - | Other Vehicle - Both Going Straight/Entering At Angle | Daylight | Add chevron signs |
| 30236644 | NM 264 | - | - | - | Overturn/Rollover - Right Side of Road | Dark - Not Lighted | Safety edge or shoulder improvement |
| 30236726 | NM 264 | - | - | - | Animal - Deer | Dark - Not Lighted | Speed feedback signs, advanced warning sign |
| 30236822 | NM 264 Edward O. Plummer Interchange | US 491 | - | - | Animal - Deer | Dark - Lighted | Speed feedback signs, advanced warning sign |
| 30237062 | Edward O. Plummer Interchange | - | - | - | Overturn/Rollover - Right Side of Road | Daylight | Add chevron signs, safety edge or shoulder improvement |
| 30256755 | NM 264 | - | NM 264 | - | Other Vehicle - One Vehicle/Leave Driveway Access | Daylight | Speed feedback signs |
| 30256793 | NM 264 | US 491 | Edward O. Plummer Interchange | - | Overturn/Rollover - Right Side of Road | Daylight | Add chevron signs, warning signs, safety edge or shoulder improvement |
| 30256858 | NM 264 | - | - | - | Other Vehicle - from Same Direction/Sideswipe Collision | Dark - Not Lighted | Lighting, add chevron signs |
| 30256876 | NM 264 WB MP 15 | - | - | - | Animal - Dog | Daylight | Speed feedback signs, advanced warning sign |
| 30256939 | NM 264 Westbound 3.5 MP | - | NM 264 Westbound 3.5 MP | - | Non-Collision - Vehicle Striking Holes or Bumps on Road Surface | Daylight | Pavement rehabilitation |
| 30256967 | NM 264 | Defiance Draw Road | - | - | Fixed Object - Barbed Wire Fence | Dark - Not Lighted | Lighting, safety edge or shoulder improvement |
| 710373711 | NM 264 | Black Hat Road | East of Speedy's Gas Station | - | Fixed Object - Guard Rail | Other | - |
| 30194522 | Edward O. Plummer Interchange | - | US 491/NM 264 | - | Animal - Horse | Dark - Lighted | Speed feedback signs, advanced warning sign |
| 710374090 | NM 264 | - | - | - | Other Object - Object Dropped from Vehicle - Construction Material | Dark - Not Lighted | Lighting |
| 30256958 | 15.9 MP NM 264 | - | - | 0.1 mi | Other Object - Object Dropped From Other Vehicle (Not Motion) | Dark - Lighted | - |
| 710389044 | NM 264 | Windy Mesa Road | Windy Mesa Road and NM 264 | E | Other Vehicle - From Same Direction/Rear End Collision | Dark - Not Lighted | Speed feedback signs |
| 30165828 | NM 264 | - | MP 1 | $\mathrm{E}, 0 \mathrm{ft}$ | Fixed Object - Guard or Reflector Posts | Dark - Not Lighted | Add chevron signs, safety edge or shoulder improvement |
| 30126846 | NM 264 | - | New Mexico/Arizona State Line | E, 0.02 mi | Other Vehicle - From Same Direction/One Right Turn | Daylight | - |


| Crash Report No. | Primary Street | Secondary Street | Landmark/Location | Direction from Landmark | Crash Analysis | Lighting | Countermeasures |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 30149118 | NM 264 | N/A | MP 11 | $\mathrm{E}, 0.1 \mathrm{mi}$ | Other Vehicle - Both Going Straight/Entering At Angle | Dark - Not Lighted | - |
| 30194881 | NM 264 | Na Pali St NE | County Road 1 | $\mathrm{E}, 0.1 \mathrm{mi}$ | Other Vehicle - Both Going Straight/Entering At Angle | Dark - Not Lighted | Lighting, speed feedback signs |
| 30226765 | NM 264 | - | - | $\mathrm{E}, 0.1 \mathrm{mi}$ | Other Vehicle - From Same Direction/Sideswipe Collision | Daylight | Speed feedback signs |
| 30194889 | NM 264 | - | MP 15 | $\mathrm{E}, 0.1 \mathrm{mi}$ | Animal - Horse | Dark - Not Lighted | Lighting, advanced warning sign |
| 30237011 | NM 264 | - | N La Bah Avenue | $\mathrm{E}, 0.1 \mathrm{mi}$ | Fixed Object - Barbed Wire Fence | Daylight | Safety edge or shoulder improvement |
| 30194899 | NM 264 | - | MP 5 | E, 0.2 mi | Other Vehicle - From Same Direction/Both Going Straight | Dark - Not Lighted | Lighting, add chevron signs |
| 30220788 | NM 264 | - | - | E, 0.2 mi | Other Vehicle - From Same Direction/Rear End Collision | Dark - Not Lighted | Lighting |
| 30237048 | NM 264 | - | - | E, 0.3 mi | Other Vehicle - From Opposite Direction/Sideswipe Collision | Dark - Not Lighted | Lighting |
| 30256997 | NM 264 | - | - | E, 0.3 mi | Overturn/Rollover - All Other/Not Stated | Daylight | Add chevron signs, safety edge or shoulder improvement |
| 30290543 | NM 264 | Driveway of 452 NM 264 | MP 12 | E, 0.4 mi | Other Vehicle - One Left Turn/Entering At Angle | Daylight | Acceleration lane |
| 30290548 | NM 264 | - | - | $\mathrm{E}, 0.4 \mathrm{mi}$ | Overturn/Rollover - Right Side of Road | Daylight | Safety edge or shoulder improvement |
| 30237078 | NM 264 1.5 MP | - | 1 MP | E, 0.5 mi | Other Vehicle - One Vehicle/Enter Driveway Access | Daylight | Speed feedback signs |
| 30256812 | NM 264 | - | - | $\mathrm{E}, 0.5 \mathrm{mi}$ | Animal - Deer | Daylight | Speed feedback signs, advanced warning sign |
| 30257028 | NM 264 | - | MP 7 | $\mathrm{E}, 0.5 \mathrm{mi}$ | Other Vehicle - Both Going Straight/Entering At Angle | Daylight | Speed feedback signs |
| 30236962 | NM 264 | - | - | E, 0.5 mi | Other Vehicle - From Same Direction/Both Going Straight | Daylight | Speed feedback signs |
| 30129588 | NM 264 | - | 15 MP | E, 0.5 mi | Other Vehicle - Both Going Straight/Entering At Angle | Daylight | Speed feedback signs |
| 30236844 | NM 264 | - | - | E, 0.7 mi | $\begin{aligned} & \text { Other Vehicle - Parts - Misc. Vehicle } \\ & \text { Parts } \end{aligned}$ | Daylight | - |
| 30194909 | NM 264 | 5.8 MP | 5 MP | E, 0.8 mi | Overturn/Rollover - Right Side of Road | Daylight | Add chevron signs, safety edge or shoulder improvement |
| 30236784 | NM 264 | Plummer Interchange | - | E, 0.8 mi | Other Vehicle - Both Going Straight/Entering At Angle | Daylight | Speed feedback signs |
| 30149071 | NM 264 | 11th And 12th Streets | 10 MP | E, 0.9 mi | Pedestrian Collision - Vehicle Going Straight | Daylight | Speed feedback signs |
| 30220695 | NM 264 | N Cle Ki | - | E, 1 mi | Pedestrian Collision - Vehicle Going Straight | Dusk | Dynamic speed feedback sign, more speed limit signs |
| 30290596 | NM 264 | - | Alma Drive | E, 100 ft | Other Vehicle - From Opposite Direction | Dark - Lighted | Speed feedback signs |
| 30236895 | NM 264 | - | MP 15.9 | E, 18 ft | Animal - Cow/Cattle | Dark - Lighted | Lighting, advanced warning sign |
| 30236780 | NM 264 | - | - | E, 300 ft | Fixed Object - Barricade | Dark - Not Lighted | Add chevron signs, safety edge or shoulder improvement |
| 30129698 | NM 264 | 5 MP | New Mexico and Arizona State Line | E, 5 mi | Fixed Object - Cattle Guard | Daylight | Add chevron signs, safety edge or shoulder improvement |


| Crash Report No. | Primary Street | Secondary Street | Landmark/Location | Direction from Landmark | Crash Analysis | Lighting | Countermeasures |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 30237051 | NM 264 | - | - | $\mathrm{E}, 67 \mathrm{ft}$ | Pedestrian Collision - Vehicle Going Straight | Dark - Not Lighted | - |
| 30194542 | NM 264 | - | 1587 NM 264 entrance | $\mathrm{N}, 0 \mathrm{mi}$ | Other Vehicle - From Same Direction/Both Going Straight | Daylight | - |
| 30194833 | US 491 | NM 264 interchange | Of MP 7 | N, 1,466 ft | Pedestrian Collision - Vehicle Going Straight | Dark - Lighted | - |
| 30256949 | NM 264 | South Labah |  | S | Other Vehicle - One Left Turn/Entering At Angle | Dark - Lighted | Speed feedback signs |
| 30194656 | NM 264 | - | Arizona/New Mexico State Line | $\mathrm{S}, 12 \mathrm{mi}$ | Other Vehicle - From Opposite Direction/One Left Turn | Daylight | - |
| 30149180 | NM 264 | RA 452 NM 264 | - | S, 15 ft | Other Vehicle - From Opposite Direction/One Left Turn | Dark - Lighted | Acceleration lane |
| 30141852 | NM 264 | - | Arizona/New Mexico State Line, Tse Bonito, NM | $\mathrm{S}, 0.3 \mathrm{mi}$ | Other Vehicle - Both Going Straight/Entering At Angle | Daylight | - |
| 710616543 | NM 264 Westbound | MP 5 | Black Hat Road | S, 4,415 ft | Other Vehicle - One Left Turn/Entering At Angle | Dusk | Lighting |
| 710620863 | Defiance Draw Road | NM 264 | NM 264 | $\mathrm{S}, 49 \mathrm{ft}$ | Fixed Object - Cattle Guard | Daylight | Safety edge or shoulder improvement |
| 30194636 | NM 264 | - | NM 2645 MP (boundary fence) | S, 50 ft | Fixed Object - Barbed Wire Fence | Dark - Not Lighted | Lighting, add chevron signs, safety edge or shoulder improvement |
| 710610468 | NM 264 MP 03 | - | - | W | Other Vehicle - From Opposite Direction/One Left Turn | Daylight | - |
| 30149157 | NM 264 | - | - | W | Other Vehicle - Both Going Straight/Entering At Angle | Dark - Not Lighted | Lighting |
| 30165837 | NM 264 | Sage Brush Bar | NM 264 | W | Other Vehicle - One Left Turn/Entering At Angle | Dark - Not Lighted | - |
| 30129660 | NM 264 | - | 16 MP | W | Fixed Object - Building | Dark - Lighted | Safety edge or shoulder improvement |
| 30148988 | NM 264 | - | 16 MP westbound | W | Fixed Object - Roadway Divider Concrete Wall | Dark - Lighted | Add chevron signs, median improvements |
| 30256717 | NM 264 | - | - | W, 0.1 mi | Vehicle Crossed Median - All Other | Daylight | Median improvements |
| 30220726 | NM 264 | - | 16 MP | W, 0.1 mi | Fixed Object - Median Raised Or Curb | Dark - Lighted | Add chevron signs |
| 30139138 | NM 264 | - | MP 16 | W, 0.1 mi | Other Vehicle - From Same Direction/Rear End Collision | Daylight | - |
| 30220773 | NM 264 | Sagebrush Liquors | 12 MP | W, 0.2 mi | Overturn/Rollover - Right Side of Road | Dawn | Safety edge or shoulder improvement |
| 30220848 | NM 264 | - | 5 | W, 0.3 mi | Overturn/Rollover - Right Side of Road | Dawn | Speed feedback signs, safety edge or shoulder improvement |
| 30256839 | Griswold Inc. 1591 NM 264 | - | - | W, 0.5 mi | Other Vehicle - One Vehicle/Leave Driveway Access | Dark - Lighted | - |
| 30149237 | NM 264 | Entrance to RA 1050 | 6 MP | W, 0.5 mi | Fixed Object - Roadway Divider Concrete Wall | Daylight | Safety edge or shoulder improvement |
| 30129610 | NM 264 | - | MP 6 | W, 0.5 mi | Animal - Cow/Cattle | Dark - Not Lighted | Lighting, add chevron signs, advanced warning sign |
| 30220463 | NM 264 | Sage Brush Bar | 12 MP NM 264 | W, 0.5 mi | Other Vehicle - Both Going Straight/Entering At Angle | Daylight | Speed feedback signs |
| 30236624 | NM 264 | - | - | W, 0.5 mi | Other Vehicle - From Same Direction/Both Going Straight | Daylight | Speed feedback signs |


| Crash Report No. | Primary Street | Secondary Street | Landmark/Location | Direction from Landmark | Crash Analysis | Lighting | Countermeasures |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 710382260 | NM 264 | County Road 1 | Sage Brush Bar | W, 1.5 mi | Overturn/Rollover - Right Side of Road | Dark - Lighted | Speed feedback signs, Safety edge or shoulder improvement |
| 30236623 | NM 264 | - | - | W, 450 ft | Animal - Coyote | Dark - Not Lighted | Advanced warning sign |
| 30194721 | NM 264 | - | 13 MP | W, 5 ft | Other Vehicle - From Same Direction/Both Going Straight | Dark - Not Lighted | Speed feedback signs |
| 30220636 | NM 264 | - | 6 MP | W, 510 mi | Other Vehicle - From Same Direction/Sideswipe Collision | Daylight | - |
| 30256973 | NM 264 | - | - | W, 6.5 mi | Other Vehicle - From Same Direction/Both Going Straight | Daylight | - |
| 30220522 | NM 264 | - | Alma Drive | W, 679 ft | Other Vehicle - From Opposite Direction/Head-On Collision | Daylight | - |

5 EXISTING CONDITIONS ANALYSIS - SEGMENT 1, MP 0 to MP 0.6, URBAN SECTION


Segment 1, the urban section of NM 264, begins at the Arizona/New Mexico state line at MP 0 and continues to the east to Hilltop Road at MP 0.6. This segment is approximately 0.6 miles long and goes through the town of Tse Bonito, New Mexico.

### 5.1 FUNCTIONAL CLASSIFICATION AND ZONING

Among the six major functional classes, NM 264 is classified as Principal Arterial - Other for all three segments of NM 264.

### 5.2 TYPICAL SECTION

Segment 1's typical section is a four-lane roadway with a center TWLTL. The travel lanes and the TWLTL are 12 feet wide. The roadway segment has curb and gutter and a 5 -foot-wide sidewalk on both sides (Figure 19).


Figure 19. NM 264 Segment 1 Existing Cross-section

### 5.3 HORIZONTAL ALIGNMENT ANALYSIS

In Segment 1, there are two horizontal curves, one at the beginning of the segment and one at the end. The horizontal curves were analyzed using the AASHTO A Policy on Geometric Design of Highways and Streets, $20187^{\text {th }}$ edition, Table 3-9, Minimum Radii for Design Superelevation Rates, Design Speeds, and Maximum Superelevation (emax) of 6 percent. Both horizontal curves meet the minimum criteria (Table 4).

| Curve No. | Design Speed (mph) | Start Station | End Station | Direction | Radius (ft) | Approx. емім | Required емім | Meets Standard |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| C1 | 50 | 100+00.00 | 103+23.50 | Right | 1,200 | 5.7\% | 5.6\% | Yes |
| C2 | 50 | 121+35.42 | 133+68.23 | Right | 1,700 | 4.8\% | 4.8\% | Yes |

Based on the AASHTO criteria, both horizontal curves meet the minimum superelevation required for the existing cross slope.

### 5.4 VERTICAL ALIGNMENT ANALYSIS

In Segment 1, three vertical curves were analyzed for a design speed of 50 mph . Comparing existing vertical curves to the required design criteria for the design speed based on AASHTO A Policy on Geometric Design of Highways and Streets, $20187^{\text {th }}$ edition, the three vertical curves meet the minimum criteria (Table 5).

| Curve No. | Design Speed (mph) | PVI Station | Type | Approx. Curve Length (ft) | Min. Curve Length (ft) | Approx. <br> K-Value | $\begin{gathered} \text { Req. } \\ \text { K-Value } \end{gathered}$ | Grade In/Out | Grade Max./ Min. | Meets Standard |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| C1 | 50 | 104+02.90 | Sag | 400 | 150 | 310.60 | 96 | $\begin{aligned} & \hline 0.33 \% / \\ & 1.62 \% \\ & \hline \end{aligned}$ | 6\%/0.3\% | Yes |
| C2 | 50 | 115+36.63 | Crest | 820 | 150 | 413.07 | 84 | $\begin{gathered} 1.62 \% / \\ -0.36 \% \\ \hline \end{gathered}$ | 6\%/0.3\% | Yes |
| C3 | 50 | 127+80.72 | Sag | 400 | 150 | 292.92 | 96 | $\begin{gathered} \hline-0.36 \% / \\ 1.01 \% \end{gathered}$ | 6\%/0.3\% | Yes |

### 5.5 OPERATING SPEEDS

On Segment 1, the 85th percentile speed was found to be 50 mph , based on 24 -hour data, whereas it is 53,49 , and 51 mph based on AM and PM peak periods, mid-day, and nighttime respectively. The mode speed, that is, the speed at which maximum drivers are driving, was found to be $47,47,44$, and 46 mph for the 24 -hour period, peak periods, mid-day, and nighttime,

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respectively. The pace speed, that is, 10 mph speed range where most drivers fall, was found to be 41 to $51 \mathrm{mph}, 43$ to $53 \mathrm{mph}, 40$ to 50 mph , and 41 to 45 mph for the 24 -hour period, peak periods, mid-day, and nighttime, respectively

Table 6. Segment 1 Posted/Design Speed

| Location | Posted Speed <br> (mph) | Design Speed <br> (mph) |
| :--- | :---: | :---: |
| Arizona/New Mexico border, <br> MP 0, to Hilltop Road, MP 0.6 | 45 | 50 |

Refer to Figure 20 and Figure 21 for the 24-hour 85th percentile and mode and pace speeds, and to Figure 22 and Figure 23 for the peak period 85th percentile and mode and pace speeds on Segment 1 west of Alma Drive

According to discussions with NMDOT, it was suggested that bike lanes might be added to narrow the travel lanes, which would reduce the operating speed of vehicles on the roadway

For detailed speed information, refer to the TNA report in Appendix $B$.


Figure 20. Cumulative Speed Distribution and 85th Percentile Speed 24-hour Data on NM 264 West of Alma Drive


Figure 21. Speed Distribution and Mode and Pace Speed 24-hour Data on NM 264 West of Alma Drive



Figure 23. Speed Distribution and Mode and Pace Speed AM and PM Peak Period on NM 264 West of Alma Drive

### 5.6 HORIZONTAL SIGHT LINE OFFSET ANALYSIS

The horizontal sight line offset (HSO) was calculated using the AASHTO A Policy on Geometric Design of Highways and Streets, $20187^{\text {th }}$ edition, equation 3-37 for each horizontal curve (Table 7).

Table 7. Segment 1 Horizontal Sight Line Offset

| Curve <br> No. | Design <br> Speed <br> (mph) | Radius <br> (ft) | Sight <br> Distance <br> (ft) | HSO <br> (ft) | Meets <br> Standard |
| :---: | :---: | :---: | :---: | :---: | :---: |
| C 1 | 50 | 1,200 | 425 | 19 | Yes |
| C 2 | 50 | 1,700 | 425 | 13 | Yes |

Based on the calculated HSO, there do not appear to be any sight distance issues for the Segment 1 horizontal curves.

### 5.7 INTERSECTION SIGHT DISTANCE ANALYSIS

The intersection sight distance was analyzed using the AASHTO A Policy on Geometric Design of Highways and Streets standards (Figure 24) for each intersection or driveway throughout the Segment 1 portion of the NM 264 corridor. The minimum intersection sign distance value was calculated using the AASHTO A Policy on Geometric Design of Highways and Streets, $20187^{\text {th }}$ edition equation 9-1 (Table 8).


Departure Sight Triangle for Viewing Traffic Approaching the Minor Road from the Left


Departure Sight Triangle for Viewing Traffic Departure Sight Triangle for Viewing Traffic
Approaching the Minor Road from the Right

Departure Sight Triangles (Stop-Controlled)
Figure 24. AASHTO A Policy on Geometric Design of Highways and Streets, $20187^{\text {th }}$ edition, Figure 9-17, Departure Sight Triangles for Intersections

The following Intersection control cases were used for Segment 1:

- Case B1 - stop control minor road turning left onto NM 264
- Case B2 - stop control minor road turning right on NM 264
- Case D - Alma Drive at NM 264 with traffic signal control
- Case F - left turns from NM 264 to minor road

CN6101220 NM 264 (Arizona/New Mexico State Line to Yah-Ta-Hey, MP 0 to MP 16)

| Intersection/ Driveway |  | Station | Offset | NM 264 <br> Design Speed (mph) | ISD Criteria | Sight Triangle | Min. ISD Value (ft) | Meets Standard |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | Driveway 1 | 104+36 | RT | 50 | B1 | Right | 827 | Yes |
|  |  |  |  |  | B1/B2 | Left | 698 | Yes |
|  |  |  |  |  | F | Upstream | 555 | Yes |
| 2 | Driveway 2 | 106+08 | RT | 50 | B1 | Right | 827 | Yes |
|  |  |  |  |  | B1/B2 | Left | 698 | Yes |
|  |  |  |  |  | F | Upstream | 555 | Yes |
| 3 | Driveway 3 | 106+30 | LT | 50 | B1 | Right | 827 | Yes |
|  |  |  |  |  | B1/B2 | Left | 698 | Yes |
|  |  |  |  |  | F | Upstream | 555 | Yes |
| 4 | Driveway 4 | 108+21 | RT | 50 | B1 | Right | 827 | Yes |
|  |  |  |  |  | B1/B2 | Left | 698 | Yes |
|  |  |  |  |  | F | Upstream | 555 | Yes |
| 5 | Driveway 5 | 109+22 | RT | 50 | B1 | Right | 827 | Yes |
|  |  |  |  |  | B1/B2 | Left | 698 | Yes |
|  |  |  |  |  | F | Upstream | 555 | Yes |
| 6 | Driveway 6 | 109+20 | LT | 50 | B1 | Right | 827 | Yes |
|  |  |  |  |  | B1/B2 | Left | 698 | Yes |
|  |  |  |  |  | F | Upstream | 555 | Yes |
| 7 | Driveway 7 | 111+16 | RT | 50 | B1 | Right | 827 | Yes |
|  |  |  |  |  | B1/B2 | Left | 698 | Yes |
|  |  |  |  |  | F | Upstream | 555 | Yes |
| 8 | Driveway 8 | $112+30$ | RT | 50 | B1 | Right | 827 | Yes |
|  |  |  |  |  | B1/B2 | Left | 698 | Yes |
|  |  |  |  |  | F | Upstream | 555 | Yes |
| 9 | Driveway 9 | 112+24 | LT | 50 | B1 | Right | 827 | Yes |
|  |  |  |  |  | B1/B2 | Left | 698 | Yes |
|  |  |  |  |  | F | Upstream | 555 | Yes |
| 10 | Driveway 10 | $113+17$ | RT | 50 | B1 | Right | 827 | Yes |
|  |  |  |  |  | B1/B2 | Left | 698 | Yes |
|  |  |  |  |  | F | Upstream | 555 | Yes |
| 11 | Driveway 11 | 113+46 | LT | 50 | B1 | Right | 827 | Yes |
|  |  |  |  |  | B1/B2 | Left | 698 | Yes |
|  |  |  |  |  | F | Upstream | 555 | Yes |


| Intersection/ Driveway |  | Station | Offset | NM 264 <br> Design <br> Speed <br> (mph) | ISD Criteria | Sight Triangle | Min. ISD Value (ft) | Meets Standard |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 12 | Driveway 12 | $113+73$ | RT | 50 | B1 | Right | 827 | Yes |
|  |  |  |  |  | B1/B2 | Left | 698 | Yes |
|  |  |  |  |  | F | Upstream | 555 | Yes |
| 13 | Driveway 13 | 115+19 | RT | 50 | B1 | Right | 827 | Yes |
|  |  |  |  |  | B1/B2 | Left | 698 | Yes |
|  |  |  |  |  | F | Upstream | 555 | Yes |
| 14 | Driveway 14 | 115+09 | LT | 50 | B1 | Right | 827 | Yes |
|  |  |  |  |  | B1/B2 | Left | 698 | Yes |
|  |  |  |  |  | F | Upstream | 555 | Yes |
| 15 | Driveway 15 | 117+68 | RT | 50 | B1 | Right | 827 | Yes |
|  |  |  |  |  | B1/B2 | Left | 698 | Yes |
|  |  |  |  |  | F | Upstream | 555 | Yes |
| 16 | Driveway 16 | 117+77 | LT | 50 | B1 | Right | 827 | Yes |
|  |  |  |  |  | B1/B2 | Left | 698 | Yes |
|  |  |  |  |  | F | Upstream | 555 | Yes |
| 17 | Alma Dr Signalized | 120+12 | LT/RT | 50 | D | N/A | N/A | - |
| 18 | Driveway 17 | 120+84 | RT | 50 | B1 | Right | 827 | Yes |
|  |  |  |  |  | B1/B2 | Left | 698 | Yes |
|  |  |  |  |  | F | Upstream | 555 | Yes |
| 19 | Driveway 18 | $121+68$ | LT | 50 | B1 | Right | 827 | Yes |
|  |  |  |  |  | B1/B2 | Left | 698 | Yes |
|  |  |  |  |  | F | Upstream | 555 | Yes |
| 20 | Driveway 19 | $121+89$ | RT | 50 | B1 | Right | 827 | Yes |
|  |  |  |  |  | B1/B2 | Left | 698 | Yes |
|  |  |  |  |  | F | Upstream | 555 | Yes |
| 21 | Driveway 20 | $124+24$ | LT | 50 | B1 | Right | 827 | Yes |
|  |  |  |  |  | B1/B2 | Left | 698 | Yes |
|  |  |  |  |  | F | Upstream | 555 | Yes |
| 22 | Driveway 21 | 124+12 | RT | 50 | B1 | Right | 827 | Yes |
|  |  |  |  |  | B1/B2 | Left | 698 | Yes |
|  |  |  |  |  | F | Upstream | 555 | Yes |
| 23 | Driveway 22 | 125+20 | RT | 50 | B1 | Right | 827 | Yes |
|  |  |  |  |  | B1/B2 | Left | 698 | Yes |
|  |  |  |  |  | F | Upstream | 555 | Yes |


| Intersection/ Driveway |  | Station | Offset | NM 264 Design Speed (mph) | ISD Criteria | Sight Triangle | Min. ISD Value (ft) | Meets Standard |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 24 | Driveway 23 | 127+14 | LT | 50 | B1 | Right | 827 | Yes |
|  |  |  |  |  | B1/B2 | Left | 698 | Yes |
|  |  |  |  |  | F | Upstream | 555 | Yes |
| 25 | Deerfield Dr Unsignalized | 129+87 | LT | 50 | B1 | Right | 827 | Yes |
|  |  |  |  |  | B1/B2 | Left | 698 | Yes |
|  |  |  |  |  | F | Upstream | 555 | Yes |
| 26 | Hilltop Rd Unsignalized | 133+49 | LT | 50 | B1 | Right | 827 | Yes |
|  |  |  |  |  | B1/B2 | Left | 698 | Yes |
|  |  |  |  |  | F | Upstream | 555 | Yes |
| 26A | Driveway 24 | 127+14 | LT | 50 | B1 | Right | 827 | Yes |
|  |  |  |  |  | B1/B2 | Left | 698 | Yes |
|  |  |  |  |  | F | Upstream | 555 | Yes |

### 5.8 TRAFFIC OPERATIONS ANALYSIS

5.8.1 Intersection Operations

Synchro 11 software was used for a level of service (LOS) analysis of the study intersection in this segment:

- NM 264 at Alma Drive (signalized) - All the approaches of this signalized intersection operate at LOS C or better for existing conditions for both the AM and PM peak hours.
- NM 264 at Alma Drive (signalized) - All the approaches of this signalized intersection operate at LOS C or better with projected volumes and existing geometric conditions for both the AM and PM peak hours (Table 9).

Table 9. LOS Summary for Alma Drive and NM 264 Intersection

|  | SEGMENT |  | 2022 Existing Scenario |  | 2042 Horizon Scenario |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | Delay (Sec/Veh) | LOS | $\begin{gathered} \text { Delay } \\ \text { (Sec/Veh) } \end{gathered}$ | LOS |
|  | AMPeak | Cycle Length (Sec) | 145 |  | 145 |  |
|  |  | OVERALL | 11.0 | B | 13.1 | B |
|  |  | EB | 13.6 | B | 14.8 | B |
|  |  | WB | 9.4 | A | 11.8 | B |
|  |  | NB | 14.8 | B | 17.8 | B |
|  |  | SB | 20.5 | C | 24.3 | C |
|  |  | Cycle Length (Sec) |  |  |  |  |
|  |  | OVERALL | 14.6 | B | 15.8 | B |
|  |  | EB | 15.3 | B | 16.8 | B |
|  | Peak | WB | 13.1 | B | 13.6 | B |
|  |  | NB | 16.8 | B | 19.7 | B |
|  |  | SB | 20.3 | C | 24.6 | C |

5.8.2 Highway Segment Operations

HCS software was used to analyze the highway segment LOS. Both directions of Segment 1 are expected to operate at LOS C or better for existing conditions for both the AM and PM peak hours. Refer to Table 10 for detailed LOS, volume-to-capacity (V/C) ratio, and speed information.

Table 10. LOS Summary for Roadway Segment 1

| Segment |  |  | LOS | V/C | Average Travel Speed |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | 2022 Existing Scenario | AM peak | B | 0.31 | 43.8 |
|  |  | PM peak | C | 0.46 | 43.8 |
|  | 2042 HorizonScenario | AM peak | C | 0.46 | 43.8 |
|  |  | PM peak | D | 0.68 | 43.8 |

For detailed operational analysis information, refer to the TNA report in Appendix B.

TRANSTRORTATION
5.9 ACCESS MANAGEMENT

The NMDOT SAMM identifies the requirements for the level of access allowed along a state highway, which depends on the highway's intended function. The function of a particular highway is defined in terms of service to through traffic movement/mobility versus access to abutting properties/land accessibility. NMDOT has developed a classification system that is based on the intended function of each state highway. Based on this functional classification system, eight access categories are defined for the purpose of managing access along New Mexico's highways. There are four rural access categories. The access categories apply to highways functionally classified as collector roadways or above. It is noted that NM 264 is classified as a Principal Arterial - Other.
Segment 1 is in the developed area of Tse Bonito; therefore, NMDOT SAMM requirements for access spacing, as listed in Table 18.C-1, of 450 feet will not be met. See Table 11 for access spacing information. The NMDOT SAMM requirements for access spacing in developed areas where existing driveway locations preclude access spacing, based on the standards listed in Table 18.C-1, indicate that new access points should be located to minimize conflicts with existing access points. Access points should be consolidated where possible to provide shared property access. No more than one access per property should be allowed.

In Segment 1 of NM 264, from MP 0 to 0.6 , there is a TWLTL that allows for uncontrolled access to the 2 turnouts and 23 driveways. There is one signalized intersection in this segment at Alma Drive. See Figure 25 for the turnout and driveway locations for Segment 1.


Table 11. Segment 1 Access Spacing

| Intersection/Driveway |  |  |  |  | SAMM STANDARDS |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Station | Offset | Distance to Access Point | Minimum Intersection or Driveway/Turnout Spacing <br> (ft) | Meets Standard |
| 1 | Driveway 1 | 104+36 | RT | 172 | 450 | No |
| 2 | Driveway 2 | 106+08 | RT | 213 | 450 | No |
| 3 | Driveway 3 | 106+30 | LT | 290 | 450 | No |
| 4 | Driveway 4 | 108+21 | RT | 101 | 450 | No |
| 5 | Driveway 5 | 109+22 | RT | 194 | 450 | No |
| 6 | Driveway 6 | 109+20 | LT | 304 | 450 | No |
| 7 | Driveway 7 | 111+16 | RT | 114 | 450 | No |
| 8 | Driveway 8 | 112+30 | RT | 87 | 450 | No |
| 9 | Driveway 9 | 112+24 | LT | 122 | 450 | No |
| 10 | Driveway 10 | $113+17$ | RT | 56 | 450 | No |
| 11 | Driveway 11 | 113+46 | LT | 163 | 450 | No |
| 12 | Driveway 12 | 113+73 | RT | 146 | 450 | No |
| 13 | Driveway 13 | 115+19 | RT | 249 | 450 | No |
| 14 | Driveway 14 | 115+09 | LT | 268 | 450 | No |
| 15 | Driveway 15 | 117+68 | RT | 244 | 450 | No |
| 16 | Driveway 16 | 117+77 | LT | 235 | 450 | No |
| 17 | Alma Dr - Signalized | 120+12 | LT/RT | N/A |  | N/A |
| 18 | Driveway 17 | 120+84 | RT | 105 | 450 | No |
| 19 | Driveway 18 | 121+68 | LT | 256 | 450 | No |
| 20 | Driveway 19 | 121+89 | RT | 223 | 450 | No |
| 21 | Driveway 20 | 124+24 | LT | 290 | 450 | No |
| 22 | Driveway 21 | 124+12 | RT | 108 | 450 | No |
| 23 | Driveway 22 | 125+20 | RT | 108 | 450 | No |
| 24 | Driveway 23 | 127+14 | LT | 635 | 450 | Yes |
| 25 | Deerfield Dr Unsignalized | 129+87 | LT | 362 | *1320 | No |
| 26 | Hilltop Rd - Unsignalized | 133+49 | LT | 362 | *1320 | No |
| 26A | Driveway 24 | 133+49 | RT | 362 | 450 | No |

* Treated as an Unsignalized Intersection


### 5.10.1 Transit

Navajo Transit System Route 5 travels along NM 264 and operates four times daily, Monday through Friday. The bus departs from Fort Defiance, Arizona, and travels to Gallup, New Mexico, prior to returning. In addition to stops in Fort Defiance and Gallup (three total), the route provides stops in both Tse Bonito and Yah-Ta-hey (a total of two stops in the study area). The nearest Amtrak service runs through Gallup on its way to Albuquerque. No other defined transit routes are present in the corridor.

### 5.10.2 Pedestrian Facilities

In Segment 1, there are 5 -foot sidewalks on each side of NM 264 starting at MP 0.0. The sidewalk is continuous on the south side to Driveway 23 (MP 0.4) and on the north side to Driveway 25 (MP $0.5)$. The existing sidewalks do not meet the current ADA/PROWAG requirements, largely because of multiple driveways along the sidewalk exceeding the maximum cross slope (Figure 26)


## Figure 26. Segment 1 Driveway Ramp

Included in the sidewalk section along Segment 1, there is one signalized intersection at Alma Drive and one unsignalized intersection at Deerfield Drive. Alma Drive has curb ramps at each of the four corners of the intersection. Based on maximum cross slope and flat landing requirements, these curb ramps do not meet the current ADA/PROWAG requirements (Figure 27). The existing sidewalk stops at the west side of the Deerfield Drive intersection, where there are no curb ramps. According to the collected pedestrian counts, the pedestrian volume is very low at the Alma Drive intersection. There were just four pedestrians using the crosswalk at this location during the PM peak hour and zero pedestrians during the AM peak hour. Currently, the team is not proposing any mid-block crosswalk in this segment, given the low pedestrian volumes and high operational
speed of the corridor. Refer to Section 4.5, Safety, for further discussion about pedestrian-related crashes in this corridor.


Figure 27. Segment 1 Southeast Alma Drive Curb Ramp
5.10.3 Bicycle Facilities

NM 264 is designated as a Tier 2 bike route in the NMDOT New Mexico Prioritized Statewide Bicycle Network Plan. There is no identified state or Navajo Nation bicycle route on NM 264, although there are shoulders greater than four feet in width that could contribute to a potential network of bike shoulder facilities. Existing rumble strips are along NM 264 on the east side of Turnout 23 to the end of the segment and are standard placement, which is 28 inches from the edge of the driving lane stripe. That leaves over seven feet of shoulder that can be used as a bike shoulder facility.
5.10.4 Pavement

The pavement condition in Segment 1 shows evidence of multiple pavement failures such as longitudinal cracking, alligator cracking, and rutting (Figure 28). A Pavement Condition Assessment Report was completed for NM 264, from MP 10 to MP 14, rating this section to be "fair." This segment of the corridor has similar visual issues as MP 10 to MP 14.


Figure 28. Segment 1 Pavement Condition <br> \section*{\subsection*{5.10.5 Clear Zone}} <br> \section*{\subsection*{5.10.5 Clear Zone}}

The clear zone for Segment 1 for the posted speed of 45 mph (design speed of 50 mph ) and an ADT above 6,000 is 20 to 22 feet, based on AASHTO Roadside Design Guide, $20114^{\text {th }}$ edition, Table 3-1, Suggested Clear-Zone Distances in Feet from Edge of Through Traveled Lane.

In this segment, the objects behind the existing curb are light poles and street signs, which are considered breakaway obstacles and are not considered to be obstructions.

### 5.10.6 Guardrail

On the east end of Segment 1, near MP 0.6, there is existing guard rail system on the south side of the eastbound NM 264 lanes protecting an existing drainage structure and steep slope. This guardrail section does not meet the current MASH requirements set by FHWA and will need to be upgraded.

### 5.10.7 Right-of-Way

ROW maps were obtained from the NMDOT during the research process:

- F-031-1(43), ROW Map
- F-036-1(2), ROW Map
- N-3(59)2, ROW Map
- ST-(F)-036-1(201), ROW Map, 1988

The ROW width for Segment 1 of NM 264 is 200 feet. There are three encroachments in this segment-see Table 12 for locations.

Table 12. Segment 1 Encroachments

| Station | Offset | Side | Right-of-Way <br> Offset from CL <br> (ft) | Description |
| :---: | :---: | :---: | :---: | :--- |
| $110+14$ | 90 | RT | 100 | Business sign - Tse Bonito Mobile Home Park |
| $112+66-113+55$ | 94 | RT | 100 | Sidewalk - KFC |
| $113+90-114+79$ | 81 | RT | 100 | Parking spaces - Griswolds Indian Arts \& Crafts |

### 5.10.8 Fencing

In Segment 1, the fencing is sporadic throughout the north side of NM 264 and is mainly along the existing ROW. The south side has multiple businesses that front the ROW, consistent with an urban corridor, and the only area of fencing is on the far east side of the segment as it transitions from an urban to a rural section.

### 5.10.9 Utilities

Segment 1 has multiple utilities along the NM 264 corridor. These utilities include sanitary sewer, fiber optic, overhead fiber optic, telephone, and overhead power lines. The existing signal at Alma Drive has buried power lines feeding the traffic signals.
The existing sanitary sewer line starts on the south side of NM 264 between Driveways 2 and 4, crosses the road between Driveways 3 and 5 , and continues east along the north side outside of the NM 264 roadway pavement to Hilltop Road. The sanitary sewer line is owned by Yah-Ta-Hey Water/Wastewater and the Navajo Tribal Utility Authority.

The fiber optic line runs along the north side of NM 264 approximately 10 feet south of the existing ROW for the entire segment. The fiber optic line is owned by Frontier Communications.

The overhead fiber optic line starts at MP 0.0 and runs east along the existing ROW to Driveway 6 where it travels outside of the ROW and turns to the north. The overhead fiber optic line is owned by Frontier Communications.

The telephone line runs along the north side of NM 264. The line diverts in and out of the existing ROW along the entire segment. The telephone line is owned by Frontier Communications.
5.10.10 Lighting

There is no roadway lighting in Segment 1.

### 5.11 EXISTING DRAINAGE

Within Segment 1, the NM 264 alignment bisects the Tse Bonito Valley. The valley is the outfall to several drainages that contribute to the local washes, including Coal Wash, Sand Wash and Tse Bonito Wash, which is immediately south of the alignment. Off-site watersheds generally drain from north to south toward the alignment. Drainage infrastructure within Segment 1 can be classified primarily as on-site roadway drainage control with vertical curb and gutter and combination inlets controlling the spread and depth of water through the street section. Off-site runoff is passed beneath the alignment through a cross culvert located at MP 0.52 , which outfalls into Sand Wash. It appears that off-site drainages affect the performance of the on-site drainage infrastructure because of the conveyance of sediment/debris into the street section. Significant deposition of off-site soil can be seen in the existing bus bays located at MP 0.25, at curb inlets, and along the gutter line. The significant deposition of material will reduce the conveyance capacity of both the roadway section and the storm drain located there. Figure 29 shows evidence of off-site sediment being deposited into the street section and ultimately into the storm drain collection system.


Figure 29. Existing Drainage Inlet

Roadside ditches and small-diameter pipes (24 inches or smaller) convey runoff through the ditches located at the driveway access points along the ROW of the alignment. However, on account of significant sediment, nearly all driveway culverts appear inoperable. Similarly, there are several large area inlets located within paved parking lots south of the alignment. These features collect runoff from the commercial areas and smaller off-site watersheds south of the alignment. Table 13 lists all identified drainage infrastructure within Segment 1. Figure 30 shows the identified drainage infrastructure within Segment 1. Red linework indicates features identified in the field and confirmed by as-builts; yellow linework indicates features identified in the field for which as-builts have not been located. Yellow features indicate the presumed configuration. Each feature has been reviewed for condition and overall performance rating. Reference Appendix $C$ for the Drainage Report, which contains a complete narrative and assessment of the identified infrastructure as well as preliminary hydrologic and hydraulic analysis of the drainage characteristics within Segment 1.

Table 13. Segment 1 Drainage Inventory

| Drainage Feature/ Crossing ID | Description | Inlet(s) Condition | Outlet Condition | Action | Overall Rating |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 0.020 | 18" corrugated metal pipe (CMP) | Good; located to north; curb drop inlet (CDI); minor debris at grate | Fair; located to south; minor pipe undermining; wireenclosed riprap end treatment | Needs cleaning and additional riprap placed under pipe outlet | Fair |
| 0.021 | $36 "$ CMP | Unknown; inlet located outside ROW | Good; located to south outside ROW | None | Good |
| 0.022 | 72" CMP | Good; located to north; concrete slope blanket; no end treatment | Fair; located to south; concrete slope blanket in good condition; $40 \%$ sediment; moderate debris | Needs cleaning | Fair |
| 0.023 | 18" CMP; CDI | Fair; CDI; moderate sediment; moderate corrosion | Unknown; storm drain culvert | Needs cleaning | Fair |
| 0.060 | 18" CMP; CDI | Unknown; CDI | Unknown; storm drain culvert | - | Pending |
| 0.070 | 30" CMP; driveway | Not found; located to east; assumed to be a storm drain or $100 \%$ buried; there is a sink hole located to east along potential alignment | Poor; located to west; major sediment; metal end section | Needs cleaning | Poor |


| Drainage Feature/ Crossing ID | Description | Inlet(s) Condition | Outlet Condition | Action | Overall Rating |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 0.120 | 18" CMP; CDI | Fair; CDI; major sediment; moderate corrosion | Unknown; storm drain culvert | Needs cleaning | Poor |
| 0.121 | 18" CMP; median drop inlet (MDI) | Fair; MDI; damaged grate | Unknown; storm drain culvert | Needs repair | Fair |
| 0.130 | 24" CMP; driveway | Fair; 30\% sediment; major vegetation; concrete end section | Poor; 30\% sediment; damaged concrete end section | Needs repair, cleaning, and clearing | Poor |
| 0.135 | 18" CMP; MDI | Unknown; MDI | Unknown; storm drain culvert | - | Pending |
| 0.180 | 24" CMP; driveway | Poor; 60\% sediment; metal end section | Poor; 60\% sediment; major vegetation; metal end section | Needs cleaning and clearing | Poor |
| 0.220 | 18" CMP; MDI | Unknown; MDI | Unknown; storm drain culvert | - | Pending |
| 0.230 | 24" CMP; driveway | Not found; assumed to be $100 \%$ buried; major vegetation | Poor; 90\% sediment; minor damage | Needs cleaning and clearing | Poor |
| 0.270 | 24" CMP; driveway | Unknown | Unknown | - | Pending |
| 0.320 | 24" CMP; driveway | Poor; 30\% sediment; major vegetation; metal end section | Poor; 70\% sediment; metal end section | Needs cleaning and clearing | Poor |
| 0.410 | 24" CMP; driveway | Poor; located to west; $90 \%$ sediment; minor pipe damage | Poor; located to east; assumed to be $100 \%$ buried | Needs repair and cleaning | Poor |
| 0.420 | 24" CMP; CDI | Fair; CDI; major sediment | Unknown; storm drain culvert | Needs cleaning | Fair |


| Drainage <br> Feature/ <br> Crossing ID | Description | Inlet(s) Condition | Outlet Condition | Action | Overall <br> Rating |
| :--- | :--- | :--- | :--- | :--- | :--- |
| 0.470 | $24 "$ CMP; <br> driveway | Fair; located to west; <br> $20 \%$ sediment; minor <br> vegetation | Fair; located to east; <br> $40 \%$ sediment | Needs cleaning <br> and clearing | Fair |
| 0.510 | 114 " CMP | Good; located to <br> north; major <br> vegetation; concrete <br> end section | Good; located to <br> south; concrete end <br> section | None | Good |
| 0.520 | $24 "$ CMP; <br> driveway | Poor; located to east; <br> $60 \%$ sediment; metal <br> end section | Poor; located to west; <br> major erosion above <br> pipe; major vegetation; <br> metal end section | Needs cleaning, <br> clearing, and <br> bank protection | Poor |
| 0.590 | 24 " CMP; <br> driveway | Poor; located to east; <br> $90 \%$ sediment; metal <br> end section | Poor; located to east; <br> 90\% sediment; metal <br> end section | Needs cleaning | Poor |



On-site drainage infrastructure discharges into Sand Wash, immediately south of Segment 1 of the NM 264 alignment. The wash is classified as a Zone A floodplain by the FEMA. Zone A floodplains are areas that have a one percent probability of flooding yearly. Structures in Zone A floodplains are at high risk of flooding under the National Flood Insurance Program. Based on preliminary analysis, the proposed improvements within Segment 1 do not appear to adversely affect the associated floodplain. For further discussion on the effective floodplain and drainage conditions within Segment 1, reference the Drainage Report (Appendix C).

### 5.12 GEOTECHNICAL EVALUATION

A geologic and geotechnical literature search, review of as-built plans, and site reconnaissance were performed, and a Preliminary Geotechnical and Scoping Report was prepared for the NM 264 improvements from MP 0 to 16. Based on the information obtained from the literature search and site reconnaissance, the project is suitable for the planned improvements. The following geotechnical considerations were identified.

### 5.12.1 Site Soils and Bedrock

The site surface and subsurface conditions will likely consist of interbedded clays, silts, sands, and gravels in alluvial and colluvium deposits. Bedrock is anticipated to be encountered at depths as shallow as one foot to greater than about 50 feet below existing site grade. The surface and shallow subsurface soils along the project alignment will likely exhibit a tendency for low to moderate compression and/or none to moderate expansion with increasing load and when elevated in moisture content. The study team anticipates that the shallow soils will exhibit low to moderate bearing capacity. The deeper soils and bedrock are anticipated to exhibit moderate to high load-bearing capability. The shallow soils may be recompacted to increase bearing capacity and reduce settlement. It is expected that the soils will have very poor to good quality pavement support characteristics.

### 5.12.2 Groundwater

Groundwater along the project alignment is anticipated to be encountered at depths greater than about 30 to 50 feet below existing site grade, excluding areas located within and adjacent to existing drainages. Regional groundwater is anticipated to have significant seasonal variations and may be encountered at depths near the ground surface when drainages, arroyos, and irrigation canals are flowing. In addition, given the relatively shallow clays and bedrock along most of the project alignment, development of perched groundwater conditions is likely with seasonal variations.
5.12.3 Construction and Excavation

On-site well/poorly graded sands and silty sands and gravels are anticipated to be suitable for use as structural backfill beneath drainage structures and pavements. On-site clays will not be suitable for use as structural backfill. On-site soils are anticipated to be suitable for use as backfill/ embankment beneath new pavements. However, clay soils may require stabilization/modification prior to use below new pavement depending on NMDOT minimum R-value and design requirements.
Shallow excavations into the on-site soils are expected to be accomplished with conventional earthwork equipment. Some low-density and elevated moisture content subgrade soils were encountered in several borings and should be anticipated along portions of the alignment. These subgrade soils may require drying or stabilization/densification during construction. Caving soils should be anticipated on account of loose, granular soil conditions. Dense to very dense sands and gravels or very hard bedrock may be encountered and may require additional effort, heavyduty, and/or specialized equipment for excavation and deep foundation construction/installation.

### 5.12.4 Slopes

For permanent slopes in compacted fill and cut areas with maximum heights of less than 5 to 10 feet, recommended maximum slopes for on-site soils and bedrock materials range from $0.75: 1$ to 3:1 (horizontal:vertical).

### 5.12.5 Pavement

The existing pavement section thickness and material types along the project alignment are variable. The pavement materials consisted of asphalt concrete and untreated base course. The asphalt concrete thickness ranges from approximately 3.5 to 10 inches. The thickness of the untreated base course ranges from 3 to 17 inches.

The preliminary and final pavement design reports will be prepared by the NMDOT Pavement Management and Design Bureau (PMDB). The information in this report will be used by NMDOT to develop the recommended new pavement section thickness.
The anticipated subgrade soils along the project alignment will likely consist of sands with varying amounts of clay, silt and gravel, clays with varying amounts sand and gravel, silt with varying amounts of sand and gravel, and gravel with varying amounts of silt and sand. The anticipated subgrade soils will likely be classified as A-1-a, A-2-4, A-4, A-6, and A-7-6 in accordance with the AASHTO Soil Classification System.

### 5.13 ENVIRONMENTAL, CULTURAL, AND COMMUNITY SETTING

Segment 1 consists of a suburban area setting at approximately 6,800 feet in elevation. Land adjacent to the roadway is mostly developed with housing and businesses. Segment 1 is located alongside private land and with Navajo Nation trust land adjacent.

The surrounding landscape has small rolling hills, with the Chuska Mountains located to the north The Coal Wash, Sand Wash, and Tse Bonito Wash are located south of the project area. Segment 1 is located within the Great Basin conifer woodland biotic community and the vegetation primarily consists of forbs, shrubs, and trees.
The habitat in Segment 1 is not particularly valuable to many wildlife species because it primarily consists of the roadway; however, the adjacent land likely provides some marginal habitat for smaller common wildlife species, such as lizards, reptiles, rodents, birds, and insects. There is no suitable habitat for bald eagles or golden eagles in Segment 1. If tree removal would be necessary as part of the project, measures such as time-of-year tree-clearing restrictions would be taken to avoid impacts on nesting or migratory birds. Because of the development in the area and the wide roadway, Segment 1 is not particularly valuable for wildlife movement.
The U.S. Fish and Wildlife Service Information for Planning and Consultation (IPaC) online too and New Mexico Department of Game and Fish (NMDGF) Environmental Review Tool (ERT) were accessed to determine whether threatened or endangered species may occur in Segment 1 The IPaC list included a total of seven threatened, endangered, or candidate species that may occur within the project area (Table 14). No threatened or endangered species have been documented within one mile of Segment 1. Critical habitat is located approximately 30 miles away o the southeast. The NMDGF ERT listed 16 Species of Greatest Conservation Need (SGCN) (Table 15).

Table 14. Threatened, Endangered, and Candidate Species That May Occur in the Project Area, per the IPaC

| Common Name | Scientific Name | Status |
| :--- | :--- | :--- |
| Mexican wolf | Canis lupus baileyi | Endangered |
| Mexican spotted owl | Strix occidentalis lucida | Threatened |
| Southwestern willow flycatcher | Empidonax traillii extimus | Endangered |
| Yellow-billed cuckoo | Coccyzus americanus | Threatened |
| Zuni bluehead sucker | Catostomus discobolus yarrow | Endangered |
| Monarch Butterfly | Danaus plexippus | Candidate |
| Zuni fleabane | Erigeron rhizomatus | Threatened |

Table 15. SGCN That May Occur in the Project Area, per the NMDGF ERT

| Common Name | Scientific Name |
| :--- | :--- |
| Northern leopard frog | Lithobates pipiens |
| Eared grebe | Podiceps nigricollis |
| Peregrine falcon | Falco peregrinus |
| Lewis's woodpecker | Melanerpes lewis |
| Williamson's sapsucker | Sphyrapicus thyroideus |
| Olive-sided flycatcher | Contopus cooperi |
| Bank swallow | Riparia |
| Pinyon jay | Gymnorhinus cyanocephalus |
| Clark's nutcracker | Nucifraga columbiana |
| Juniper titmouse | Baeolophus ridgwayi |
| Pygmy nuthatch | Sitta pygmaea |
| Western bluebird | Sialia Mexicana |
| Loggerhead shrike | Lanius ludovicianus |
| Grey vireo | Vireo vicinior |
| Spotted bat | Euderma maculatum |
| Gunnison's prairie dog | Cynomys gunnisoni |

Within Segment 1, there is no perennially flowing surface water; however, Tse Bonito Wash is located south of the roadway. The National Wetlands Inventory classifies this wash and the wash that feeds into it from the north as a riverine habitat. Segment 1 is located in FEMA's Flood Insurance Rate Map 35031C1100E, effective date 02/17/2010. There is a flood hazard Zone A located adjacent to and across the roadway. A small section of the roadway nearest to the Arizona/New Mexico border is in Zone D, which is an area where flood hazard analysis has not been conducted.
A previous cultural resources survey conducted in 1986 covered 100 percent of the NM 264 ROW from MP 0 to MP 0.5. A search of the New Mexico Cultural Resource Information System (NMCRIS) database reveals that one previously recorded site-a historic/recent gasoline service station-is located within the ROW. The National Register of Historic Places (NRHP) status of the site is unknown. A review of archival and recent aerial photographs indicates that this site is no longer extant and is now the location of a Domino's Pizza restaurant.

No buildings, linear structures, historic objects, or historic districts are depicted in the NMCRIS GIS database along this stretch of road.

Aerial imagery was reviewed to determine the likelihood of Section 4(f) resources in the project area. No public parks, recreation areas, waterfowl or wildlife refuges, or NRHP-eligible sites are located within Segment 1 or are anticipated to be affected by the project.
Noise receptors in Segment 1 include businesses and homes adjacent to the roadway. A roadway reconstruction project would likely qualify as a Type II project under 23 Code of Federal Regulations (CFR) 772 - Procedures for Abatement of Highway Traffic Noise and Construction Noise. This type of project would not require an in-depth analysis of potential traffic noise impacts; however, the project will be evaluated further during Phase I-C of the project.

The Clean Air Act is a federal law that prevents air quality impacts that cause or contribute to volations of the National Ambient Air Quality Standards (NAAQS). Air Quality Control Regions are areas designated by the U.S. Environmental Protection Agency for the attainment and maintenance of the NAAQS. The project is located within the Four Corners Interstate Air Quality Control Region 014. McKinley County is in attainment of all current air quality standards

The Hazardous Material Investigation Bureau (HMIB) completed a preliminary Initial Site Assessment (pISA) for the study area, including Segment 1. The pISA identified 7 findings within and adjacent to the project corridor "where releases of hazardous materials or petroleum products have or could have occurred." It was determined that these findings would not potentially affect Segment 1.
Within a $1 / 2$-mile radius of Segment 1 , there is a population of 349 people. Approximately 95 percent of the population are people of color, approximately 3 percent of the population is Hispanic, and approximately 9 percent of the population is age 65 or older. During Phase I-C, the project will be evaluated to determine whether there will be impacts to Environmental Justice populations, but it is not anticipated impacts would be disproportionately high and adverse. The overall, long-term impacts from the project are anticipated to be beneficial to the community. Short-term, temporary impacts may include travel delays during construction. Access to community resources would not be affected and access to residences would be maintained.

6 EXISTING CONDITIONS ANALYSIS - SEGMENT 2, MP 0.6 to MP 15.5, RURAL SECTION


Segment 2 is the longest of the three segments and extends from Hilltop Road at MP 0.6 to the Cle Ki Drive intersection at MP 15.5 and is approximately 14.9 miles long

### 6.1 FUNCTIONAL CLASSIFICATION AND ZONING

Among the six major functional classes, NM 264 is classified as a Principal Arterial - Other for all three segments of NM 264.

### 6.2 TYPICAL SECTION

Segment 2 is a divided roadway with two 12-foot travel lanes along each direction with a raised median in the middle. This section also has paved inside 4-foot shoulders and outside 10- to 15 -foot shoulders with rumble strips (Figure 31).


LEFT TURN ACCESS LOCATIONS


LEFT TURN ACCESS LOCATIONS
Figure 31. NM 264 Segment 2 Existing Cross-section

At approximately MP 4.2, there is an existing bridge structure (Bridge Nos. 8626 and 8627). The typical roadway section remains a divided roadway with two 12-foot travel lanes along each direction with a raised median and paved inside 4 -foot shoulders and outside 10-foot shoulders with rumble strips (Figure 32).


Figure 32. NM 264 Segment 2 Existing Bridge Cross-section at MP 4.2
6.3 HORIZONTAL ALIGNMENT ANALYSIS

In Segment 2, there are seven horizontal curves. The horizontal curves were analyzed using the AASHTO A Policy on Geometric Design of Highways and Streets, $20187^{\text {th }}$ edition, Table 3-9, Minimum Radii for Design Superelevation Rates, Design Speeds and Maximum Superelevation ( $e_{\max }$ ) of 6\%. Five horizontal curves do not meet the minimum criteria (Table 16)

Table 16. Segment 2 Horizontal Alignment Analysis

| Curve <br> No. | Design <br> Speed <br> (mph) | Start <br> Station | End <br> Station | Direction | Radius <br> (ft) | Approx. <br> $\mathbf{e m i n}^{2}$ | Required <br> $\mathbf{e m i n}^{\prime}$ | Meets <br> Standard |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| C3 | 60 | $142+59.51$ | $160+67.70$ | Left | 1,895 | $4.7 \%$ | $5.6 \%$ | No |
| C4 | 60 | $223+83.91$ | $236+28.38$ | Left | 2,950 | $3.6 \%$ | $4.6 \%$ | No |
| C5 | 60 | $358+66.74$ | $382+90.95$ | Right | 2,865 | $4.6 \%$ | $4.6 \%$ | Yes |
| C6 | 60 | $403+85.70$ | $424+10.98$ | Left | 2,865 | $3.0 \%$ | $4.6 \%$ | No |
| C7 | 60 | $433+06.53$ | $445+20.14$ | Left | 2,900 | $6.2 \%$ | $4.6 \%$ | Yes |
| C8 | 70 | $639+38.82$ | $649+01.73$ | Right | 5,750 | $2.2 \%$ | $3.4 \%$ | No |
| C9 | 70 | $774+15.90$ | $783+05.84$ | Right | 5,500 | $2.9 \%$ | $3.6 \%$ | No |

6.4 VERTICAL ALIGNMENT ANALYSIS

In Segment 2, there are 42 vertical curves that were analyzed for a varying design speed of 50 to 70 mph . The study team compared existing vertical curves to the required design criteria, including k-value, curve length, and maximum/minimum grade, for the design speed based on AASHTO A Policy on Geometric Design of Highways and Streets, $20187^{\text {th }}$ edition. There are 15vertical curves that do not meet the minimum criteria (Table 17).

Table 17. Segment 2 Vertical Alignment Analysis

| Curve <br> No. | Design <br> Speed <br> (mph) | PVI <br> Station | Type | Approx. <br> Curve <br> Length <br> (ft) | Min. <br> Curve <br> Length <br> (ft) | Approx. <br> K-Value | Req. <br> K- <br> Value | Grade <br> In/Out | Grade <br> Max./Min. | Meets <br> Standard |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| C4 | 50 | $137+69.00$ | Crest | 520 | 180 | 350.66 | 84 | $1.01 \% /$ <br> $-0.47 \%$ | $6 \% / 0.3 \%$ | Yes |
| C5 | 60 | $147+12.00$ | Sag | 800 | 180 | 696.54 | 136 | $-0.47 \% /$ |  |  |
| $0.68 \% /$ | $6 \% / 0.3 \%$ | Yes |  |  |  |  |  |  |  |  |
| C6 | 60 | $160+91.00$ | Crest | 800 | 180 | 1575.68 | 151 | $0.68 \% /$ <br> $0.17 \%$ | $6 \% / 0.3 \%$ | No |
| C7 | 60 | $180+30.00$ | Sag | 1200 | 180 | 2826.74 | 136 | $0.17 \% /$ <br> $0.59 \%$ | $6 \% / 0.3 \%$ | No |
| C8 | 60 | $210+73.00$ | Sag | 600 | 180 | 1375.92 | 136 | $0.59 \% /$ <br> $1.03 \%$ | $6 \% / 0.3 \%$ | Yes |
| C9 | 60 | $242+24.00$ | Sag | 800 | 180 | 702.83 | 136 | $1.03 \% /$ <br> $2.17 \%$ | $6 \% / 0.3 \%$ | Yes |


| Curve | Design Speed (mph) | PVI Station | Type | Approx. Curve Length (feet) | Min. <br> Curve <br> Length <br> (feet) | Approx. <br> K-Value | Req. KValue | Grade In/Out | Grade Max./Min. | Meets Standard |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| C10 | 60 | 256+84.00 | Crest | 800 | 180 | 258.71 | 151 | $\begin{aligned} & \hline 2.17 \% / \\ & -0.92 \% \\ & \hline \end{aligned}$ | 6\%/0.3\% | Yes |
| C11 | 60 | 266+58.00 | Sag | 600 | 180 | 273.21 | 136 | $\begin{gathered} \hline-0.92 \% / \\ 1.27 \% \end{gathered}$ | 6\%/0.3\% | Yes |
| C12 | 60 | 283+10.00 | Sag | 800 | 180 | 170.39 | 136 | $\begin{gathered} \hline 1.27 \% / \\ 5.97 \% \end{gathered}$ | 6\%/0.3\% | Yes |
| C13 | 60 | 312+96.00 | Crest | 2070 | 180 | 207.79 | 151 | $\begin{aligned} & 5.97 \% / \\ & -3.99 \% \end{aligned}$ | 6\%/0.3\% | Yes |
| C14 | 60 | 334+69.00 | Crest | 800 | 180 | 864.73 | 151 | $\begin{aligned} & \hline-3.99 \% / \\ & -4.92 \% \\ & \hline \end{aligned}$ | 6\%/0.3\% | Yes |
| C15 | 60 | 350+64.00 | Sag | 1400 | 180 | 126.74 | 136 | $\begin{gathered} \hline-4.92 \% / \\ 6.13 \% \\ \hline \end{gathered}$ | 6\%/0.3\% | No |
| C16 | 60 | 362+00.00 | Crest | 450 | 180 | 202.84 | 151 | $\begin{gathered} 6.13 \% / \\ 3.91 \% \\ \hline \end{gathered}$ | 6\%/0.3\% | Yes |
| C17 | 60 | 379+55.00 | Crest | 1550 | 180 | 204.20 | 151 | $\begin{aligned} & \hline 3.91 \% / \\ & -3.68 \% \\ & \hline \end{aligned}$ | 6\%/0.3\% | Yes |
| C18 | 60 | 392+68.00 | Sag | 600 | 180 | 178.12 | 136 | $\begin{aligned} & \hline-3.68 \% / \\ & -0.31 \% \end{aligned}$ | 6\%/0.3\% | Yes |
| C19 | 60 | 405+15.00 | Crest | 1150 | 180 | 265.69 | 151 | $\begin{aligned} & -0.31 \% / \\ & -4.64 \% \\ & \hline \end{aligned}$ | 6\%/0.3\% | Yes |
| C20 | 60 | 422+75.00 | Sag | 1100 | 180 | 291.45 | 136 | $\begin{gathered} \hline-4.64 \% / \\ -0.87 \% \\ \hline \end{gathered}$ | 6\%/0.3\% | Yes |
| C21 | 60 | 434+84.00 | Crest | 600 | 180 | 254.96 | 151 | $\begin{aligned} & \hline-0.87 \% / \\ & -3.22 \% \\ & \hline \end{aligned}$ | 6\%/0.3\% | Yes |
| C22 | 60 | $445+00.00$ | Sag | 600 | 180 | 344.49 | 136 | $\begin{gathered} \hline-3.22 \% / \\ -1.48 \\ \hline \end{gathered}$ | 6\%/0.3\% | Yes |
| C23 | 70 | 464+35.00 | Crest | 450 | 210 | 310.16 | 247 | $\begin{aligned} & -1.48 \% / \\ & -2.93 \% \\ & \hline \end{aligned}$ | 6\%/0.3\% | Yes |
| C24 | 70 | 474+50.00 | Sag | 650 | 210 | 242.74 | 181 | $\begin{aligned} & \hline-2.93 \% / \\ & -0.25 \% \\ & \hline \end{aligned}$ | 6\%/0.3\% | No |
| C25 | 70 | 485+51.00 | Crest | 900 | 210 | 213.18 | 247 | $\begin{aligned} & -0.25 \% 1 \\ & -4.47 \% \end{aligned}$ | 6\%/0.3\% | No |
| C26 | 70 | 497+64.00 | Sag | 600 | 210 | 153.23 | 181 | $\begin{gathered} -4.47 /- \\ 0.56 \% \\ \hline \end{gathered}$ | 6\%/0.3\% | No |
| C27 | 70 | 507+80.00 | Crest | 900 | 210 | 325.67 | 247 | $\begin{aligned} & \hline-0.56 \% / \\ & -3.32 \% \\ & \hline \end{aligned}$ | 6\%/0.3\% | Yes |
| C28 | 70 | 522+70.00 | Sag | 1200 | 210 | 368.61 | 181 | $\begin{aligned} & -3.32 \% / \\ & -0.07 \% \end{aligned}$ | 6\%/0.3\% | No |
| C29 | 70 | 565+73.00 | Sag | 300 | 210 | 1283.34 | 181 | $\begin{gathered} -0.01 \% / \\ 0.22 \% \\ \hline \end{gathered}$ | 6\%/0.3\% | No |
| C30 | 70 | 573+09.00 | Sag | 400 | 210 | 147.09 | 181 | $\begin{aligned} & \hline 0.22 \% 1 \\ & 2.94 \% \\ & \hline \end{aligned}$ | 6\%/0.3\% | No |
| C31 | 70 | 591+70.00 | Crest | 1600 | 210 | 235.13 | 247 | $\begin{aligned} & \hline 2.94 \% / \\ & -3.86 \% \\ & \hline \end{aligned}$ | 6\%/0.3\% | No |
| C32 | 70 | 609+70.00 | Sag | 800 | 210 | 215.51 | 181 | $\begin{aligned} & \hline-3.86 \% / \\ & -0.15 \% \\ & \hline \end{aligned}$ | 6\%/0.3\% | No |
| C33 | 70 | 635+85.00 | Sag | 950 | 210 | 250.90 | 181 | $\begin{gathered} -0.15 \% / \\ 3.64 \% \end{gathered}$ | 6\%/0.3\% | No |


| Curve <br> No. | Design <br> Speed <br> (mph) | PVI <br> Station | Type | Approx. <br> Curve <br> Length <br> (ft) | Min. <br> Curve <br> Length <br> (ft) | Approx. <br> K-Value | Req <br> K- <br> Value | Grade <br> In/Out | Grade <br> Max./Min. | Meets <br> Standard |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| C34 | 70 | $651+95.00$ | Crest | 300 | 210 | 305.82 | 247 | $3.64 \% /$ <br> $2.66 \%$ | $6 \% / 0.3 \%$ | Yes |
| C35 | 70 | $669+78.00$ | Sag | 300 | 210 | 593.07 | 181 | $2.66 \% /$ <br> $3.16 \%$ | $6 \% / 0.3 \%$ | Yes |
| C36 | 70 | $690+42.00$ | Crest | 1650 | 210 | 190.71 | 247 | $3.16 \% /$ <br> (-5.4.9\% | $6 \% / 0.3 \%$ | No |
| C37 | 70 | $709+67.00$ | Sag | 1200 | 210 | 253.07 | 181 | $-5.49 \% /$ <br> $-0.75 \%$ | $6 \% / 0.3 \%$ | Yes |
| C38 | 70 | $747+70.00$ | Crest | 950 | 210 | 772.99 | 247 | $-0.75 \% /$ <br> $-1.98 \%$ | $6 \% / 0.3 \%$ | Yes |
| C39 | 70 | $770+23.00$ | Sag | 600 | 210 | 395.23 | 181 | $-1.98 \% /$ <br> $-0.46 \%$ | $6 \% / 0.3 \%$ | Yes |
| C40 | 70 | $789+50.00$ | Crest | 800 | 210 | 310.64 | 247 | $-0.46 \% /$ <br> $-3.03 \%$ | $6 \% / 0.3 \%$ | Yes |
| C41 | 70 | $816+48.00$ | Sag | 650 | 210 | 377.81 | 181 | $-3.03 \% /$ <br> $-1.31 \%$ | $6 \% / 0.3 \%$ | Yes |
| C42 | 70 | $856+02.00$ | Sag | 500 | 210 | 958.84 | 181 | $-1.31 \% /$ <br> $-0.79 \%$ | $6 \% / 0.3 \%$ | Yes |
| C43 | 70 | $877+23.00$ | Sag | 300 | 210 | 2830.33 | 181 | $-0.79 \% /$ <br> $-0.69 \%$ | $6 \% / 0.3 \%$ | Yes |
| C44 | 70 | $900+60.00$ | Sag | 300 | 210 | 349.89 | 181 | $-0.69 \% /$ <br> $-0.17 \%$ | $6 \% / 0.3 \%$ | No |
| C45 | 60 | $915+90.00$ | Sag | 500 | 180 | 114.63 | 136 | $0.17 \% /$ <br> $4.53 \%$ | $6 \% / 0.3 \%$ | No |

### 6.5 OPERATING SPEEDS

In Segment 2, the 85th percentile speed was found in the range from 69 to 72 mph based on 24hour data, whereas it is from 67 to 74 mph for other peak periods depending on location and time of day. Refer to Figure 33 and Figure 34 for 24 -hour 85 th percentile and mode and pace speeds at a sample location (west of Winchester Road) on Segment 2.

The mode speed was found to be in a range from 58 to 68 mph based on 24 -hour data; other time of day data show a similar range for mode speed. The pace speed is approximately 64 to 74 mph . Refer to Figure 35, and Figure 36 for mode and pace speeds on Segment 2 west of Winchester
Road (a sample location). For detailed speed information, refer to the TNA report in Appendix B.
Table 18. Segment 2 Posted/Design Speeds

| Location | Posted Speed <br> $(\mathbf{m p h})$ | Design Speed <br> $(\mathbf{m p h})$ |
| :--- | :---: | :---: |
| Hilltop Road, MP 0.6, to east of Black Hat Road, MP 6.55 | 55 | 60 |
| East of Black Hat Road, MP 6.55, to MP 15 | 65 | 70 |
| MP 15 to Cle Ki Drive, MP 15.5, | 55 | 60 |



Figure 33. Cumulative Speed Distribution and 85th Percentile Speed 24-hour Data at West of Winchester Road


Figure 34. Speed Distribution and Mode and Pace Speed 24-hour Data at West of Winchester Road


Figure 35. Cumulative Speed Distribution and 85th Percentile Speed AM and PM Peak Period at West of Winchester Road


Figure 36. Speed Distribution and Mode and Pace Speed AM and PM Peak Period at West of Winchester Road
6.6 HORIZONTAL SIGHT LINE OFFSET ANALYSIS

The HSO was calculated using the AASHTO A Policy on Geometric Design of Highways and Streets, $20187^{\text {th }}$ edition, equation 3-37 for each horizontal curve. See Table 19 for results.

Table 19. Segment 2 Horizontal Sight Line Offset

| Curve <br> No. | Design Speed <br> $(\mathbf{m p h})$ | Radius <br> (ft) | Sight Distance <br> (ft) | HSO <br> (ft) | Meets <br> Standard |
| :---: | :---: | :---: | :---: | :---: | :---: |
| C3 | 60 | 1,895 | 570 | 22 | Yes |
| C4 | 60 | 2,950 | 570 | 14 | Yes |
| C5 | 60 | 2,865 | 570 | 15 | Yes |
| C6 | 60 | 2,865 | 570 | 15 | Yes |
| C7 | 60 | 2,900 | 570 | 14 | Yes |
| C8 | 70 | 5,750 | 730 | 12 | Yes |
| C9 | 70 | 5,500 | 730 | 13 | Yes |

Based on the calculated HSO, there does not appear to be any sight distance issues for the Segment 2 horizontal curves.

### 6.7 INTERSECTION SIGHT DISTANCE ANALYSIS

The intersection sight distance was analyzed using the AASHTO A Policy on Geometric Design of Highways and Streets, $20187^{\text {th }}$ edition standards (Figure 37) for each intersection or turnout throughout the Segment 2 portion of the NM 264 corridor. The minimum intersection sight distance value was calculated using the AASHTO A Policy on Geometric Design of Highways and Streets, $20187^{\text {th }}$ edition, equation 9-1. See Table 20 for results.


Departure Sight Triangle for Viewing Traffic Approaching the Minor Road from the Left

> Departure Sight Triangles (Stop-Controlled)

Figure 37. AASHTO A Policy on Geometric Design of Highways and Streets, $20187^{\text {th }}$ edition, Figure 9-17, Departure Sight Triangles for Intersections
The following intersection control cases were used for Segment 2:

- Case B1 - stop control minor road turning left onto NM 264
- Case B2 - stop control minor road turning right on NM 264
- Case F - left turns from NM 264 to minor road

Table 20. Segment 2 Intersection Sight Distance

| Intersection/ Turnout |  | Station | Offset | NM 264 <br> Design <br> Speed <br> (mph) | ISD Criteria | Sight Triangle | Min. ISD Value (ft) | Meets Standard | Deficient ISD Value <br> (ft) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 27 | Turnout 1 | 139+06 | LT | 60 | B1 | Right | 992 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 838 | Yes |  |
|  |  |  |  |  | F | Upstream | 666 | Yes |  |
| 28 | Turnout 2 | 156+82 | RT | 60 | B1 | Right | 992 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 838 | Yes |  |
|  |  |  |  |  | F | Upstream | 666 | Yes |  |
| 29 | Old Coal Mine | 162+25 | LT | 60 | B1 | Right | 992 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 838 | Yes |  |
|  |  |  |  |  | F | Upstream | 666 | Yes |  |
| 30 | P \& M Rd | $181+25$ | LT | 60 | B1 | Right | 992 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 838 | Yes |  |
|  |  |  |  |  | F | Upstream | 666 | Yes |  |


| Intersection/ Turnout |  | Station | Offset | NM 264 <br> Design <br> Speed <br> (mph) | ISD Criteria | Sight Triangle | Min. ISD Value (ft) | Meets Standard | Deficient ISD Value <br> (ft) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 31 | Tse Bonito Ridge Rd | 181+28 | RT | 60 | B1 | Right | 992 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 838 | Yes |  |
|  |  |  |  |  | F | Upstream | 666 | Yes |  |
| 32 | Star <br> Route 5 | 212+64 | LT | 60 | B1 | Right | 992 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 838 | Yes |  |
|  |  |  |  |  | F | Upstream | 666 | Yes |  |
| 33 | Garden Ln | 265+27 | RT | 60 | B1 | Right | 992 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 838 | Yes |  |
|  |  |  |  |  | F | Upstream | 666 | Yes |  |
| 34 | Turnout 3 | 265+46 | LT | 60 | B1 | Right | 992 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 838 | Yes |  |
|  |  |  |  |  | F | Upstream | 666 | Yes |  |
| 35 | Turnout 4 | 270+56 | LT | 60 | B1 | Right | 992 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 838 | Yes |  |
|  |  |  |  |  | F | Upstream | 666 | Yes |  |
| 36 | Turnout 5 | 275+90 | RT | 60 | B1 | Right | 992 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 838 | Yes |  |
|  |  |  |  |  | F | Upstream | 666 | Yes |  |
| 37 | Route 5 | 280+46 | LT | 60 | B1 | Right | 992 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 838 | Yes |  |
|  |  |  |  |  | F | Upstream | 666 | Yes |  |
| 38 | Turnout 6 | 314+18 | LT | 60 | B2 | Left | 838 | No | 712 |
| 39 | Defiance | 349+54 | RT | 60 | B1 | Right | 992 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 838 | Yes |  |
|  |  |  |  |  | F | Upstream | 666 | Yes |  |
| 40 | Turnout 7 | 367+18 | RT | 60 | B1 | Right | 992 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 838 | Yes |  |
|  |  |  |  |  | F | Upstream | 666 | Yes |  |
| 41 | Turnout 8 | 378+57 | LT | 60 | B1 | Right | 992 | No * | 862 |
|  |  |  |  |  | B1/B2 | Left | 838 | No | 720 |
|  |  |  |  |  | F | Upstream | 666 | Yes |  |
| 42 | Turnout 9 | 383+22 | LT | 60 | B1 | Right | 992 | No * | 802 |
|  |  |  |  |  | B1/B2 | Left | 838 | Yes |  |
|  |  |  |  |  | F | Upstream | 666 | Yes |  |
| 43 | Turnout 10A | 385+35 | RT | 60 | B2 | Left | 838 | No | 733 |
| 44 | $\begin{aligned} & \text { Turnout } \\ & 10 \mathrm{~B} \end{aligned}$ | 387+04 | RT | 60 | B1 | Right | 992 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 838 | Yes |  |
|  |  |  |  |  | F | Upstream | 666 | Yes |  |


| Intersection/ Turnout |  | Station | Offset | NM 264 Design Speed (mph) | ISD Criteria | Sight Triangle | Min. ISD Value (ft) | Meets Standard | Deficient ISD Value <br> (ft) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 45 | Turnout 11 | 387+47 | LT | 60 | B1 | Right | 992 | No * | 644 |
|  |  |  |  |  | B1/B2 | Left | 838 | Yes |  |
|  |  |  |  |  | F | Upstream | 666 | Yes |  |
| 46 | Turnout 12 | 391+01 | RT | 60 | B1 | Right | 992 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 838 | Yes |  |
|  |  |  |  |  | F | Upstream | 666 | Yes |  |
| 47 | Turnout 13 | 392+59 | LT | 60 | B2 | Left | 838 | Yes |  |
| 48 | Turnout 14 | 400+84 | LT | 60 | B1 | Right | 992 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 838 | Yes |  |
|  |  |  |  |  | F | Upstream | 666 | Yes |  |
| 49 | Turnout 15 | 404+21 | RT | 60 | B1 | Right | 992 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 838 | Yes |  |
|  |  |  |  |  | F | Upstream | 666 | Yes |  |
| 50 | Turnout 16 | 417+02 | LT | 60 | B1 | Right | 992 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 838 | Yes |  |
|  |  |  |  |  | F | Upstream | 666 | Yes |  |
| 51 | Turnout 17 | 417+85 | LT | 60 | B1 | Right | 992 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 838 | Yes |  |
|  |  |  |  |  | F | Upstream | 666 | Yes |  |
| 52 | Turnout 18 | 419+98 | LT | 60 | B1 | Right | 992 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 838 | Yes |  |
|  |  |  |  |  | F | Upstream | 666 | Yes |  |
| 53 | Black Hat Rd | $427+63$ | LT | 70 | B1 | Right | 1158 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 978 | Yes |  |
|  |  |  |  |  | F | Upstream | 777 | Yes |  |
| 54 | Turnout 19 | 444+62 | RT | 70 | B1 | Right | 1158 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 978 | Yes |  |
|  |  |  |  |  | F | Upstream | 777 | Yes |  |
| 55 | Turnout 20 | 453+20 | LT | 70 | B1 | Right | 1158 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 978 | Yes |  |
|  |  |  |  |  | F | Upstream | 777 | Yes |  |
| 56 | Turnout 21 | 465+26 | LT | 70 | B1 | Right | 1158 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 978 | Yes |  |
|  |  |  |  |  | F | Upstream | 777 | Yes |  |
| 57 | Turnout 22 | 470+57 | RT | 70 | B1 | Right | 1158 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 978 | Yes |  |
|  |  |  |  |  | F | Upstream | 777 | Yes |  |
| 58 | Turnout 23 | 499+75 | RT | 70 | B1 | Right | 1158 | No* | 1062 |
|  |  |  |  |  | B1/B2 | Left | 978 | Yes |  |
|  |  |  |  |  | F | Upstream | 777 | Yes |  |


| Intersection/ Turnout |  | Station | Offset | NM 264 <br> Design <br> Speed <br> (mph) | ISD Criteria | Sight Triangle | Min. ISD Value (ft) | Meets Standard | Deficient ISD Value <br> (ft) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 59 | Turnout 24 | 530+98 | LT | 70 | B1 | Right | 1158 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 978 | Yes |  |
|  |  |  |  |  | F | Upstream | 777 | Yes |  |
| 60 | Defiance Draw Rd | 536+52 | RT | 70 | B1 | Right | 1158 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 978 | Yes |  |
|  |  |  |  |  | F | Upstream | 777 | Yes |  |
| 61 | Cove Rd | 540+59 | LT | 70 | B1 | Right | 1158 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 978 | Yes |  |
|  |  |  |  |  | F | Upstream | 777 | Yes |  |
| 62 | Wildcat Dr | 573+91 | RT | 70 | B1 | Right | 1158 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 978 | Yes |  |
|  |  |  |  |  | F | Upstream | 777 | Yes |  |
| 63 | Turnout 25 | 586+95 | LT | 70 | B1 | Right | 1158 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 978 | No | 790 |
|  |  |  |  |  | F | Upstream | 777 | Yes |  |
| 64 | Turnout 26 | 589+38 | RT | 70 | B1 | Right | 1158 | No * | 790 |
|  |  |  |  |  | B1/B2 | Left | 978 | Yes |  |
|  |  |  |  |  | F | Upstream | 777 | Yes |  |
| 65 | Turnout 27 | 628+09 | LT | 70 | B1 | Right | 1158 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 978 | Yes |  |
|  |  |  |  |  | F | Upstream | 777 | Yes |  |
| 66 | Winchester Rd | 656+48 | LT | 70 | B1 | Right | 1158 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 978 | Yes |  |
|  |  |  |  |  | F | Upstream | 777 | Yes |  |
| 67 | Turnout 28 | 657+24 | RT | 70 | B1 | Right | 1158 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 978 | Yes |  |
|  |  |  |  |  | F | Upstream | 777 | Yes |  |
| 68 | Turnout 29 | 670+05 | LT | 70 | B1 | Right | 1158 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 978 | Yes |  |
|  |  |  |  |  | F | Upstream | 777 | Yes |  |
| 69 | Turnout 30 | 669+98 | RT | 70 | B1 | Right | 1158 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 978 | Yes |  |
|  |  |  |  |  | F | Upstream | 777 | Yes |  |
| 70 | Turnout 31 | 676+79 | RT | 70 | B1 | Right | 1158 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 978 | Yes |  |
|  |  |  |  |  | F | Upstream | 777 | Yes |  |
| 71 | HighCountryRd Rd | $685+60$ | LT | 70 | B1 | Right | 1158 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 978 | No | 733 |
|  |  |  |  |  | F | Upstream | 777 | Yes |  |


| Intersection/ Turnout |  | Station | Offset | NM 264 Design Speed (mph) | ISD Criteria | Sight <br> Triangle | Min. ISD Value (ft) | Meets Standard | Deficient ISD Value <br> (ft) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 72 | Horse View Rd | 694+51 | RT | 70 | B1 | Right | 1158 | No * | 860 |
|  |  |  |  |  | B1/B2 | Left | 978 | No | 772 |
|  |  |  |  |  | F | Upstream | 777 | Yes |  |
| 73 | Turnout 32 | 712+77 | LT | 70 | B1 | Right | 1158 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 978 | Yes |  |
|  |  |  |  |  | F | Upstream | 777 | Yes |  |
| 74 | Spring Valley Rd | 745+66 | LT | 70 | B1 | Right | 1158 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 978 | Yes |  |
|  |  |  |  |  | F | Upstream | 777 | Yes |  |
| 75 | Smooth <br> Rock Rd | 768+87 | LT | 70 | B1 | Right | 1158 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 978 | Yes |  |
|  |  |  |  |  | F | Upstream | 777 | Yes |  |
| 76 | Turnout 33 | 769+45 | RT | 70 | B1 | Right | 1158 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 978 | Yes |  |
|  |  |  |  |  | F | Upstream | 777 | Yes |  |
| 77 | Green Meadows Rd | 816+90 | LT | 70 | B1 | Right | 1158 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 978 | Yes |  |
|  |  |  |  |  | F | Upstream | 777 | Yes |  |
| 78 | Rock Springs Rd | $816+90$ | LT | 70 | B1 | Right | 1158 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 978 | Yes |  |
|  |  |  |  |  | F | Upstream | 777 | Yes |  |
| 79 | Turnout 34 | 857+79 | LT | 70 | B1 | Right | 1158 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 978 | Yes |  |
|  |  |  |  |  | F | Upstream | 777 | Yes |  |
| 80 | Turnout 35 | 858+63 | RT | 70 | B1 | Right | 1158 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 978 | Yes |  |
|  |  |  |  |  | F | Upstream | 777 | Yes |  |
| 81 | Turnout 36 | 877+29 | LT | 70 | B1 | Right | 1158 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 978 | Yes |  |
|  |  |  |  |  | F | Upstream | 777 | Yes |  |
| 82 | Turnout 37 | 885+54 | LT | 70 | B1 | Right | 1158 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 978 | Yes |  |
|  |  |  |  |  | F | Upstream | 777 | Yes |  |
| 83 | Turnout 38 | 889+46 | RT | 70 | B1 | Right | 1158 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 978 | Yes |  |
|  |  |  |  |  | F | Upstream | 777 | Yes |  |
| 84 | Turnout 39 | 894+55 | LT | 70 | B1 | Right | 1158 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 978 | Yes |  |
|  |  |  |  |  | F | Upstream | 777 | Yes |  |


| Intersection/ Turnout |  | Station | Offset | NM 264 Design Speed (mph) | $\begin{aligned} & \text { ISD } \\ & \text { Criteria } \end{aligned}$ | Sight Triangle | Min. ISD Value (ft) | Meets Standard | Deficient ISD Value <br> (ft) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 85 | Turnout 40 | 901+49 | RT | 60 | B1 | Right | 992 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 838 | Yes |  |
|  |  |  |  |  | F | Upstream | 666 | Yes |  |
| 86 | Windy Mesa Dr | 908+79 | RT | 60 | B1 | Right | 992 | No | 750 |
|  |  |  |  |  | B1/B2 | Left | 838 | Yes |  |
|  |  |  |  |  | F | Upstream | 666 | Yes |  |

* During the analysis of intersection sight distance per AASHTO requirement, 11 turnouts failed to meet the AASHTO design standard however per the NMDOT SAMM, Chapter 8, Section F, pg. 88, if the median can safely store the turning or crossing vehicle ( 20 -feet or greater), then the sight distance may consider a two stop condition. The existing median is 24 feet wide.


### 6.8 TRAFFIC OPERATIONS ANALYSIS

6.8.1 Intersection Operations

Synchro 11 software was used for LOS analysis of the study intersection in this segment. On NM 264 at P\&M Road/Tse Bonito Ridge Road (unsignalized), all critical movements operate at LOS D or better for existing conditions for both the AM and PM peak hours.

- NM 264 at P\&M Road/Tse Bonito Ridge Road at MP 1.5 (Unsignalized) - Refer to Table 21.
- The northbound approach of the unsignalized intersection operates at LOS E during the AM peak hour and LOS F during the PM peak hour scenario with projected volumes and existing geometric conditions.
- The southbound left-turn approach operates at LOS F during both the AM and PM peak hour scenarios with projected volumes and existing geometric conditions.
- The traffic volume for these approaches is minimal and it is not uncommon for minor approaches along major roadways to have a high delay. With professional engineering judgement, it can be concluded that a little longer delay would not affect the overall functionality because there are only 24 southbound left-turning vehicles and 4 northbound left-turning vehicles.

Table 21. LOS Summary for P\&M Road/Tse Bonito Ridge Road and NM 264 Intersection (MP 1.5)

| Segment |  |  | 2022 Existing Scenario |  | 2042 HorizonScenario |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | $\begin{gathered} \text { Delay } \\ \text { (Sec./Veh.) } \end{gathered}$ | LOS | $\begin{gathered} \text { Delay } \\ \text { (Sec./Veh.) } \end{gathered}$ | LOS |
|  | AM Peak | EBL | 9.9 | A | 12.6 | B |
|  |  | WBL | 0.0 | A | 0.0 | A |
|  |  | NBL | 21.4 | C | 46.4 | E |
|  |  | SBL | 29.6 | D | 94.6 | F |
|  |  | SBR | 11.7 | B | 15.0 | B |
|  | PM Peak | EBL | 8.6 | A | 9.5 | A |
|  |  | WBL | 10.4 | B | 13.5 | B |
|  |  | NBL | 31.7 | D | 89.7 | $F$ |
|  |  | SBL | 31.0 | D | 137.4 | F |
|  |  | SBR | 10.2 | B | 11.5 | B |

6.8.2 Highway Segment Operations

HCS software was used to analyze the highway segment LOS. Both directions of Segment 2 are expected to operate at LOS C or better for existing conditions for both the AM and PM peak hours. Refer to Table 22 for detailed LOS, V/C ratio, and speed information.

Table 22. LOS Summary for Roadway Segment 2

| Segment |  |  | LOS | V/C | Average Travel Speed (mph) |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | 2022 ExistingScenario | AM peak | A | 0.24 | 59.5 |
|  |  | PM peak | B | 0.36 | 59.5 |
|  | 2042 HorizonScenario | AM peak | B | 0.35 | 59.5 |
|  |  | PM peak | C | 0.53 | 59.5 |

For detailed operational analysis information, refer to the TNA report in Appendix B.
6.9 ACCESS MANAGEMENT

As defined in the NMDOT SAMM, Segment 2 of the NM 264 corridor is classified as a Rural Principal Arterial (RPA). Through this segment, there are 20 unsignalized side streets and 40turnouts/driveways that access both private and public properties.
According to the NMDOT SAMM, the minimum spacing of full access unsignalized intersections is 2,640 feet on RPA highways with posted speed limits greater than 55 mph . For driveway spacing with traversable medians, the minimum spacing is 775 feet for posted speed limits greater than 55 mph . Through Segment 2, the posted speed changes from 55 to 65 mph at MP 6.6.

See Figure 38 for access locations and Table 23 For access spacing compliance.


Figure 38. Segment 2 Access Locations

$$
\frac{\text { LEGEND }}{x \quad \text { TURNOUT NUMBER }}
$$





Continued Figure 38. Segment 2 Access Locations
Turnouts 32 to 40)


TRANSPORTATTONTM


Continued Figure 38. Segment 2 Access Locations
(Turnouts 53 to 59)

| $\frac{\text { LEGEND }}{x}$ TUANOUT NUMBER |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |





Continued Figure 38. Segment 2 Access Locations (Turnouts 77 to 86)

| Table 23. Segment 2 Access Spacing |  |  |  |  |  | Meets Standard |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  | SAMM STANDARDS |  |
|  | Intersection or Driveway/Turnout | Station | Offset | Distance to Access Point | Minimum Intersection or Driveway/Turnout Spacing <br> (ft) |  |
| 27 | Turnout 1 | 139+06 | LT | 557 | 775 | No |
| 28 | Turnout 2 | 156+82 | RT | 1776 | 775 | Yes |
| 29 | Old Coal Mine | 162+25 | LT | 543 | 775 | No |
| 30 | P \& M Rd | 181+25 | LT | 1900 | 775 | Yes |
| 31 | Tse Bonito Ridge Rd | 181+28 | RT | 1903 | 775 | Yes |
| 32 | Star Route 5 | 212+64 | LT | 3136 | 775 | Yes |
| 33 | Garden Ln | 265+27 | RT | 5263 | 775 | Yes |
| 34 | Turnout 3 | 265+46 | LT | 5282 | 775 | Yes |
| 35 | Turnout 4 | 270+56 | LT | 510 | 775 | No |
| 36 | Turnout 5 | 275+90 | RT | 534 | 775 | No |
| 37 | Route 5 | 280+46 | LT | 456 | 775 | No |
| 38 | Turnout 6 | $314+18$ | LT | 3372 | 775 | Yes |
| 39 | Defiance | 349+54 | RT | 6908 | 775 | Yes |
| 40 | Turnout 7 | 367+18 | RT | 1764 | 775 | Yes |
| 41 | Turnout 8 | 378+57 | LT | 1139 | 775 | Yes |
| 42 | Turnout 9 | $383+22$ | LT | 465 | 775 | No |
| 43 | Turnout 10A | 385+35 | RT | 213 | 775 | No |
| 44 | Turnout 10B | 387+04 | RT | 382 | 775 | No |
| 45 | Turnout 11 | 387+47 | LT | 425 | 775 | No |
| 46 | Turnout 12 | 391+01 | RT | 354 | 775 | No |
| 47 | Turnout 13 | 392+59 | LT | 158 | 775 | No |
| 48 | Turnout 14 | 400+84 | LT | 825 | 775 | Yes |
| 49 | Turnout 15 | $404+21$ | RT | 337 | 775 | No |
| 50 | Turnout 16 | 417+02 | LT | 1281 | 775 | Yes |
| 51 | Turnout 17 | $417+85$ | LT | 83 | 775 | No |
| 52 | Turnout 18 | 419+98 | LT | 213 | 775 | No |
| 53 | Black Hat Rd | 427+63 | LT | 765 | 775 | No |
| 54 | Turnout 19 | 444+62 | RT | 1699 | 775 | Yes |
| 55 | Turnout 20 | 453+20 | LT | 858 | 775 | Yes |
| 56 | Turnout 21 | 465+26 | LT | 1206 | 775 | Yes |
| 57 | Turnout 22 | 470+57 | RT | 531 | 775 | No |
| 58 | Turnout 23 | 499+75 | RT | 2918 | 775 | Yes |


| Intersection or Driveway/Turnout |  | Station | Offset | Distance to Access Point | SAMM <br> STANDARDS <br> Minimum <br> Intersection or <br> Driveway/Turnout <br> Spacing <br> (ft) | Meets Standard |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |
| 59 | Turnout 24 | 530+98 | LT | 3123 | 775 | Yes |
| 60 | Defiance Draw Rd | 536+52 | RT | 554 | 775 | No |
| 61 | Cove Rd | 540+59 | LT | 407 | 775 | No |
| 62 | Wildcat Dr | 573+91 | RT | 3332 | 775 | Yes |
| 63 | Turnout 25 | 586+95 | LT | 1304 | 775 | Yes |
| 64 | Turnout 26 | 589+38 | RT | 243 | 775 | No |
| 65 | Turnout 27 | 628+09 | LT | 3871 | 775 | Yes |
| 66 | Winchester Rd | 656+48 | LT | 2839 | 775 | Yes |
| 67 | Turnout 28 | 657+24 | RT | 2915 | 775 | Yes |
| 68 | Turnout 29 | 670+05 | LT | 1281 | 775 | Yes |
| 69 | Turnout 30 | 669+98 | RT | 1274 | 775 | Yes |
| 70 | Turnout 31 | 676+79 | RT | 681 | 775 | No |
| 71 | High Country Rd | 685+60 | LT | 881 | 775 | Yes |
| 72 | Horse View Rd | 694+51 | RT | 891 | 775 | Yes |
| 73 | Turnout 32 | 712+77 | LT | 1826 | 775 | Yes |
| 74 | Spring Valley Rd | 745+66 | LT | 3289 | 775 | Yes |
| 75 | Smooth Rock Rd | 768+87 | LT | 2321 | 775 | Yes |
| 76 | Turnout 33 | 769+45 | RT | 2379 | 775 | Yes |
| 77 | Rock Spring Rd | 806+78 | RT | 3733 | 775 | Yes |
| 78 | Green Meadows Rd | 816+90 | LT | 1012 | 775 | Yes |
| 79 | Turnout 34 | 857+79 | LT | 4089 | 775 | Yes |
| 80 | Turnout 35 | 858+63 | RT | 4173 | 775 | Yes |
| 81 | Turnout 36 | 877+29 | LT | 1866 | 775 | Yes |
| 82 | Turnout 37 | 885+54 | LT | 825 | 775 | Yes |
| 83 | Turnout 38 | 889+46 | RT | 392 | 775 | No |
| 84 | Turnout 39 | 894+55 | LT | 509 | 775 | No |
| 85 | Turnout 40 | 901+49 | RT | 694 | 775 | No |
| 86 | Windy Mesa Dr | 908+79 | RT | 730 | 775 | No |

### 6.10 EXISTING ROADWAY ELEMENTS

### 6.10.1 Bicycle Facilities

NM 264 is designated as a Tier 2 bike route in the NMDOT New Mexico Prioritized Statewide Bicycle Network Plan. In Segment 2, the existing outside shoulder, for eastbound and westbound, varies from 10 to 15 feet, which is acceptable for bicycle use. The existing shoulder width allows for bicycles to have a 5 -foot-wide lane and approximately a 3 -foot buffer to the edge of the existing rumble strip (Figure 39)


Figure 39. Segment 2 Existing Shoulder

### 6.10.2 Pavement

A Pavement Condition Assessment Report was completed for NM 264, MP 10 to MP 14, and this section was rated to be "fair." The remainder of the segment has similar visual issues as MP 10 to MP 14, showing evidence of multiple pavement failures such as longitudinal cracking, alligator cracking, and rutting (Figure 40).


Figure 40. Segment 2 Pavement Condition
6.10.3 Clear Zone

Segment 2 has a posted speed that varies from 55 mph (design speed $=60 \mathrm{mph}$ ) to 65 mph (design speed $=70 \mathrm{mph}$ ) and an ADT above 6,000. The AASHTO Roadside Design Guide, 2011 $4^{\text {th }}$ edition, Table 3-1, Suggested Clear-Zone Distances in Feet from Edge of Through Traveled Lane, show that for a speed of 60 mph the clear zone is 30 to 32 feet and for 70 mph the clear zone is 30 to 34 feet.
This segment is a rural section of NM 264 and so the street signs within the clear zone along the corridor are considered to be breakaway obstacles and are not obstacles within the clear zone. The existing culvert pipe slope blankets with safety grates meet the traversable criteria and are not considered obstacles. The existing pipe culvert end sections and the concrete box culverts within the clear zone are considered obstacles.

### 6.10.4 Guardrai

Segment 2 has multiple guardrail systems along both the eastbound and westbound sides of the NM 264 corridor protecting existing drainage structures or steep slopes. These guardrail systems do not meet the current FHWA requirement for TL-3 MASH and will need to be replaced, including updated length of need calculations.

### 6.10.5 Right-of-Way

ROW maps were obtained from NMDOT during the research process

- F-031-1(43), ROW Map
- F-036-1(2), ROW Map
- N-3(59)2, ROW Map
- ST-(F)-036-1(201), ROW Map, 1988

The majority of the ROW width for Segment 2 of NM 264 is 200 feet except near Curve 5, where the width varies from 200 to 295 feet. There are no encroachments in this segment.

### 6.10.6 Fencing

In Segment 2, the fencing is primarily along the existing ROW except at the larger drainage crossings. At these crossings, the fence line will angle and tie into the existing headwall, wingwall, bridge abutment, or culvert slope blanket. The fence lines appear to be in fair condition.
6.10.7 Utilities

Segment 2 has multiple utilities along the NM 264 corridor. These utilities are fiber optic, telephone line, and overhead electric lines

The buried fiber optic line runs along the north side of the NM 264 corridor approximately paralleling the ROW line. West of Rock Spring Road, at MP 12.7, a second fiber optic line starts and continues to the east for the rest of Segment 2. The fiber optic line is owned by Sacred Wind and Frontier Communications.
The overhead electric line starts along the south side of the NM 264 corridor but crosses NM 264 multiple times going from the south to north and north to south. The line also is both within and outside of the existing ROW throughout the Segment 2 corridor. The overhead electric line is owned by Continental Divide Electric Cooperative and PNM.

The buried telephone line runs along the north side of the NM 264 corridor approximately paralleling the ROW line. The line has short runs that divert in and out of the existing ROW along the entire segment. The telephone line is owned by Sacred Wind and Frontier Communications.

### 6.11 EXISTING DRAINAGE

Existing drainage conditions within Segment 2 can be classified primarily as cross conveyance features with several roadside ditches to direct flows to and through pipe culvert and/or driveway crossings. Similar to Segment 1, contributing watersheds generally drain from north to south toward the NM 264 alignment. However, it should be noted there are several areas where watersheds also drain from south to north, out falling into the Sand Wash. NM 264 is located in the valley floor of the surroundings terrain, paralleling Sand Wash for several miles. There is no roadway edge treatment; rather, on-site discharges are allowed to sheet flow off the alignment where they are captured by roadside ditches or follow the gradient of the surrounding terrain and eventually outfall into existing washes located throughout the segment. All cross culverts at driveways are nearly or completely filled with sediment and appear to be ineffective at conveying collected stormwater runoff.

Two items became very apparent within the segment. Multiple cross culverts appear close to structural failure because of significant scour and erosion at the outfall. The ability to repair will be limited given the proximity to the existing ROW. The erosion at the outfall appears to be in the form of headcuts that are migrating upstream, resulting in a perched pipe condition that only continues to exacerbate the condition. Figure 41 shows evidence of this kind of condition noted from the field review. Note the significant scour depth (measured as approximately 7 feet) and failure of the slope blanket


Figure 41. Segment 2 Scour Conditions
A full listing of drainage infrastructure located within Segment 2 and their rating (Table 24) was created based on a desktop review. Figure 42 is a map of all existing drainage infrastructure identified as a part of this study. Red linework indicates features identified in the field and confirmed by as-builts. NMDOT District 6 Maintenance has indicated there are multiple regions within Segment 2 where existing drainage infrastructure is inadequate, resulting in overtopping of the roadway and flooding of properties within the immediate region. Reference Appendix $C$ for the Drainage Report, which contains a complete narrative and assessment of the identified infrastructure as well as preliminary hydrologic and hydraulic analysis of the drainage characteristics within Segment 2.

Table 24. Segment 2 Drainage Inventory

| Drainage Feature/ Crossing ID | Description | Inlet(s) Condition | Outlet Condition | Action | Overall Rating |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 0.82 | 24" CMP; <br> Shoulder drop inlet (SDI) | Poor; SDI; located to north; major sediment | Unknown; located to south; appears to be in good condition; outside ROW; metal end section | - | Pending |
| 0.85 | $64^{\prime \prime} \times 23^{\prime \prime}$ <br> corrugated metal pipe arch (CMPA) | Good; located to north; concrete end section with safety grate bars | Unknown; located to south; appears to be in good condition; outside ROW | - | Pending |
| 1.04 | 24" CMP; SDI | Unknown | Unknown | - | Pending |
| 1.05 | 24" CMP | Unknown | Unknown | - | Pending |
| 1.20 | (3) $120^{\prime \prime} \times 144^{\prime \prime}$ Concrete box culvert (CBC) | Unknown; located to north; appears to be in good condition; outside ROW | Unknown; located to south; appears to be in good condition; outside ROW | - | Pending |
| 2.10 | 24" CMP; driveway | Good; located to east; metal end section | Poor; located to west; 70\% sediment; metal end section | Needs cleaning | Poor |
| 2.25 | 24" CMP; SDI | Unknown | Unknown | - | Pending |
| 2.40 | 24" CMP; SDI | Good; SDI; located to north; minor sediment | Unknown; storm drain culvert | Good | Good |
| 2.45 | $36 "$ CMP | Fair; located to north; major vegetation; concrete slope blanket with safety grate bars | Poor; located to south; major scour outside ROW; metal end section; wireenclosed riprap end treatment | Needs clearing and end treatment adjustment | Poor |


| Drainage Feature/ Crossing ID | Description | Inlet(s) Condition | Outlet Condition | Action | Overall Rating |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 2.55 | 36" CMP | Good; located to north; concrete slope blanket with safety grate bars | Good; located to south; minor bank erosion; metal end section; wireenclosed riprap end treatment; | None | Good |
| 2.65 | 30" CMP | Good; located to north; concrete slope blanket | Good; located to south; metal end section | None | Good |
| 2.75 | 30" CMP | Good; located to north; metal end section | Fair; located to south; minor vegetation; metal end section | Needs clearing | Fair |
| 2.80 | 30" CMP | Fair; located to north; minor vegetation; concrete end section | Fair; located to south; minor vegetation; concrete end section | Needs clearing | Fair |
| 2.85 | 30" CMP | Good; located to north; concrete end section | Fair; located to south; minor vegetation; metal end section | Needs clearing | Fair |
| 3.00 | (2) 36 " CMP | Poor; located to north; 80\% sediment and rocks; damaged pipe; concrete end section | Poor; located to south; 20\% sediment and rocks; major scour outside ROW; concrete end section | Needs cleaning and end treatment adjustment | Poor |
| 3.10 | (2) 30 " CMP | Fair; located to north; minor vegetation; concrete end section | Good; located to south outside ROW; minor vegetation; metal end section | Needs clearing | Fair |
| 3.12 | 24" CMP; driveway | Fair; located to east. Major vegetation; damaged pipe | Fair; located to west. Damaged pipe | Needs repair and clearing | Fair |


| Drainage Feature/ Crossing ID | Description | Inlet(s) Condition | Outlet Condition | Action | Overall Rating |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 3.20 | 24" CMP; driveway | Fair; located to east. Major vegetation; metal end section | Good; located to west | Needs clearing | Fair |
| 3.40 | (3) CMP | Fair; located to north outside ROW; major vegetation; concrete slope blanket | Fair; located to south outside ROW; major vegetation; concrete slope blanket | Needs cleaning | Fair |
| 3.45 | (2) 30 " CMP | Unknown | Unknown | - | Pending |
| 3.60 | 24" CMP | Unknown | Unknown | - | Pending |
| 3.80 | 24" CMP | Good; located to south; concrete slope blanket with safety grate bars | Good; located to north; concrete slope blanket with safety grate bars | None | Good |
| 4.60 | 36" CMP | Good; located to north; concrete slope blanket with safety grate bars | Unknown; located to south; potential scour | - | Pending |
| 4.80 | 174" CMP | Unknown; located to north outside ROW; large riprap tributary channels | Unknown; located to south outside ROW | - | Pending |
| 4.90 | 24" CMP; SDI | Unknown | Unknown | - | Pending |
| 5.10 | 30" CMP | Good; located to north; 20\% sediment; metal end section | Unknown; located to south outside ROW | - | Pending |
| 5.30 | 24" CMP; driveway | Poor; located to east; $90 \%$ sediment | Poor; located to west; 90\% sediment | Needs cleaning | Poor |
| 5.37 | 24" CMP; driveway | Fair; located to west; major vegetation | Fair; located to east; major vegetation | Needs clearing | Fair |


| Drainage Feature/ Crossing ID | Description | Inlet(s) Condition | Outlet Condition | Action | Overall Rating |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 5.40 | 24" CMP; driveway | Good; located to west; metal end section | Good; located to east; metal end section | None | Good |
| 5.42 | 24" CMP; driveway | Fair; located to west; minor vegetation; metal end section | Fair; located to east; minor vegetation; metal end section | Needs clearing | Fair |
| 5.43 | 24" CMP; driveway | Fair; located to west; minor vegetation; metal end section | Fair; located to east; minor vegetation; metal end section | Needs clearing | Fair |
| 5.50 | 24" CMP; driveway | Unknown | Unknown | - | Pending |
| 5.55 | 24" CMP; driveway | Fair; located to west; minor vegetation; metal end section | Fair; located to east; minor vegetation; metal end section | Needs clearing | Fair |
| 5.65 | 54" CMP | Unknown | Unknown | - | Pending |
| 5.80 | 24" CMP; driveway | Fair; located to west; minor debris; metal end section | Fair; located to east; minor debris; metal end section | Needs clearing | Fair |
| 5.85 | 24" CMP; SDI | Unknown; SDI | Unknown; storm drain culvert | - | Pending |
| 6.00 | 24" CMP; SDI | Fair; SDI; corrosion | Good; located to south; corrosion; concrete slope blanket with safety grate bars | Needs corrosion treatment | Fair |
| 6.15 | 24" CMP; driveway | Fair; located to west; minor vegetation metal end section | Fair; located to east; large rocks; minor vegetation | Needs clearing | Fair |
| 6.20 | (2) 54 " CMP | Good; located to north; minor debris | Unknown; located to south outside ROW; large debris (vehicles) in channel | - | Pending |


| Drainage Feature/ Crossing ID | Description | Inlet(s) Condition | Outlet Condition | Action | Overall Rating |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 6.21 | (2) 36 " CMP | Fair; located to west, minor vegetation | Poor; located to east; 60\% sediment | Needs cleaning and clearing | Poor |
| 6.45 | 24" CMP; SDI | Poor; located to south; major debris; concrete end section | Poor; SDI; located to north; major debris and sediment; corrosion | Needs cleaning | Poor |
| 6.50 | 24" CMP; driveway | Poor; located to west; 30\% sediment; major vegetation | Poor; located to east; $30 \%$ sediment; major vegetation | Needs cleaning and clearing | Poor |
| 6.70 | $\begin{aligned} & \text { (2) } 48^{\prime \prime} \times 72^{\prime \prime} \\ & \text { CMPA } \end{aligned}$ | Good; located to north; 10\% sediment; minor debris; concrete end section with safety grate bars | Good; located to south; 10\% sediment; metal end section; riprap bank protection | None | Good |
| 6.90 | 42" CMP | Fair; located to north; 10\% sediment; concrete end section with safety grate bars; minor damage to grate bars | Poor; located to south; 80\% sediment; minor vegetation; concrete end section with safety grate bars | Needs repair, cleaning, and clearing | Poor |
| 7.30 | 24" CMP | Fair; located to north; 40\% sediment; concrete end section with safety grate bars | Fair; located to south; concrete end section with safety grate bars; minor damage to grate bars | Needs repair and cleaning | Fair |
| 7.50 | 24" CMP; driveway | Poor; located to west; 100\% sediment | Poor; located to east; 80\% sediment | Needs cleaning | Poor |


| Drainage Feature/ Crossing ID | Description | Inlet(s) Condition | Outlet Condition | Action | Overall Rating |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 7.60 | 24" CMP | Good; 10\% sediment; concrete end section with safety grate bars | Good; located to north; pipe debris inside culvert; concrete end section with safety grate bars | None | Good |
| 7.70 | 24" CMP | Good; located to south; concrete end section with safety grate bars | Poor; located to north; 100\% sediment; major vegetation | Needs cleaning and clearing | Poor |
| 8.10 | (10) 48" CMP | Poor; located to north; 30\% sediment; major vegetation; concrete end section | Poor; located to south; 30\% sediment; concrete end section | Needs cleaning and clearing | Poor |
| 8.30 | 18" CMP | Poor; located to west; 100\% sediment; major debris | Poor; located to east; major debris | Needs cleaning and clearing | Poor |
| 8.40 | 72" CMP | Unknown; located to north outside of ROW | Unknown; located to south outside of ROW | - | Pending |
| 8.60 | 164" CMP | Unknown; located to north outside of ROW | Unknown; located to south outside of ROW | - | Pending |
| 8.90 | 24" CMP; driveway | Poor; located to west; 60\% sediment | Poor; located to east; 60\% sediment | Needs cleaning | Poor |
| 9.00 | 36" CMP | Unknown | Unknown | - | Pending |
| 9.60 | 54" CMP | Good; located to north; concrete end section with safety grate bars | Unknown; located to south | - | Pending |
| 9.80 | $\text { (3) } 128^{\prime \prime} \times 48^{\prime \prime}$ <br> CMPA | Unknown; located to north outside of ROW | Good; located to south; concrete end section | - | Pending |
| 9.90 | 24" CMP; driveway | Poor; located to east; 100\% sediment | Poor; located to east; 100\% sediment; metal end section | Needs cleaning | Poor |


| Drainage Feature/ Crossing ID | Description | Inlet(s) Condition | Outlet Condition | Action | Overall Rating |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 10.2 | 24" CMP | Median inlet. <br> Apparent south side of road. No visible structural damage. No sediment. | Apparent north side of road. No visible structural damage. About 80\% filled with sediment. No evidence of scour. | Needs cleaning | Poor |
| 10.3 | 30" CMP | Filled 100\% with sediment | Location unknown. | Needs cleaning | Poor |
| 10.5 | 30" CMP | Apparent south side of road. No visible structural damage. No sediment. | Apparent north side of road. No visible structural damage. Filled $100 \%$ with sediment. No evidence of scour. | Needs cleaning | Poor |
| 10.7 | 24" CMP | No visible structural damage. Signs of debris collection. No evidence of scour. | No visible structural damage. About 50\% filled with sediment. No evidence of scour. | Needs cleaning | Poor |
| 11.0 | 24" CMP | Filled 100\% with sediment | Filled 100\% with sediment | Needs cleaning | Poor |
| 11.2 | 24" CMP | Apparent west side of road. No visible structural damage. About $50 \%$ filled with sediment. | Apparent east side of road. No visible structural damage. About $70 \%$ filled with sediment. No evidence of scour. | Needs cleaning | Poor |
| 11.6 | 24" CMP | No visible structural damage. No sediment | Apparent east side of driveway. No structural damage. About $50 \%$ filled with sediment. No evidence of scour. | Needs cleaning | Poor |


| Drainage Feature/ Crossing ID | Description | Inlet(s) Condition | Outlet Condition | Action | Overall Rating |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 11.61 | (2) 42 " CMP | Apparent south side of road. No visible structural damage. No sediment. | Apparent north side of road. No structural damage. About $50 \%$ filled with sediment. No evidence of scour. | Needs cleaning | Poor |
| 11.7 | 36" CMP | Apparent south side of road. No visible structural damage. No sediment. | Apparent north side of road. No structural damage. About $10 \%$ filled with sediment. No evidence of scour. | Needs cleaning | Fair |
| 12.0 | 54" CMP | Apparent south side of road. No structural damage. No sediment. | Apparent north side of road. No structural damage. No sediment. Major scour downstream (north) from culvert. | Scour attention required. | Poor |
| 12.3 | 30" CMP | Apparent south side of road. No visible structural damage. No sediment. | Apparent north side of road. No structural damage. No sediment. Major scour downstream (north) from culvert. | Scour attention required. | Poor |
| 12.4 | 30" CMP | Apparent south side of road. No visible structural damage. No sediment. | Apparent north side of road. No structural damage. No sediment. No evidence of scour. | None | Good |


| Drainage Feature/ Crossing ID | Description | Inlet(s) Condition | Outlet Condition | Action | Overall Rating |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 12.5 | 24" CMP | No visible structural damage. No apparent sediment. | No visible structural damage. No sediment deposition. Significant scour downstream (north) from culvert. | Scour attention required. | Poor |
| 12.7 | (2) 24 " CMP | Existing end section. No structural damage (both). 24" dia. Culvert about $25 \%$ filled with sediment. 36" dia. Culvert about $80 \%$ filled with sediment. | Existing end section. No structural damage. 70\% filled with sediment (both). No evidence of scour. | Needs cleaning | Poor |
| 12.71 | $36 " \times 72$ " CBC | No visible structural damage. <br> Approximately $25 \%$ of opening filled with sediment. | No visible structural damage. Approximately $75 \%$ outlet filled with sediment. | Needs cleaning | Poor |
| 12.9 | 24" CMP | Median inlet. No visible structural damage. No deposition of sediment. | No visible structural damage. No deposition of sediment. Significant scour downstream (north) from culvert. | Needs end treatment | Poor |


| Drainage Feature/ Crossing ID | Description | Inlet(s) Condition | Outlet Condition | Action | Overall Rating |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 12.91 | 30" CMP | No visible structural damage. No apparent sediment. | No visible structural damage. <br> Approximately $25 \%$ reduction in cell opening due to sediment. No visible evidence of scour. |  | Good |
| 13.2 | 54" CMP | No visible structural damage. No apparent sediment. | Evidence of structural damage. Major scour and erosion under concrete structure. |  | Poor |
| 13.4 | 24" CMP | Poor; 100\% sediment | Poor; 100\% sediment |  | Poor |
| 13.5 | $\begin{aligned} & \text { (6) } 96^{\prime \prime} \times 72^{\prime \prime} \\ & \text { CBC } \end{aligned}$ | No visible structural damage. Far west barrel approximately $30 \%$ reduction in cell opening due to sediment. | No visible structural damage. Far west barrel approximately $30 \%$ reduction in cell opening due to sediment. No evidence of scour. |  | Fair |
| 13.9 | $\begin{aligned} & \text { (2) } 36^{\prime \prime} \times 96^{\prime \prime} \\ & \text { CBC } \end{aligned}$ | No visible structural damage. No apparent sediment deposition. Significant vegetation in channel. | No visible structural damage. No apparent sediment deposition. No evidence of scour at outfall. Significant vegetation on top of CBC headwall. |  | Good |


| Drainage Feature/ Crossing ID | Description | Inlet(s) Condition | Outlet Condition | Action | Overall Rating |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 14.20 | 48" CMP | Good; located to north; minor debris; concrete end section with safety grate bars | Good; concrete end section with safety grate bars | None | Good |
| 14.30 | 24" CMP; driveway | Poor; located to west; 100\% sediment; major vegetation | Poor; located to east; $50 \%$ sediment | Needs cleaning and clearing | Poor |
| 14.55 | $\begin{array}{\|l} \hline \text { (2) } 70^{\prime \prime} \times 30^{\prime \prime} \\ \text { CBC } \end{array}$ | Unknown | Unknown | - | Pending |
| 14.65 | 12" CMP; driveway | Unknown | Unknown | - | Pending |
| 14.70 | 48" CMP | Good; located to north; minor vegetation | Good; located to north; 20\% sediment; minor debris | None | Good |
| 14.80 | 18" CMP; driveway | Poor: located to east; 100\% sediment | Poor; located to west; 90\% sediment; metal end section | Needs cleaning | Poor |
| 15.00 | 24" CMP; driveway | Unknown; located to east | Poor: located to west; 100\% sediment | - | Pending |
| 15.10 | 60" CMP | Good; located to north; minor debris; concrete end section | Fair; located to south; major debris; concrete end section | Needs clearing | Fair |
| 15.20 | 24" CMP; driveway | Poor; located to east; 100\% sediment | Poor; located to east; 100\% sediment; concrete end section | Needs cleaning | Poor |



Figure 42. Segment 2 Drainage Feature Locations and Flow Patterns


Continued Figure 42. Segment 2 Drainage Feature Locations and Flow Patterns





LEGEND


Continued Figure 42. Segment 2 Drainage Feature Locations and Flow Patterns

Segment 2 of NM 264 alignment bisects multiple FEMA Zone A effective floodplains. To further understand their characteristics and potential flooding at the NM 264 alignment, a two-dimensional hydraulic model was developed. Coordination with the local floodplain administrator will be conducted to confirm the results and assess local floodplain permitting requirements. As the study progresses, the crossing will be further analyzed with proposed conditions features for a final analysis of the recommended improvements. Figure 43 is a map of the preliminary twodimensional analysis


Figure 43. FEMA Floodplain Map
Results of the preliminary analysis indicate the culverts at Sta 194+00 and Sta 200+00 (MP 11.6 to MP 11.7) combine with intermingled flows and result in overtopping. The flow is conveyed eastward along the southern ROW and results in significant ponding in the eastbound lanes.
The proposed improvements within Segment 2 do not appear to adversely affect the associated floodplain. For further discussion on the effective floodplain and drainage conditions within Segment 2, reference Appendix C for the Drainage Report

### 6.12 GEOTECHNICAL EVALUATION

A geologic and geotechnical literature search, review of as-built plans, and site reconnaissance were performed, and a Preliminary Geotechnical and Scoping Report was prepared for the

NM 264 improvements from MP 0 to MP 16. Based on the information obtained from the literature search and site reconnaissance, the project is suitable for the planned improvements. The following geotechnical considerations were identified.

### 6.12.1 Site Soils and Bedrock

The site surface and subsurface conditions will likely consist of interbedded clays, silts, sands, and gravels in alluvial and colluvium deposits. Bedrock is anticipated to be encountered at depths as shallow as one foot to greater than about 50 feet below existing site grade. The surface and shallow subsurface soils along the project alignment will likely exhibit a tendency for low to moderate compression and/or none to moderate expansion with increasing load and when elevated in moisture content. It is anticipated the shallow soils will exhibit low to moderate bearing capacity. The deeper soils and bedrock are anticipated to exhibit moderate to high load-bearing capability. The shallow soils may be recompacted to increase bearing capacity and reduce settlement. It is expected that the soils will have very poor to good quality pavement support characteristics.

### 6.12.2 Groundwater

Groundwater along the project alignment is anticipated to be encountered at depths greater than about 30 to 50 feet below existing site grade, excluding areas located within and adjacent to existing drainages. Regional groundwater is anticipated to have significant seasonal variations and may be encountered at depths near the ground surface when drainages, arroyos, and irrigation canals are flowing. In addition, given the relatively shallow clays and bedrock along most of the project alignment, development of perched groundwater conditions is likely with seasonal variations.
6.12.3 Construction and Excavation

On-site well/poorly graded sands and silty sands and gravels are anticipated to be suitable for use as structural backfill beneath drainage structures and pavements. On-site clays will not be suitable for use as structural backfill. On-site soils are anticipated to be suitable for use as backfill/ embankment beneath new pavements. However, clay soils may require stabilization/modification prior to use below new pavements depending on NMDOT minimum R-value and design requirements.

Shallow excavations into the on-site soils are expected to be accomplished with conventional earthwork equipment. Some low-density and elevated moisture content subgrade soils were encountered in several borings and should be anticipated along portions of the alignment. These subgrade soils may require drying or stabilization/densification during construction. Caving soils should be anticipated on account of loose, granular soil conditions. Dense to very dense sands
and gravels or very hard bedrock may be encountered and may require additional effort, heavyduty, and/or specialized equipment for excavation and deep foundation construction/installation.

### 6.12.4 SIopes

For permanent slopes in compacted fill and cut areas with maximum heights of less than 5 to 10 feet, recommended maximum slopes for on-site soils and bedrock materials range from 0.75:1 to 3:1 (horizontal:vertical).

## 125 Pavement

The existing pavement section thickness and material types along the project alignment are variable. The pavement materials consisted of asphalt concrete and untreated base course. The asphalt concrete thickness ranges from approximately 3.5 to 10 inches. The thickness of the untreated base course ranges from 3 to 17 inches

The preliminary and final pavement design reports will be prepared by the NMDOT PMDB. The information in this report will be used by NMDOT to develop the recommended new pavement section thickness
The anticipated subgrade soils along the project alignment will likely consist of sands with varying amounts of clay, silt and gravel, clays with varying amounts sand and gravel, silt with varying amounts of sand and gravel, and gravel with varying amounts of silt and sand. The anticipated subgrade soils will likely be classified as A-1-a, A-2-4, A-4, A-6, and A-7-6 in accordance with the AASHTO Soil Classification System.

### 6.13 EXISTING BRIDGE EVALUATIONS

The existing structural condition of each bridge or culvert structure with an assigned bridge number was evaluated for this study. The latest routine bridge inspection reports for each structure were provided by NMDOT and reviewed by HDR. On December 8, 2022, HDR also completed a field observation visit at each of these structures. In attendance for HDR was Danton Bean and Kelly Heath.
6.13.1 Bridge No. 8741

Bridge No. 8741, at MP 1.18, is a three-cell concrete box culvert (CBC) with 12 -foot x 10 -foot cells at NM 264 and Coal Mine Wash. The bridge inspection report documented an inspection conducted on June 16, 2020 and indicates that the culvert is rated as 6 (Satisfactory Condition). The Health Index and Sufficiency Ratings were 83.55 and 70.00 , respectively.

## Concrete Box

The top side of the top slab was unobservable because of the asphalt overlay and the fill material The underside of the top slab has transverse, longitudinal, and map cracks with leaching and honeycombing. One diagonal crack with heavy leaching was noted at midspan of the box (Figure 44). During a field visit with the NMDOT Bridge Bureau on July 5, 2023, active leaching was observed in a significant portion of the structure. The roadway typical section includes a median with a low point, which has signs of ponding from roadway runoff (Figure 44). The bottom slab was unobservable because of sediment deposition. The box walls have minor vertical, diagonal horizontal, and map cracks with some minor leaching and honeycombing. There is moderate to heavy leaching in some areas.


Figure 44. Bridge No. 8741: Midspan Diagonal Crack with Leaching (left) and Low Spot in Roadway Median (right)

Wingwalls and Headwalls
The concrete wingwalls at the inlet and outlet have minor vertical, horizontal, diagonal, and map cracks. The wingwall to barrel connection at the northwest corner of the structure has a major vertical crack. The concrete headwalls have minor spalling and honeycombing

## Rating

A bridge's load rating model provides bridge capacity information for normal operations and overload permit vehicles. The NMDOT Bridge Design Procedures and Guide requires that all new designs have a minimum AASHTOWare Bridge Rating inventory rating of HS25 (Highway [H], Semi-trailer [S], 25-ton [25]) and an operating rating of HS42. The rating reported on the bridge inspection reports indicates that Bridge No. 8741 has an Load Factor Rating (LFR) rating of HS19.8 (Inventory) and HS39.6 (Operating). While the inventory rating does not meet the minimum for new bridges, the operating rating results in no posting requirements at this structure.
6.13.2 Bridge No. 10017

Bridge No. 10017, at MP 3.39, is a three-barrel corrugated metal pipe (CMP) at NM 264 and Tse Bonito Wash (Figure 45).


Figure 45. Bridge No. 10017 Inlet
The latest routine bridge inspection report, documenting an inspection conducted on May 18, 2021, indicates that culvert is rated as 6 (Satisfactory Condition). The Health Index and Sufficiency Ratings were 99.07 and 69.60, respectively.

## Steel Culvert

The steel culverts have minor rusting and leaching. The bridge inspection report notes some bulging in barrel 3.

## Slope Paving

There are minor cracks in the slope paving

## Rating

A bridge's load rating model provides bridge capacity information for normal operations and overload permit vehicles. The NMDOT Bridge Design Procedures and Guide requires that all new designs have a minimum AASHTOWare Bridge Rating inventory rating of HS25 and operating rating of HS42. The rating reported on the bridge inspection reports indicates that Bridge No. 10017 has an LFR rating of HS19.8 (Inventory) and HS54.5 (Operating). While the inventory rating does not meet the minimum for new bridges, the operating rating results in no posting requirements at this structure.
6.13.3 Bridge No. 8626 and No. 8627

Bridge No. 8626 and No. 8627, at MP 4.2, are twin bridges at NM 264 and Coal Mine Haul Road (Figure 46). These bridges are three spans each, continuous, with 54-, 63-, and 54-foot spans.

They are rolled steel girder bridges with concrete stub abutments and concrete pile caps supported on steel H-piling with concrete web walls.


Figure 46. Bridge No. 8626 and No. 8627
The latest routine bridge inspection reports, documenting an inspection conducted on June 8 2022, indicate that the deck and substructure for were rated as 6 (Satisfactory Condition) and the superstructure was rated as 7 (Good Condition). The Health Index and Sufficiency Ratings for Bridge No. 8626 were 99.78 and 94.20 and for Bridge No. 8627 were 98.23 and 94.20 , respectively.

Deck
The top of the concrete decks has an Open Graded Friction Course (OGFC) overlay with some potholing. The underside of the decks at the overhangs have transverse cracks with leaching. The stay-in-place forms have patches of moderate to heavy rust, indicating leaking of the bridge deck.

## Superstructure

The steel girders are in good condition. There is moderate corrosion on the top flanges near the bridge joints as a result of joint leaking but with no girder section loss

## Bearings

Elastomeric bearing pads are in good condition and functioning properly. Several anchor bolts at Abutment 2 are bent or broken

## Substructure

The abutments have minor transverse, vertical, and map cracking, and severe horizontal cracks approximately 2 inches below the beam seat. A major horizontal crack with delamination appears on the northwest corner of Abutment 1 and the northeast corner of Abutment 2 (Figure 47).

Pier caps, web walls, and H -piles are in good condition.


Figure 47. Bridge No. 8626 and 8627: Stay-in-place Form Rust (top left), Top Flange Rust (top right), Bent Anchor Bolt (bottom left), and Abutment Horizontal Crack (bottom right)

## Rating

A bridge's load rating model provides bridge capacity information for normal operations and overload permit vehicles. The NMDOT Bridge Design Procedures and Guide requires that all new designs have a minimum AASHTOWare Bridge Rating inventory rating of HS25 and operating rating of HS42. The rating reported on the bridge inspection reports indicate that both Bridge No. 8626 and Bridge No. 8627 have an LFR rating of HS35.0 (Inventory) and HS58.5 (Operating). The rating values exceed the desired value for new bridges using current design standards.
6.13.4 Bridge No. 10016

Bridge No. 10016, at MP 9.89, is a three-barrel multi-plate arch structure with 10-foot-11-inch $x$ 7-foot-1-inch barrels, at NM 264 and an unnamed waterway.

The latest routine bridge inspection reports, documenting an inspection conducted on May 18, 2021, indicate that culvert is rated as 6 (Satisfactory Condition). The Health Index and Sufficiency Ratings were 97.99 and 69.60, respectively.

Steel Culvert
Minor rusting was observed at some of the plate splices, indicating moisture leaking (Figure 48). No bulging or out-of-plane panels were observed. A small number of bolts were missing from the structure.


Figure 48. Bridge No. 10016 Culvert Rust at Splice

## Slope Paving

There is minor cracking in the slope paving on both the inlet and outlet ends of the culvert.

## Rating

A bridge's load rating model provides bridge capacity information for normal operations and overload permit vehicles. The NMDOT Bridge Design Procedures and Guide requires that all new designs have a minimum AASHTOWare Bridge Rating inventory rating of HS25 and operating rating of HS42. The rating reported on the bridge inspection reports indicates that Bridge No. 10016 has an LFR rating of HS19.8 (Inventory) and HS54.5 (Operating). While the inventory rating does not meet the minimum for new bridges, the operating rating results in no posting requirements at this structure.

### 6.13.5 Bridge No. 5381

Bridge No. 5381, at MP 13.53, is a six-cell CBC with 6-foot x 8 -foot cells at NM 264 and Banana Ridge Wash (Figure 49).


Figure 49. Bridge No. 5381 Inlet
The latest routine bridge inspection reports, documenting an inspection conducted on January 20, 2021, indicate that culvert is rated as 6 (Satisfactory Condition). The Health Index and Sufficiency Ratings were 96.55 and 57.50 , respectively.

Concrete Box
The top side of top slab is unobservable because of the asphalt overlay and the fill material. The underside of the top slab has areas of honeycomb and transverse cracks with leaching. The bottom slab was unobservable because of sediment deposition. The box walls have minor vertical, diagonal, horizontal, and map cracks with some minor leaching and honeycombing.

Wingwalls and Headwalls
The concrete wingwalls at the inlet and outlet have minor vertical, horizontal, diagonal, and map cracks. The concrete headwalls are in good condition.

## Rating

A bridge's load rating model provides bridge capacity information for normal operations and overload permit vehicles. The NMDOT Bridge Design Procedures and Guide requires that all new designs have a minimum AASHTOWare Bridge Rating inventory rating of HS25 and operating rating of HS42. The rating reported on the bridge inspection reports indicates that Bridge No. 5381 has an LFR rating of HS14.8 (Inventory) and HS54.5 (Operating). While the inventory rating does not meet the minimum for new bridges, the operating rating results in no posting requirements at this structure.

### 6.14 ENVIRONMENTAL, CULTURAL, AND COMMUNITY SETTING

Segment 2 is located in a rural area setting ranging from 6,585 to 7,070 feet in elevation. The surrounding landscape has larger rolling hills, with no major landforms near the project area. Various washes cross through the project area, including Burned Through the Rock Wash, Burned Death Wash, and Banana Ridge Wash. Segment 2 is located within the Great Basin conifer woodland biotic community and the vegetation primarily consists of forbs, shrubs, and trees.
Land adjacent to the roadway is primarily undeveloped with occasional houses or businesses adjacent to the ROW. Segment 2 is located alongside private land, New Mexico State Trust Land, and Bureau of Land Management land, with Navajo Nation trust land adjacent.

Land in Segment 2 is not particularly valuable to many wildlife species because it primarily consists of the roadway; however, the adjacent land likely provides some marginal habitat for smaller common wildlife species, such as lizards, reptiles, rodents, birds, and insects. There is no suitable habitat for bald eagles or golden eagles in Segment 2 .If tree removal would be necessary as part of the project, measures would be taken to avoid impacts on nesting or migratory birds. Because there is sparse development in the area, there may be wildlife in the project area; however, the wide roadway and ROW fence create barriers that may restrict movement.

The U.S. Fish and Wildlife Service IPaC online tool and NMDGF ERT were accessed to determine whether threatened or endangered species may occur in Segment 2. The IpaC list included a total of seven threatened, endangered, or candidate species that may occur within the project area (Table 25). No threatened or endangered species have been documented within one mile of Segment 2. Critical habitat is located approximately 30 miles away to the southeast. The NMDGF ERT listed 16 SGCN (Table 26).

Table 25. Threatened, Endangered, and Candidate Species That May Occur in the Project Area, per the IpaC

| Common Name | Scientific Name | Status |
| :--- | :--- | :--- |
| Mexican wolf | Canis lupus baileyi | Endangered |
| Mexican spotted owl | Strix occidentalis lucida | Threatened |
| Southwestern willow flycatcher | Empidonax traillii extimus | Endangered |
| Yellow-billed cuckoo | Coccyzus americanus | Threatened |
| Zuni bluehead sucker | Catostomus discobolus yarrow | Endangered |
| Monarch Butterfly | Danaus plexippus | Candidate |
| Zuni fleabane | Erigeron rhizomatus | Threatened |

Table 26. SGCN That May Occur in the Project Area, per the NMDGF ERT

| Common Name | Scientific Name |
| :--- | :--- |
| Northern leopard frog | Lithobates pipiens |
| Eared grebe | Podiceps nigricollis |
| Peregrine falcon | Falco peregrinus |
| Lewis's woodpecker | Melanerpes lewis |
| Williamson's sapsucker | Sphyrapicus thyroideus |
| Olive-sided flycatcher | Contopus cooperi |
| Bank swallow | Riparia |
| Pinyon jay | Gymnorhinus cyanocephalus |
| Clark's nutcracker | Nucifraga columbiana |
| Juniper titmouse | Baeolophus ridgwayi |
| Pygmy nuthatch | Sitta pygmaea |
| Western bluebird | Sialia Mexicana |
| Loggerhead shrike | Lanius ludovicianus |
| Grey vireo | Vireo vicinior |
| Spotted bat | Euderma maculatum |
| Gunnison's prairie dog | Cynomys gunnisoni |

There is no perennially flowing surface water; however, numerous washes are located in Segment 2 and the National Wetlands Inventory indicates 21 riverine habitats cross this segment Segment 2 is located in FEMA's Flood Insurance Rate Maps 35031C1150E, 35031C1125E, 35031C1500E, and 35031C1100E, all with an effective date of 02/17/2010. Along the western limits of Segment 2, flood hazard Zone A is located along the roadway and crosses the road. Flood hazard Zone A also crosses NM 264 in two other locations.

A previous cultural resources survey conducted in 1986 covered the entirety of the NM ROW along this section; both prior and subsequent surveys have covered small sections of the ROW and a recent (2022) survey covered the ROW from MP 10 to MP 14. At least nine cultural properties are within the ROW along this stretch, with both prehistoric and historic-age sites represented. No buildings, linear structures, historic objects, or historic districts are depicted in the NMCRIS GIS database along this segment. Aerial imagery was reviewed to determine the likelihood of Section 4(f) resources in Segment 2. No public parks, recreation areas, or waterfow or wildlife refuges are located within Segment 2 or are anticipated to be affected by the project. Five NRHP-eligible or recommended eligible sites were found within or near the project area.
Noise receptors in Segment 2 include a few businesses and low-density housing adjacent to the roadway. A roadway reconstruction project would likely qualify as a Type II project under 23-CFR772 - Procedures for Abatement of Highway Traffic Noise and Construction Noise. This type of
project would not require an in-depth analysis of potential traffic noise impacts; however, the project will be evaluated further during Phase I-C.
The Clean Air Act is a federal law that prevents air quality impacts that cause or contribute to violations of the NAAQS. Air Quality Control Regions are areas designated by the
U.S. Environmental Protection Agency for the attainment and maintenance of the NAAQS. The project is located within the Four Corners Interstate Air Quality Control Region 014. McKinley County is in attainment of all current air quality standards.

The HMIB completed a pISA for the study area, including Segment 2. The pISA identified 9 findings within and adjacent to the project corridor "where releases of hazardous materials or petroleum products have or could have occurred." It was determined that three of these findings may affect Segment 2.
Within a $1 / 2$-mile radius of Segment 2, there is a population of 1,295 people. Approximately 95 percent of the population are people of color, approximately 8 percent of the population is Hispanic, and approximately 8 percent of the population is age 65 or older. During Phase $\mathrm{I}-\mathrm{C}$, the project will be evaluated to determine whether there will be impacts to environmental justice populations, but it is not anticipated that impacts would be disproportionately high and adverse. The overall, long-term impacts from the project are anticipated to benefit the community. Shortterm, temporary impacts may include travel delays during construction. Access to community resources would not be affected and access to residences would be maintained.

7 EXISTING CONDITIONS ANALYSIS - SEGMENT 3, MP 15.5 to MP 16, URBAN/RURAL SECTION


Segment 3 of the study area extends from Cle Ki Drive intersection at MP 15.5 to the US 49 interchange at MP 16 for approximately 0.42 mile.

### 7.1 FUNCTIONAL CLASSIFICATION AND ZONING

Among the six major functional classes, NM 264 classifies as a Principal Arterial - Other for all three segments of NM 264.

### 7.2 TYPICAL SECTION

The segment is a four-lane roadway with a center TWLTL. The travel lanes and the TWLTL are 12 feet wide. There are 10-to 12-foot paved shoulders with rumble strips on both sides of the segment (Figure 50).


Figure 50. Existing Cross-section of NM 264

### 7.3 HORIZONTAL ALIGNMENT ANALYSIS

In Segment 3, there is one horizontal curve. The horizontal curve was analyzed using the AASHTO A Policy on Geometric Design of Highways and Streets, $20187^{\text {th }}$ edition, Table 3-9 Minimum Radii for Design Superelevation Rates, Design Speeds and Maximum Superelevation ( $\mathrm{e}_{\max }$ ) of $6 \%$. This curve does not meet the minimum criteria (Table 27).

Table 27. Segment 3 Horizontal Alignment Analysis

| Curve <br> No. | Design <br> Speed <br> (mph) | Start <br> Station | End <br> Station | Direction | Radius <br> (ft) | Approx. <br> emin | Required <br> emin | Meets <br> Standard |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| C10 | 60 | $909+73.07$ | $918+30.98$ | Right | 5,700 | $2.3 \%$ | $2.8 \%$ | No |

### 7.4 VERTICAL ALIGNMENT ANALYSIS

In Segment 3, two vertical curves were analyzed for a design speed of 60 mph . Comparing existing vertical curves to the required design criteria, including $k$-value, curve length, and maximum/minimum grade, for the design speed based on AASHTO A Policy on Geometric Design of Highways and Streets, $20187^{\text {th }}$ edition, the two vertical curves meet the minimum criteria (Table 28).

| Curve No. | Design Speed (mph) | PVI Station | Type | Approx. Curve Length (ft) | Min. Curve Length (ft) | Approx. <br> K-Value | Req. KValue | Grade In/Out | Grade Max./ Min. | Meets Standard |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| C46 | 60 | 936+30.00 | Crest | 1,750 | 180 | 200.58 | 151 | $\begin{aligned} & \hline 4.53 \% / \\ & -4.19 \% \\ & \hline \end{aligned}$ | 6\% /0.3\% | Yes |
| C47 | 60 | 939+10.00 | Sag | 500 | 180 | 137.60 | 136 | $\begin{gathered} -4.19 \% / \\ -0.56 \% \\ \hline \end{gathered}$ | 6\% /0.3\% | Yes |

### 7.5 OPERATING SPEEDS

On Segment 3, the 85th percentile speed was found in the range from 35 to 72 mph based on $24-$ hour data, whereas it is from 45 to 74 mph for other peak periods depending on location and time of day. Refer to Figure 51 and Figure 52 for the 24 -hour 85 th percentile and mode and pace speeds at a sample location (west of Green Meadows) on Segment 3.

The mode speed was found in a range from 50 to 68 mph based on 24 -hour data, while other time of day shows a similar range for mode speed. The pace speed is approximately 50 and 60 mph Refer to Figure 53 and Figure 54 for mode and pace speeds on Segment 3 west of Green Meadows (a sample location).

Table 29. Segment 3 Posted/Design Speed

| Location | Posted Speed <br> $(\mathrm{mph})$ | Design Speed <br> $(\mathrm{mph})$ |
| :---: | :---: | :---: |
| Cle Ki Drive, MP 15.5, to US 491 interchange, MP 16.0 | 55 | 60 |

For detailed speed information, refer to the TNA report in Appendix B.


Figure 51. Cumulative Speed Distribution and 85th Percentile Speed 24-hour Data at West of Green Meadows


Figure 52. Speed Distribution and Mode and Pace Speed 24-hour data at West of Green Meadows



Figure 54. Speed Distribution and Mode and Pace Speed AM and PM Peak at West of Green Meadows

### 7.6 HORIZONTAL SIGHT LINE OFFSET ANALYSIS

The HSO was calculated using the AASHTO A Policy on Geometric Design of Highways and Streets, $20187^{\text {th }}$ edition, equation 3-37 for each horizontal curve. See Table 30 for results.
Table 30. Segment 3 Horizontal Sight Line Offset

| Curve <br> No. | Design <br> Speed <br> (mph) | Radius <br> (ft) | Sight <br> Distance <br> (ft) | HSO <br> (ft) | Meets <br> Standard |
| :--- | :---: | :---: | :---: | :---: | :---: |
| C10 | 60 | 5700 | 570 | 8 | Yes |

Based on the calculated HSO, there does not appear to be any sight distance issue for the Segment 3 horizontal curve.

### 7.7 INTERSECTION SIGHT DISTANCE ANALYSIS

The intersection sight distance was analyzed per AASHTO A Policy on Geometric Design of Highways and Streets, $20187^{\text {th }}$ edition, standards (Figure 55) for each intersection throughout the

Segment 3 portion of NM 264 corridor. The minimum intersection sight distance value was calculated using the AASHTO A Policy on Geometric Design of Highways and Streets, $20187^{\text {th }}$ edition, equation 9-1. See Table 31 for results.


Departure Sight Triangle for Viewing Traffic Approaching the Minor Road from the Left


Departure Sight Triangle for Viewing Traffic Approaching the Minor Road from the Right

> Departure Sight Triangles (Stop-Controlled)

Figure 55. AASHTO A Policy on Geometric Design of Highways and Streets, $20187^{\text {th }}$ edition, Figure 9-17, Departure Sight Triangles for Intersections

The following Intersection Control cases were used for Segment 3:

- Case B1 - stop control minor road turning left onto NM 264
- Case B2 - stop control minor road turning right on NM 264
- Case F - left turns from NM 264 to minor road

Table 31. Segment 3 Intersection Sight Distance

| Intersection/ Turnout |  | Station | Offset | NM 264 Design Speed (mph) | ISD Criteria | Sight Triangle | Min. ISD Value (ft) | Meets Standard | Deficient ISD Value (ft) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 87 | N Cle Ki Dr | 919+18 | LT | 60 | B1 | Right | 992 | No * | 622 |
|  |  |  |  |  | B1/B2 | Left | 838 | Yes |  |
|  |  |  |  |  | F | Upstream | 666 | Yes |  |
| 88 | S Cle Ki Dr | 919+92 | RT | 60 | B1 | Right | 992 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 838 | No | 772 |
|  |  |  |  |  | F | Upstream | 666 | Yes |  |
| 89 | N Ola Rd | 923+53 | LT | 60 | B1 | Right | 992 | No * | 679 |
|  |  |  |  |  | B1/B2 | Left | 838 | Yes |  |
|  |  |  |  |  | F | Upstream | 666 | Yes |  |
| 90 | N La Bah Dr | 927+64 | LT | 60 | B1 | Right | 992 | No * | 816 |
|  |  |  |  |  | B1/B2 | Left | 838 | Yes |  |
|  |  |  |  |  | F | Upstream | 666 | Yes |  |
| 91 | $\underset{\substack{\text { Sr } \\ \text { Sah }}}{\text { La }}$ | 928+08 | RT | 60 | B1 | Right | 992 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 838 | Yes |  |
|  |  |  |  |  | F | Upstream | 666 | Yes |  |
| 92 | Turnout 41 | 928+55 | LT | 60 | B1 | Right | 992 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 838 | Yes |  |
|  |  |  |  |  | F | Upstream | 666 | Yes |  |
| 93 | Turnout 42 | 930+59 | LT | 60 | B1 | Right | 992 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 838 | Yes |  |
|  |  |  |  |  | F | Upstream | 666 | Yes |  |
| 94 | Turnout 43 | 936+97 | RT | 60 | B1 | Right | 992 | No * | 825 |
|  |  |  |  |  | B1/B2 | Left | 838 | Yes |  |
|  |  |  |  |  | F | Upstream | 666 | Yes |  |
| 95 | Turnout 44 | 937+01 | LT | 60 | B1 | Right | 992 | Yes |  |
|  |  |  |  |  | B1/B2 | Left | 838 | Yes |  |
|  |  |  |  |  | F | Upstream | 666 | Yes |  |

[^0]
### 7.8 TRAFFIC OPERATIONS ANALYSIS

### 7.8.1 Highway Segment Operations

HCS software was used to analyze the highway segment LOS. Both directions of Segment 3 are expected to operate at LOS C or better for existing conditions for both the AM and PM peak hours Refer to Table 32 for detailed LOS, V/C ratio, and speed information.

Table 32. LOS Summary for Roadway Segment 3

| Segment |  |  | LOS | V/C | Average Travel Speed |
| :---: | :---: | :---: | :---: | :---: | :---: |
| $\begin{aligned} & \text { M } \\ & \stackrel{\rightharpoonup}{\bar{\omega}} \\ & \stackrel{\text { E}}{\mathbf{N}} \end{aligned}$ | 2022 ExistingScenario | AM peak | A | 0.23 | 51.5 |
|  |  | PM peak | B | 0.35 | 51.5 |
|  | 2042 Horizon Scenario | AM peak | B | 0.35 | 51.5 |
|  |  | PM peak | C | 0.52 | 51.5 |

For detailed operational analysis information, refer to the TNA report in Appendix B.

## 79 ACCESS MANAGEMENT

Segment 3 of the NM 264 corridor is classified as an RPA. Through this segment, there are six unsignalized side streets and four turnouts/driveways that access private and public properties.

According to the NMDOT SAMM, the minimum spacing of full access unsignalized intersections is 2,640 feet on RPA highways with posted speed limits greater than or equal to 55 mph . For driveway spacing with traversable medians, the minimum spacing is 775 feet for posted speeds greater than or equal to 55 mph . Through Segment 3, the posted speed limit is 55 mph .
See Figure 56 for access locations and Table 33 for access spacing compliance.
 (Turnouts 87 to 95)

Table 33. Segment 3 Access Spacing

|  |  |  |  |  |  | SAMM Standards |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Intersection/Driveway |  | Station | Offset | Distance to <br> Access <br> Point | Minimum Intersection <br> or Driveway Spacing <br> (ft) | Meets <br> Standard |  |
| 87 | N Cle Ki Dr | $919+18$ | LT | 1039 | 2640 | No |  |
| 88 | S Cle Ki Dr | $919+92$ | RT | 1113 | 2640 | No |  |
| 89 | N Ola Rd | $923+53$ | LT | 361 | 2640 | No |  |
| 90 | N La Bah Dr | $927+64$ | LT | 411 | 2640 | No |  |
| 91 | S La Bah Dr | $928+08$ | RT | 455 | 2640 | No |  |
| 92 | Turnout 41 | $928+55$ | LT | 47 | 775 | No |  |
| 93 | Turnout 42 | $930+59$ | LT | 204 | 775 | No |  |
| 94 | Turnout 43 | $936+97$ | RT | 638 | 775 | No |  |
| 95 | Turnout 44 | $937+01$ | LT | 642 | 775 | No |  |

### 7.10 EXISTING ROADWAY ELEMENTS

7.10.1 Bicycle Facilities

NM 264 is designated as a Tier 2 bike route in the NMDOT New Mexico Prioritized Statewide Bicycle Network Plan. In Segment 3, the existing outside shoulder, for eastbound and westbound, varies from 10 to 12 feet, which is acceptable for bicycle use. The existing shoulder width allows for bicycles to have a 5 -foot-wide lane and an approximate 3 -foot buffer to the edge of the existing rumble strip (Figure 57).


Figure 57. Segment 3 Existing Shoulder

### 7.10.2 Pavement

The pavement condition in Segment 3 shows evidence of multiple pavement failures, such as longitudinal cracking, alligator cracking, and rutting (Figure 58). A Pavement Condition Assessment Report was performed for NM 264, MP 10 to MP 14, and the section was rated to be "Fair." This segment of the corridor has similar visual issues as MP 10 to MP 14.


Figure 58. Segment 3 Pavement Condition

## Clear Zone

Segment 3 has a posted speed of 55 mph (design speed $=60 \mathrm{mph}$ ) and an ADT above 6,000 The AASHTO Roadside Design Guide, $20114^{\text {th }}$ edition, Table 3-1, Suggested Clear-Zone Distances in Feet from Edge of Through Traveled Lane, indicates that for a speed of 60 mph , the clear zone is 30 to 32 feet.
This segment is an urban/rural section of NM 264 so the street signs and light poles within the clear zone along the corridor are considered to be breakaway obstacles and are not obstacles within the clear zone. The existing pipe culvert end sections and the concrete box culverts within the clear zone are considered obstacles.

### 7.10.3 Guardrai

Segment 3 has one guardrail system along the NM 264 corridor on the south side at Bridge No. 8703, at MP 15.93. This guardrail system does not meet the current FHWA requirement for MASH 3 testing level and will need to be replaced, including updated length of need calculations.

### 7.10.4 Right-of-Way

ROW maps were obtained from NMDOT during the research process. The following maps were used to determine limits

- F-031-1(43), ROW Map
- F-036-1(2), ROW Map
- N-3(59)2, ROW Map
- ST-(F)-036-1(201), ROW Map, 1988

The ROW width for most of Segment 3 of NM 264 is 200 feet. On the south side, the local road that parallels NM 264 from S La Chee Drive to S Labah Drive is partially within the existing ROW.

### 7.10.5 Fencing

In Segment 3, the fencing on the north is mainly along the existing ROW. For the south side, the fence line is approximately 15 -feet north of the existing ROW. The fence lines appear to be in fair condition.

### 7.10.6 Utilities

Segment 3 has multiple utilities along the NM 264 corridor: a gas line, water line, sanitary sewe line, multiple fiber optic lines, overhead telephone line, and overhead power lines.

The gas line runs approximately parallel to the ROW line along the south side of the NM 264 corridor to S Labah Drive where it crosses NM 264 and runs along the north side until the end of the project. The gas line is owned by New Mexico Gas Company.
There are two water lines, with one located on the north side and the other on the south side of NM 264. The lines run primarily parallel to the existing ROW line. There are two water lines crossing NM 264. One crossing is between S La Chee Drive and N Cle Ki Drive and the other crossing is at S Ola Drive. The water lines are owned by the Navajo Tribal Utility Authority.

There are two sanitary sewer lines, with one located on the north and the other on the south side of NM 264. The lines run primarily parallel to the existing ROW line. There is a sanitary sewer line crossing of NM 264 at S Labah Drive. The sanitary sewer line is owned by the Navajo Tribal Utility Authority.
There are multiple fiber optic lines in Segment 3. The fiber optic lines run primarily parallel to the ROW line along the north side of the NM 264 corridor. The fiber optic lines are owned by Sacred Wind and Frontier Communications.
One overhead power line continues from Segment 3 along the south side of the NM 264 corridor outside of the existing ROW. Another overhead power line starts along the north side of NM 264 and continues to just east of $\mathrm{N} \mathrm{Cle} \mathrm{Ki} \mathrm{Drive} \mathrm{within} \mathrm{the} \mathrm{existing} \mathrm{ROW}$. NM 264 multiple times going from the south to north side. The overhead power line is owned by Continental Divide Electric Cooperative and PNM.

There are multiple telephone lines on both the north and south sides of NM 264. The lines run primarily parallel to the existing ROW line. Two telephone lines run along the north side of NM 264 just within the existing ROW. Additionally, there is a telephone line on the south side of NM 264 within the existing ROW. The telephone lines are owned by Sacred Wind and Frontier Communications.
Other underground power lines for the light poles in the area are owned by the NMDOT and maintained by McKinley County per agreement.

### 7.10.7 Existing Drainage

Existing drainage conditions within Segment 3 can be classified primarily as cross conveyance features with a number of roadside ditches to direct flows to and through pipe culvert and/or driveway crossings. Contributing watersheds drain from north to south, through the alignment. Onsite discharges are allowed to sheet flow off the alignment and are captured within the roadside ditches. The two cross culverts conveying off-site flows beneath the alignment appear to be in satisfactory condition.

Table 34 lists identified drainage infrastructure within the alignment. Figure 59 is a map of the drainage infrastructure identified within the segment. Red linework indicates features identified in the field and confirmed by as-builts.

Table 34. Segment 3 Drainage Inventory

| Drainage Feature/ Crossing ID | Description | Inlet(s) Condition | Outlet Condition | Action | Overall Rating |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 15.10 | 60" CMP | Good; located to north; minor debris; concrete end section | Fair; located to south; major debris; concrete end section | Needs clearing | Fair |
| 15.20 | 24" CMP; driveway | Poor; located to east; 100\% sediment | Poor; located to east; 100\% sediment; concrete end section | Needs cleaning | Poor |
| 15.50 | 24" CMP; driveway | Unknown; located to east | Poor; located to west; 60\% sediment; major vegetation | Needs cleaning and clearing | Poor |
| 15.68 | 24" CMP; driveway | Unknown | Unknown | - | Pending |
| 15.69 | 24" CMP; driveway | Unknown | Unknown | - | Pending |
| 15.70 | 18" CMP; MDI; driveway | Good; MDI | Poor; located to east; 90\% sediment; minor pipe damage | Needs repair and cleaning | Poor |
| 15.71 | 18" CMP; MDI; driveway | Unknown | Unknown | - | Pending |
| 15.80 | (2) 24 " CMP; driveway | Poor; located to west; 60\% sediment; metal end sections | Poor; located to east; $70 \%$ sediment; metal end sections | Needs cleaning | Poor |
| 15.93 | $\begin{aligned} & \text { (2) } 60^{\prime \prime} \times 124^{\prime \prime} \\ & \text { CBC } \end{aligned}$ | Unknown; located to north outside ROW | Unknown; located to south outside ROW | - | Pending |



Figure 59. Segment 3 Drainage Feature Locations and Flow Patterns

Black Ridge Wash is bisected by the NM 264 alignment directly west of the traffic interchange with NM 491. The wash is another FEMA-designated Zone A floodplain conveyed to and through the alignment. NMDOT Maintenance has indicated the structure at MP 15.9 is obstructed by a significant amount of vegetation and debris on the inlet side, impeding conveyance of stormwater concentrating at the feature. There is a history of overtopping and flooding within the area. Further evaluation will be required as the final design is developed. To further understand the characteristics and potential flooding at the NM 264 alignment, a two-dimensional hydraulic model was developed for Segment 3. Preliminary modeling confirms known flooding regions and is similar to the effective Zone A floodplain mapping in the effective Flood Insurance Study. Coordination with the local floodplain administrator will be conducted to confirm the results and assess local floodplain permitting requirements. As the study progresses, the crossing will be further analyzed with proposed conditions features for a final analysis of the recommended improvements. Figure 60 is a map of the preliminary two-dimensional analysis.
Results of the preliminary analysis indicate culverts throughout the segment work in tandem or as a multiple opening system. Stormwater concentrated along the northern right of way of the project corridor will follow the natural gradient of the terrain. As headwater increase at pipe crossings the stormwater will breakout towards the east and to the next available pipe.
However, multiple driveway culverts were noted as filled with sediment and inoperable. In order to properly convey the "breakout" flows the driveway culverts and ditches will need to be replaced and regrading to provide adequate capacity and mitigate the spread of floodwaters along the right of way limits. Preliminary modeling indicates the cross culvert at MP 15.9 has adequate capacity to drain the region, if properly maintained and routinely cleared of debris and sediment.


Figure 60. Preliminary SRH2D Floodplain Modeling

### 7.11 GEOTECHNICAL EVALUATION

A geologic and geotechnical literature search, review of as-built plans, and site reconnaissance were performed and a Preliminary Geotechnical and Scoping Report was prepared for the NM 264 improvements from MP 0 to MP 16. Based on the information obtained from the literature search and site reconnaissance, it is expected that the project is suitable for the planned improvements. The following geotechnical considerations were identified.

### 7.11.1 Site Soils and Bedrock

The site surface and subsurface conditions will likely consist of interbedded clays, silts, sands, and gravels in alluvial and colluvium deposits. Bedrock is anticipated to be encountered at depths as shallow as 1 foot to greater than about 50 feet below existing site grade. The surface and shallow subsurface soils along the project alignment will likely exhibit a tendency for low to moderate compression and/or none to moderate expansion with increasing load and when elevated in moisture content. We anticipate the shallow soils will exhibit low to moderate bearing capacity. The deeper soils and bedrock are anticipated to exhibit moderate to high load bearing capability. The shallow soils may be recompacted to increase bearing capacity and reduce settlement. It is expected that the soils will have very poor to good quality pavement support characteristics

### 7.11.2 Groundwater

Groundwater along the project alignment is anticipated to be encountered at depths greater than about 30 to 50 feet below existing site grade, excluding areas located within and adjacent to existing drainages. Regional groundwater is anticipated to have significant seasonal variations and may be encountered at depths near the ground surface when drainages, arroyos, and irrigation canals are flowing. In addition, given the relatively shallow clays and bedrock along most of the project alignment, development of perched groundwater conditions is likely with seasonal variations.

### 7.11.3 Construction and Excavation

On-site well/poorly graded sands and silty sands and gravels are anticipated to be suitable for use as structural backfill beneath drainage structures and pavements. On-site clays will not be suitable for use as structural backfill. On-site soils are anticipated to be suitable for use as backfill/ embankment beneath new pavements. However, clay soils may require stabilization/modification prior to use below new pavements depending on NMDOT minimum R-value and design requirements.

Shallow excavations into the on-site soils are expected to be accomplished with conventional earthwork equipment. Some low-density and elevated moisture content subgrade soils were encountered in several borings and should be anticipated along portions of the alignment. These subgrade soils may require drying or stabilization/densification during construction. Caving soils should be anticipated on account of loose, granular soil conditions. Dense to very dense sands and gravels or very hard bedrock may be encountered and may require additional effort, heavyduty, and/or specialized equipment for excavation and deep foundation construction/installation.

### 7.11.4 Slopes

For permanent slopes in compacted fill and cut areas with maximum heights of less than 5 to 10 feet, recommended maximum slopes for on-site soils and bedrock materials range from 0.75:1 to 3:1 (horizontal:vertical).

### 7.11.5 Pavement

The existing pavement section thickness and material types along the project alignment are variable. The pavement materials consisted of asphalt concrete and untreated base course. The asphalt concrete thickness ranges from approximately 3.5 to 10 inches. The thickness of the untreated base course ranges from 3 to 17 inches.

The preliminary and final pavement design reports will be prepared by the NMDOT PMDB. The information contained in this report will be used by NMDOT to develop the recommended new pavement section thickness.

The anticipated subgrade soils along the project alignment will likely consist of sands with varying amounts of clay, silt and gravel, clays with varying amounts sand and gravel, silt with varying amounts of sand and gravel, and gravel with varying amounts of silt and sand. The anticipated subgrade soils will likely be classified as A-1-a, A-2-4, A-4, A-6, and A-7-6 in accordance with the AASHTO Soil Classification System

## 712 EXISTING BRIDGE EVALUATION

The existing structural condition of each bridge or culvert structure with an assigned bridge number was evaluated for this study. The latest routine bridge inspection reports for each structure were provided by NMDOT and reviewed by HDR. On December 8, 2022, HDR also completed a field observation visit at each of these structures. In attendance for HDR was Danton Bean and Kelly Heath.

## CN6101220 NM 264 (Arizona/New Mexico State Line to Yah-Ta-Hey, MP 0 to MP 16

 Final Phase I-A/B Report7.12.1 Bridge No. 8703

Bridge No. 8703, at MP 15.93, is a two-cell CBC with 10-foot x 5 -foot cells at NM 264 and Black Ridge Wash (Figure 61).


Figure 61. Bridge No. 8703 Outlet
The latest routine bridge inspection reports, documenting an inspection conducted on January 20, 2021, indicate that culvert is rated as 7 (Good Condition). The Health Index and Sufficiency Ratings were 99.91 and 85.00 , respectively.

Concrete Box
The top side of the top slab is unobservable because of the asphalt overlay and the fill material. The underside of the top slab has minor diagonal cracks. The bottom slab was unobservable because of sediment deposition. The box walls are in good condition.

Wingwalls and Headwalls
The concrete wingwalls at the inlet and outlet have minor horizontal and diagonal cracks. The concrete headwalls are in good condition.

## Rating

A bridge's load rating model provides bridge capacity information for normal operations and overload permit vehicles. The NMDOT Bridge Design Procedures and Guide requires that all new designs have a minimum AASHTOWare Bridge Rating inventory rating of HS25 and operating rating of HS42. The rating reported on the bridge inspection reports indicates that Bridge No. 8703 has an LFR rating of HS19.8 (Inventory) and HS23.8 (Operating). While the inventory rating does not meet the minimum for new bridges, the operating rating results in no posting requirements at this structure.

### 7.13 ENVIRONMENTAL, CULTURAL, AND COMMUNITY SETTING

Segment 3 is located in a rural/urban area setting at approximately 6,600 feet in elevation. Land adjacent to the roadway is mostly developed with housing and businesses. The surrounding landscape has gentle rolling hills; there are no significant landforms in the area. Black Ridge Wash occurs just west of the NM 264 and US 491 interchange. Segment 3 is located within the Great Basin Desert scrub biotic community. Vegetation in Segment 3 is sparse but primarily consists of forbs and shrubs, with few trees.

Land in Segment 3 is not particularly valuable to many wildlife species because it primarily consists of the roadway; however, the adjacent land likely provides some marginal habitat to smaller, common wildlife species, such as lizards, reptiles, rodents, birds, and insects. There is no suitable habitat for bald eagles or golden eagles in Segment 3. If tree removal would be necessary as part of the project, measures would be taken to avoid impacts on nesting or migratory birds. Because of development in the area and the wide roadway, the project area is not particularly valuable for wildlife movement.

The U.S. Fish and Wildlife Service IPaC online tool and NMDGF ERT were accessed to determine whether threatened or endangered species may occur in the project area. The IPaC list included a total of seven threatened, endangered, or candidate species that may occur within the project area (Table 35). No threatened or endangered species have been documented within 1 mile of Segment 3. Critical habitat is located approximately 30 miles away to the southeast. The NMDGF ERT listed 16 SGCN (Table 36).

Table 35. Threatened, Endangered, and Candidate Species That May Occur in the Project Area, per the IPaC

| Common Name |  | Scientific Name |
| :--- | :--- | :--- |
| Status |  |  |
| Mexican wolf | Canis lupus baileyi | Endangered |
| Mexican spotted owl | Strix occidentalis lucida | Threatened |
| Southwestern willow flycatcher | Empidonax traillii extimus | Endangered |
| Yellow-billed cuckoo | Coccyzus americanus | Threatened |
| Zuni bluehead sucker | Catostomus discobolus yarrow | Endangered |
| Monarch Butterfly | Danaus plexippus | Candidate |
| Zuni fleabane | Erigeron rhizomatus | Threatened |

Table 36. SGCN That May Occur in the Project Area, per the NMDGF ERT

| Common Name | Scientific Name |
| :--- | :--- |
| Northern leopard frog | Lithobates pipiens |
| Eared grebe | Podiceps nigricollis |
| Peregrine falcon | Falco peregrinus |
| Lewis's woodpecker | Melanerpes lewis |
| Williamson's sapsucker | Sphyrapicus thyroideus |
| Olive-sided flycatcher | Contopus cooperi |
| Bank swallow | Riparia |
| Pinyon jay | Gymnorhinus cyanocephalus |
| Clark's nutcracker | Nucifraga columbiana |
| Juniper titmouse | Baeolophus ridgwayi |
| Pygmy nuthatch | Sitta pygmaea |
| Western bluebird | Sialia Mexicana |
| Loggerhead shrike | Lanius ludovicianus |
| Grey vireo | Vireo vicinior |
| Spotted bat | Euderma maculatum |
| Gunnison's prairie dog | Cynomys gunnisoni |

Within Segment 3, there is no perennially flowing surface water; however, Black Ridge Wash is located just west of the US 491 interchange and crosses through Bridge No. 8703 in this segment. The National Wetlands Inventory classifies this wash as a riverine habitat, though it is ephemeral and wetlands are not present. Segment 3 is located in FEMA's Flood Insurance Rate Map 35031 C1150E, with an effective date of $02 / 17 / 2010$. There is a flood hazard Zone A that crosses the roadway at Black Ridge Wash.
A previous cultural resources survey conducted in 1986 covered 100 percent of the NM 264 ROW from MP 15.5 to MP 16. No cultural resources were found within the NM 264 ROW along this stretch of roadway. No buildings, linear structures, historic objects, or historic districts are depicted in the NMCRIS GIS database along this segment.

Aerial imagery was reviewed to determine the likelihood of Section 4(f) resources in Segment 3. No public parks, recreation areas, waterfowl or wildlife refuges, or NRHP-eligible sites are located within Segment 3 or are anticipated to be affected by the project.

Noise receptors in Segment 3 include businesses and homes adjacent to the roadway. A roadway reconstruction project would likely qualify as a Type II project under 23 CFR 772 - Procedures for Abatement of Highway Traffic Noise and Construction Noise. This type of project would not
require an in-depth analysis of potential traffic noise impacts; however, the project will be evaluated further during Phase I-C.
The Clean Air Act is a federal law that prevents air quality impacts that cause or contribute to violations of the NAAQS. Air Quality Control Regions are areas designated by the
U.S. Environmental Protection Agency for the attainment and maintenance of the NAAQS. The project is located within the Four Corners Interstate Air Quality Control Region 014. McKinley County is in attainment of all current air quality standards.

The HMIB completed a pISA for the study area, including Segment 3. The pISA identified 9 findings within and adjacent to the project corridor "where releases of hazardous materials or petroleum products have or could have occurred." It was determined that none of these findings would affect Segment 3.
Within a $1 / 2$-mile radius of Segment 3, there is a population of 678 people. Approximately 97 percent of the population are people of color, approximately 12 percent of the population is Hispanic, and approximately 7 percent of the population is age 65 or older. During Phase I-C, the project will be evaluated to determine whether there will be impacts to environmental justice populations, but it is not anticipated that impacts would be disproportionately high and adverse. The overall, long-term impacts from the project are anticipated to benefit the community. Shortterm, temporary impacts may include travel delays during construction. Access to community resources would not be affected and access to residences will be maintained.

8
PHASE I-A ALTERNATIVES
8.1 SEGMENT 1 URBAN SECTION ALTERNATIVES
8.1.1 Urban Alternative 1 - No-Build

ALTERNATIVE DESCRIPTION
The No-Build Alternative would make no improvements to the NM 264 urban section. The existing typical section (Figure 62), lane configuration, median details, and pedestrian facilities can be found under Section 1.3, Existing Conditions. See the TNA (Appendix B) for existing traffic safety and operation.


Figure 62. Urban Alternative 1 Existing Typical Section

## PURPOSE AND NEED

The No-Build Alternative would not provide any roadway, drainage, or safety improvements and, therefore, would not meet the purpose and need for this project.

## TRAFFIC OPERATIONS

The No-Build Alternative would not improve traffic operations. Existing traffic operations can be found under Section 1.3, Existing Conditions and in the TNA (Appendix B).

## SAFETY

The No-Build Alternative would not improve safety. Existing traffic operations can be found under the Existing Conditions section of this Study and in the TNA (Appendix B).

EXISTING ACCESS AND LAND USE
The No-Build Alternative would not have any impact on existing access or land use.
RIGHT-OF-WAY IMPACTS
The No-Build Alternative would not have any impact on existing ROW.
CONSTRUCTABILITY
The No-Build Alternative would not have any constructability issues.

ENVIRONMENTAL IMPACTS
The No-Build Alternative would not have any impacts on the physical environment; however, important community resources and the people they serve, such as businesses, schools, and other facilities, and public services, would continue to be affected by poor intersection geometries, poor access, and safety issues that currently exist.

### 8.1.2 Urban Alternative 2-4 Lane Reconstruction with Raised Median and Bike Lanes

 ALTERNATIVE DESCRIPTIONUrban Alternative 2 includes reconstruction of the full 4-lane roadway section. The newly constructed section would include two 12-foot driving lanes in each direction, a 16-foot raised mountable curb median, and 6 -foot bike lanes in each direction. There would be mountable curb and gutter on the outside of the section in each direction with a 6 -foot sidewalk (Figure 63). Other improvements include updated signing and striping with left-turn lanes provided to adjacent properties.

PURPOSE AND NEED
Urban Alternative 2 would meet the purpose and need for the project. Full reconstruction of the roadway provides the opportunity to address the poor pavement condition and allows for improvement of the roadway drainage. Additionally, it allows for the project to provide upgraded pedestrian facilities to meet ADA/PROWAG requirements, as well as bicycle facilities for the project and managed access to improve the safety of the roadway.


Figure 63. Urban Alternative 2 Typical Section

## TRAFFIC OPERATIONS

The corridor operates within an acceptable LOS with Urban Alternative 2, including the signalized intersection with Alma Road. See TNA (Appendix B) for the operational analysis.

## SAFETY

Urban Alternative 2 would provide opportunities to improve safety in the corridor. Studies suggest that improving the pavement condition and providing a raised median would reduce crashes. Access management would reduce the potential conflict points with through traffic. Improvements to the signalized intersection at Alma Drive would improve safety in several ways. Improvements to crosswalk striping and the addition of intersection lighting would improve pedestrian safety. Adding dedicated left-turn lane striping with a positive offset would reduce angle and rear-end crashes. Installing signs warning of the approaching signal would improve overall safety as well.

## EXISTING ACCESS AND LAND USE

Urban Alternative 2 would allow the implementation of access management for the urban section. Existing driveways would be consolidated or eliminated to improve access and safety in the corridor. See Figure 64 for access modifications proposed with this alternative.

RIGHT-OF-WAY IMPACTS
There are no anticipated ROW impacts with this Alternative. There may be a need for temporary work permits (TWPs) for driveway tie-ins or for ADA/PROWAG-compliant improvements to driveways and curb ramps throughout the urban section.

## CONSTRUCTABILITY

There are no significant constructability issues with Urban Alternative 2. Temporary access from adjacent properties appears plausible for most properties within the existing ROW during construction.

## ENVIRONMENTAL IMPACTS

Urban Alternative 2 is not expected to adversely affect land use, geologic features, landforms threatened or endangered species, bald or golden eagles, wildlife, surface waters, wetlands, FEMA flood zones, Section 4(f) properties, farmlands, or visual resources.
Ground disturbance and minor vegetation removal would likely be necessary for this alternative however, impacts would be restricted to within the existing ROW. This alternative may have slightly more or less ground disturbance than other alternatives, but it would likely be negligible. If trees are removed, there may be impacts to migratory or nesting birds; however, fieldwork for the biological report during the environmental phase will provide more information regarding the potential impact to birds and identify mitigation measures to reduce impacts. Likewise, a cultura survey will be conducted during Phase I-C to assess effects to cultural resources and historic properties. Construction equipment and vehicles would likely elevate noise levels temporarily however, noise impacts would be short-term. The HMIB's pISA will assist with determining the risk of contamination as the design process progresses. Lastly, if there are any impacts to drainage structures, this alternative will be evaluated to determine whether there will be any impacts to potential waters of the United States

8.1.3 Urban Alternative 3-4 Lane Reconstruction with TWLTL and Bike Lanes

ALTERNATIVE DESCRIPTION
Urban Alternative 3 includes reconstruction of the full 4-lane roadway section. The newly constructed section would include two 12-foot driving lanes in each direction, a 16-foot TWLTL and 6 -foot bike lanes in each direction (Figure 65). There is an option for the bike lanes to be separated from the travel lanes with a buffer by reducing the travel lanes to 11 feet wide, which may improve bicyclist safety and provide traffic-calming benefits. There would be mountable curb and gutter on the outside of the section in each direction with a 6 -foot sidewalk. Other improvements include updated signing and striping with left-turn lanes provided to adjacent properties. Signal timing along the segment would also be improved to accommodate the more elderly population in the area by providing increased walk times to cross the street at signalized intersections.


Figure 65. Urban Alternative 3 Typical Section
PURPOSE AND NEED
Urban Alternative 3 would meet the purpose and need for the project. Full reconstruction of the roadway provides the opportunity to address the poor pavement condition and allows for improvement of the roadway drainage. Additionally, it allows for the project to provide ADA/PROWAG-complaint pedestrian and bicycle facilities for the project.

TRAFFIC OPERATIONS
The corridor would operate within an acceptable LOS with Urban Alternative 3, including the signalized intersection with Alma Road. See the TNA (Appendix B) for the operational analysis

SAFETY
Urban Alternative 3 would provide opportunities to improve safety in the corridor. Studies suggest that improving pavement condition would reduce crashes. However, studies also suggest that striped medians provide less safety benefits than raised medians, since raised medians provide a physical barrier of protection against opposite direction "head-on" crashes. Although not as effective as Urban Alternative 2, access management would reduce the potential conflict points with through traffic. Improvements to the signalized intersection at Alma Drive would improve safety in several ways. Improvements to crosswalk striping and addition of intersection lighting would improve pedestrian safety. A mid-block crossing may be considered near the transit stops; however, there are nearby traffic signals with crosswalks that present a safe opportunity to cross the street. Furthermore, pedestrian volumes in the area are low, which may not justify the midblock crossing. Adding dedicated left-turn lane striping with a positive offset would reduce angle and rear-end crashes. Installing signs warning of the approaching signal would improve overall safety as well.

## EXISTING ACCESS AND LAND USE

Urban Alternative 3 would allow for limited implementation of access management for the urban section. To the extent feasible, existing driveways would be consolidated or eliminated to improve access and safety in the corridor. See Figure 64 for access modifications proposed with this alternative.

RIGHT-OF-WAY IMPACTS
There are no anticipated ROW impacts with this alternative. TWPs or temporary construction permits (TCPs) may be required to tie-in existing driveways, curb ramps, and side streets.

## CONSTRUCTABILITY

There are no significant constructability issues with Urban Alternative 3. There may be a need for TWPs for driveway tie-ins or for ADA/PROWAG-compliant improvements to driveways and curb ramps throughout the urban section.

ENVIRONMENTAL IMPACTS
Urban Alternative 3 is not expected to adversely affect land use, geologic features, landforms, threatened or endangered species, bald or golden eagles, wildlife, surface waters, wetlands, FEMA flood zones, Section 4(f) properties, farmlands, or visual resources.

Ground disturbance and minor vegetation removal would likely be necessary for this alternative; however, impacts would be restricted to the existing ROW. This alternative may have slightly more or less ground disturbance than the other alternatives, but it would likely be negligible. If trees are removed, there may be impacts to migratory or nesting birds; however, fieldwork for the biological report during the environmental phase will provide more information regarding the potential impact
o birds. Likewise, a cultural survey and report during the environmental phase would indicate whether cultural resources or historic properties will be affected. Construction equipment and vehicles during construction would likely elevate noise levels temporarily; however, impacts would be short-term. The HMIB's pISA will assist with determining the risk of contamination as the design process progresses. Lastly, if there are any impacts to drainage structures, this alternative will be evaluated to determine whether there will be any impacts to potential waters of the United States.
8.1.4 Urban Alternative 4-4 Lane Reconstruction with Raised Median and Multi-Use Trail

## alTERNATIVE DESCRIPTION

Urban Alternative 4 includes reconstruction of the full 4-lane roadway section. The newly constructed section would include two 12-foot driving lanes in each direction and a 16-foot raised mountable curb median (Figure 66). There would be mountable curb and gutter on the outside o the section in each direction with a 6-foot sidewalk in one direction and a 12-foot multi-use trail in the other. Other improvements include updated signing and striping with left-turn lanes provided to adjacent properties


Figure 66. Urban Alternative 4 Typical Section

PURPOSE AND NEED
Urban Alternative 4 would meet the purpose and need for the project. Full reconstruction of the roadway provides the opportunity to address the poor pavement condition and allows for
improvement of the roadway drainage. Additionally, it allows for the project to provide ADA/PROWAG-compliant pedestrian and bicycle facilities for the project and manage access to improve the safety of the roadway

TRAFFIC OPERATIONS
The corridor would operate within an acceptable LOS with Urban Alternative 4 including the signalized intersection with Alma Road. See the TNA (Appendix B) for the operational analysis.

## SAFETY

Urban Alternative 4 would provide opportunities to improve safety in the corridor. Studies suggest that improving the pavement condition and raised median will reduce crashes. Access management would reduce the potential conflict points with through traffic. Improvements to the signalized intersection at Alma Drive would improve safety in several ways. Improvements to crosswalk striping and addition of intersection lighting would improve pedestrian safety. Adding dedicated left-turn lane striping with a positive offset would reduce angle and rear-end crashes. Installing signs warning of the approaching signal would improve overall safety as well. The separated multi-use trail would enhance safety by removing bikes near traffic lanes.

EXISTING ACCESS AND LAND USE
Urban Alternative 4 would allow the implementation of access management for the urban section. To the extent feasible, existing driveways would be consolidated or eliminated to improve access and safety in the corridor. See Figure 64 for access modifications proposed with this alternative.

## RIGHT-OF-WAY IMPACTS

There are no anticipated ROW impacts with this alternative. TWPs may be required to tie-in existing driveways and side streets.

CONSTRUCTABILITY
There are no significant constructability issues with Urban Alternative 4. There may be a need for TWPs for driveway tie-ins or for ADA/PROWAG-compliant improvements to driveways and curb ramps throughout the urban section.

ENVIRONMENTAL IMPACTS
Urban Alternative 4 is not expected to adversely affect land use, geologic features, landforms threatened or endangered species, bald or golden eagles, wildlife, surface waters, wetlands, FEMA flood zones, Section 4(f) properties, farmlands, or visual resources.

Ground disturbance and minor vegetation removal would likely be necessary for this alternative however, impacts would be restricted to the existing ROW. This alternative may have slightly more
or less ground disturbance than other alternatives, but it would likely be negligible. If trees are removed, there may be impacts to migratory or nesting birds; however, fieldwork for the biological report during the environmental phase will provide more information regarding the potential impact o birds. Likewise, a cultural survey and report during the environmental phase will indicate whether cultural resources or historic properties will be affected. Construction equipment and vehicles during construction would likely elevate noise levels temporarily; however, impacts would be short-term. The HMIB's pISA will assist with determining the risk of contamination as the design process progresses. Lastly, if there are any impacts to drainage structures, this alternative will be evaluated to determine whether there will be any impacts to potential waters of the United States.
8.1.5 Urban Alternative 5-4 Lane Reconstruction with TWLTL and Multi-Use Trail ALTERNATIVE DESCRIPTION

Urban Alternative 5 includes reconstruction of the full 4-lane roadway section. The newly constructed section would include two 12-foot driving lanes in each direction and a 16-foot TWLTL (Figure 67). There would be mountable curb and gutter on the outside of the section in each direction with a 6 -foot sidewalk in one direction and a 12-foot multi-use trail in the other direction. Other improvements include updated signs and striping with left-turn lanes provided to adjacent properties.


Figure 67. Urban Alternative 5 Typical Section

PURPOSE AND NEED
Urban Alternative 5 would meet the purpose and need for the project. Full reconstruction of the roadway provides the opportunity to address the poor pavement condition and allows for improvement of the roadway drainage. Additionally, it allows for the project to provide upgraded pedestrian and bicycle facilities.

## TRAFFIC OPERATIONS

The corridor would operate within an acceptable LOS with Urban Alternative 5 including the signalized intersection with Alma Road. See the TNA (Appendix B) for the operational analysis.

## SAFETY

Urban Alternative 5 would I provide opportunities to improve safety in the corridor. Studies sugges that improving pavement condition would reduce crashes. However, studies also suggest that striped medians provide less safety benefits than raised medians, since raised medians provide a physical barrier of protection against opposite direction "head-on" crashes. Although not as effective as Urban Alternative 4, access management will reduce the potential conflict points with through traffic. Improvements to the signalized intersection at Alma Drive would improve safety in several ways. Improvements to crosswalk striping and the addition of intersection lighting would improve pedestrian safety. Adding dedicated left-turn lane striping with a positive offset would reduce angle and rear-end crashes. Installing signs warning of the approaching signal would improve overall safety as well. The separated multi-use trail would enhance safety by removing bikes near traffic lanes.

## EXISTING ACCESS AND LAND USE

Urban Alternative 5 would allow for limited implementation of access management for the urban section. Existing driveways would be consolidated or eliminated to improve access and safety in the corridor. See Figure 64 for access modifications proposed with this alternative.

RIGHT-OF-WAY IMPACTS
There are no anticipated ROW impacts with this alternative. TWPs or TCPs may be required to tie-in existing driveways and side streets.

CONSTRUCTABILITY
There are no significant constructability issues with Urban Alternative 5. There may be a need for TWPs for driveway tie-ins or for ADA/PROWAG-compliant improvements to driveways and curb ramps throughout the urban section.

ENVIRONMENTAL IMPACTS
Urban Alternative 5 is not expected to adversely affect land use, geologic features, landforms, threatened or endangered species, bald or golden eagles, wildlife, surface waters, wetlands, FEMA flood zones, Section 4(f) properties, farmlands, or visual resources.

Ground disturbance and minor vegetation removal would likely be necessary for this alternative; however, impacts would be restricted to the existing ROW. This alternative may have slightly more or less ground disturbance than other alternatives, but it would likely be negligible. If trees are removed, there may be impacts to migratory or nesting birds; however, fieldwork for the biological report during the environmental phase will provide more information regarding the potential impact to birds. Likewise, a cultural survey and report during the environmental phase will indicate whether cultural resources or historic properties will be affected. Construction equipment and vehicles during construction would likely elevate noise levels temporarily; however, impacts would be short-term. The HMIB's pISA will assist with determining the risk of contamination as the design process progresses. Lastly, if there are any impacts to drainage structures, this alternative will be evaluated to determine whether there will be any impacts to potential waters of the United States.
8.1.6 Urban Alternative 6 - 2 Lane Reconstruction with Raised Median and Bike Lanes

## ALTERNATIVE DESCRIPTION

Urban Alternative 6 includes reconstruction of a 2-lane roadway section. The newly constructed section would include a 12 -foot driving lane in each direction, a 16-foot raised mountable curb median, and 6 -foot bike lanes in each direction (Figure 68). There would be mountable curb and gutter on the outside of the section in each direction with a 6 -foot sidewalk. Other improvements include updated signs and striping with left-turn lanes provided to adjacent properties.


Figure 68. Urban Alternative 6 Typical Section

## PURPOSE AND NEED

Urban Alternative 6 would meet the purpose and need for the project. Full reconstruction of the roadway provides the opportunity to address the poor pavement condition and allows for improvement of the roadway drainage. Additionally, it allows for the project to provide upgraded pedestrian and bicycle facilities for the project and manage access to improve the safety of the roadway. The reduction of travel lanes would provide "traffic-calming" effects in the corridor to reduce vehicular travel speed. The lane reduction would also result in increased congestion.

## TRAFFIC OPERATIONS

The corridor would not operate within an acceptable LOS with Urban Alternative 6 including the signalized intersection with Alma Road. See Table 37 for the operational analysis.

Table 37. LOS Summary for Urban Alternative 6

| Segment |  |  | LOS | V/C | Average Travel Speed |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | 2022 ExistingScenario | AM peak | B | 0.31 | 43.8 |
|  |  | PM peak | C | 0.46 | 43.8 |
|  | 2042 Two-Lane Scenario | AM peak | E | 0.61 | 41.0 |
|  |  | PM peak | E | 0.89 | 40.5 |

SAFETY
Urban Alternative 6 would provide opportunities to improve safety in the corridor. Studies sugges that improving pavement condition and providing a raised median would reduce crashes. Access management will reduce the potential conflict points with through traffic. Improvements to the signalized intersection at Alma Drive would improve safety in several ways. Improvements to crosswalk striping and addition of intersection lighting would improve pedestrian safety. Adding dedicated left-turn lane striping with a positive offset would reduce angle and rear-end crashes Installing signs warning of the approaching signal would improve overall safety as well. Providing speed feedback signs would reduce overall travel speed through the urban section.

## EXISTING ACCESS AND LAND USE

Urban Alternative 6 would allow the implementation of access management for the urban section Existing driveways would be consolidated or eliminated to improve access and safety in the corridor. See Figure 64 for access modifications proposed with this alternative.

RIGHT-OF-WAY IMPACTS
There are no anticipated ROW impacts with this alternative. TWPs may be required to tie-in existing driveways and side streets.

CONSTRUCTABILITY
There are no significant constructability issues with Urban Alternative 6. There may be a need for TWPs for driveway tie-ins or for ADA/PROWAG compliant improvements to driveways and curb ramps throughout the urban section; however, this impact would be reduced by the reduced width of the typical section compared to existing.

ENVIRONMENTAL IMPACTS
Urban Alternative 6 is not expected to adversely affect land use, geologic features, landforms, threatened or endangered species, bald or golden eagles, wildlife, surface waters, wetlands FEMA flood zones, Section 4(f) properties, farmlands, or visual resources
Ground disturbance and minor vegetation removal would likely be necessary for this alternative; however, impacts would be restricted to the existing ROW. This alternative may have slightly more or less ground disturbance than other alternatives, but it would likely be negligible. If trees are removed, there may be impacts to migratory or nesting birds; however, fieldwork for the biological report during the environmental phase will provide more information regarding the potential impact to birds. Likewise, a cultural survey and report during the environmental phase will indicate whether cultural resources or historic properties will be affected. Construction equipment and vehicles during construction would likely elevate noise levels temporarily; however, impacts would be short-term. The HMIB's pISA will assist with determining the risk of contamination as the design process progresses. Lastly, if there are any impacts to drainage structures, this alternative
will be evaluated to determine whether there will be any impacts to potential waters of the United States.
8.1.7 Urban Alternative 7-2 Lane Reconstruction with TWLTL and Bike Lanes

## ALTERNATIVE DESCRIPTION

Urban Alternative 7 includes reconstruction of a 2-lane roadway section. The newly constructed section would include a 12 -foot driving lane in each direction, a 16 -foot TWLTL, and 6 -foot bike lanes in each direction (Figure 69). There would be mountable curb and gutter on the outside of the section in each direction with a 6 -foot sidewalk. Other improvements include updated signs and striping with left-turn lanes provided to adjacent properties.


Figure 69. Urban Alternative 7 Typical Section
PURPOSE AND NEED
Urban Alternative 7 would meet the purpose and need for the project. Full reconstruction of the roadway provides the opportunity to address the poor pavement condition and allows for improvement of the roadway drainage. Additionally, it allows for the project to provide upgraded pedestrian and bicycle facilities for the project and manage access to improve the safety of the roadway. The reduction of travel lanes would provide "traffic-calming" effects in the project to reduce vehicular travel speed. In addition to reduced speed, the lane reduction would also result in increased congestion.

TRAFFIC OPERATIONS
The corridor would not operate within an acceptable LOS with Urban Alternative 7 including the signalized intersection with Alma Road. See Table 37 for the operational analysis.

## SAFETY

Urban Alternative 7 would provide opportunities to improve safety in the corridor. Studies sugges that improving the pavement condition will reduce crashes. However, studies also suggest that striped medians provide less safety benefits than raised medians, since raised medians provide a physical barrier of protection against opposite direction "head-on" crashes. Although not as effective as Urban Alternative 6, access management would reduce the potential conflict points with through traffic. Improvements to the signalized intersection at Alma Drive would improve safety in several ways. Improvements to crosswalk striping and addition of intersection lighting would improve pedestrian safety. Adding dedicated left-turn lane striping with a positive offset would reduce angle and rear-end crashes. Installing signs warning of the approaching signal would improve overall safety as well. The reduced typical section would reduce overall travel speed through the urban section.

EXISTING ACCESS AND LAND USE
Although not as effective as Urban Alternative 6, Urban Alternative 7 would implement access management for the urban section. Existing driveways would be consolidated or eliminated to improve access and safety in the corridor. See Figure 64 for access modifications proposed with this alternative.
RIGHT-OF-WAY IMPACTS
There are no anticipated ROW impacts with this alternative. TWPs may be required to tie-in existing driveways and side streets.
CONSTRUCTABILITY
There are no significant constructability issues with Urban Alternative 7. There may be a need for TWPs for driveway tie-ins or for ADA/PROWAG-compliant improvements to driveways and curb ramps throughout the urban section; however, this impact would be reduced by the reduced width of the typical section compared to existing.

ENVIRONMENTAL IMPACTS
Urban Alternative 7 is not expected to adversely affect land use, geologic features, landforms, threatened or endangered species, bald or golden eagles, wildlife, surface waters, wetlands, FEMA flood zones, Section 4(f) properties, farmlands, or visual resources.
Ground disturbance and minor vegetation removal would likely be necessary for this alternative; however, impacts would be restricted to the existing ROW. This alternative may have slightly more
or less ground disturbance than other alternatives, but it would likely be negligible. If trees are removed, there may be impacts to migratory or nesting birds; however, fieldwork for the biological report during the environmental phase will provide more information regarding the potential impact to birds. Likewise, a cultural survey and report during the environmental phase will indicate whether cultural resources or historic properties would be affected. Construction equipment and vehicles during construction would likely elevate noise levels temporarily; however, impacts would be short-term. The HMIB's pISA will assist with determining the risk of contamination as the design process progresses. Lastly, if there are any impacts to drainage structures, this alternative will be evaluated to determine whether there will be any impacts to potential waters of the United States.

### 8.1.8 Alternative 8 - Traffic Recommendations

The following recommendations would be applied to all typical section alternatives for Segment 1:

- Add frontage roads at back of the sidewalk along both directions in Segment 1.
- Improve lighting condition at select intersections with driveways and select roadway segments with crashes that occurred during dark - not lighted conditions. - MP 0, MP 0.2
- Install safety edge treatment on select roadway segments with overturn/rollover, run-off road, and fixed object crashes.
- MP 0.5 to MP 0.6
- Upgrade or install stop signs on driveway approaches for Segment 1 where crashes occurred as vehicles left driveways.
- Install dynamic speed feedback signs at MP 0 and MP 0.6 to address the, speeding that is prevalent throughout Segment 1.
- NM 264 and Alma Drive signalized intersection:
- Improve striping on all four legs with visible markings for through and turn lanes.
- Provide dedicated left-turn lanes on both the north- and southbound directions and provide a 4-foot positive offset for left-turning vehicles.
- Improve crosswalk markings on all four legs.
- Provide a 4-foot positive offset for left-turning vehicles on both the east- and westbound directions.
- Upgrade the traffic signal equipment and pedestrian push buttons to be in compliance with the MUTCD.
- Update corner ramps to be in compliance with ADA and PROWAG regulations.
- Enhance intersection lighting on both the north and south legs.
- Implement access control along south side of the intersection.
- Install "intersection ahead" and "prepare to stop" signs along NM 264 (two on each direction).


### 8.1.9 Alternative 9 - Drainage Recommendations

The following recommendations are to be applied to all typical section alternatives for Segment 1:

- Replace all existing access point cross culverts with newly constructed cross culverts, sediment traps, and riprap erosion control at pipe outfalls. Oversize culverts to account for sediment-laden flows.
- From MP 0.0 through MP 0.47, reconstruct the roadside ditch located north of the segment. Apply erosion and sediment-control measures including check dams, waddles, Class G and Class A riprap, and embankment seeding to mitigate embankment erosion and reduce scour potential at pipe culvert outfalls. Reconfigure ditch to properly convey off-site drainage, with a 20 percent sediment bulking factor applied to peak discharge rates.
- Reconstruct the on-site drainage system based on an analysis of roll curb end condition and a 20 percent sediment bulking factor applied to peak discharge rates.


### 8.2 SEGMENT 2 RURAL SECTION ALTERNATIVES

8.2.1 Rural Alternative 1 - No-Build

## ALTERNATIVE DESCRIPTION

The No-Build Alternative would make no improvements to the NM 264 rural section. The existing typical section (Figure 70), lane configuration, median details, pedestrian facilities can be found under the Section 1.3, Existing Conditions, of this report. See the TNA (Appendix B) for existing traffic safety and operation.


## PURPOSE AND NEED

The No-Build Alternative would not provide any roadway, drainage, or safety improvements and, therefore, would not meet the purpose and need for this project.

TRAFFIC OPERATIONS
The No-Build Alternative would not improve traffic operations. Existing traffic operations can be found under the Section 1.3, Existing Conditions, of this report and in the TNA (Appendix B).

SAFETY
The No-Build Alternative would not improve safety. Existing traffic operations can be found under the Section 1.3, Existing Conditions, of this report and in the TNA (Appendix B).

EXISTING ACCESS AND LAND USE
The No-Build Alternative would not have any impact to existing access or land use.

BRIDGE
The No-Build Alternative would not have any impact to the existing bridges.
RIGHT-OF-WAY IMPACTS
The No-Build Alternative would not have any impact to existing ROW.
CONSTRUCTABILITY
There would be no constructability issues with the No-Build Alternative.

## DRAINAGE IMPACTS

The No-Build Alternative would not improve drainage operations. Existing drainage operations and performance, including scour-vulnerable features, would remain within this segment and continue to deteriorate.

## ENVIRONMENTAL IMPACTS

The No-Build Alternative would not have any impacts on the physical environment; however, important community resources and the people they serve, such as businesses, schools, and other facilities and public services, would continue to be affected by poor roadway drainage and safety issues that currently exist.

### 8.2.2 Rural Alternative 2-4 Lane Reconstruction with Raised Median

## ALTERNATIVE DESCRIPTION

Rural Alternative 2 includes reconstruction of the full 4 -lane roadway section. The rural segment is the longest segment within this corridor, starting at MP 0.6 and extending to MP 15.5. The newly constructed section would include two 12 -foot driving lanes in each direction, a raised 16 -foot mountable curb median, a 4 -foot inside shoulder, and an 8 -foot outside shoulder in each direction (Figure 71). No pedestrian facilities would be included. Other improvements include updated signs and striping with left-turn lanes provided to adjacent properties.


Figure 71. Rural Alternative 2 Typical Section
PURPOSE AND NEED
Rural Alternative 2 would meet the purpose and need for the project. Full reconstruction of the roadway provides the opportunity to address the poor pavement condition and allows for improvement of the roadway drainage. Additionally, it allows for the project to provide improved managed access to improve the safety of the roadway.

TRAFFIC OPERATIONS
The corridor would operate within an acceptable LOS with Rural Alternative 2. There are no signalized intersections within the rural section. See the TNA (Appendix B) for the operational analysis.

## SAFETY

Rural Alternative 2 would provide opportunities to improve safety in the corridor. Studies suggest that improving the pavement condition and raised median would reduce crashes. Access management would I reduce the potential conflict points with through traffic. Upgrades to the roadside barrier within this segment would comply with the AASHTO MASH requirements.

EXISTING ACCESS AND LAND USE
Rural Alternative 2 would allow the implementation of access management for the rural section. Existing left-turn lanes would be extended to meet the SAMM requirements and auxiliary lanes would be implemented where warranted.

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BRIDGES
Bridge Nos. 10017, 10016, and 5381
No improvements are required for these structures.
Bridge No. 8741 (MP 1.18
Replacement of the top slab is recommended for the box structure due to the active leaching and deterioration of the member. The remaining portions of the structure will need concrete repair and addition of galvanic anodes per section 533 of the specifications

Bridge Nos. 8626 and 8627 (MP 4.2)
For this alternative, bridge deck replacement is recommended because of the existing deck deterioration. The concrete deck, stay-in-place forms, and barriers would be removed and replaced. The typical section of the new bridge would match the existing bridge section

The steel girders are in good condition. Minor rehabilitation to remove existing rust near the abutments would be included in this alternative. Approach slabs would be added to the bridges and joints moved to the end of the new approach slabs. This would prevent further water infiltration and subsequent deterioration at the abutments.

The substructures are still in good condition and meet the geometric requirements of the project improvements. Minor rehabilitation of the abutment caps through concrete repair and grout injection would be included in this alternative

RIGHT-OF-WAY IMPACTS
The improved pavement tapers and roadside ditch to drainage structures would likely have impacts to existing ROW. It is anticipated that ROW takes for slope limits and construction maintenance easements (CMEs) would be required for construction of this section.

CONSTRUCTABILITY
Rural Alternative 2 would not have significant constructability issues. ROW needs, if applicable, may require additional coordination with the Navajo Nation and BIA.

ENVIRONMENTAL IMPACTS
Rural Alternative 2 is not expected to adversely affect land use, geologic features, landforms, threatened or endangered species, bald and golden eagles, wildlife, surface waters, wetlands, FEMA flood zones, Section 4(f) properties, farmlands, or visual resources.

Ground disturbance and minor vegetation removal would likely be necessary for this alternative; however, impacts would be restricted to the existing ROW. This alternative may have slightly more or less ground disturbance than other alternatives, but it would likely be negligible. If trees are removed, there may be impacts to migratory or nesting birds; however, fieldwork for the biological
report during the environmental phase will provide more information regarding the potential impac to birds. Likewise, a cultural survey and report during the environmental phase will indicate whether cultural resources or historic properties will be affected. Construction equipment and vehicles during construction would likely elevate noise levels temporarily; however, impacts would be short-term. The HMIB's pISA will assist with determining the risk of contamination as the design process progresses. Lastly, if there are any impacts to drainage structures, this alternative will be evaluated to determine whether there will be any impacts to potential waters of the United States.

### 8.2.3 Rural Alternative 3-2 Lane Reconstruction with Raised Median

## ALTERNATIVE DESCRIPTION

Rural Alternative 3 includes reconstruction of a 2-lane roadway section. The newly constructed section would include one 12 -foot driving lane in each direction, a raised 16 -foot mountable curb median, and an 8 -foot outside shoulder (Figure 72). No pedestrian facilities would be included. Other improvements include updated signs and striping with left-turn lanes provided to adjacent properties.


Figure 72. Rural Alternative 3 Typical Section

## PURPOSE AND NEED

Rural Alternative 2 would meet the purpose and need for the project. Full reconstruction of the roadway provides the opportunity to address the poor pavement condition and allows for
mprovement of the roadway drainage. Additionally, it allows for the project to provide managed access to improve the safety of the roadway.

## TRAFFIC OPERATIONS

The corridor would not operate within an acceptable LOS with Rural Alternative 3. There are no signalized intersections within the rural segment. See Table 38 for the operational analysis.

Table 38. LOS Summary for Rural Alternative 3

| Segment |  |  | LOS | V/C | Average Travel Speed (mph) |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | 2022 Existing Scenario | AM peak | A | 0.24 | 59.5 |
|  |  | PM peak | B | 0.36 | 59.5 |
|  | 2042 Two-Lane Scenario | AM peak | D | 0.53 | 57.4 |
|  |  | PM peak | E | 0.8 | 56.7 |

SAFETY
Rural Alternative 3 would provide opportunities to improve safety in the corridor. Studies suggest that improving the pavement condition and raised median will reduce crashes. Access management would reduce the potential conflict points with through traffic. This alternative reduces the typical section, which would reduce overall travel speed through the rural section.

EXISTING ACCESS AND LAND USE
Rural Alternative 2 would implement access management for the rural section. Existing left-turn lanes would be extended to meet the SAMM requirements and auxiliary lanes would be implemented where warranted

BRIDGES
Bridge Nos. 10017, 10016, and 5381
No improvements are required for these structures.
Bridge No. 8741 (MP 1.18)
Replacement of the top slab is recommended for the box structure due to the active leaching and deterioration of the member. The remaining portions of the structure will need concrete repair and addition of galvanic anodes per section 533 of the specifications

Bridge Nos. 8626 and 8627 (MP 4.2 )
For this alternative, bridge deck replacement is recommended on account of the existing deck deterioration. The concrete deck, stay-in-place forms, and barriers would be removed and replaced. Given the reduced typical section of the roadway, two exterior beam lines for each bridge would be removed. The new typical section of the bridge deck would be reduced to match the 2-lane typical section of this alternative.
The remaining steel girders are in good condition. Minor rehabilitation to remove existing rust near the abutments would be included in this alternative. Approach slabs would be added to the bridges, and joints moved to the end of the new approach slabs. This would prevent further water infiltration and subsequent deterioration at the abutments.

The substructures are still in good condition and meet the geometric requirements of the project improvements. Minor rehabilitation of the abutment caps through concrete repair and grout injection would be included in this alternative

RIGHT-OF-WAY IMPACTS
The reduced typical section width of this alternative makes ROW impacts unlikely.
CONSTRUCTABILITY
There are no constructability issues with Rural Alternative 3
ENVIRONMENTAL IMPACTS
Rural Alternative 3 is not expected to adversely affect land use, geologic features, landforms threatened or endangered species, bald or golden eagles, wildlife, surface waters, wetlands, FEMA flood zones, Section 4(f) properties, farmlands, or visual resources

Ground disturbance and minor vegetation removal would likely be necessary for this alternative; however, impacts would be restricted to the existing ROW. This alternative may have slightly more or less ground disturbance than other alternatives, but it would likely be negligible. If trees are removed, there may be impacts to migratory or nesting birds; however, fieldwork for the biologica report during the environmental phase will provide more information regarding the potential impac to birds. Likewise, a cultural survey and report during the environmental phase will indicate whether cultural resources or historic properties would be affected. Construction equipment and vehicles during construction would likely elevate noise levels temporarily; however, impacts would be short-term. The HMIB's pISA will assist with determining the risk of contamination as the design process progresses. Lastly, if there are any impacts to drainage structures, this alternative will be evaluated to determine whether there will be any impacts to potential waters of the United States.

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8.2.4 Rural Alternative 4-4 Lane Reconstruction with Striped Median

ALTERNATIVE DESCRIPTION
Rural Alternative 4 includes reconstruction of the full 4-lane roadway section. The newly constructed section would include two 12-foot driving lanes in each direction, an unraised 8 -foot median, and an 8 -foot outside shoulder in each direction (Figure 73). No pedestrian facilities would be included. Other improvements include updated signs and striping with left-turn lanes provided to adjacent properties


Figure 73. Rural Alternative 4 Typical Section

## URPOSE AND NEED

Rural Alternative 2 would meet the purpose and need for the project. Full reconstruction of the roadway provides the opportunity to address the poor pavement condition and allows for improvement of the roadway drainage. Additionally, it allows for the project to provide improved managed access to improve the safety of the roadway.

TRAFFIC OPERATIONS
The corridor operates within an acceptable LOS with Rural Alternative 4. There are no signalized intersections within the rural section. See the TNA (Appendix B) for the operational analysis

SAFETY
Rural Alternative 4 would provide opportunities to improve safety in the corridor. Studies suggest that improving the pavement condition will reduce crashes. However, studies also suggest that striped medians provide less safety benefits than raised medians, since raised medians provide a physical barrier of protection against opposite direction "head-on" crashes. Access management
would reduce the potential conflict points with through traffic. Upgrade to the roadside barrier within this segment would comply with the AASHTO MASH requirements.

## EXISTING ACCESS AND LAND USE

Rural Alternative 4 would implement access management for the rural section. Existing left-turn lanes would be extended to meet the SAMM requirements and auxiliary lanes would be implemented where warranted.

## BRIDGES

Bridge Nos. 10017, 10016, and 5381
No improvements are required for these structures
Bridge No. 8741 (MP 1.18)
Replacement of the top slab is recommended for the box structure due to the active leaching and deterioration of the member. The remaining portions of the structure will need concrete repair and addition of galvanic anodes per section 533 of the specifications.

Bridge Nos. 8626 and 8627 (MP 4.2)
For this alternative, bridge deck replacement is recommended because of the existing deck deterioration. The concrete deck, stay-in-place forms, and barriers would be removed and replaced. The overall bridge typical section width would be constructed to match existing. However, the new bridge would be constructed with an 8 -foot raised median to match the proposed roadway typical section. This would result in a 14 -foot outside shoulder width. The approach guardrail would be placed to match the bridge barrier railing alignment.
The steel girders are in good condition. Minor rehabilitation to remove existing rust near the abutments would be included in this alternative. Approach slabs would be added to the bridges, and joints moved to the end of the new approach slabs. This would prevent further water infiltration and subsequent deterioration at the abutments.

The substructures are still in good condition and meet the geometric requirements of the project improvements. Minor rehabilitation of the abutment caps through concrete repair and grout injection would be included in this alternative.

RIGHT-OF-WAY IMPACTS
The reduced median width should offset improved pavement tapers and roadside ditch to drainage structures and avoid impacts to existing ROW. It is not anticipated that ROW takes for slope limits and CMEs would be required for construction of this section.

CONSTRUCTABILITY
Rural Alternative 4 would not have significant constructability issues
ENVIRONMENTAL IMPACTS
Rural Alternative 4 is not expected to adversely affect land use, geologic features, landforms, threatened or endangered species, bald or golden eagles, wildlife, surface waters, wetlands FEMA flood zones, Section 4(f) properties, farmlands, or visual resources

Ground disturbance and minor vegetation removal would likely be necessary for this alternative; however, impacts would be restricted to the existing ROW. This alternative may have slightly more or less ground disturbance than other alternatives, but it would likely be negligible. If trees are removed, there may be impacts to migratory or nesting birds; however, fieldwork for the biological report during the environmental phase would provide more information regarding the potential mpact to birds. Likewise, a cultural survey and report during the environmental phase would indicate whether cultural resources or historic properties would be affected. Construction equipment and vehicles during construction would likely elevate noise levels temporarily; however, impacts would be short-term. The HMIB's pISA will assist with determining the risk of contamination as the design process progresses. Lastly, if there are any impacts to drainage structures, this alternative would be evaluated to determine whether there will be any impacts to potential waters of the United States.

### 8.2.5 Alternative 5 - Traffic Recommendations

The following recommendations are to be applied to all typical section alternatives for Segment 2

- Add deceleration lanes along both directions at Turnout 27, Hilltop Road (MP 0.61).
- Add deceleration lane at County Road 1 (Defiance Draw Road) (MP 8.25)
- Add left-turn acceleration lane at Turnout 62, Wildcat Drive (MP 8.95)
- Add deceleration lanes and left-turn acceleration lane at Turnout 86, Windy Mesa Drive (MP 15.29).
- Install an exclusive left-turn lane for Turnouts 50, 51, and 52.
- Improve lighting conditions at select intersections with driveways and select roadway segments with crashes that occurred during dark - not lighted conditions:
- MP 5, MP 5.3, MP 5.5, MP 6, MP 8.2, MP 8.9, MP 11.7, MP 14.3, MP 14.7, and MP 15.5
- Install safety edge treatment on select roadway segments with overturn/rollover, run-off road, and fixed-object crashes
- MP 0.6 to MP 1, MP 5 to MP 5.2, MP 8.2, MP 11.5 to MP 13
- Install chevron signs and/or related curvature warning signs on select segments of roadway where crashes occurred in curved sections of roadway
- MP 0.8 to MP 1.1 and MP 5 to MP 6
- Upgrade or install stop signs at all turnouts throughout Segment 2.
- Install dynamic speed feedback signs at appropriate spacing throughout Segment 2 because speeding is prevalent throughout the area
- NM 264 and P\&M Road/Tse Bonito Ridge Road unsignalized intersection:
- Install oversized advance intersection warning signs along NM 264
- Improve signs at the intersection.


### 8.2.6 Alternative 6 - Drainage Recommendations

The following recommendations are to be applied to all typical section alternatives for Segment 2:

- Replace all existing access point cross culverts with newly constructed cross culverts, sediment traps, and riprap erosion control at pipe outfalls. Oversize culverts to account for sediment-laden flows.
- Construct roadside ditches and apply erosion and sediment control measures including check dams, waddles, Class G and Class A riprap, and embankment seeding. Size ditches for sediment-laden conditions ( 20 percent bulking factor).
- Reconstruct pipe culvert outfalls identified as being at the terminus of the ROW limits or in scour-critical conditions. Add energy dissipation features including inline drop structures and junction boxes to mitigate headcutting and embankment failure (Figure 74).


Figure 74. Energy Dissipation Example

- Install new cross culverts at Station 194+00 and Station 200+00 (MP 11.6 to MP 11.7) to control stormwater breakout into the segment and intermingling of off-site runoff to adjacent pipe culvert crossings.
- Increase cross conveyance features and identified repetitive overtopping regions, including at MP 2.55, MP 3.12, MP 5.80, MP 6.7, MP 8.1, MP 9.8, and MP 12.75.
- Install NMDOT Type A inlets to collect concentrated stormwater runoff at the terminus of the mountable raised median in superelevated conditions.
- Clean and maintain all existing and newly constructed drainage infrastructure. Debris and sediment conveyed into and through project limits would continue with all alternatives.
8.3

SEGMENT 3 - URBAN/RURAL SECTION ALTERNATIVES
8.3.1 Urban/Rural Alternative 1 - No-Build

## ALTERNATIVE DESCRIPTION

The No-Build Alternative would make no improvements to the NM 264 urban/rural section. The existing typical section (Figure 75), lane configuration, median details, and pedestrian facilities can be found in Section 1.3, Existing Conditions, of this report. See the TNA (Appendix B) for existing traffic safety and operation.


Figure 75. Urban/Rural Alternative 1 Existing Typical Section

## PURPOSE AND NEED

The No-Build Alternative would not provide any roadway, drainage, or safety improvements and, therefore, would not meet the purpose and need for this project.
TRAFFIC OPERATIONS
The No-Build Alternative would not improve traffic operations. Existing traffic operations can be found under Section 1.3, Existing Conditions, of this report and in the TNA (Appendix B).

SAFETY
The No-Build Alternative would not improve safety. Existing traffic operations can be found under Section 1.3, Existing Conditions, of this report and in the TNA (Appendix B).

EXISTING ACCESS AND LAND USE
The No-Build Alternative would not have any impact to existing access or land use.
BRIDGE
The No-Build Alternative would not have any impact to the existing bridge.
RIGHT-OF-WAY IMPACTS
The No-Build Alternative would not have any impact to existing ROW.

CONSTRUCTABILITY
There would be no constructability issues with the No-Build Alternative.
DRAINAGE IMPACTS
The No-Build Alternative would not improve safety. Existing drainage operations can be found under Section 1.3, Existing Conditions, of this report and in the Drainage Report (Appendix C).

ENVIRONMENTAL IMPACTS
The No-Build Alternative would not have any impacts on the physical environment; however, important community resources and the people they serve, such as businesses, schools, and other facilities and public services would continue to be affected by poor intersection geometries, poor access, and safety issues that currently exist.
8.3.2 Urban/Rural Alternative 2-4 Lane Reconstruction with Raised Median

ALTERNATIVE DESCRIPTION
Urban/Rural Alternative 2 includes reconstruction of the full 4-lane roadway section. The newly constructed section would include two 12-foot driving lanes in each direction, a raised 16-foot mountable curb median, and 8 -foot outside shoulders in each direction (Figure 76). Other improvements include updated signs and striping with left-turn lanes provided to adjacent properties.


Figure 76. Urban/Rural Alternative 2 Typical Section
PURPOSE AND NEED
Urban/Rural Alternative 2 would meet the purpose and need for the project. Full reconstruction of the roadway provides the opportunity to address the poor pavement condition and allows for improvement of the roadway drainage. Additionally, it allows for the project to provide managed access to improve the safety of the roadway.

TRAFFIC OPERATIONS
The corridor operates within an acceptable LOS with Urban/Rural Alternative 2. There are no signalized intersections within the urban/rural section. See the TNA (Appendix B) for the operational analysis.

## SAFETY

Urban/Rural Alternative 2 would provide opportunities to improve safety in the corridor. Studies suggest that improving pavement condition and providing a raised median will reduce crashes. Access management would reduce the potential conflict points with through traffic. Upgrades to the roadside barrier within this segment would comply with the AASHTO MASH requirements.

## CN6101220 NM 264 (Arizona/New Mexico State Line to Yah-Ta-Hey, MP 0 to MP 16)

 Final Phase I-A/B ReportEXISTING ACCESS AND LAND USE
Urban/Rural Alternative 2 would implement access management for the urban/rural section. Existing left-turn lanes would be extended to meet the SAMM requirements and auxiliary lanes would be


## Figure 77. Segment 3 Access Management

## BRIDGES

Bridge No. 8703
No improvements are required for this structure.
RIGHT-OF-WAY IMPACTS
The improved pavement tapers and roadside ditch to drainage structures are not expected to have impacts to existing ROW. It is not anticipated that ROW takes or CMEs would be required for construction of this section.

## CONSTRUCTABILITY

There are no constructability issues with Urban/Rural Alternative 2.
ENVIRONMENTAL IMPACTS
Urban/Rural Alternative 2 is not expected to adversely affect land use, geologic features, landforms, threatened or endangered species, bald or golden eagles, wildlife, surface waters, wetlands, FEMA flood zones, Section 4(f) properties, farmlands, or visual resources.

Ground disturbance and minor vegetation removal would likely be necessary for this alternative; however, impacts would be restricted to the existing ROW. This alternative may have slightly more or less ground disturbance than other alternatives, but it would likely be negligible. If trees are removed, there may be impacts to migratory or nesting birds; however, fieldwork for the biologica report during the environmental phase will provide more information regarding the potential impact to birds. Likewise, a cultural survey and report during the environmental phase will indicate whether cultural resources or historic properties would be affected. Construction equipment and vehicles during construction would likely elevate noise levels temporarily; however, impacts would be short-term. The HMIB's pISA will assist with determining the risk of contamination as the design process progresses. Lastly, if there are any impacts to drainage structures, this alternative will be evaluated to determine whether there would be any impacts to potential waters of the United States.
8.3.3 Urban/Rural Alternative 3-4 Lane Reconstruction with TWLTL

ALTERNATIVE DESCRIPTION
Urban/Rural Alternative 3 includes reconstruction of the full 4-lane roadway section. The newly constructed section would include two 12-foot driving lanes in each direction, a 16-foot TWLTL and an 8 -foot outside shoulder in each direction (Figure 78). No pedestrian facilities would be included. Other improvements include updated signs and striping with left-turn lanes provided to adjacent properties


Figure 78. Urban/Rural Alternative 3 Typical Section
PURPOSE AND NEED
Urban/Rural Alternative 4 would meet the purpose and need for the project. Full reconstruction of the roadway provides the opportunity to address the poor pavement condition and allows for improvement of the roadway drainage. Additionally, it allows for the project to provide managed access to improve the safety of the roadway.

TRAFFIC OPERATIONS
The corridor would operate within an acceptable LOS with Urban/Rural Alternative 3. There are no signalized intersections within the rural section. See the TNA (Appendix B) for the operational analysis.

SAFETY
Urban/Rural Alternative 3 would provide opportunities to improve safety in the corridor. Studies suggest that improving the pavement condition will reduce crashes. However, studies also suggest that striped medians provide less safety benefits than raised medians, since raised medians provide a physical barrier of protection against opposite direction "head-on" crashes. Access management would reduce the potential conflict points with through traffic. Upgrades to the roadside barrier within this segment would comply with the AASHTO MASH requirements.

EXISTING ACCESS AND LAND USE
Urban/Rural Alternative 3 would implement access management for the rural section (Figure 77) Existing left-turn lanes would be extended to meet the SAMM requirements and auxiliary lanes would be implemented where warranted.

BRIDGES
Bridge No. 8703
No improvements are required for this structure.
RIGHT-OF-WAY IMPACTS
The improved pavement tapers and roadside ditch to drainage structures are not expected to have impacts to existing ROW. It is not anticipated that ROW takes, or CMEs would be required for construction of this section.

## CONSTRUCTABILITY

There are no constructability issues with Urban/Rural Alternative 3
ENVIRONMENTAL IMPACTS
Urban/Rural Alternative 3 is not expected to adversely affect land use, geologic features, landforms, threatened or endangered species, bald or golden eagles, wildlife, surface waters wetlands, FEMA flood zones, Section 4(f) properties, farmlands, or visual resources
Ground disturbance and minor vegetation removal would likely be necessary for this alternative however, impacts would be restricted to the existing ROW. This alternative may have slightly more or less ground disturbance than other alternatives, but it would likely be negligible. If trees are removed, there may be impacts to migratory or nesting birds; however, fieldwork for the biological report during the environmental phase will provide more information regarding the potential impac to birds. Likewise, a cultural survey and report during the environmental phase will indicate whether cultural resources or historic properties would be affected. Construction equipment and vehicles during construction would likely elevate noise levels temporarily; however, impacts would be short-term. The HMIB's pISA will assist with determining the risk of contamination as the design process progresses. Lastly, if there are any impacts to drainage structures, this alternative would be evaluated to determine whether there will be any impacts to potential waters of the United States.

### 8.3.4 Urban/Rural Alternative 4 - 2 Lane Reconstruction with Raised Median

## ALTERNATIVE DESCRIPTION

Urban/Rural Alternative 4 includes reconstruction of a 2-lane roadway section. The newly constructed section would include one 12-foot driving lane in each direction, a raised 16-foot mountable curb median, and an 8 -foot outside shoulder on each side (Figure 79). No pedestrian facilities would be included. Other improvements include updated signs and striping with left-turn lanes provided to adjacent properties.


Figure 79. Urban/Rural Alternative 4 Typical Section

PURPOSE AND NEED
Urban/Rural Alternative 4 would meet the purpose and need for the project. Full reconstruction of the roadway provides the opportunity to address the poor pavement condition and allows for improvement of the roadway drainage. Additionally, it allows for the project to provide managed access to improve the safety of the roadway.

## TRAFFIC OPERATIONS

The corridor would not operate within an acceptable LOS with Urban/Rural Alternative 4. There are no signalized intersections within the rural segment. See Table 39 for the operational analysis.

Table 39. LOS Summary for Urban/Rural Alternative 4

| Segment |  |  | LOS | V/C | Average Travel Speed (mph) |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | 2022 ExistingScenario | AM peak | A | 0.23 | 51.5 |
|  |  | PM peak | B | 0.35 | 51.5 |
|  | 2042 Two-Lane Scenario | AM peak | D | 0.48 | 56.5 |
|  |  | PM peak | E | 0.72 | 55.8 |

SAFETY
Urban/Rural Alternative 4 would provide opportunities to improve safety in the corridor. Studies suggest that improving the pavement condition and raised median will reduce crashes. Access management would reduce the potential conflict points with through traffic. This alternative reduces the typical section, which would reduce overall travel speed through the rural section.

EXISTING ACCESS AND LAND USE
Urban/Rural Alternative 4 would implement access management for the rural section (Figure 77).
Existing left-turn lanes would be extended to meet the SAMM requirements and auxiliary lanes would be implemented where warranted.

BRIDGES
Bridge No. 8703
No improvements are required for this structure.
RIGHT-OF-WAY IMPACTS
The reduced typical section width makes ROW impacts unlikely.
CONSTRUCTABILITY
There are no constructability issues with the Urban/Rural Alternative 4.
ENVIRONMENTAL IMPACTS
Urban/Rural Alternative 4 is not expected to adversely affect land use, geologic features, landforms, threatened or endangered species, bald or golden eagles, wildlife, surface waters, wetlands, FEMA flood zones, Section 4(f) properties, farmlands, or visual resources.

Ground disturbance and minor vegetation removal would likely be necessary for this alternative; however, impacts would be restricted to the existing ROW. This alternative may have slightly more or less ground disturbance than other alternatives, but it would likely be negligible. If trees are removed, there may be impacts to migratory or nesting birds; however, fieldwork for the biological report during the environmental phase will provide more information regarding the potential impact to birds. Likewise, a cultural survey and report during the environmental phase will indicate whether cultural resources or historic properties would be affected. Construction equipment and vehicles during construction would likely elevate noise levels temporarily; however, impacts would be short-term. The HMIB's pISA will assist with determining the risk of contamination as the design process progresses. Lastly, if there are any impacts to drainage structures, this alternative will be evaluated to determine whether there would be any impacts to potential waters of the United States.
8.3.5 Urban/Rural Alternative 5-2 Lane Reconstruction with TWLTL

## ALTERNATIVE DESCRIPTION

Urban/Rural Alternative 5 includes reconstruction of a 2-lane roadway section. The newly constructed section would include one 12-foot driving lane in each direction, a TWLTL, and an 8foot outside shoulder on each side (Figure 80). No pedestrian facilities would be included. Other improvements include updated signs and striping with left-turn lanes provided to adjacent properties.


Figure 80. Urban/Rural Alternative 5 Typical Section

## UURPOSE AND NEED

Urban/Rural Alternative 5 would meet the purpose and need for the project. Full reconstruction of the roadway provides the opportunity to address the poor pavement condition and allows for improvement of the roadway drainage. Additionally, it allows for the project to provide managed access to improve the safety of the roadway.

TRAFFIC OPERATIONS
The corridor would not operate within an acceptable LOS with Urban/Rural Alternative 5. There are no signalized intersections within the rural segment. See Table 39 for the operational analysis.

## SAFETY

Urban/Rural Alternative 5 would provide opportunities to improve safety in the corridor. Studies suggest that improving the pavement condition will reduce crashes. However, studies also suggest that striped medians provide less safety benefits than raised medians, since raised medians provide a physical barrier of protection against opposite direction "head-on" crashes. Access management would reduce the potential conflict points with through traffic. This alternative reduces the typical section, which would reduce overall travel speeds through the rura section.

EXISTING ACCESS AND LAND USE
Urban/Rural Alternative 5 would implement access management for the rural section (Figure 77) Existing left-turn lanes would be extended to meet the SAMM requirements and auxiliary lanes would be implemented where warranted.

BRIDGES
Bridge No. 8703
No improvements are required for this structure
RIGHT-OF-WAY IMPACTS
The reduced typical section width makes ROW impacts unlikely.

## CONSTRUCTABILITY

There are no constructability issues with the Urban/Rural Alternative 5.

## ENVIRONMENTAL IMPACTS

Urban/Rural Alternative 5 is not expected to adversely affect land use, geologic features landforms, threatened or endangered species, bald or golden eagles, wildlife, surface waters wetlands, FEMA flood zones, Section 4(f) properties, farmlands, or visual resources.

Ground disturbance and minor vegetation removal would likely be necessary for this alternative however, impacts would be restricted to the existing ROW. This alternative may have slightly more or less ground disturbance than other alternatives, but it would likely be negligible. If trees are removed, there may be impacts to migratory or nesting birds; however, fieldwork for the biological report during the environmental phase will provide more information regarding the potential impac to birds. Likewise, a cultural survey and report during the environmental phase will indicate whether cultural resources or historic properties would be affected. Construction equipment and vehicles during construction would likely elevate noise levels temporarily; however, impacts would be short-term. The HMIB's pISA will assist with determining the risk of contamination as the design process progresses. Lastly, if there are any impacts to drainage structures, this alternative will be evaluated to determine whether there would be any impacts to potential waters of the United States.

### 8.3.6 Alternative 6 - Traffic Recommendations

The following recommendations are to be applied to all typical section alternatives for Segment 3:

- Add frontage road from N Cle Ki Drive to N Labah Drive (MP 15.5).
- Close off N Ola Drive to NM 264 (MP 15.57).
- Add deceleration lanes along both directions at Cle Ki Drive and Labah Drive (MP 15.5 and MP 15.65).
- Add deceleration lanes in both directions at Turnouts 94 and 95 (MP 15.83).
- Improve lighting conditions at select intersections with turnouts and select roadway segments with crashes that occurred during dark - not lighted conditions: - MP 15.5 and MP 15.9
- Install safety edge treatment on select roadway segments with overturn/rollover, run-off road, and fixed-object crashes:
- MP 15.7 to MP 16
- Install chevron signage and/or related curvature warning signage at MP 16's curved section of roadway where crashes have occurred.
- Install dynamic speed feedback signs at appropriate spacing throughout Segment 3 because speeding is prevalent throughout the area.
8.3.7 Alternative 7 - Drainage Recommendations

The following recommendations are to be applied to all typical section alternatives for Segment 3:

- Replace all existing access point cross culverts with newly constructed cross culverts, sediment traps, and riprap erosion control at pipe outfalls. Oversize culverts to account for sediment-laden flows.
- Reconstruct roadside ditches and apply erosion and sediment control measures including check dams, waddles, Class G and Class A riprap, and embankment seeding. Size ditches for sediment-laden conditions (20 percent bulking factor).
- Clean and maintain all existing and newly constructed drainage infrastructure. Debris and sediment conveyed into project limits will continue with all alternatives.
- Rebuild conveyance crossing at MP 15.93 to increase capacity and construct dedicated drainage channel to reduce debris and vegetation.



## 9 RECOMMENDATIONS TO PROCEED TO PHASE I-B

### 9.1 SEGMENT 1 - URBAN SECTION

Each alternative was evaluated based on the impact parameters including purpose and need, traffic operations (vehicular and multimodal), safety, existing access and land use, ROW impacts, constructability, and environmental impacts. The alternatives were assigned a factor value rating from 1 to 4 , with a rating of 4 being the highest. Based on the Urban Section Matrix (Table 40 ), it is
 would be applied and combined with both advanced alternatives. The No-Build Alternative will be advanced to Phase I-B for comparison purposes only.

Table 40. Segment 1 Urban Section Matrix

|  | ALTERNATIVE 1 | ALTERNATIVE 2 | ALTERNATIVE 3 | ALTERNATIVE 4 | ALTERNATIVE 5 | ALTERNATIVE 6 | ALTERNATIVE 7 | ALTERNATIVE 8 | ALTERNATIVE 9 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Evaluation Factors | No Build | 4 lane with raised median \& bike lanes | 4 lane with TWLTL \& bike lanes | 4 lane with raised median \& multi-use trail | 4 lane with TWLTL \& multi-use trail | 2 lane with raised median \& bike lanes | 2 lane with TWLTL \& bike lanes | Traffic Recommendations | Drainage Recommendations |
| Purpose and Need | 0 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Traffic Operations | 2 | 4 | 4 | 3 | 3 | 0 | 0 | 3 | 3 |
| Safety - Vehicle | 2 | 4 | 3 | 4 | 3 | 0 | 0 | 4 | 4 |
| Safety - Multi-Modal | 2 | 4 | 4 | 3 | 3 | 4 | 4 | 3 | 2 |
| Existing Access and Land use | 2 | 4 | 3 | 4 | 3 | 4 | 3 | 2 | 2 |
| Right-of-Way Impacts | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Constructability | 2 | 1 | 3 | 1 | 3 | 1 | 1 | 3 | 1 |
| Environmental Impacts | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Evaluation Score | 13 | 25 | 25 | 23 | 23 | 17 | 16 | 23 | 20 |


| LEGEND |  |  |
| :--- | :--- | :--- |
| $\mathbf{0}$ | Very Negative Impact |  |
| $\mathbf{1}$ | Negative |  |
| $\mathbf{2}$ | No Impact |  |
| $\mathbf{3}$ | Positive Impact |  |
| $\mathbf{4}$ | Very Positive Impact |  |

9.2 SEGMENT 2 - RURAL SECTION

Each alternative was evaluated based on the impact parameters including purpose and need, traffic operations (vehicular and multimodal), safety, existing access and land use, ROW impacts, constructability, and environmental impacts. The alternatives were assigned a factor value rating from 1 to 4 , with a rating of 4 being the highest. Based on the Rural Section Matrix (Table 41 ), it is
 and Alternative 7 (Bridge Recommendations) will be applied and combined with both advanced alternatives. The No-Build Alternative will be advanced to Phase I-B for comparison purposes only.

Table 41. Segment 2 Rural Section Matrix

|  | ALTERNATIVE 1 | ALTERNATIVE 2 | ALTERNATIVE 3 | ALTERNATIVE 4 | ALTERNATIVE 5 | ALTERNATIVE 6 | ALTERNATIVE 7 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Evaluation Factors | No Build | 4 lane with raised median | 2 lane with raised median | 4 lane with striped median | Traffic Recommendations | Drainage Recommendations | Bridge Recommendations |
| Purpose and Need | 0 | 4 | 4 | 4 | 4 | 4 | 4 |
| Traffic Operations | 2 | 4 | 0 | 4 | 4 | 2 | 2 |
| Safety | 2 | 4 | 0 | 4 | 4 | 4 | 3 |
| Existing Access and Land use | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Right-of-Way Impacts | 2 | 0 | 2 | 2 | 2 | 1 | 2 |
| Constructability | 2 | 1 | 3 | 1 | 1 | 2 | 1 |
| Environmental Impacts | 1 | 0 | 2 | 2 | 2 | 2 | 2 |
| Evaluation Score | 11 | 15 | 13 | 19 | 19 | 17 | 16 |


| LEGEND |  |
| :--- | :--- |
| $\mathbf{0}$ | Very Negative Impact |
| $\mathbf{1}$ | Negative |
| $\mathbf{2}$ | No Impact |
| $\mathbf{3}$ | Positive Impact |
| $\mathbf{4}$ | Very Positive Impact |
|  |  |


9.3 SEGMENT 3 - URBAN/RURAL SECTION

Each alternative was evaluated based on the impact parameters including purpose and need, traffic operations (vehicular and multimodal), safety, existing access and land use, ROW impacts,

 will be applied and combined with both advanced alternatives. The No-Build will be advanced to Phase I-B for comparison purposes only.

Table 42. Segment 3 Urban/Rural Section Matrix

|  | ALTERNATIVE 1 | ALTERNATIVE 2 | ALTERNATIVE 3 | ALTERNATIVE 4 | ALTERNATIVE 5 | ALTERNATIVE 6 | ALTERNATIVE 7 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Evaluation Factors | No Build | 4 lane with raised median | 4 lane with TWLTL | 2 lane with raised median | 2 lane with TWLTL | Traffic Recommendations | Drainage Recommendations |
| Purpose and Need | 0 | 4 | 4 | 4 | 4 | 4 | 4 |
| Traffic Operations | 2 | 4 | 4 | 0 | 0 | 4 | 2 |
| Safety | 2 | 4 | 3 | 1 | 1 | 4 | 4 |
| Existing Access and Land use | 2 | 3 | 3 | 3 | 3 | 2 | 2 |
| Right-of-Way Impacts | 2 | 2 | 2 | 2 | 2 | 2 | 1 |
| Constructability | 2 | 1 | 1 | 3 | 3 | 1 | 2 |
| Environmental Impacts | 1 | 2 | 2 | 2 | 2 | 2 | 2 |
| Evaluation Score | 11 | 20 | 19 | 15 | 15 | 19 | 17 |

## LEGEND

| $\mathbf{0}$ | Very Negative Impact |
| :--- | :--- |
| $\mathbf{1}$ | Negative |
| $\mathbf{2}$ | No Impact |
| $\mathbf{3}$ | Positive Impact |
| $\mathbf{4}$ | Very Positive Impact |

## 10 PHASE I-B ALTERNATIVES

10.1 EVALUATION OF ALTERNATIVES

Each alternative has been developed and evaluated using engineering and environmental criteria. The evaluation process assigned a factor value to the different criteria for each alternative. The factors are as follows:

| Factor Value | Description |
| :---: | :---: |
| 0 | Very Negative Impact |
| 1 | Negative |
| 2 | No Impact |
| 3 | Positive Impact |
| 4 | Very Positive Impact |

The following discussion details the scoring of those factors for each alternative and determines the preferred alternative for advancement into Phase I-C and Phase I-D of the project development.

### 10.2 SEGMENT 1 - URBAN SECTION (MP 0 TO MP 0.5)

For the urban section, alternatives that have been advanced from Phase I-A are evaluated for the westernmost section of the corridor.

### 10.2.1 Purpose and Need Analysis

Urban Alternative 1 - No-Build
Urban Alternative 1 would not meet the purpose and need of the project. The deteriorating pavement would not be improved, drainage issues would not be addressed, and the safety of the corridor would not be improved. Urban Alternative 1 was rated at 0 because it would not meet the purpose and need of the project.

Urban Alternative 2-4 Lane with Raised Median and Bike Lanes
Urban Alternative 2 would meet the purpose and need of the project. The deteriorating pavement would be fully reconstructed, drainage issues would be addressed, and the safety of the corridor would be improved. Urban Alternative 2 was rated at 4, having addressed all items of the purpose and need of the project.

Urban Alternative 3-4 Lane with TWLTL and Bike Lanes
Urban Alternative 3 would meet the purpose and need of the project. The deteriorating pavement would be fully reconstructed, drainage issues would be addressed, and the safety of the corridor would be improved. Urban Alternative 3 was rated at 4, having addressed all items of the purpose and need of the project.

SUMMARY PURPOSE AND NEED

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 0 |
| Urban Alternative 2 | 4 |
| Urban Alternative 3 | 4 |

### 10.2.2 Cost Analysis

Funding is continually requested to improve infrastructure and construct new projects. With so many needs and requests for funding, each available dollar is greatly valued when requested. The evaluation of alternatives under this factor considered the cost of the alternative. The more the alternative will cost, the greater the negative effect. The costs were developed by considering the major items for the project. Some of the items were estimated using a lump sum approach. The estimated quantities and construction cost development are shown in Appendix $F$ of this report. Each alternative also has maintenance costs that are typically borne by the NMDOT District and should be considered in the evaluation. Maintenance costs for new infrastructure are expected to be less than the costs for maintaining old and aging infrastructure. The maintenance costs are not quantified below but were factored into the evaluation. The ROW costs are not known at this time given the uncertainty associated with the agreement with the Navajo Nation. The following costs are estimates and were developed for planning purposes and should not be regarded as actual costs. Inflation factors may be appropriate for future construction timelines.

Urban Alternative 1 - No-Build
The estimated cost for Urban Alternative 1 is:
Estimated Construction and Detour Cost: \$0
Estimated ROW Cost: \$0 (no ROW required)
Estimated Maintenance Cost: High maintenance cost for existing infrastructure that remains.

The cost for the Urban Alternative 1 was rated at 0 because of the expected cost for maintenance on the deteriorated pavement.

Urban Alternative 2-4 Lane with Raised Median and Bike Lanes
The estimated cost for Urban Alternative 2 is:
Estimated Construction and Detour Cost: \$12,005,500 including New Mexico Gross Receipt Tax (NMGRT)

Estimated ROW Cost: \$0 (no ROW required)
Estimated Maintenance Cost: Low maintenance cost for new infrastructure
The cost for the Urban Alternative 2 was rated at 1 because of the expected high cost for construction but it would improve the project infrastructure.

Urban Alternative 3-4 Lane with TWLTL and Bike Lanes
The estimated cost for Urban Alternative 3 is:
Estimated Construction and Detour Cost: \$9,782,500 including NMGRT
Estimated ROW Cost: \$0 (no ROW required)
Estimated Maintenance Cost: Low maintenance cost for new infrastructure
The cost for the Urban Alternative 3 was rated at 3 because it improves the project infrastructure at a lower cost than other alternatives.

SUMMARY COST ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 0 |
| Urban Alternative 2 | 1 |
| Urban Alternative 3 | 3 |

### 10.2.3 Engineering Factors and Analysis

The evaluation for some of the typical engineering factors was consistent for all the alternatives and thus was not evaluated separately. Those engineering categories are not differentiators and do not contribute to the identification of a preferred alternative. Some of the non-differentiating engineering factors are:

- Access management: Expected to remain the same as existing for all alternatives
- Geology and soils: Existing geology and soils would affect all the alternatives equally
- Utility conflicts Expected to be equal for all alternatives

The engineering factors discussed below contributed to the identification of a preferred alternative

- Traffic operations and safety
- Constructability
- ROW impacts
- Future maintenance and operation
- Drainage performance
- Floodplain


## TRAFFIC OPERATIONS AND SAFETY

The primary purpose of performing a traffic analysis is to determine the operating characteristics of an identified transportation facility for existing and future conditions and to identify any deficiencies on the facility from an operational perspective. If any deficiencies are identified, recommendations for geometrics and/or traffic control devices are made to improve performance. The two primary elements of a transportation facility that are identified and analyzed in this study are intersections and roadway segments.

The project team analyzed traffic safety for the NM 264 corridor, including a crash analysis, access management analysis, and speed analysis. The corridor was also analyzed for roadside barriers within the clear zone of the roadway.

Urban Alternative 1 - No-Build
Urban Alternative 1 would not improve Traffic Operations or Safety. Existing traffic operations can be found under Section 1.3, Existing Condition, and in the TNA (Appendix B). Urban Alternative 1 was rated at 2 because it has no effect on Traffic Operations and Safety.

Urban Alternative 2-4 Lane with Raised Median and Bike Lanes
The corridor would operate within an acceptable LOS with Urban Alternative 2 including the signalized intersection with Alma Road. See the TNA (Appendix B) for the operational analysis. Urban Alternative 2 would also provide opportunities to improve safety in the corridor. Studies suggest that improving pavement condition and providing a raised median will reduce crashes. Access management would reduce the potential conflict points with through traffic. Improvements to the signalized intersection at Alma Drive would improve safety in several ways. Improvements to crosswalk striping and intersection lighting would improve pedestrian safety. Segment lighting between the transit stop in this segment and the nearby signal, NM 264 at Alma Drive, would also improve safety. Adding dedicated left-turn lane striping with a positive offset would reduce angle and rear-end crashes. Installing signs warning of the approaching signal would improve overall safety as well. Urban Alternative 2 was rated at 4 because of improvements to traffic operations and safety within the segment.

Urban Alternative 3-4 Lane with TWLTL and Bike Lanes
The corridor operates within an acceptable LOS with Urban Alternative 3, including the signalized intersection with Alma Road. See the TNA (Appendix B) for the operational analysis. Urban Alternative 3 would provide opportunities to improve safety in the corridor. Studies suggest that improving pavement condition will reduce crashes. However, studies also suggest that striped medians provide less safety benefits than raised medians, since raised medians provide a physical barrier of protection against opposite direction "head-on" crashes. Although not as effective as Urban Alternative 2, access management would reduce the potential conflict points with through traffic. Improvements to the signalized intersection at Alma Drive would improve safety in several ways. Improvements to crosswalk striping and intersection lighting would improve pedestrian safety. Segment lighting between the transit stop in this segment and the nearby signal, NM 264 at Alma Drive, would also improve safety Adding dedicated left-turn lane striping with a positive offset would reduce angle and rear-end crashes. Installing signage warning of the approaching signal would improve overall safety as well. Urban Alternative 3 was rated at 3 because of improvements to traffic operations and safety within the segment.

SUMMARY OF TRAFFIC OPERATIONS AND SAFETY ANALYSIS

| Alternative | Evaluation |
| :--- | :---: |
| No-Build | 2 |
| Urban Alternative 2 | 4 |
| Urban Alternative 3 | 3 |

## CONSTRUCTABILITY

The evaluation of constructability considered the alternatives' feasibility to be built. This factor considered how construction would affect residential or business access, utilities, and ROW. It also considered whether the alternative can be constructed using methods, materials, and equipment common to the construction industry and area. Positive scores were given to alternatives that minimize impacts and are more easily constructed. The evaluation also considered the location of the work zone in relation to the traveling public. A greater negative effect was valued for the approaches with work zones near the travel ways with hindered access

Urban Alternative 1 - No-Build
There would be no construction with Urban Alternative 1; however, the lack of new construction would result in significant maintenance needs until the corridor is reconstructed. Urban Alternative 1 was rated at 0 because it has significant effects on maintenance

Urban Alternative 2-4 Lane with Raised Median and Bike Lanes
There are no significant constructability issues with Urban Alternative 2. Temporary access from adjacent properties appears plausible for most properties within existing ROW during construction There does not appear to be the need for TWPs or TCPs to build the Alternative. Property access would be more difficult during the phase that constructs the center raised median, making access to turnouts across the median more difficult. Urban Alternative 2 was rated at 3 because of the constructability issue listed above.

## Urban Alternative 3-4 Lane with TWLTL and Bike Lanes

There are no significant constructability issues with Urban Alternative 3. Temporary access from adjacent properties appears plausible for most properties within existing ROW during construction There does not appear to be the need for TWPs or TCPs to build the Alternative. This alternative would not have the same challenges providing access to turnouts across the median because it is not raised. Urban Alternative 3 was rated at 4 because of the constructability aspect listed above.

SUMMARY OF CONSTRUCTABILITY ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 0 |
| Urban Alternative 2 | 3 |
| Urban Alternative 3 | 4 |

RIGHT-OF-WAY IMPACTS
The need for additional ROW for the alternatives is a factor to be considered with each alternative The location of the required property and the impacts that the acquisition brings to the project must be considered. The adjacent properties are all similar in nature and are valued the same. No property would be valued greater, so the score was based on solely on the quantity of needed property. The alternatives with fewer acreage impacts received more positive scores.

SUMMARY OF RIGHT-OF-WAY IMPACTS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 0 acres (4) |
| Urban Alternative 2 | 0 acres (4) |
| Urban Alternative 3 | 0 acres (4) |

## FUTURE MAINTENANCE AND OPERATION

Different levels of preservation or maintenance can occur on infrastructure. For this discussion, the different levels and efforts are combined. The overall purpose of those efforts is to delay or reduce deterioration of infrastructure or infrastructure elements. The higher level of future maintenance and operation results in a lower point rating

Urban Alternative 1 - No-Build
Urban Alternative 1 would not replace or improve the existing infrastructure, so the existing infrastructure would continue to age and degrade. Being already significantly deteriorated the infrastructure maintenance efforts would continue and accelerate as time passes. Urban Alternative 1 was valued as a very negative affect given the expected level of maintenance needed for the existing old structures and was rated at 0 because it has a significant level of maintenance to allow for continued operation.

Urban Alternative 2-4 Lane with Raised Median and Bike Lanes
Urban Alternative 2 would reconstruct all the existing infrastructure, including the addition of a raised median. Based on current sediment gathering in the corridor, the raised median would result in additional maintenance to keep the median clear. Urban Alternative 2 was rated at 1 because of the additional maintenance required for the raised median.

Urban Alternative 3-4 Lane with TWLTL and Bike Lanes
Urban Alternative 3 would reconstruct all the existing infrastructure, including the addition of an atgrade median. The at-grade median would not result in additional maintenance to keep the median clear. Urban Alternative 3 was rated at 4 because of the reduced maintenance with no raised median.

SUMMARY OF MAINTENANCE AND OPERATIONAL ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 0 |
| Urban Alternative 2 | 1 |
| Urban Alternative 3 | 4 |

## DRAINAGE PERFORMANCE

Based on preliminary hydraulic modeling of the alternatives under consideration to address the existing roadway capacity, the following advantages and disadvantages should be considered. No significant differentiating factors for the construction approaches were identified with regard to the
drainage performance, so the discussion focuses on the build alternatives rather than their construction approaches.

Urban Alternative 1 - No-Build
Urban Alternative 1 would not improve the existing drainage performance. The current performance of the corridor is problematic and results in safety concerns related to flooding and overtopping the roadway and significant sediment deposition within the roadway corridor. Urban Alternative 1 was rated at 0 because of the poor expected performance and safety impacts.

Urban Alternative 2-4 Lane with Raised Median and Bike Lanes
Urban Alternative 2 would reconstruct both on and off-site drainage infrastructure. Off-site drainage infrastructure would consist of reconstructed roadside ditches, channels, and swales to increase capture and conveyance of the sediment-laden off-site runoff. Cross culverts at access points would be oversized to account for potential sediment deposition. The on-site drainage system would include curb inlets, laterals, and a newly sized trunkline to maintain street runoff conditions at or below NMDOT DDM criteria. Outfall features would include riprap erosion control pads to dissipate hydraulic energy and provide a stable channel section to mitigate potential for headcutting and undermining of the pipe section. Urban Alternative 2 was rated at 4 because it improves on- and off- site drainage, resulting in improved driver conditions and a reduction in sediment deposition within the roadway prism.

Urban Alternative 3-4 Lane with TWLTL and Bike Lanes
Urban Alternative 3 would reconstruct both on- and off-site drainage infrastructure. Off-site drainage infrastructure would consist of reconstructed roadside ditches, channels, and swales to increase capture and conveyance of the sediment-laden off-site runoff. Cross culverts at access points would be oversized to account for potential sediment deposition. The on-site drainage system would include curb inlets, laterals, and a newly sized trunkline to maintain street runoff conditions at or below NMDOT DDM criteria. Outfall features would include riprap erosion control pads to dissipate hydraulic energy and provide a stable channel section to mitigate potential for headcutting and undermining of the pipe section. Urban Alternative 3 was rated at 4 because it improves on- and off- site drainage capacity, resulting in improved driver conditions and a reduction in sediment deposition withing the roadway prism.

SUMMARY OF DRAINAGE PERFORMANCE ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 0 |
| Urban Alternative 2 | 4 |
| Urban Alternative 3 | 4 |

## FLOODPLAIN

Zone A is described by FEMA as areas of potential flooding with a 1 percent annual chance of being equaled or exceeded in any given year." This means that structures in this area have a 26 percent chance of experiencing flooding equal to, or greater than, the depths of flooding represented by this floodplain over a 30-year period. Detailed analyses were not performed for this area by FEMA and no depths or base flood elevations are shown within these zones on the Flood Insurance Rate Map (FIRM). As a result, a hydraulic analysis pursuant to National Flood Insurance Program (NFIP) regulations (44 CFR 60.3) will be required for final design. The preliminary 2D hydraulic analysis conducted for this study is a more modern approach to the prediction of potential floodplain limits, depths, and general characteristics. Results of the assessment predict more widespread riverine flooding/inundation during the 100-year storm event and appear to confirm field observations. Remapping of the FEMA FIRM is not currently planned in the scope of this study and project.

Urban Alternative 1 - No-Build
Urban Alternative 1 would not alter the existing floodplain characteristics. The current floodplain is problematic with safety concerns related to flooding. Urban Alternative 1 was rated at 0 because of the lack of improvement to the existing floodplain area affecting the roadway.

Urban Alternative 2-4 Lane with Raised Median and Bike Lanes
Urban Alternative 2 proposed drainage improvements would provide increased capacity for capture and conveyance of floodwaters, resulting in a reduction of volume of water and headwater elevations at cross culverts. Analysis of the combined improvements and existing 100-year runoff would be required to confirm impact to floodplain limits, adhering to local and national floodplain regulations. Urban Alternative 2 was rated at 3 because it increases the potential for capture of the peak discharge and volume of off-site flow entering the NM 264 corridor, resulting in a reduction of flooding extents.

Urban Alternative 3-4 Lane with TWLTL and Bike Lanes
Urban Alternative 3 proposed drainage improvements would provide increased capacity for capture and conveyance of floodwaters, resulting in a reduction of volume of water and headwater elevations at cross culverts. Analysis of the combined improvements and existing 100-year runoff would be required to confirm impact to floodplain limits, adhering to local and national floodplain regulations. Urban Alternative 3 was rated at 3 because it increases the potential for capture o the peak discharge and volume of off-site flow entering the NM 264 corridor, resulting in a reduction of flooding extents

SUMMARY OF FLOODPLAIN ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 0 |
| Urban Alternative 2 | 3 |
| Urban Alternative 3 | 3 |

### 10.2.4 Environmental Factors and Analysis

GENERAL ENVIRONMENTAL SETTING
The general environmental setting would be described as urban, developed properties with frontage access and storm drain.

Urban Alternative 1 - No-Build
Urban Alternative 1 would not affect the general environmental setting. Urban Alternative 1 was rated at 2 because of the lack of impacts on the physical environment

Urban Alternative 2-4 Lane with Raised Median and Bike Lanes
Construction of Urban Alternative 2 would be in keeping with the current environmental setting. The roadway would be improved but would not alter the urban setting. Urban Alternative 2 was rated at 2 because the improvements would not affect the overall general environmental setting

Urban Alternative 3-4 Lane with TWLTL and Bike Lanes
Construction of Urban Alternative 3 would be in keeping with the current environmental setting. The roadway would be improved but would not alter the urban setting. Urban Alternative 3 was rated at 2 because the improvements would not affect the overall general environmental setting

SUMMARY OF GENERAL ENVIRONMENTAL SETTINGS ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Urban Alternative 2 | 2 |
| Urban Alternative 3 | 2 |

## BIOLOGICAL RESOURCES

Impacts on biological resources would include vegetation removal, ground disturbance, and habitat destruction for plants and animals

Urban Alternative 1 - No-Build
Urban Alternative 1 would not affect biological resources. Urban Alternative 1 was rated at 2 because of the lack of impacts on the physical environment

Urban Alternative 2-4 Lane with Raised Median and Bike Lanes
Construction of Urban Alternative 2 would include ground disturbance and minor vegetation removal within the ROW. Approximately two acres of ground disturbance would be anticipated Urban Alternative 2 was rated at 1 because of the impacts to vegetation and potential impacts to wildlife and nesting or migratory birds that inhabit vegetation to be removed.

Urban Alternative 3-4 Lane with TWLTL and Bike Lanes
Construction of Urban Alternative 3 would include ground disturbance and minor vegetation removal within the ROW. Approximately 1.25 acres of ground disturbance would be anticipated. Urban Alternative 3 was rated at 1 because of the reduced impacts to vegetation and potential impacts to wildlife and nesting or migratory birds that inhabit vegetation to be removed.

## SUMMARY OF BIOLOGICAL RESOURCES ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Urban Alternative 2 | 1 |
| Urban Alternative 3 | 1 |

## CULTURAL RESOURCES

mpacts to cultural resources, historic properties, and traditional cultural properties must be taken into consideration as alternatives for transportation projects are developed.

Urban Alternative 1 - No-Build
Urban Alternative 1 would have no impacts on cultural resources because of the lack of impact on the physical environment; therefore, Urban Alternative 1 was rated at 2

Urban Alternative 2-4 Lane with Raised Median and Bike Lanes
Construction of Urban Alternative 2 would include ground disturbance outside of the existing roadway prism, but within the ROW. Approximately two acres of ground disturbance would be anticipated. While it is unlikely that cultural resources would be affected because ground disturbance would be within the ROW, a cultural resources survey and report would need to be completed to determine that definitively. Urban Alternative 2 was rated at 1 because of the potential to impact cultural resources found within the ROW.

Urban Alternative 3-4 Lane with TWLTL and Bike Lanes
Construction of Urban Alternative 3 would include ground disturbance outside of the existing roadway prism, but within the ROW. Approximately 1.25 acres of ground disturbance would be anticipated. While it is unlikely that cultural resources would be affected because ground disturbance would be within the ROW, a cultural resources survey and report will need to be completed to determine that definitively. Urban Alternative 3 was rated at 1 because of the reduced potential to impact cultural resources found within the ROW.

SUMMARY OF CULTURAL RESOURCES ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Urban Alternative 2 | 1 |
| Urban Alternative 3 | 1 |

SECTION 4(f)
Section 4(f) of the Department of Transportation Act of 1966 requires that impacts on public parks recreation lands, wildlife and waterfowl refuges, and historic properties are taken into consideration as transportation projects are developed.

Urban Alternative 1 - No-Build
Urban Alternative 1 would have no impact on Section 4(f) resources because of the lack of impact on the physical environment; therefore, Urban Alternative 1 was rated at 2.

Urban Alternative 2-4 Lane with Raised Median and Bike Lanes
Urban Alternative 2 would have no impact to Section 4(f) properties because there are no Section $4(f)$ properties found in Segment 1 ; therefore, Urban Alternative 2 was rated at 2.

Urban Alternative 3-4 Lane with TWLTL and Bike Lanes
Urban Alternative 3 would have no impact to Section 4(f) properties because there are no Section $4(f)$ properties found in Segment 1; therefore, Urban Alternative 3 was rated at 2.

SUMMARY OF SECTION 4(f) ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Urban Alternative 2 | 2 |
| Urban Alternative 3 | 2 |

## NOISE

Urban Alternative 1 - No-Build
Urban Alternative 1 would have no noise effects given the lack of impact on the physica environment; therefore, Urban Alternative 1 was rated at 2.

Urban Alternative 2-4 Lane with Raised Median and Bike Lanes
Urban Alternative 2 would elevate noise levels temporarily during construction of the redesigned roadway; however, noise impacts would be short-term and cease once construction is complete. Urban Alternative 2 would not increase capacity. Urban Alternative 2 was rated at 1 because of the temporary elevated noise impacts that would occur during construction.

Urban Alternative 3-4 Lane with TWLTL and Bike Lanes
Urban Alternative 3 would elevate noise levels temporarily during construction of the redesigned roadway; however, noise impacts would be short-term and cease once construction is complete. Urban Alternative 3 would not increase capacity. Urban Alternative 3 was rated at 1 because of the temporary elevated noise impacts that would occur during construction.

## SUMMARY OF NOISE ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Urban Alternative 2 | 1 |
| Urban Alternative 3 | 1 |

## AIR QUALITY

Urban Alternative 1 - No-Build
Urban Alternative 1 would have no air quality effects given the lack of impact on the physical environment; therefore, Urban Alternative 1 was rated at 2.

Urban Alternative 2-4 Lane with Raised Median and Bike Lanes
Urban Alternative 2 would not increase capacity on the roadway and would not impact overall air quality for the area in the long-term. Air quality may be affected during construction because of the use of heavy machinery; however, best management practices would be used to mitigate these impacts. Given these reasons, Urban Alternative 2 was rated at 1.

Urban Alternative 3-4 Lane with TWLTL and Bike Lanes
Urban Alternative 3 would not increase capacity on the roadway and would not impact overall air quality for the area in the long-term. Air quality may be affected during construction because of the use of heavy machinery; however, best management practices would be used to mitigate these impacts. Given these reasons, Urban Alternative 3 was rated at 1

SUMMARY OF AIR QUALITY ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Urban Alternative 2 | 1 |
| Urban Alternative 3 | 1 |

VISUAL RESOURCES
Impacts to visual resources, including the existing viewshed, landforms, vegetation, and water features, must be taken into consideration when evaluating alternatives for roadway projects.

Urban Alternative 1 - No-Build
The Urban Alternative 1 would have no visual resources effects given the lack of impact on the physical environment; therefore, Urban Alternative 1 was rated at 2.

Urban Alternative 2-4 Lane with Raised Median and Bike Lanes
Construction of Urban Alternative 2 would be in keeping with the current visual character. The roadway would be improved, but the profile of the roadway would not change. Urban Alternative 2 was rated at 2 because the improvements would not affect the overall visual character of the roadway or the area.

Urban Alternative 3-4 Lane with TWLTL and Bike Lanes
Construction of Urban Alternative 3 would be in keeping with the current visual character. The roadway would be improved, but the profile of the roadway would not change. Urban Alternative 3 was rated at 2 because the improvements would not affect the overall visual character of the roadway or the area.

SUMMARY OF VISUAL RESOURCES ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Urban Alternative 2 | 2 |
| Urban Alternative 3 | 2 |

## MAJOR FARMLANDS

Impacts to prime and unique farmlands must be taken into consideration when evaluating alternatives for roadway projects
Urban Alternative 1 - No-Build
Urban Alternative 1 would have no major farmlands effects given the lack of impact on the physical environment; therefore, Urban Alternative 1 was rated at 2.
Urban Alternative 2-4 Lane with Raised Median and Bike Lanes
Urban Alternative 2 would have no impact to farmland because no farmland exists in Segment 1; therefore, Urban Alternative 2 was rated at 2.
Urban Alternative 3-4 Lane with TWLTL and Bike Lanes
Urban Alternative 3 would have no impact to farmland because no farmland exists in Segment 1; therefore, Urban Alternative 3 was rated at 2.

SUMMARY OF MAJOR FARMLANDS ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Urban Alternative 2 | 2 |
| Urban Alternative 3 | 2 |

## WATER RESOURCES

Urban Alternative 1 - No-Build
Urban Alternative 1 would have no water resources effects given the lack of impact on the physical environment; therefore, Urban Alternative 1 was rated 2.

Urban Alternative 2-4 Lane with Raised Median and Bike Lanes
Urban Alternative 2 proposes to improve various culverts and drainage features, which would improve drainage conditions for the roadway. The design elements would not alter existing water resources, including washes, streams, or rivers; therefore, Urban Alternative 2 was rated 2.
Urban Alternative 3-4 Lane with TWLTL and Bike Lanes
Urban Alternative 3 proposes to improve various culverts and drainage features, which would improve drainage conditions for the roadway. The design elements would not alter existing water resources, including washes, streams, or rivers; therefore, Urban Alternative 3 was rated 2.

SUMMARY OF WATER RESOURCES ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Urban Alternative 2 | 2 |
| Urban Alternative 3 | 2 |

## ENVIRONMENTAL JUSTICE AND OTHER SPECIAL-STATUS POPULATIONS

Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income when considering development, including design and construction of transportation projects.

Urban Alternative 1 - No-Build
Urban Alternative 1 would have no environmental justice and other special-status population effects given the lack of impact on the physical environment; therefore, Urban Alternative 1 was rated 2.

Urban Alternative 2-4 Lane with Raised Median and Bike Lanes
The population that would be affected by construction of Urban Alternative 2 is likely a protected population; however, the effects resulting from this alternative are not expected to disproportionately affect this population; therefore, Urban Alternative 2 was rated 2.
Urban Alternative 3-4 Lane with TWLTL and Bike Lanes
The population that would be affected by construction of Urban Alternative 3 is likely a protected population; however, the effects resulting from this alternative are not expected to disproportionately affect this population; therefore, Urban Alternative 3 was rated 2.

SUMMARY OF ENVIRONMENTAL JUSTICE ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Urban Alternative 2 | 2 |
| Urban Alternative 3 | 2 |

## MPORTANT COMMUNITY RESOURCES

Important community resources include businesses, schools, parks, churches and other community facilities, police, fire, emergency, and other public services. Access to these important community resources must be taken into consideration when alternatives are being evaluated.

Urban Alternative 1 - No-Build
Urban Alternative 1 would have no important community resources effects given the lack of impact on the physical environment; therefore, Urban Alternative 1 was rated 2.

Urban Alternative 2-4 Lane with Raised Median and Bike Lanes
Urban Alternative 2 would include improvements that would improve traffic and pedestrian safety which would allow for safer access to important community resources. Additionally, access to businesses would be maintained during and after construction. Because of these reasons, Urban Alternative 2 was rated at 3 .

Urban Alternative 3-4 Lane with TWLTL and Bike Lanes
Urban Alternative 3 would include improvements that would improve traffic and pedestrian safety which would allow for safer access to important community resources. Additionally, access to businesses would be maintained during and after construction. Because of these reasons, Urban Alternative 3 was rated at 3.

SUMMARY OF IMPORTANT COMMUNITY RESOURCES ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Urban Alternative 2 | 3 |
| Urban Alternative 3 | 3 |

HAZARDOUS MATERIALS
Impacts to hazardous materials should be considered when roadway design alternatives are developed so that avoidance or mitigation can be incorporated in construction.

Urban Alternative 1 - No-Build
Urban Alternative 1 would have no hazardous materials effects given the lack of impact on the physical environment; therefore, Urban Alternative 1 was rated 2.

Urban Alternative 2-4 Lane with Raised Median and Bike Lanes
Urban Alternative 2 would not require ROW; therefore, this alternative would not affect any structures or buildings. Additionally, the HMIB pISA did not identify any findings that may affect Segment 1. Nonetheless, if this alternative is moved forward and as the design process continues, the risk of contamination should continue to be evaluated. Because of the lack of findings that may affect Urban Alternative 2, this Alternative was rated 2.

Urban Alternative 3-4 Lane with TWLTL and Bike Lanes
Urban Alternative 3 would not require ROW; therefore, this alternative would not affect any structures or buildings. Additionally, the HMIB pISA did not identify any findings that may affect Segment 1. Nonetheless, if this alternative is moved forward and as the design process continues, the risk of contamination should continue to be evaluated. Because of the lack of findings that may affect Urban Alternative 3, this Alternative was rated 2.

SUMMARY OF HAZARDOUS MATERIALS ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Urban Alternative 2 | 2 |
| Urban Alternative 3 | 2 |

## LAND USE/LAND OWNERSHIP

Changes in land use and land ownership should be considered as alternatives for roadway projects are developed.

Urban Alternative 1 - No-Build
Urban Alternative 1 has no land use or land ownership effects given the lack of impact on the physical environment; therefore, Urban Alternative 1 was rated 2

Urban Alternative 2-4 Lane with Raised Median and Bike Lanes
Urban Alternative 2 would not require any ROW acquisitions, would not convert any land to a different use, or change ownership of any land; therefore, Urban Alternative 2 was rated 2.

Urban Alternative 3-4 Lane with TWLTL and Bike Lanes
Urban Alternative 3 would not require any ROW acquisitions, would not convert any land to a different use, or change ownership of any land; therefore, Urban Alternative 3 was rated 2.

## SUMMARY OF LAND USE/LAND OWNERSHIP ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Urban Alternative 2 | 2 |
| Urban Alternative 3 | 2 |

### 10.3 SEGMENT 2 - RURAL SECTION (MP 0.6 TO MP 15.5

For the rural section, the alternatives that have been advanced from Phase I-A are evaluated for the middle section of the corridor.

### 10.3.1 Purpose and Need Analysis

Rural Alternative 1 - No-Build
Rural Alternative 1 would not meet the purpose and need of the project. The deteriorating pavement would not be improved, drainage issues would not be addressed, and the safety of the corridor would not be improved. Because of not meeting the purpose and need of the project, it was rated at 0 .

Rural Alternative 2-4 Lane with Raised Median
Rural Alternative 2 would meet the purpose and need of the project. The deteriorating pavement would be fully reconstructed, drainage issues would be addressed, and the safety of the corridor would be improved. Having addressed all items of the purpose and need of the project, it was rated at 4.

Rural Alternative 4-4 Lane with Striped Median
Rural Alternative 4 would meet the purpose and need of the project. The deteriorating pavement would be fully reconstructed, drainage issues would be addressed, and the safety of the corridor
would be improved. Having addressed all items of the purpose and need of the project, it was rated at 4.

SUMMARY PURPOSE AND NEED

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 0 |
| Rural Alternative 2 | 4 |
| Rural Alternative 4 | 4 |

### 10.3.2 Cost Analysis

Funding is continually requested to improve infrastructure and construct new projects. With so many needs and requests for funding, each available dollar is greatly valued when requested. The evaluation of alternatives under this factor considered the cost of the alternative. The more the alternative would cost, the greater the negative effect. The costs were developed by considering the major items for the project. Some of the items were estimated using a lump sum approach. The estimated quantities and construction cost development are shown in Appendix $F$ of this report. Each alternative also has maintenance costs that are typically borne by the NMDOT District and should be considered in the evaluation. Maintenance costs for new infrastructure are expected to be less than the costs for maintaining old and aging infrastructure. The maintenance costs are not quantified below but were factored into the evaluation. The ROW costs are not known at this time given the uncertainty associated with the agreement with the Navajo Nation. The following costs are estimates and were developed for planning purposes and should not be regarded as actual costs. Inflation factors may be appropriate for future construction timelines.

Rural Alternative 1 - No-Build
The estimated cost for the Rural Alternative 1 is:
Estimated Construction and Detour Cost: \$0
Estimated ROW Cost: \$0 (no ROW required)
Estimated Maintenance Cost: High maintenance cost for existing infrastructure that remains.
The cost for the Rural Alternative 1 was rated at 0 because of the expected cost for maintenance on the deteriorated pavement.

Rural Alternative 2-4 Lane with Raised Median
The estimated cost for Rural Alternative 2 is:
Estimated Construction and Detour Cost: \$97,569,000 including NMGRT
Estimated ROW Cost: \$0 (no ROW required)
Estimated Maintenance Cost: Low maintenance cost for new infrastructure
The cost for the Rural Alternative 2 was rated at 1 because of the expected high cost for construction and high maintenance costs.
Rural Alternative 4-4 Lane with Striped Median
The estimated cost for Rural Alternative 4 is:
Estimated Construction and Detour Cost: \$83,413,500 including NMGRT
Estimated ROW Cost: \$0 (no ROW required)
Estimated Maintenance Cost: Low maintenance cost for new infrastructure
The cost for the Rural Alternative 4 was rated at 3 because of the lower construction and the lower maintenance cost for no raised median.

SUMMARY COST ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 0 |
| Rural Alternative 2 | 1 |
| Rural Alternative 4 | 3 |

### 10.3.3 Engineering Factors and Analysis

The evaluation for some of the typical engineering factors was consistent for all the alternatives and thus was not evaluated separately. Those engineering categories are not differentiators and do not contribute to the identification of a preferred alternative. Some of the non-differentiating engineering factors are:

- Access management: Expected to remain the same as existing for all alternatives
- Geology and soils: Existing geology and soils would affect all the alternatives equally
- Utility conflicts Expected to be equal for all alternatives

The engineering factors that contributed to the identification of a preferred alternative are:

- Traffic operations and safety
- Constructability
- ROW impacts
- Future maintenance and operation
- Drainage performance
- Floodplain


## TRAFFIC OPERATIONS AND SAFETY

The primary purpose of performing a traffic analysis is to determine the operating characteristics of an identified transportation facility for existing and future conditions and to identify any deficiencies on the facility from an operational perspective. If any deficiencies are identified, recommendations to geometrics and/or traffic control devices of that facility are made to improve performance. The two primary elements of a transportation facility that are identified and analyzed in this study are intersections and roadway segments.

The project team performed a traffic safety analysis for the NM 264 corridor including a crash analysis, access management analysis, and speed analysis. The corridor was also analyzed for roadside barriers within the clear zone of the roadway.

Rural Alternative 1 - No-Build
Rural Alternative 1 would not improve Traffic Operations or improve Safety. Existing traffic operations can be found Section 1.3, Existing Condition, and in the TNA (Appendix B). Rural Alternative 1 was rated at 2 because it has no effect on Traffic Operations and Safety.

Rural Alternative 2-4 Lane with Raised Median
The corridor operates within an acceptable LOS with Rural Alternative 2. See the TNA (Appendix B) for operational analysis. Rural Alternative 2 would also provide opportunities to improve safety in the corridor. Studies suggest that improving pavement condition and installing raised median will reduce crashes. Access management would reduce the potential conflict points with through traffic. Furthermore, it is recommended to add "Watch for Pedestrian" signs in this segment on the approaches to segments 1 and 3 to improve pedestrian safety. Rural Alternative 2 was rated at 4 because of improved traffic operations and safety in the segment.

Rural Alternative 4-4 Lane with Striped Median
The corridor operates within an acceptable LOS with Rural Alternative 4. See the TNA (Appendix B) for operational analysis. Rural Alternative 4 would provide opportunities to improve safety in the corridor. Studies suggest that improving pavement condition will reduce crashes. Although not as effectively as Rural Alternative 2, access management would reduce the potential conflict points with through traffic. Furthermore, it is recommended to add "Watch for Pedestrian"
signs in this segment on the approaches to segments 1 and 3 to improve pedestrian safety. Rura Alternative 4 was rated at 3 because of improvements to traffic operations and safety within the segment.

SUMMARY OF TRAFFIC OPERATIONS AND SAFETY ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Rural Alternative 2 | 4 |
| Rural Alternative 4 | 3 |

## CONSTRUCTABILITY

The evaluation of constructability considered the alternatives' feasibility to be built. This factor considered how construction would affect residential or business access, utilities, and ROW. It also considered whether the alternative can be constructed using methods, materials, and equipment common to the construction industry and area. Positive scores were given to alternatives that minimize impacts and are more easily constructed. The evaluation also considered the location of the work zone in relation to the traveling public. A greater negative effect was valued for the approaches with work zones near the travel ways with hindered access

Rural Alternative 1 - No-Build
There would be no construction with the Rural Alternative 1; however, the lack of new construction would result in significant maintenance needs until the corridor is reconstructed. Rural Alternative 1 was rated at 0 because it has significant effects on maintenance.

Rural Alternative 2-4 Lane with Raised Median
There are no significant constructability issues with Rural Alternative 2. Temporary access from adjacent properties appears plausible for most properties within the existing ROW during construction. There does appear to be the need for TWPs or TCPs for turnouts to build the Alternative. Property access would be more difficult during the phase that constructs the center raised median, making access to turnouts across the median more difficult. Rural Alternative 2 was rated at 3 because of the constructability issue listed above.

Rural Alternative 4-4 Lane with Striped Median
There are no significant constructability issues with Rural Alternative 4. Temporary access from adjacent properties appears plausible for most properties within the existing ROW during construction. There does not appear to be the need for TWPs or TCPs for turnouts to build the Alternative. This alternative would not have the same challenges providing access to turnouts across the median because it is not raised. Rural Alternative 4 was rated at 4 because of the constructability aspect listed above.

SUMMARY OF CONSTRUCTABILITY ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 0 |
| Rural Alternative 2 | 3 |
| Rural Alternative 4 | 4 |

## RIGHT-OF-WAY IMPACTS

The need for additional ROW for the alternatives is a factor to be considered with each alternative The location of the needed property and the impacts that the acquisition brings to the project mus be considered. The adjacent properties are all similar in nature and are valued the same. No property would be valued greater, so the score was based on solely on the quantity of needed property. The alternatives with fewer acreage impacts received more positive scores.

## SUMMARY OF RIGHT-OF-WAY IMPACTS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 0 acres (4) |
| Rural Alternative 2 | 0.8 acres (1) |
| Rural Alternative 4 | 0.8 acres (1) |

## FUTURE MAINTENANCE AND OPERATION

Different levels of preservation or maintenance can occur on infrastructure. For this discussion, the different levels and efforts are combined. The overall purpose of those efforts is to delay or reduce deterioration of infrastructure or infrastructure elements. The higher level of future maintenance and operation results in a lower point rating.

Rural Alternative 1 - No-Build
Rural Alternative 1 would not replace or improve the existing infrastructure, so the existing infrastructure would continue to age and degrade. Being already significantly deteriorated the infrastructure maintenance efforts would continue and accelerate as time passes. Rural Alternative 1 was valued as a very negative effect given the expected level of maintenance needed for the existing old structures. Rural Alternative 1 was rated 0 because it has a significant level of maintenance to allow for continued operation

Rural Alternative 2-4 Lane with Raised Median
Rural Alternative 2 would reconstruct all the existing infrastructure, including the addition of a raised median. Based on current sediment gathering in the corridor, the raised median would result in additional maintenance to keep the median clear. Rural Alternative 2 was rated at 1 because of the additional maintenance required for the raised median.

Rural Alternative 4-4 Lane with Striped Median
Rural Alternative 4 would reconstruct all the existing infrastructure, including the addition of an atgrade median. The at-grade median would not result in additional maintenance to keep the median clear. Rural Alternative 4 was rated at 3 because of no additional maintenance required for the raised median.

SUMMARY OF MAINTENANCE AND OPERATIONAL ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 0 |
| Rural Alternative 2 | 1 |
| Rural Alternative 4 | 3 |

## DRAINAGE PERFORMANCE

Based on preliminary hydraulic modeling of the alternatives under consideration to address the existing roadway capacity, the following advantages and disadvantages should be considered. No significant differentiating factors for the construction approaches were identified with regard to the drainage performance, so the discussion focuses on the build alternatives rather than their construction approaches.

Rural Alternative 1 - No-Build
Rural Alternative 1 would not improve the existing drainage performance. The current performance of the corridor is problematic and results in safety concerns related to flooding and overtopping the roadway. Rural Alternative 1 was rated at 0 because of the poor expected performance and safety impacts.

Rural Alternative 2-4 Lane with Raised Median
Rural Alternative 2 would result in improved capacity at access roads, cross culverts, roadside ditches, and other pertinent drainage features. The improved capacity to collect and convey stormwater runoff would improve driver safety and reduce potential for overtopping of the segment in locations identified by NMDOT Maintenance and analysis conducted in the preliminary drainage analysis. The raised median would reduce the amount of sheet flow conveyed along the cross
slope in superelevated sections, potentially reducing hydroplaning effects. Rural Alternative 2 was rated at 4 because of the capacity to collect and convey roadway stormwater runoff.
Rural Alternative 4-4 Lane with Striped Median
Rural Alternative 4 would result in improved capacity at access roads, cross culverts, roadside ditches, and other pertinent drainage features. The improved capacity to collect and convey stormwater runoff would improve driver safety and reduce potential for overtopping of the segment in locations identified by NMDOT Maintenance and analysis conducted in the preliminary drainage analysis. Rural Alternative 4 was rated at 3 because of the improved capacity to collect and convey stormwater runoff.

SUMMARY OF DRAINAGE PERFORMANCE ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 0 |
| Rural Alternative 2 | 4 |
| Rural Alternative 4 | 3 |

FLOODPLAIN
Zone $A$ is described by FEMA as "areas of potential flooding with a $1 \%$ annual chance of being equaled or exceeded in any given year." This means that structures within this area have a 26 percent chance of experiencing flooding equal to, or greater than, the depths of flooding represented by this floodplain over a 30-year period. Detailed analyses were not performed for this area by FEMA and no depths or base flood elevations are shown within these zones on the FIRM. As a result, a hydraulic analysis pursuant to NFIP regulations (44 CFR 60.3) will be required for final design. The preliminary 2D hydraulic analysis conducted for this study is a more modern approach to the prediction of potential floodplain limits, depths, and general characteristics. Results of the assessment predict more widespread riverine flooding/inundation during the 100-year storm event and appear to confirm field observations. Remapping of the FEMA FIRM is not currently planned in the scope of this study and project.

## Rural Alternative 1 - No-Build

Rural Alternative 1 would not alter the existing floodplain characteristics. The current floodplain is problematic with safety concerns of flooding. Rural Alternative 1 was rated at 0 because of the lack of improvement to the existing floodplain area affecting the roadway.

Rural Alternative 2-4 Lane with Raised Median
Rural Alternative 2 proposed drainage improvements provide increased capacity for capture and conveyance of floodwaters, resulting in a reduction of volume of water and headwater elevations at cross culverts. Analysis of the combined improvements and existing 100-year runoff will be
required to confirm the impact to floodplain limits, adhering to local and national floodplain regulations. Rural Alternative 2 was rated at 4 because the proposed drainage improvements provide increased capacity for capture and conveyance of floodwaters, reducing flooding potential at known locations of roadway overtopping and ponding of floodwaters in the ROW limits.

Rural Alternative 4-4 Lane with Striped Median
Rural Alternative 4 proposed drainage improvements provide increased capacity for capture and conveyance of floodwaters, resulting in a reduction of volume of water and headwaters elevation at cross culverts. Analysis of the combined improvements and existing 100-year runoff will be required to confirm impact to floodplain limits, adhering to local and national floodplain regulations. Rural Alternative 4 was rated at 4 because the proposed drainage improvements provide increased capacity for capture and conveyance of floodwaters, reducing flooding potential at known locations of roadway overtopping and ponding of floodwaters in the ROW limits.

SUMMARY OF FLOODPLAIN ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 0 |
| Rural Alternative 2 | 4 |
| Rural Alternative 4 | 4 |

### 10.3.4 Environmental Factors and Analysis

GENERAL ENVIRONMENTAL SETTING
The general environmental setting would be described as rural, with few businesses found adjacent but outside of the ROW

Rural Alternative 1 - No-Build
Rural Alternative 1 would not affect the general environmental setting because of the lack of impacts on the physical environment; therefore, Rural Alternative 1 was rated at 2.

Rural Alternative 2-4 Lane with Raised Median
Construction of Rural Alternative 2 would be in keeping with the current environmental setting.
The roadway would be improved but would not alter the rural setting. Rural Alternative 2 was rated at 2 because the improvements would not affect the overall general environmental setting

Rural Alternative 4-4 Lane with Striped Median
Construction of Rural Alternative 4 would be in keeping with the current environmental setting. The roadway would be improved but would not alter the rural setting. Rural Alternative 4 was rated at 2 because the improvements would not affect the overall general environmental setting.

## SUMMARY OF GENERAL ENVIRONMENTAL SETTINGS ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Rural Alternative 2 | 2 |
| Rural Alternative 4 | 2 |

## BIOLOGICAL RESOURCES

Impacts on biological resources would include vegetation removal, ground disturbance, and habitat destruction for plants and animals.

Rural Alternative 1 - No-Build
Rural Alternative 1 would not affect biological resources and was valued as a negligible effect because of the lack of impacts on the physical environment; therefore, Rural Alternative 1 was rated 2.

Rural Alternative 2-4 Lane with Raised Median
Construction of Rural Alternative 2 would include ground disturbance and vegetation removal within the ROW and in a small amount of acquired ROW. Approximately 27.5 acres of ground disturbance would be anticipated. Rural Alternative 2 has more acres of ground disturbance than Rural Alternative 4 and was rated at 0 because of the high impacts to vegetation and potential impacts to wildlife and nesting or migratory birds that inhabit vegetation requiring removal.

Rural Alternative 4-4 Lane with Striped Median
Construction of Rural Alternative 4 would include ground disturbance and minor vegetation removal within the ROW and in a small amount of acquired ROW. Approximately 21 acres of ground disturbance would be anticipated. Rural Alternative 4 was rated at 1 because of the impacts to vegetation and potential impacts to wildlife and nesting or migratory birds that inhabit vegetation requiring removal.

## SUMMARY OF BIOLOGICAL RESOURCES ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Rural Alternative 2 | 0 |
| Rural Alternative 4 | 1 |

## CULTURAL RESOURCES

Impacts to cultural resources, historic properties, and traditional cultural properties must be taken into consideration as alternatives for transportation projects are developed.

## Rural Alternative 1 - No-Build

Rural Alternative 1 would have no impacts on cultural resources because of the lack of impact on the physical environment; therefore, Rural Alternative 1 was rated 2.

Rural Alternative 2-4 Lane with Raised Median
Construction of Rural Alternative 2 would include ground disturbance within the ROW and will require 0.8 acre of ROW to be acquired. There are at least nine previously recorded cultural resources or properties within the ROW, and approximately 27.5 acres of ground disturbance would be anticipated. Cultural resources may be affected; however, a cultural resources survey and report will need to be completed to determine that definitively. Rural Alternative 2 was rated at 0 because of the potential to affect cultural resources.

## Rural Alternative 4-4 Lane with Striped Median

Construction of Rural Alternative 4 would include ground disturbance within the ROW and will require 0.8 acre of ROW to be acquired. There are at least nine previously recorded cultural resources or properties within the ROW, and approximately 21 acres of ground disturbance would be anticipated. Cultural resources may be affected; however, a cultural resources survey and report will need to be completed to determine that definitively. Rural Alternative 4 was rated at 1 because of the potential to impact cultural resources.

## SUMMARY OF CULTURAL RESOURCES ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Rural Alternative 2 | 0 |
| Rural Alternative 4 | 1 |

## SECTION 4(f)

Section 4(f) of the Department of Transportation Act of 1966 requires that impacts on public parks recreation lands, wildlife and waterfowl refuges, and historic properties are taken into consideration as transportation projects are developed.

Rural Alternative 1 - No-Build
Rural Alternative 1 would have no impacts on Section $4(\mathrm{f})$ resources because of the lack of impact on the physical environment; therefore, Rural Alternative 1 was rated 2.

Rural Alternative 2-4 Lane with Raised Median
There are numerous NRHP-eligible sites or properties found within the ROW; however, further survey and design is needed to determine whether this alternative would affect these sites. This alternative would require 27.5 acres of ground disturbance, which is more than Rural Alternative 4, and has more likelihood to affect one of these sites. Rural Alternative 2 may have an impact to Section 4(f) properties; therefore, Rural Alternative 2 was rated at 0 .

Rural Alternative 4-4 Lane with Striped Median
There are numerous NRHP-eligible sites or properties found within the ROW; however, further survey and design is needed to determine whether this alternative would affect these sites. This alternative would require 21 acres of ground disturbance, which is less than Rural Alternative 2, and has less likelihood to affect one of these sites. Rural Alternative may have an impact to Section 4(f) properties; therefore, Rural Alternative 4 was rated at 1.

SUMMARY OF SECTION 4(f) ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Rural Alternative 2 | 0 |
| Rural Alternative 4 | 1 |

## NOISE

Rural Alternative 1 - No-Build
Rural Alternative 1 would have no noise effects given the lack of impact on the physical environment; therefore, Rural Alternative 1 was rated 2.

Rural Alternative 2-4 Lane with Raised Median
Rural Alternative 2 would elevate noise levels temporarily during construction of the redesigned roadway; however, noise impacts would be short-term and cease once construction is complete. Rural Alternative 2 would not increase capacity. Rural Alternative 2 was rated at 1 because of the temporary elevated noise impacts that would occur during construction.

Rural Alternative 4-4 Lane with Striped Median
Rural Alternative 4 would elevate noise levels temporarily during construction of the redesigned roadway; however, noise impacts would be short-term and cease once construction is complete. Rural Alternative 4 would not increase capacity. Rural Alternative 4 was rated at 1 because of the temporary elevated noise impacts that would occur during construction.

## SUMMARY OF NOISE ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Rural Alternative 2 | 1 |
| Rural Alternative 4 | 1 |

## AIR QUALITY

Rural Alternative 1 - No-Build
Rural Alternative 1 would have no air quality effects given the lack of impact on the physical environment; therefore, Rural Alternative 1 was rated at 2.

Rural Alternative 2-4 Lane with Raised Median
Rural Alternative 2 would not increase capacity on the roadway and would not affect overall air quality for the area in the long-term. Air quality may be affected during construction because of the use of heavy machinery; however, best management practices would be used to mitigate these impacts. Given these reasons, Rural Alternative 2 was rated at 1 .

Rural Alternative 4-4 Lane with Striped Median
Rural Alternative 4 would not increase capacity on the roadway and would not affect overall air quality for the area in the long-term. Air quality may be affected during construction because of the use of heavy machinery; however, best management practices would be used to mitigate these impacts. Given these reasons, Rural Alternative 4 was rated at 1

SUMMARY OF AIR QUALITY ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Rural Alternative 2 | 1 |
| Rural Alternative 4 | 1 |

VISUAL RESOURCES
Impacts to visual resources, including the existing viewshed, landforms, vegetation, and water features, must be taken into consideration when evaluating alternatives for roadway projects.

Rural Alternative 1 - No-Build
Rural Alternative 1 would have no visual resources effects given the lack of impact on the physical environment; therefore, Rural Alternative 1 was rated at 2.

Rural Alternative 2-4 Lane with Raised Median
Construction of Rural Alternative 2 would be in keeping with the current visual character. The roadway would be improved, but the profile of the roadway would not change. Rural Alternative 2 was rated at 2 because the improvements would not affect the overall visual character of the roadway or the area.

Rural Alternative 4-4 Lane with Striped Median
Construction of Rural Alternative 4 would be in keeping with the current visual character. The roadway would be improved, but the profile of the roadway would not change. Rural Alternative 4 was rated at 2 because the improvements would not affect the overall visual character of the roadway or the area.

## SUMMARY OF VISUAL RESOURCES ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Rural Alternative 2 | 2 |
| Rural Alternative 4 | 2 |

## MAJOR FARMLANDS

Impacts to prime and unique farmlands must be taken into consideration when evaluating alternatives for roadway projects.
Rural Alternative 1 - No-Build
Rural Alternative 1 would have no major farmlands effects given the lack of impact on the physical environment; therefore, Rural Alternative 1 was rated at 2.

Rural Alternative 2-4 Lane with Raised Median
Rural Alternative 2 would have no impact to farmland because no prime or unique farmland exists in Segment 2; therefore, Rural Alternative 2 was rated at 2.

Rural Alternative 4-4 Lane with Striped Median
Rural Alternative 4 would have no impact to farmland because no prime or unique farmland exists in Segment 2; therefore, Rural Alternative 4 was rated at 2.

SUMMARY OF MAJOR FARMLANDS ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Rural Alternative 2 | 2 |
| Rural Alternative 4 | 2 |

## WATER RESOURCES

Rural Alternative 1 - No-Build
Rural Alternative 1 would have no water resources effects given the lack of impact on the physical environment; therefore, Rural Alternative 1 was rated at 2.

## Rural Alternative 2-4 Lane with Raised Median

Rural Alternative 2 proposes to improve various culverts and drainage features, which would improve drainage conditions for the roadway. The design elements would not alter existing water resources, including washes, streams, or rivers; therefore, Rural Alternative 2 was rated 2.

Rural Alternative 4-4 Lane with Striped Median
Rural Alternative 4 proposes to improve various culverts and drainage features, which would improve drainage conditions for the roadway. The design elements would not alter existing water resources, including washes, streams, or rivers; therefore, Rural Alternative 4 was rated 2.

SUMMARY OF WATER RESOURCES ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Rural Alternative 2 | 2 |
| Rural Alternative 4 | 2 |

## ENVIRONMENTAL JUSTICE AND OTHER SPECIAL-STATUS POPULATIONS

Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income when considering development, including design and construction of transportation projects.

Rural Alternative 1 - No-Build
Rural Alternative 1 would have no environmental justice and other special-status populations effects given the lack of impact on the physical environment; therefore, Rural Alternative 1 was rated at 2.

Rural Alternative 2-4 Lane with Raised Median
The population that would be affected by construction of Rural Alternative 2 is likely a protected population; however, the effects resulting from this alternative are not expected to disproportionately impact this population, therefore, Rural Alternative 2 was rated 2.

Rural Alternative 4-4 Lane with Striped Median
The population that would be affected by construction of Rural Alternative 4 is likely a protected population; however, the effects resulting from this alternative are not expected to disproportionately impact this population; therefore, Rural Alternative 4 was rated at 2.

SUMMARY OF ENVIRONMENTAL JUSTICE ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Rural Alternative 2 | 2 |
| Rural Alternative 4 | 2 |

## IMPORTANT COMMUNITY RESOURCES

Important community resources include businesses, schools, parks, churches, and other community facilities, police, fire, emergency, and other public services. Access to these important community resources must be taken into consideration when alternatives are being evaluated.
Rural Alternative 1 - No-Build
Rural Alternative 1 would have no important community resources effects given the lack of impact on the physical environment; therefore, Rural Alternative 1 was rated at 2.

Rural Alternative 2-4 Lane with Raised Median
Rural Alternative 2 would include improvements that would improve traffic safety, which would allow for safer access to important community resources. Additionally, access to businesses would be maintained during and after construction. Because of these reasons, Rural Alternative 2 was rated at 3.

## Rural Alternative 4-4 Lane with Striped Median

Rural Alternative 4 would include improvements that would improve traffic safety, which would allow for safer access to important community resources. Additionally, access to businesses would be maintained during and after construction. Because of these reasons, Rural Alternative 4 was rated at 3 .

SUMMARY OF IMPORTANT COMMUNITY RESOURCES ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Rural Alternative 2 | 3 |
| Rural Alternative 4 | 3 |

## HAZARDOUS MATERIALS

Impacts to hazardous materials should be considered when roadway design alternatives are developed so that avoidance or mitigation can be incorporated in construction.

Rural Alternative 1 - No-Build
Rural Alternative 1 would have no hazardous materials effects given the lack of impact on the physical environment; therefore, Rural Alternative 1 was rated at 2.

Rural Alternative 2-4 Lane with Raised Median
The HMIB pISA identified three findings that may affect Segment 2 and while Rural Alternative 2 would require only minimal ROW, it would not affect any structures or buildings. Nonetheless, if this alternative is moved forward and as the design process continues, the risk of contamination should continue to be evaluated. Because findings where "releases of hazardous materials or petroleum products have or could have occurred" were identified and may affect Rural Alternative 2, this Alternative was rated 1.

Rural Alternative 4-4 Lane with Striped Median
The HMIB pISA identified three findings that may affect Segment 2 and, while Rural Alternative 4 would require only minimal ROW, it would not affect any structures or buildings. Nonetheless, if this alternative is moved forward and as the design process continues, the risk of contamination should continue to be evaluated. Because findings where "releases of hazardous materials or petroleum products have or could have occurred" were identified and may affect Rural Alternative 4, this Alternative was rated 1.

SUMMARY OF HAZARDOUS MATERIALS ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Rural Alternative 2 | 1 |
| Rural Alternative 4 | 1 |

## LAND USE/LAND OWNERSHIP

Changes in land use and land ownership should be considered as alternatives as roadway projects are developed.

Rural Alternative 1 - No-Build
Rural Alternative 1 would have no land use or land ownerships effects given the lack of impact on the physical environment; therefore, Rural Alternative 1 was rated at 2.

Rural Alternative 2-4 Lane with Raised Median
Rural Alternative 2 would require minimal ROW acquisitions ( 0.8 acre) but would not convert any land to a different use, or change ownership of any land, therefore, Rural Alternative 2 was rated 2.

Rural Alternative 4-4 Lane with Striped Median
Rural Alternative 4 would require minimal ROW acquisitions ( 0.8 acre) but would not convert any land to a different use, or change ownership of any land, therefore, Rural Alternative 4 was rated 2.

SUMMARY OF LAND USE/LAND OWNERSHIP ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Rural Alternative 2 | 2 |
| Rural Alternative 4 | 2 |

### 10.4 SEGMENT 3 - URBAN/RURAL SECTION (MP 15.5 to MP 16.0)

For the Urban/Rural section, the alternatives that have been advanced from Phase I-A were evaluated for the easternmost section of the corridor
10.4.1 Purpose and Need Analysis

Urban/Rural Alternative 1 - No-Build
Urban/Rural Alternative 1 would not meet the purpose and need of the project. The deteriorating pavement would not be improved, drainage issues would not be addressed, and the safety of the corridor would not be improved. Because of not meeting the purpose and need of the project, it was rated at 0 .

Urban/Rural Alternative 2-4 Lane with Raised Median
Urban/Rural Alternative 2 would meet the purpose and need of the project. The deteriorating pavement would be fully reconstructed, drainage issues would be addressed, and the safety of the corridor would be improved. Having addressed all items of the purpose and need of the project, it was rated at 4

Urban/Rural Alternative 3-4 Lane with TWLTL
Urban/Rural Alternative 3 would meet the purpose and need of the project. The deteriorating pavement would be fully reconstructed, drainage issues would be addressed, and the safety of the corridor would be improved. Having addressed all items of the purpose and need of the project, it was rated at 4.

SUMMARY PURPOSE AND NEED

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 0 |
| Urban/Rural Alternative 2 | 4 |
| Urban/Rural Alternative 3 | 4 |

### 10.4.2 Cost Analysis

Funding is continually requested to improve infrastructure and construct new projects. With so many needs and requests for funding, each available dollar is greatly valued when requested. The evaluation of alternatives under this factor considered the cost of the alternative. The more the alternative would cost, the greater the negative effect. The costs were developed by considering the major items for the project. Some of the items were estimated using a lump sum approach The estimated quantities and construction cost development are shown in Appendix $F$ of this report. Each alternative also has maintenance costs that are typically borne by the NMDOT District and should be considered in the evaluation. Maintenance costs for new infrastructure are expected to be less than the costs for maintaining old and aging infrastructure. The maintenance costs are not quantified below but were factored into the evaluation. The ROW costs are not known at this time given the uncertainty associated with the agreement with the Navajo Nation. The following costs are estimates and were developed for planning purposes and should not be regarded as actual costs. Inflation factors may be appropriate for future construction timelines.

Urban/Rural Alternative 1 - No-Build
The estimated cost for Urban/Rural Alternative1 is:
Estimated Construction and Detour Cost: \$0
Estimated ROW Cost: \$0 (no ROW required)
Estimated Maintenance Cost: High maintenance cost for existing infrastructure that remains.

The cost for the Urban/Rural Alternative 1 was rated at 0 because of the expected cost for maintenance on the deteriorated pavement.

Urban/Rural Alternative 2-4 Lane with Raised Median
The estimated cost for Urban/Rural Alternative 2 is:
Estimated Construction and Detour Cost: \$5,319,500 (including NMGRT)
Estimated ROW Cost: \$100,000
Estimated Maintenance Cost: Low maintenance cost for new infrastructure
The cost for Urban/Rural Alternative 2 was rated at 1 because of the expected high cost for construction and potential ROW need.

Urban/Rural Alternative 3-4 Lane with TWLTL
The estimated cost for Urban/Rural Alternative 3 is:
Estimated Construction and Detour Cost: \$4,790,000 (including NMGRT)
Estimated ROW Cost: \$100,000
Estimated Maintenance Cost: Low maintenance cost for new infrastructure
The cost for the Urban/Rural Alternative 3 was rated at 3 because of the expected cost for construction, reduced maintenance without a raised median, and potential ROW need.

SUMMARY COST ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 0 |
| Urban/Rural Alternative 2 | 1 |
| Urban/Rural Alternative 3 | 3 |

### 10.4.3 Engineering Factors and Analysis

The evaluation for some of the typical engineering factors was consistent for all the alternatives and thus was not evaluated separately. Those engineering categories are not differentiators and do not contribute to the identification of a preferred alternative. Some of the non-differentiating engineering factors are:

- Access management: Expected to remain the same as existing for all alternatives
- Geology and soils: Existing geology and soils would affect all the alternatives equally
- Utility conflicts Expected to be equal for all alternatives

The engineering factors that contributed to the identification of a preferred alternative are:

- Traffic operations and safety
- Constructability
- ROW impacts
- Future maintenance and operation
- Drainage performance
- Floodplain


## TRAFFIC OPERATIONS AND SAFETY

The primary purpose of performing a traffic analysis is to determine the operating characteristics of an identified transportation facility for existing and future conditions and to identify any deficiencies on the facility from an operational perspective. If any deficiencies are identified, recommendations for geometrics and/or traffic control devices of that facility are made to improve performance. The two primary elements of a transportation facility that are identified and analyzed in this study are intersections and roadway segments.

The project team analyzed traffic safety for the NM 264 corridor, including a crash analysis, access management analysis, and speed analysis. The corridor was also analyzed for roadside barriers within the clear zone of the roadway.

Urban/Rural Alternative 1 - No-Build
Urban/Rural Alternative 1 would not improve Traffic Operations or improve Safety. Existing traffic operations can be found under Section 1.3, Existing Condition, and in the TNA (Appendix B). Urban/Rural Alternative 1 was rated 2 because it has no effect on Traffic Operations and Safety.
Urban/Rural Alternative 2-4 Lane with Raised Median
The corridor would operate within an acceptable LOS with Urban/Rural Alternative 2. See the TNA (Appendix B) for operational analysis. Urban/Rural Alternative 2 would also provide opportunities to improve safety in the corridor. Studies suggest that improving pavement condition and raised median will reduce crashes. Access management would reduce the potential conflict points with through traffic. Urban/Rural Alternative 2 was rated at 4 because of improvements to safety within the segment.

Urban/Rural Alternative 3-4 Lane with TWLTL
The corridor operates within an acceptable LOS with Urban/Rural Alternative 3. See the TNA (Appendix B) for operational analysis. Urban/Rural Alternative 3 would provide opportunities to improve safety in the corridor. Studies suggest that improving the pavement condition will reduce crashes. However, studies also suggest that striped medians provide less safety benefits than raised medians, since raised medians provide a physical barrier of protection against opposite direction "head-on" crashes. Although not as effective as Urban/Rural Alternative 2, access
management would reduce the potential conflict points with through traffic. Urban/Rural Alternative 3 was rated at 3 because of improvements to safety within the segment.

SUMMARY OF TRAFFIC OPERATIONS AND SAFETY ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Urban/Rural Alternative 2 | 4 |
| Urban/Rural Alternative 3 | 3 |

## CONSTRUCTABILITY

The evaluation of constructability considered the alternatives' feasibility to be built. This factor considered how construction would affect residential or business access, utilities, and ROW. It also considered whether the alternative can be constructed using methods, materials, and equipment common to the construction industry and area. Positive scores were given to alternatives that minimize impacts and are more easily constructed. The evaluation also considered the location of the work zone in relation to the traveling public. A greater negative effect was valued for the approaches with work zones near the travel ways with hindered access

## Urban/Rural Alternative 1 - No-Build

There would be no construction with the Urban/Rural Alternative 1; however, the lack of new construction would result in significant maintenance needs until the corridor is reconstructed. Urban/Rural Alternative 1 was rated 0 because it has significant effects on maintenance.

Urban/Rural Alternative 2-4 Lane with Raised Median
There are no significant constructability issues with Urban/Rural Alternative 2. Temporary access from adjacent properties appears plausible for most properties within existing ROW during construction. There does not appear to be the need for TWPs or TCPs to build the Alternative. Property access would be more difficult during the phase that constructs the center raised median, making access to turnouts across the median more difficult. Urban/Rural Alternative 2 was rated at 3 because of the constructability issue listed above.

Urban/Rural Alternative 3-4 Lane with TWLTL
There are no significant constructability issues with Urban/Rural Alternative 3. Temporary access from adjacent properties appears plausible for most properties within existing ROW during construction. There does not appear to be the need for TWPs or TCPs to build the Alternative. This alternative would not have the same challenges providing access to turnouts across the median because it is not raised. Urban/Rural Alternative 3 was rated at 4 because of the constructability aspect listed above.

SUMMARY OF CONSTRUCTABILITY ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 0 |
| Urban/Rural Alternative 2 | 3 |
| Urban/Rural Alternative 3 | 4 |

## RIGHT-OF-WAY IMPACTS

The need for additional ROW for the alternatives is a factor to be considered with each alternative The location of the needed property and the impacts that the acquisition brings to the project mus be considered. The adjacent properties are all similar in nature and are valued the same. No property would be valued greater, so the score was based on solely on the quantity of needed property. The alternatives with fewer acreage impacts received more positive scores.

SUMMARY OF RIGHT-OF-WAY IMPACTS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 0 acres (4) |
| Urban/Rural Alternative 2 | 0.7 acres (1) |
| Urban/Rural Alternative 3 | 0.7 acres (1) |

FUTURE MAINTENANCE AND OPERATION
Different levels of preservation or maintenance can occur on infrastructure. For this discussion, the different levels and efforts are combined. The overall purpose of those efforts is to delay or reduce deterioration of infrastructure or infrastructure elements. The higher level of future maintenance and operation results in a lower point rating.

Urban/Rural Alternative 1 - No-Build
Urban/Rural Alternative 1 would not replace or improve the existing infrastructure, so the existing infrastructure would continue to age and degrade. Being already significantly deteriorated, the infrastructure maintenance efforts would continue and accelerate as time passes. Urban/Rural Alternative 1 was valued as a very negative effect given the expected level of maintenance needed for the existing old structures; therefore, it was rated 0 because it has a significant level of maintenance to allow for continued operation.

Urban/Rural Alternative 2-4 Lane with Raised Median
Urban/Rural Alternative 2 would reconstruct all the existing infrastructure, including the addition of a raised median. Based on current sediment gathering in the corridor, the raised median would
result in additional maintenance to keep the median clear. Urban/Rural Alternative 2 was rated at 1 because of the additional maintenance required for the raised median.

Urban/Rural Alternative 3-4 Lane with TWLTL
Urban/Rural Alternative 3 would reconstruct all the existing infrastructure, including the addition of an at-grade median. The at-grade median would not result in additional maintenance to keep the median clear. Urban/Rural Alternative 3 was rated at 4 because of no additional maintenance required for the raised median.

SUMMARY OF MAINTENANCE AND OPERATIONAL ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 0 |
| Urban/Rural Alternative 2 | 1 |
| Urban/Rural Alternative 3 | 4 |

DRAINAGE PERFORMANCE
Based on preliminary hydraulic modeling of the alternatives under consideration to address the existing roadway capacity, the following advantages and disadvantages should be considered. No significant differentiating factors for the construction approaches were identified regarding the drainage performance, so the discussion focuses on the build alternatives rather than their construction approaches.

Urban/Rural Alternative 1 - No-Build
Urban/Rural Alternative 1 would not improve the existing drainage performance. The current performance of the corridor is problematic and results in safety concerns related to flooding and overtopping the roadway. Urban/Rural Alternative 1 was rated at 0 because of the poor expected performance and safety impacts.

Urban/Rural Alternative 2-4 Lane with Raised Median
Urban/Rural Alternative 2 would not significantly increase roadway runoff or increase runoff from the roadway section. Off-site improvements including reconstructed ditches and swales with erosion control features would improve capacity to both capture and convey stormwater runoff Improvements to the cross culvert at MP 15.9 would reduce potential overtopping and flooding as noted by NMDOT Maintenance and confirmed by preliminary drainage analysis conducted for this project. Urban/Rural Alternative 2 was rated at 4 because of the items listed above.

Urban/Rural Alternative 3-4 Lane with TWLTL
Urban/Rural Alternative 3 would not significantly increase roadway runoff or increase runoff from the roadway section. Off-site improvements including reconstructed ditches and swales with erosion control features would improve capacity to both capture and convey stormwater runoff. Improvements to the cross culvert at MP 15.9 would reduce potential overtopping and flooding as noted by NMDOT Maintenance and confirmed by preliminary drainage analysis conducted for this project. Urban/Rural Alternative 3 was rated at 4 because of the items listed above.

SUMMARY OF DRAINAGE PERFORMANCE ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 0 |
| Urban/Rural Alternative 2 | 4 |
| Urban/Rural Alternative 3 | 4 |

FLOODPLAIN
Zone $A$ is described by FEMA as areas of potential flooding with a 1 percent annual chance of being equaled or exceeded in any given year." This means that structures within this area have a 26 percent chance of experiencing flooding equal to, or greater than, the depths of flooding represented by this floodplain over a 30 -year period. Detailed analyses were not performed for this area by FEMA and no depths or base flood elevations are shown within these zones on the FIRM. As a result, a hydraulic analysis pursuant to NFIP regulations (44 CFR 60.3) will be required for final design. The preliminary 2D hydraulic analysis conducted for this study is a more modern approach to the prediction of potential floodplain limits, depths, and general characteristics. Results of the assessment predict more widespread riverine flooding/inundation during the 100-year storm event and appear to confirm field observations. Remapping of the FEMA FIRM is not currently planned in the scope of this study and project

Urban/Rural Alternative 1 - No-Build
Urban/Rural Alternative 1 would not alter the existing floodplain characteristics. The current floodplain is problematic with safety concerns of flooding. The Urban/Rural Alternative 1 was rated at 0 because of the lack of improvement to the existing floodplain area affecting the roadway.

Urban/Rural Alternative 2-4 Lane with Raised Median
Urban/Rural Alternative 2 proposed drainage improvements provide increased capacity for capture and conveyance of floodwaters, resulting in a reduction of volume of water and headwater elevations at cross culverts. Analysis of the combined improvements and existing 100-year runoff will be required to confirm the impact to floodplain limits, adhering to local and national floodplain regulations. Urban/Rural Alternative 2 was rated at 4 because of the items listed above.

Urban/Rural Alternative 3-4 Lane with TWL TL
Urban/Rural Alternative 3 proposed drainage improvements provide increased capacity for capture and conveyance of floodwaters, resulting in a reduction of volume of water and headwater elevations at cross culverts. Analysis of the combined improvements and existing 100-year runoff will be required to confirm the impact to floodplain limits, adhering to local and national floodplain regulations. Urban/Rural Alternative 3 was rated at 4 because of the items listed above.

SUMMARY OF FLOODPLAIN ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 0 |
| Urban/Rural Alternative 2 | 4 |
| Urban/Rural Alternative 3 | 4 |

### 10.4.4 Environmental Factors and Analysis

GENERAL ENVIRONMENTAL SETTING
The general environmental setting would be described as both urban and rural, with developed properties and some local frontage access.

Urban/Rural Alternative 1 - No-Build
Urban/Rural Alternative 1 would not affect the general environmental setting. Urban/Rural Alternative 1 was rated at 2 because of the lack of impacts on the physical environment.

Urban/Rural Alternative 2-4 Lane with Raised Median
Construction of Urban/Rural Alternative 2 would be in keeping with the current environmental setting. The roadway would be improved but would not alter the urban/rural setting. Urban/Rural Alternative 2 was rated at 2 because the improvements would not affect the overall general environmental setting

Urban/Rural Alternative 3-4 Lane with TWLTL
Construction of Urban/Rural Alternative 3 would be in keeping with the current environmental setting. The roadway would be improved but would not alter the urban/rural setting. Urban/Rural Alternative 3 was rated at 2 because the improvements would not affect the overall general environmental setting.

## SUMMARY OF GENERAL ENVIRONMENTAL SETTINGS ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Urban/Rural Alternative 2 | 2 |
| Urban/Rural Alternative 3 | 2 |

## BIOLOGICAL RESOURCES

Impacts on biological resources would include vegetation removal, ground disturbance, and habitat destruction for plants and animals

Urban/Rural Alternative 1 - No-Build
Urban/Rural Alternative 1 would not affect biological resources. Urban/Rural Alternative 1 was valued as a negligible effect because of the lack of impacts on the physical environment; therefore, Urban/Rural Alternative 1 was rated at 2

Urban/Rural Alternative 2-4 Lane with Raised Median
Construction of Urban/Rural Alternative 2 would include ground disturbance and minor vegetation removal within the ROW and in a small amount of acquired ROW. Approximately 4.2 acres of ground disturbance would be anticipated. Urban/Rural Alternative 2 was rated at 1 because of the impacts to vegetation and potential impacts to wildlife and nesting or migratory birds that inhabit vegetation to be removed.

Urban/Rural Alternative 3-4 Lane with TWLTL
Construction of Urban/Rural Alternative 3 would include ground disturbance and minor vegetation removal within the ROW and in a small amount of acquired ROW. Approximately 4.2 acres of ground disturbance would be anticipated. Urban/Rural Alternative 3 was rated at 1 because of the impacts to vegetation and potential impacts to wildlife and nesting or migratory birds that inhabit vegetation to be removed.

SUMMARY OF BIOLOGICAL RESOURCES ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Urban/Rural Alternative 2 | 1 |
| Urban/Rural Alternative 3 | 1 |

## CULTURAL RESOURCES

Impacts to cultural resources, historic properties, and traditional cultural properties must be taken into consideration as alternatives for transportation projects are developed.

Urban/Rural Alternative 1 - No-Build
Urban/Rural Alternative 1 would have no impacts on cultural resources because of the lack of impact on the physical environment; therefore, Urban/Rural Alternative 1 was rated at 2.

Urban/Rural Alternative 2-4 Lane with Raised Median
Construction of Urban/Rural Alternative 2 would include ground disturbance outside of the existing roadway prism and within the ROW, including a small amount of acquired ROW. Approximately 4.2 acres of ground disturbance would be anticipated. While it is unlikely that cultural resources would be affected because ground disturbance would be within the ROW, a cultural resources survey and report will need to be completed to determine that definitively. Urban/Rural Alternative 2 was rated at 1 because of the potential to affect cultural resources.

Urban/Rural Alternative 3-4 Lane with TWLTL
Construction of Urban/Rural Alternative 3 would include ground disturbance outside of the existing roadway prism and within the ROW, including a small amount of acquired ROW. Approximately 4.2 acres of ground disturbance would be anticipated. While it is unlikely that cultural resources would be affected because ground disturbance would be within the ROW, a cultural resources survey and report will need to be completed to determine that definitively. Urban/Rural Alternative 3 was rated at 1 because of the potential to affect cultural resources.

## SUMMARY OF CULTURAL RESOURCES ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Urban/Rural Alternative 2 | 1 |
| Urban/Rural Alternative 3 | 1 |

SECTION 4(f)
Section 4(f) of the Department of Transportation Act of 1966 requires that impacts on public parks, recreation lands, wildlife and waterfowl refuges, and historic properties are taken into consideration as transportation projects are developed.

Urban/Rural Alternative 1 - No-Build
Urban/Rural Alternative 1 would have no impacts on Section 4(f) resources because of the lack of impact on the physical environment; therefore, Urban/Rural Alternative 1 was rated at 2.

Urban/Rural Alternative 2-4 Lane with Raised Median
Urban/Rural Alternative 2 would have no impact to Section 4(f) properties because there are no Section 4(f) properties found in Segment 3; therefore, Urban/Rural Alternative 2 was rated at 2.

Urban/Rural Alternative 3-4 Lane with TWLTL
Urban/Rural Alternative 3 would have no impact to Section 4(f) properties because there are no Section 4(f) properties found in Segment 3; therefore, Urban/Rural Alternative 3 was rated at 2.

## SUMMARY OF Section 4(f) ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Urban/Rural Alternative 2 | 2 |
| Urban/Rural Alternative 3 | 2 |

## NOISE

Urban/Rural Alternative 1 - No-Build
Urban/Rural Alternative 1 would have no noise effects given the lack of impact on the physical environment; therefore, Urban/Rural Alternative 1 was rated at 2.

Urban/Rural Alternative 2-4 Lane with Raised Median
Urban/Rural Alternative 2 would elevate noise levels temporarily during construction of the redesigned roadway; however, noise impacts would be short-term and cease once construction is complete. Urban/Rural Alternative 2 would not increase capacity. Urban/Rural Alternative 2 was rated at 1 because of the temporary elevated noise impacts that would occur during construction.

Urban/Rural Alternative 3-4 Lane with TWLTL
Urban/Rural Alternative 3 would elevate noise levels temporarily during construction of the redesigned roadway; however, noise impacts would be short-term and cease once construction is complete. Urban/Rural Alternative 3 would not increase capacity. Urban/Rural Alternative 3 was rated at 1 because of the temporary elevated noise impacts that would occur during construction.

SUMMARY OF NOISE ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Urban/Rural Alternative 2 | 1 |
| Urban/Rural Alternative 3 | 1 |

AIR QUALITY
Urban/Rural Alternative 1 - No-Build
Urban/Rural Alternative 1 would have no air quality effects given the lack of impact on the physical environment; therefore, Urban/Rural Alternative 1 was rated at 2.

Urban/Rural Alternative 2-4 Lane with Raised Median
Urban/Rural Alternative 2 would not increase capacity on the roadway and would not affect overall air quality for the area in the long-term. Air quality may be affected during construction because of the use of heavy machinery; however, best management practices would be used to mitigate these impacts. Given these reasons, Urban/Rural Alternative 2 was rated at 1.

Urban/Rural Alternative 3-4 Lane with TWLTL
Urban/Rural Alternative 3 would not increase capacity on the roadway and would not affect overall air quality for the area in the long-term. Air quality may be affected during construction because of the use of heavy machinery; however, best management practices would be used to mitigate these impacts. Given these reasons Urban/Rural Alternative 3 was rated at 1.

SUMMARY OF AIR QUALITY ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Urban/Rural Alternative 2 | 1 |
| Urban/Rural Alternative 3 | 1 |

VISUAL RESOURCES
Impacts to visual resources, including the existing viewshed, landforms, vegetation, and water features, must be taken into consideration when evaluating alternatives for roadway projects.

Urban/Rural Alternative 1 - No-Build
Urban/Rural Alternative 1 would have no visual resources effects given the lack of impact on the physical environment; therefore, Urban/Rural Alternative 1 was rated at 2.

Urban/Rural Alternative 2-4 Lane with Raised Median
Construction of Urban/Rural Alternative 2 would be in keeping with the current visual character
The roadway would be improved, but the profile of the roadway would not change. Urban/Rural Alternative 2 was rated at 2 because the improvements would not affect the overall visual character of the roadway or the area.

Urban/Rural Alternative 3-4 Lane with TWLTL
Construction of Urban/Rural Alternative 3 would be in keeping with the current visual character. The roadway would be improved, but the profile of the roadway would not change. Urban/Rural Alternative 3 was rated at 2 because the improvements would not affect the overall visual character of the roadway or the area.

SUMMARY OF VISUAL RESOURCES ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Urban/Rural Alternative 2 | 2 |
| Urban/Rural Alternative 3 | 2 |

MAJOR FARMLANDS
Impacts to prime and unique farmlands must be taken into consideration when evaluating alternatives for roadway projects.

Urban/Rural Alternative 1 - No-Build
Urban/Rural Alternative 1 would have no major farmlands effects given the lack of impact on the physical environment; therefore, Urban/Rural Alternative 1 was rated at 2.

Urban/Rural Alternative 2-4 Lane with Raised Median
Urban/Rural Alternative 2 would have no impact to farmland because no farmland in exists Segment 3; therefore, Urban/Rural Alternative 2 was rated at 2.

Urban/Rural Alternative 3-4 Lane with TWL TL
Urban/Rural Alternative 3 would have no impact to farmland because there is no farmland in exists Segment 3; therefore, Urban/Rural Alternative 3 was rated at 2.

## SUMMARY OF MAJOR FARMLANDS ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Urban/Rural Alternative 2 | 2 |
| Urban/Rural Alternative 3 | 2 |

## WATER RESOURCES

Urban/Rural Alternative 1 - No-Build
Urban/Rural Alternative 1 would have no water resources effects given the lack of impact on the physical environment; therefore, Urban/Rural Alternative 1 was rated at 2.

Urban/Rural Alternative 2-4 Lane with Raised Median
Urban/Rural Alternative 2 proposes to improve various drainage features, which would improve drainage conditions for the roadway. The design elements would not alter existing water resources, including washes, streams, or rivers; therefore, Urban/Rural Alternative 2 was rated 2.

Urban/Rural Alternative 3-4 Lane with TWLTL
Urban/Rural Alternative 3 proposes to improve various drainage features, which would improve drainage conditions for the roadway. The design elements would not alter existing water resources, including washes, streams, or rivers; therefore, Urban/Rural Alternative 3 was rated 2.

SUMMARY OF WATER RESOURCES ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Urban/Rural Alternative 2 | 2 |
| Urban/Rural Alternative 3 | 2 |

ENVIRONMENTAL JUSTICE AND OTHER SPECIAL-STATUS POPULATIONS
Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income when considering development, including design and construction of transportation projects.

Urban/Rural Alternative 1 - No-Build
Urban/Rural Alternative 1 would have no environmental justice and other special-status populations effects given the lack of impact on the physical environment; therefore, Urban/Rural Alternative 1 was rated at 2.

Urban/Rural Alternative 2-4 Lane with Raised Median
The population that would be affected by construction of Urban/Rural Alternative 2 is likely a protected population; however, the effects resulting from this alternative are not expected to disproportionately affect this population; therefore, Urban/Rural Alternative 2 was rated 2.

Urban/Rural Alternative 3-4 Lane with TWLTL
The population that would be affected by construction of Urban/Rural Alternative 3 is likely a protected population; however, the effects resulting from this alternative are not expected to disproportionately affect this population; therefore, Urban/Rural Alternative 3 was rated 2

SUMMARY OF ENVIRONMENTAL JUSTICE ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Urban/Rural Alternative 2 | 2 |
| Urban/Rural Alternative 3 | 2 |

## IMPORTANT COMMUNITY RESOURCES

Important community resources include businesses, schools, parks, churches, and other community facilities, police, fire, emergency, and other public services. Access to these important community resources must be taken into consideration when alternatives are being evaluated.

Urban/Rural Alternative 1 - No-Build
Urban/Rural Alternative 1 would have no important community resources effects given the lack of impact on the physical environment; therefore, Urban/Rural Alternative 1 was rated at 2

Urban/Rural Alternative 2-4 Lane with Raised Median
Urban/Rural Alternative 2 would include improvements that would improve traffic safety, which would allow for safer access to important community resources. Additionally, access to businesses would be maintained during and after construction. Because of these reasons, Urban/Rural Alternative 2 was rated at 3.

Urban/Rural Alternative 3-4 Lane with TWL TL
Urban/Rural Alternative 3 would include improvements that would improve traffic safety, which would allow for safer access to important community resources. Additionally, access to businesses would be maintained during and after construction. Because of these reasons, Urban/Rural Alternative 3 was rated at 3

SUMMARY OF IMPORTANT COMMUNITY RESOURCES ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Urban/Rural Alternative 2 | 3 |
| Urban/Rural Alternative 3 | 3 |

## HAZARDOUS MATERIALS

Impacts to hazardous materials should be considered when roadway design alternatives are developed so that avoidance or mitigation can be incorporated in construction.

Urban/Rural Alternative 1 - No-Build
Urban/Rural Alternative 1 would have no hazardous materials effects given the lack of impact on the physical environment; therefore, Urban/Rural Alternative 1 was rated at 2.

Urban/Rural Alternative 2-4 Lane with Raised Median
Urban/Rural Alternative 2 would require minimal ROW; however, it would not affect any structures or buildings. Additionally, the HMIB pISA did not identify any findings that may affect Segment 3. Nonetheless, if this alternative is moved forward and as the design process continues, the risk of contamination should continue to be evaluated. Because of the lack of findings that may affect Urban/Rural Alternative 2, this Alternative was rated 2

Urban/Rural Alternative 3-4 Lane with TWLTL
Urban/Rural Alternative 3 would require minimal ROW; however, it would not affect any structures or buildings. Additionally, the HMIB pISA did not identify any findings that may affect Segment 3. Nonetheless, if this alternative is moved forward and as the design process continues, the risk of contamination should continue to be evaluated. Because of the lack of findings that may affect Urban/Rural Alternative 3, this Alternative was rated 2

SUMMARY OF HAZARDOUS MATERIALS ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Urban/Rural Alternative 2 | 2 |
| Urban/Rural Alternative 3 | 2 |

## LAND USE/LAND OWNERSHIP

Changes in land use and land ownership should be considered as alternatives for roadway projects are developed.

Urban/Rural Alternative 1 - No-Build
Urban/Rural Alternative 1 would have no land use or land ownership effects given the lack of impact on the physical environment; therefore, Urban/Rural Alternative 1 was rated at 2.

Urban/Rural Alternative 2-4 Lane with Raised Median
Urban/Rural Alternative 2 would require minimal ROW acquisitions ( 0.7 acre) but would not convert any land to a different use, or change ownership of any land; therefore, Urban/Rural Alternative 2 was rated 2.

Urban/Rural Alternative 3-4 Lane with TWLTL
Urban/Rural Alternative 3 would require minimal ROW acquisitions ( 0.7 acre) but would not convert any land to a different use, or change ownership of any land; therefore, Urban/Rural Alternative 3 was rated 2

SUMMARY OF LAND USE/LAND OWNERSHIP ANALYSIS

| Alternative | Factor Value |
| :--- | :---: |
| No-Build | 2 |
| Urban/Rural Alternative 2 | 2 |
| Urban/Rural Alternative 3 | 2 |

11 RECOMMENDATIONS TO PROCEED TO PHASE I-C AND I-D
11.1 SEGMENT 1 - URBAN SECTION

Each alternative was evaluated based on the impact parameters, including purpose and need, traffic operations (vehicular and multimodal), safety, existing access and land use, ROW impacts, constructability, and construction cost. The alternatives were then assigned a factor value rating from 1 to 4 , with a rating of 4 being the highest. Based on the Urban Section Matrix (Table 43 ), it is recommended that Alternative 3 be advanced into Phase I-C and Phase I-D.

Table 43. Segment 1 Urban Section Matrix

| Evaluation Factors | ALTERNATIVE 1 | ALTERNATIVE 2 | ALTERNATIVE 3 |
| :--- | :---: | :---: | :---: |
|  |  | No Build | $\begin{array}{c}\text { 4 lane with raised } \\ \text { median \& bike lanes }\end{array}$ | \(\left.\begin{array}{c}4 lane with TWLTL \& <br>

bike lanes\end{array}\right]\)

## Evaluation Score

## LEGEND

| $\mathbf{0}$ | Very Negative Impact |
| :--- | :--- |
| $\mathbf{1}$ | Negative |
| $\mathbf{2}$ | No Impact |
| $\mathbf{3}$ | Positive Impact |
| $\mathbf{4}$ | Very Positive Impact |

11.2 SEGMENT 2 - RURAL SECTION

Each alternative was evaluated based on the impact parameters, including purpose and need, traffic operations (vehicular and multimodal), safety, existing access and land use, ROW impacts, constructability, and construction cost. The alternatives were then assigned a factor value rating from 1 to 4 , with a rating of 4 being the highest. Based on the Rural Section Matrix (Table 44 ), it is recommended that Alternative 4 be advanced into Phase I-C and Phase I-D.

Table 44. Segment 2 Rural Section Matrix

| Evaluation Factors | ALTERNATIVE 1 | ALTERNATIVE 2 | ALTERNATIVE 4 |
| :---: | :---: | :---: | :---: |
|  | No Build | 4 lane with raised median | 4 lane with striped median |
| Purpose and Need | 0 | 4 | 4 |
| Cost | 0 | 1 | 3 |
| Engineering Factors |  |  |  |
| Traffic Operations and Safety | 2 | 4 | 3 |
| Constructability | 0 | 3 | 4 |
| Right-of-Way Impacts | 4 | 1 | 1 |
| Future Maintenance and Operation | 0 | 1 | 3 |
| Drainage Performance | 0 | 4 | 3 |
| Floodplain | 0 | 4 | 4 |
| Environmental Factors |  |  |  |
| General Environmental Setting | 2 | 2 | 2 |
| Biological Resources | 2 | 0 | 1 |
| Cultural Resources | 2 | 0 | 1 |
| Section 4(f) | 2 | 0 | 1 |
| Noise | 2 | 1 | 1 |
| Air Quality | 2 | 1 | 1 |
| Visual Resources | 2 | 2 | 2 |
| Major Farmlands | 2 | 2 | 2 |
| Water Resources | 2 | 2 | 2 |
| Environmental Justice and Other Special-Status Populations | 2 | 2 | 2 |
| Important Community Resources | 2 | 3 | 3 |
| Hazardous Materials | 2 | 1 | 1 |
| Land Use/Land Ownership | 2 | 2 | 2 |
| Evaluation Score | 32 | 40 | 46 |

CN6101220 NM 264 (Arizona/New Mexico State Line to Yah-Ta-Hey, MP 0 to MP 16)
11.3 SEGMENT 3 - URBAN/RURAL SECTION

Each alternative was evaluated based on the impact parameters, including purpose and need, traffic operations (vehicular and multimodal), safety, existing access and land use, ROW impacts,
 recommended that Alternative 3 be advanced into Phase I-C and Phase I-D.

Table 45. Segment 3 Urban/Rural Section Matrix

| Evaluation Factors | ALTERNATIVE 1 | ALTERNATIVE 2 | ALTERNATIVE 3 |
| :---: | :---: | :---: | :---: |
|  | No-Build | 4 Lane with raised median | 4 Lane with TWLTL |
| Purpose and Need | 0 | 4 | 4 |
| Cost | 0 | 1 | 3 |
| Engineering Factors |  |  |  |
| Traffic Operations and Safety | 2 | 4 | 3 |
| Constructability | 0 | 3 | 4 |
| Right-of-Way Impacts | 4 | 1 | 1 |
| Future Maintenance and Operation | 0 | 1 | 4 |
| Drainage Performance | 0 | 4 | 4 |
| Floodplain | 0 | 4 | 4 |
| Environmental Factors |  |  |  |
| General Environmental Setting | 2 | 2 | 2 |
| Biological Resources | 2 | 1 | 1 |
| Cultural Resources | 2 | 1 | 1 |
| Section 4(f) | 2 | 2 | 2 |
| Noise | 2 | 1 | 1 |
| Air Quality | 2 | 1 | 1 |
| Visual Resources | 2 | 2 | 2 |
| Major Farmlands | 2 | 2 | 2 |
| Water Resources | 2 | 2 | 2 |
| Environmental Justice and Other Special-status Populations | 2 | 2 | 2 |
| Important Community Resources | 2 | 3 | 3 |
| Hazardous Materials | 2 | 2 | 2 |
| Land Use/Land Ownership | 2 | 2 | 2 |
| Evaluation Sc | 32 | 45 | 50 |

## LEGEND



Very Negative Impact
Negative
No Impact
Positive Impact
Very Positive Impact


[^0]:    During the analysis of intersection sight distance per AASHTO A Policy on Geometric Design of Highways and Streets requirements, 5 turnouts failed to meet the AASHTO A Policy on Geometric Design of Highways and Streets design standard but per the NMDOT SAMM, Chapter 8, Section Fpg. 88, the criteria for sight distance is applicable to access points located where 100 trips are expected to use the access during the design hour. The turnouts for Segment 3 do not meet this criterion

