CLARK COUNTY RURAL STREETS STUDY

FINAL REPORT: MAY 31, 2018

PARSONS

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Executive Summary

Project Overview

Purpose and Background

The purpose of the study is to build upon concepts identified in the Complete Streets Design Guidelines for Livable Communities and identify additional solutions for multi-modal transportation designs suitable for rural (non-urban) residential areas. The study area is identified as the Rural Neighborhood Preservation (RNP) for the unincorporated area of Clark County called Lone Mountain. The Town of Lone Mountain lies in the northwest corner of the Las Vegas Valley. The study area is bounded by Clark County-215 Beltway to the north and west, Alexander Road to the south, and Durango Drive to the east.

STUDY OBJECTIVE

Provide recommendations to improve mobility for all users (vehicle, bicycle, pedestrian, and equestrian) while balancing considerations from best practices in engineering design, benefits to the community, adopted plans, and community input.

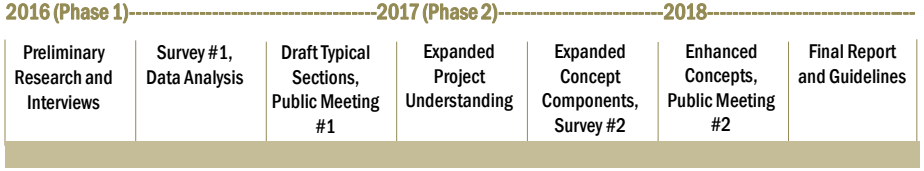
This study provides recommendations for implementing multi-modal facilities within public right-of-way, while preserving the rural nature of the neighborhood. The study will identify and evaluate options for safety, flood control, roadway design, and traffic control improvements suitable for the Lone Mountain RNP area. The design options must address the concerns of the many stakeholders in the area including residents and Clark County engineering and maintenance departments. The goal is to strike a balance with design options that meet mobility needs, consider maintenance costs, all while promoting safety and improved mobility for users of the roadway. Feedback for the development of this study evolved from a combination of input from the community and other relevant stakeholders. Summaries of discussions with these groups are included in the Appendices:

- Community Input
- Regional Transportation Commission of Southern Nevada
- Clark County Public Works
- Clark County Maintenance
- Clark County Safe Routes to Schools
- Developers
- City of Las Vegas

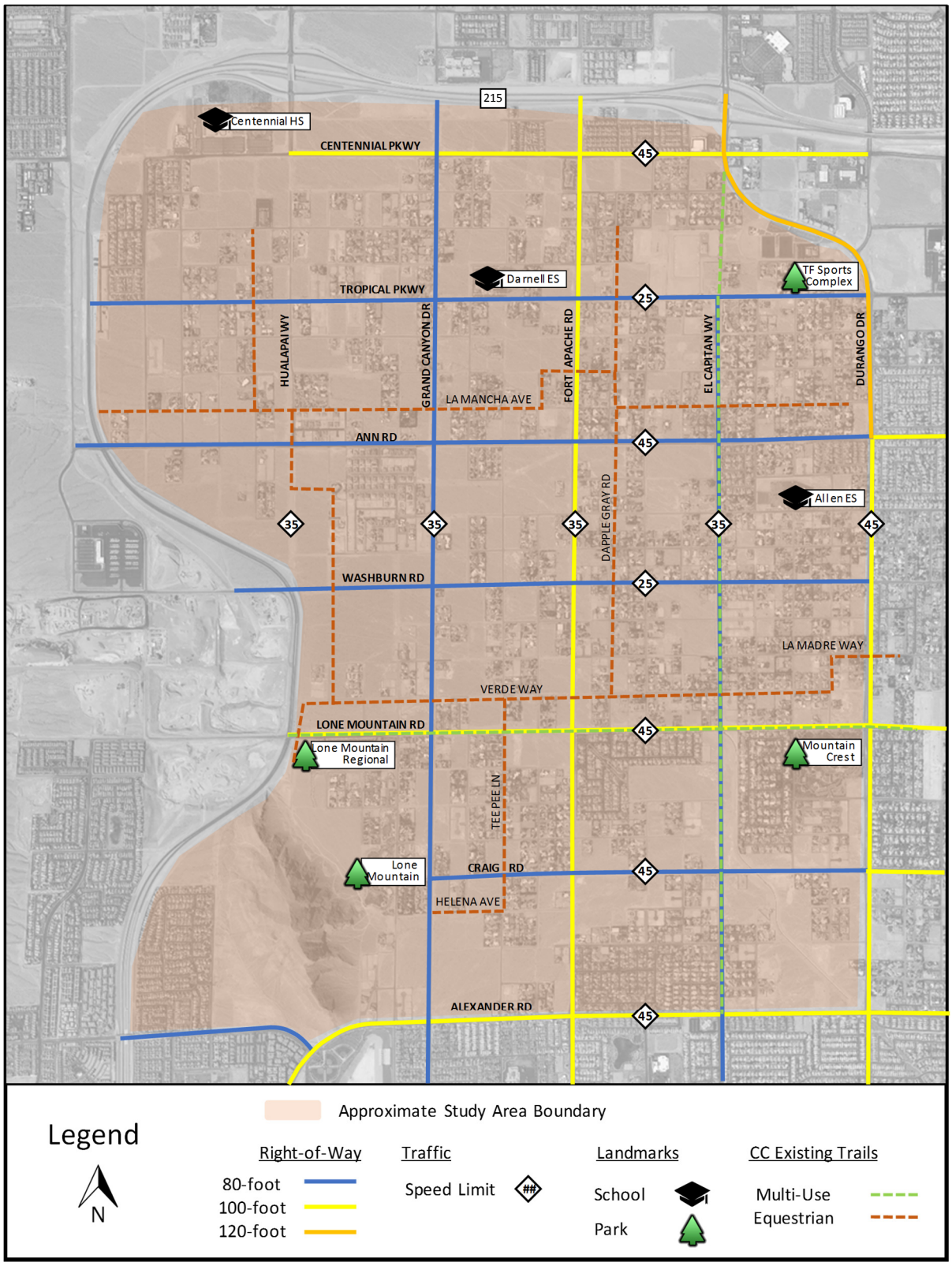
Project Approach

The overall Project Approach includes two phases of work. Phase 1 included research on best practices in rural street design, outreach to the community including an online survey and public meeting, and development of conceptual street cross sections. Documentation covering the effort from Phase 1 is included as a reference in Appendix F. After completion of Phase 1, the stakeholder group recognized the need to further expand the scope and study expectations.

PROJECT SCHEDULE



Study Area Map



Some of the primary feedback the Phase 2 project team received from stakeholders was the desire to have a more comprehensive list of references, additional stakeholder interviews and an expanded menu of options presented to the public that are "visually-enhanced".

Review Existing References

Before drafting conceptual street cross sections, the project team researched available references in the United States and around the world. These references include studies, similar projects and industry practices as they relate to improved mobility of all users (vehicle, bicycle, pedestrian and equestrian) in rural settings. The research focused on three areas: 1) Clark County planning documents related to the RNP; 2) local and national documents related to multimodal travel; and 3) local and national engineering standards related to the design of multimodal travel. The research identified 48 documents with varying degrees of applicability. A complete list of the documents with summaries of each can be found in Appendix A.

Outreach

Phase 1 Outreach

The Phase 2 Project Team reviewed the outreach efforts completed in Phase 1 of this study effort. Phase 1 outreach coordination included several one-on-one stakeholder interviews, a Public Meeting and an on-line public survey. For more details, please see Appendix F. Below is an outline of the key outreach meetings included in the Phase 1 effort:

- Public Input Meeting, April 19, 2016 (approximately 100 attendees)
- DR Horton, Developer, May 17, 2016
- Lone Mountain Citizens Advisory Council, May 18, 2016
- Online Public Survey, May 19 – June 1, 2016 (295 Responses)

Phase 2 Outreach

Phase 2 included additional outreach to both agency stakeholders and the community. This included a Phase 2 kick-off meeting and three stakeholder advisory committee group meetings. It also included some separate one-on-one meetings with Clark County Public Works and added new stakeholder interviews with Clark County Maintenance, the City of Las Vegas, and the Safe Routes to School representative. The project team included two community outreach efforts: an online public survey and a community open house. A summary of the community comments received during the Phase 2 outreach effort include:

- There were 445 total responses received on the online survey which indicates a high confidence level reflecting general opinion based on the study area population.
- The online survey resulted in 9 of the 15 options being carried forward. The top five options included a multi-use side path, traffic control signs, paved shoulder, median islands and low-lighting.
- During the public meeting, of the various roadway scenarios presented, the preferred alternatives that were most preferred were those offering a balance between rural preservation and increased safety and drainage improvements.
- Drainage improvements were mentioned the most often, included in nearly 30% of the comments. Attendees wanted to preserve the rural character but were willing to have more infrastructure on the ground in order to address drainage needs such as through a concrete ditch.

- Lighting came in second being mentioned in about 20%. Residents favored low lighting on 60' roadways and increased lighting on 80' and 100' for safety reasons.
- Safety of pedestrians, bicyclists and equestrians was the third most mentioned in the comments and the safety of horses crossing Lone Mountain to the equestrian park was mentioned in one third of these comments.
- Speed control was a concern in 15% of the comments and using roundabouts or traffic circles to slow traffic was suggested in five comments.

Photo of the Community Open House Outreach Event

Expanded Menu of Multimodal Options

Phase 2 covers the development of an expanded list of options and discusses how Phase 1 Draft Cross-Sections were further refined and then incorporated into "visually-enhanced" roadway configuration options. Based on the extended reference research, the project team identified a list of multimodal and drainage options appropriate for the study area. The traffic control options proposed are supported by FHWA as safety improvements appropriate for rural and small-town communities. The project team prepared an evaluation matrix for discussion with stakeholders. The matrix outlines safety benefits and concerns, appropriate traffic conditions, preservation of rural characteristics, relative cost and maintenance, appropriate road types and some possible applicable roadways within the study area. In Section 3, Table 3.1 outlines the Multi-Modal Options Evaluations Matrix and Table 3.2 outlines the Drainage Options Evaluations Matrix.

Refined List of Concepts and Online Survey Results

Section 3, Table 3.3 identifies options and their evaluation matrices presented to Clark County Public Works for review and feedback, prior to distribution to the public. The refined list of concepts was then organized into an online survey for the community to provide feedback. The survey included a stand-alone page for each option being considered. Each page included a brief description, a photo for visual preference and explanation, appropriate road types, and a brief list of advantages and disadvantages. An example of one option is shown here which displays the format presented to the public. The full survey is included in Appendix D.

Example Survey Option

Multi-Use Side Path

A paved path typically using asphalt separated from the roadway. May be used by pedestrians, cyclists and equestrians. When there is sufficient space, equestrians will have a separate path. This option does not include concrete curb and gutter.

Appropriate Road Type
- Roads with highest pedestrian volumes and near schools and parks

Advantages
- Separated facility increases safety
- Lower infrastructure costs than full sidewalk
- Opportunity to replace current paths with new ones designed to meet standards and ADA requirements

Disadvantages
- Does not include vertical curb separation for increased safety
- Does not include gutter for improved drainage control, although swales could be used instead

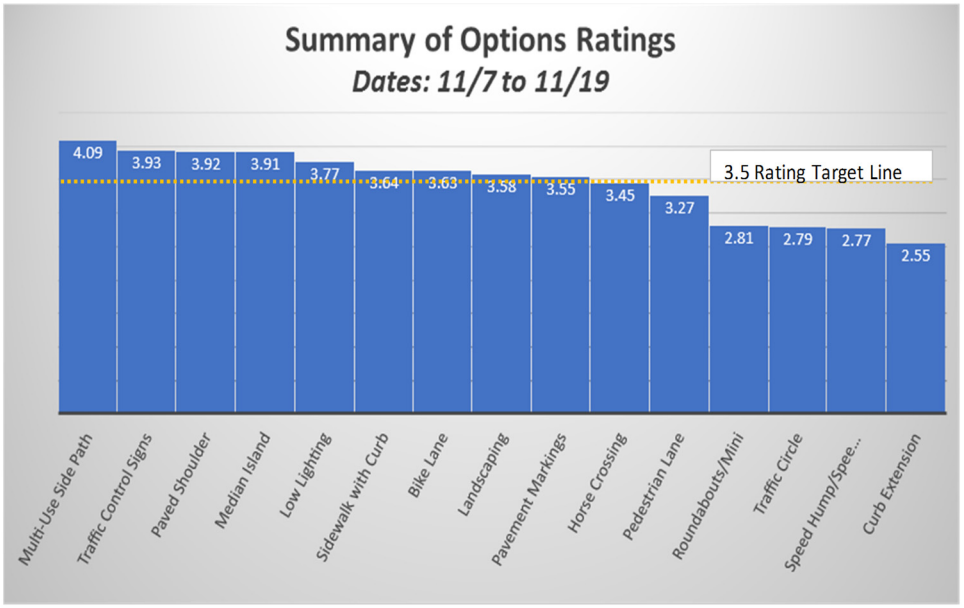
On-Line Survey Results

An online survey was available for the RNP community participation including the options discussed above from November 7th to 19th, 2017. The survey was promoted by an email blast to the list of interested participants as well as posting the survey link on social media. There were 445 total responses received which indicates a high confidence level reflecting general opinion based on the study area population. The community was asked to rate the options on a five-point scale ranging from "dislike very much" to "like very much" (rating from 1 to 5). The project team summarized the results and selected a target cut -off line of 3.5 (or higher) for identifying which options would advance for the "visually enhanced" roadway configuration options. This indicates options that generally had favorable results. Figure 3.4 shows a summary of the online public survey results and the options advanced for further conceptual development.

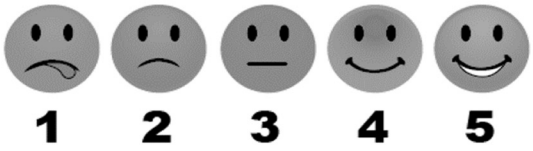
Summary of On-Line Public Survey Results

Survey Period: November 7-19, 2017
Total Respondents: 445

No.	Option	Ave Rating
1	Multi-Use Side Path	4.09
2	Traffic Control Signs	3.93
3	Paved Shoulder	3.92
4	Median Island	3.91
5	Low Lighting	3.77
6	Sidewalk with Curb	3.64
7	Bike Lane	3.63
8	Landscaping	3.58
9	Pavement Markings	3.55
10	Horse Crossing	3.45
11	Pedestrian Lane	3.27
12	Roundabouts/Mini	2.81
13	Traffic Circle	2.79
14	Speed Hump/Speed Table	2.77
15	Curb Extension	2.55



Rating Legend



1 2 3 4 5

dislike very much somewhat dislike neutral somewhat like like very much

Visually-Enhanced Concepts and Community Feedback

Based on the survey results, three configuration concepts were developed for each of the roadway types (60, 80 and 100-foot). Option 1 generally provided a configuration that maintained the highest preservation of rural characteristics, however, it included the least benefit in terms of drainage mitigation and safety for all users. At the other end, Option 3 generally provided a configuration with the greatest benefit in terms of drainage mitigation and safety for all users, however, it typically offered the least rural preservation. Option 2 typically fell in between both these alternatives in terms of these criteria. In addition to the configuration options, the project team developed "before and after" photo renderings to provide a visual representation of how the improvements may actually look within the study area. The team also presented a board of "Other Considerations" showing examples of traffic control signs, low lighting and landscaping.

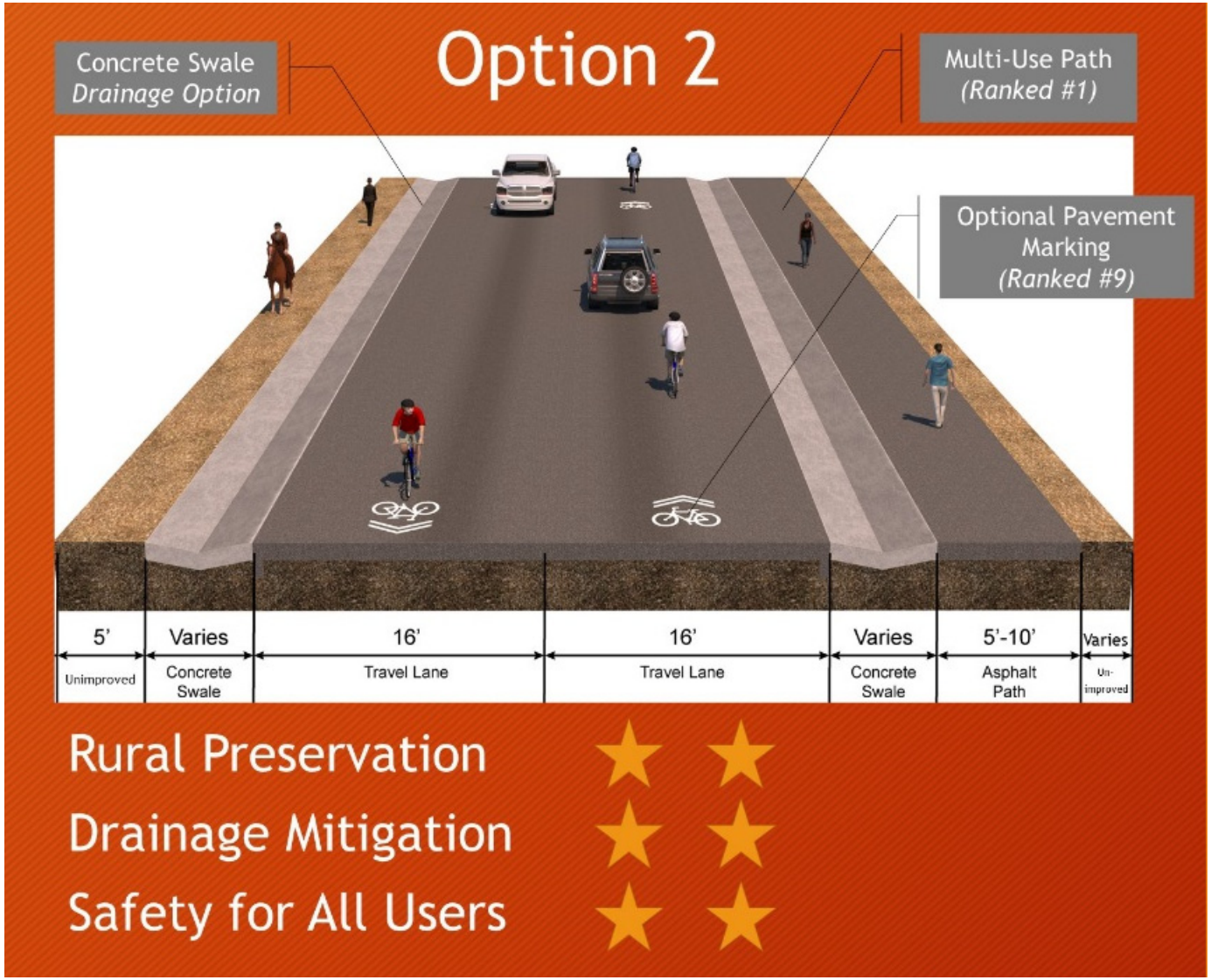
Feedback from Community Open House

The project team presented the visually enhanced alternatives at a Community Open House on February 20, 2018 and community participants were given the opportunity to vote on their preferences. On all three roadway scenarios, Option 2 was the preferred alternative. A summary of the votes is included in the table below. The project team also reviewed the hand-written comments received during the public meeting and some received by email following the public meeting. Attendees wanted to preserve the rural character but were willing to have more infrastructure on the ground in order to address drainage needs and increased safety with lighting and speed control. The following figure identifies the topics discussed most frequently in comments received by giving specific words a size relative to the number of times they were mentioned.

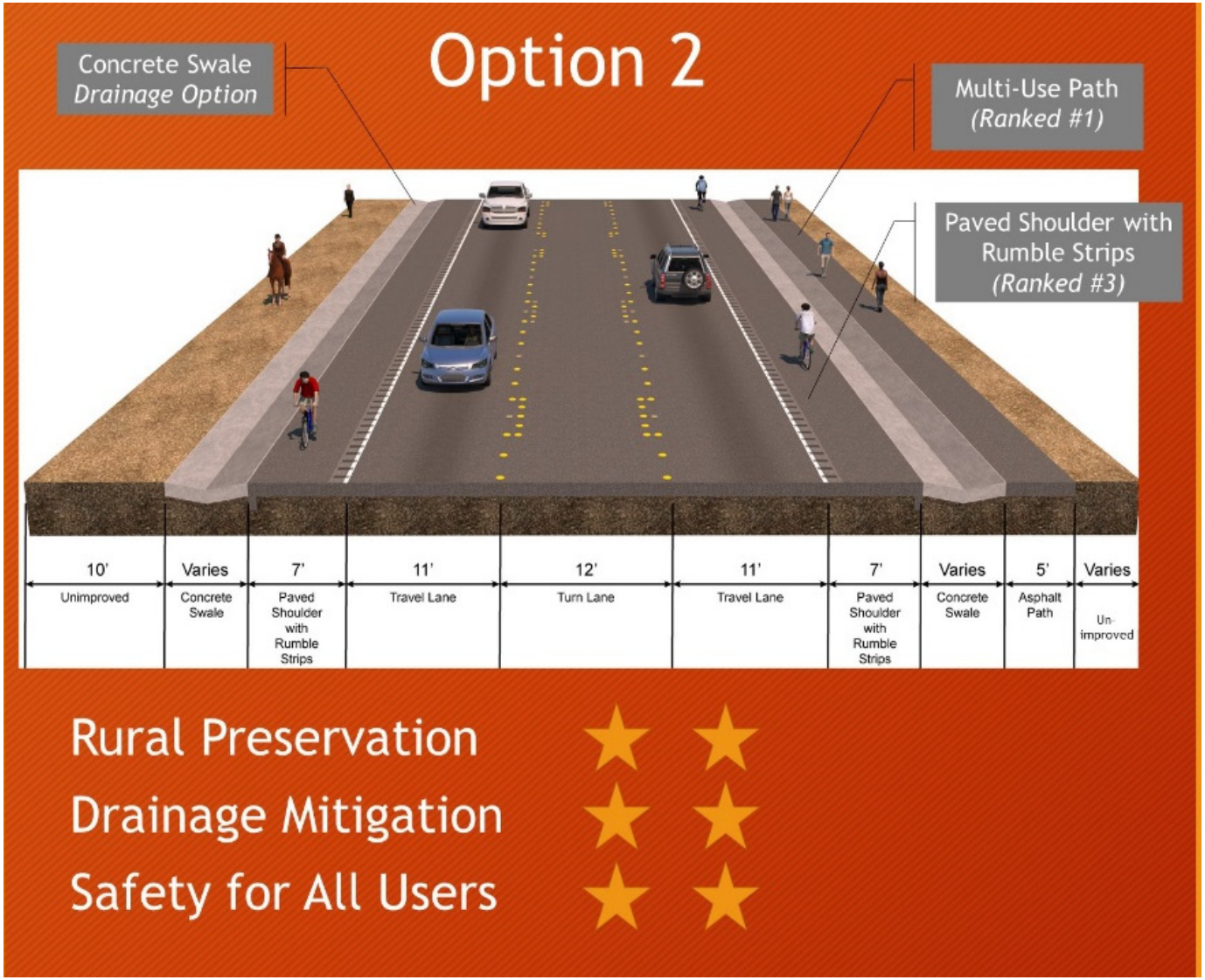
Voting Results for Roadway Options and Comment Word Cloud

Cross-Section	Option	No. of Votes	Figure No.
60' ROW	1	12	Fig. 3.5
60' ROW	2	15	Fig. 3.6
60' ROW	3	7	Fig. 3.7
80' ROW	1	6	Fig. 3.9
80' ROW	2	19	Fig. 3.10
80' ROW	3	8	Fig. 3.11
100' ROW	1	4	Fig. 3.13
100' ROW	2	22	Fig. 3.14
100' ROW	3	7	Fig. 3.15

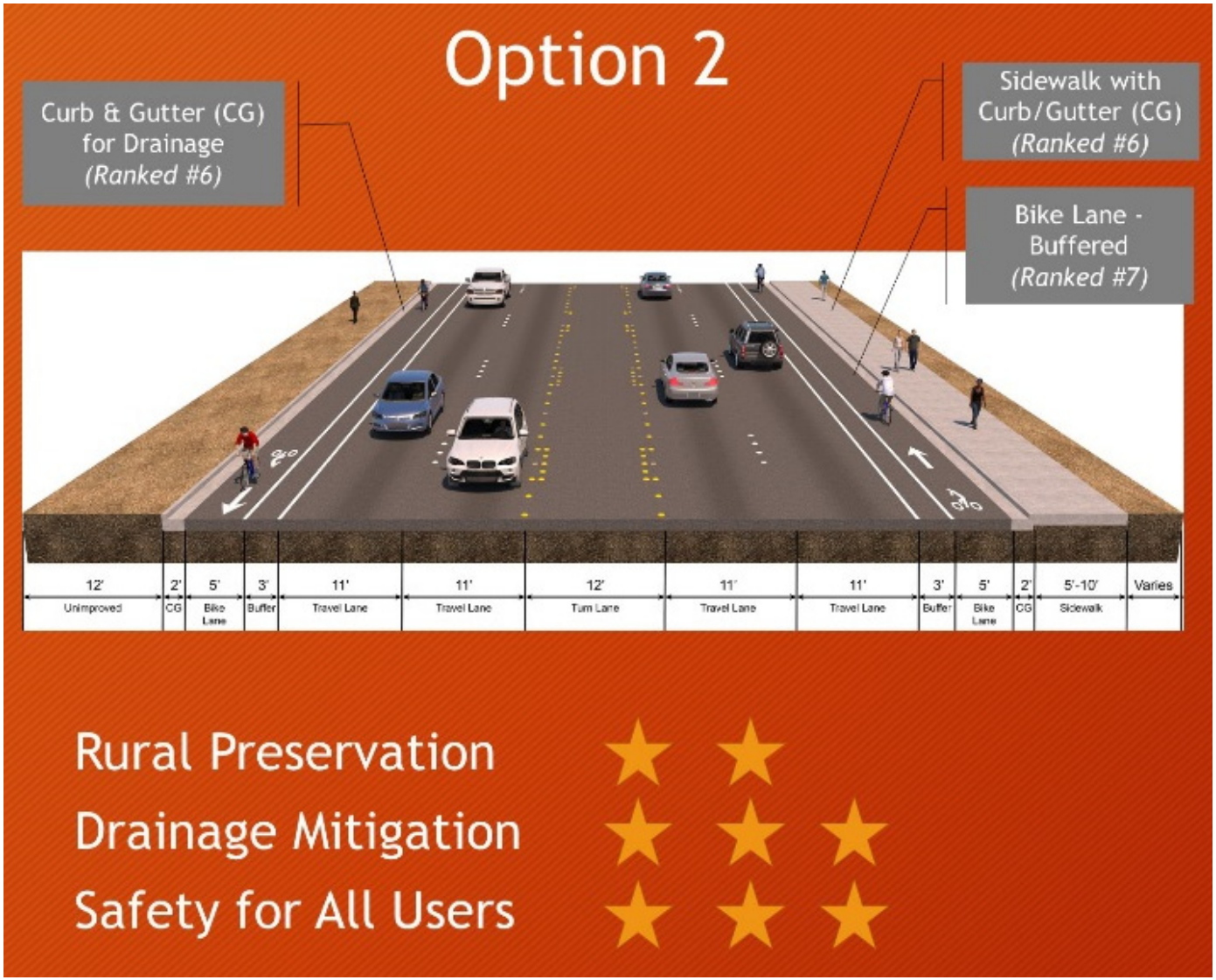
60-Foot ROW Option 2



80-Foot ROW Option 2



100-Foot ROW Option 2



Other Considerations

OTHER CONSIDERATIONS

Traffic Control Signs
(Ranked #2)

- Provides regulatory information
- Provides information on priority of users on roadway
- Encourages reduced speeds

Low Lighting at Major Intersections Only
(Ranked #5)

Dark Sky Compliant Lighting Fixtures

- Only on when needed
- Light only the area that needs it
- No brighter than necessary
- Minimize light pollution
- Fully shielded (pointing downward)

Landscaping
(Ranked #8)

- Must be maintained by a Homeowners' Association (HOA)
- Can be placed on median or adjacent to pedestrian paths

Study Applicability

The concepts presented in this study are not intended to act as standards and requirements. RTC Board approval is required before new concepts become a part of the standard drawings for Southern Nevada. These concepts should be used as guidelines for consideration when a roadway in the study area is programmed for design and construction of improvements.

The visually-enhanced alternatives demonstrate the options most preferred by stakeholders and the community. The top nine improvement options favored by the community are highlighted again in the table below. Other options presented should also still be considered on a case-by-case basis, including ones that did not make the cutoff from the survey rankings. The project team does not recommend eliminating these concepts completely if they are acceptable to CCPW.

No.	Option	Ave Rating
1	Multi-Use Side Path	4.09
2	Traffic Control Signs	3.93
3	Paved Shoulder	3.92
4	Median Island	3.91
5	Low Lighting	3.77
6	Sidewalk with Curb	3.64
7	Bike Lane	3.63
8	Landscaping	3.58
9	Pavement Markings	3.55

Additionally, the concepts included in this study may have some applicability to other rural or RNP areas, however, some of the development factors are unique to the Lone Mountain RNP for two primary reasons:

- Concepts were developed based on feedback from residents specific to this RNP study area.
- Drainage issues that exist here were a strong determinant on the roadway configuration and these limitations may not exist in other RNPs. For example, separated pedestrian and bicycle facilities are not feasible in this study area because the infrastructure gets washed away if it is not attached to the roadway pavement. However separated facilities may be possible and preferred in other RNP areas where the drainage impacts are not significant.

When a roadway within this study area is programmed to receive improvements, it is suggested the designers refer to the guidelines and considerations included in Section 4.2 of this report.

Section 1: Project Overview

1.1 Purpose and Background

The purpose of the study is to build upon concepts identified in the Complete Streets Design Guidelines for Livable Communities (2013) and identify additional solutions for multi-modal transportation designs suitable for rural (non-urban) residential areas. The study area is identified as the Rural Neighborhood Preservation (RNP) for the unincorporated area of Clark County called Lone Mountain. This study will provide recommendations for implementing multi-modal facilities within public right-of-way, while preserving the rural nature of the neighborhood. The study will identify and evaluate options for safety, flood control, roadway design, and traffic control improvements suitable for the Lone Mountain RNP area. The design options must address the concerns of the many stakeholders in the area including residents and Clark County engineering and maintenance departments. The goal is to strike a balance with design options that meet mobility needs, consider maintenance costs, all while promoting safety and improved mobility for users of the roadway.

STUDY OBJECTIVE

Provide recommendations to improve mobility for all users (vehicle, bicycle, pedestrian, and equestrian) while balancing considerations from best practices in engineering design, benefits to the community, adopted plans, and community input.

Feedback for the development of this study evolved from a combination of input from the community and other relevant stakeholders. Summaries of discussions with these groups are included in the Appendices:

- Community Input
- Regional Transportation Commission of Southern Nevada
- Clark County Public Works
- Clark County Maintenance
- Clark County Safe Routes to Schools
- Developers
- City of Las Vegas

1.2 Study Area

The Town of Lone Mountain lies in the northwest corner of the Las Vegas Valley. The study area is bounded by Clark County-215 Beltway to the north and west, Alexander Road to the south, and Durango Drive to the east. The area consists mostly of residential uses with some commercial uses at the extremities. Residential typically consists of half-acre parcels and larger to be consistent with the RNP designation. However, new smaller lot subdivisions continue to be built in the area. The result is rural residential “ranchettes” (some with equestrian features) neighboring more suburban neighborhoods. Some of the key area destinations include Lone Mountain Regional Park, Mountain Crest Park, Thunderbird Family Sports Complex and area schools – Centennial High School, Marshall C. Darnell Elementary School, and Dean Lamar Allen Elementary School. Currently, there is unmet demand for transportation access on foot and by bike or horse in and around the study area. A Study Area Map and table with traffic data and other details are shown in Figure 1.1 and Table 1.1 on the following pages.

Figure 1.1: Study Area Map

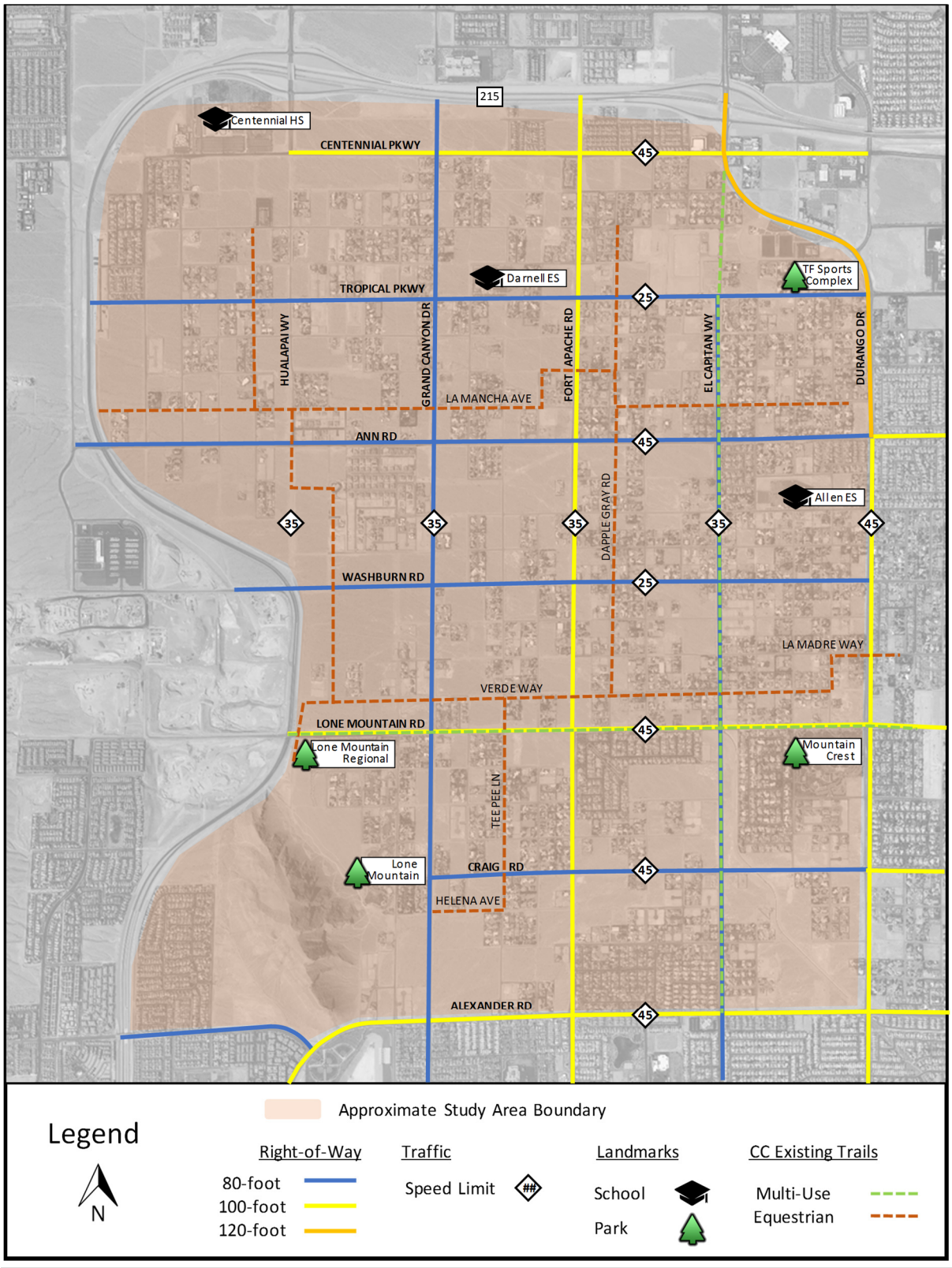


Table 1.1: Historical Traffic Volumes and Trends Within Study Area
(Source: NDOT, 2007-2016)

Station	Route/Location	Functional Classification (Clark Co.)	Functional Classification (NDOT)	2007 AADT	2008 AADT	2009 AADT	2010 AADT	2011 AADT	2012 AADT	2013 AADT	2014 AADT	2015 AADT	2016 AADT	Traffic Increase (Decrease)	Average Increase (Decrease) per year
30414	Hualapai Wy, 150ft N of Ann Rd	Collector (60+ ft R/W) Ann to Regina	Minor Collector (N. of Centennial)	170	160	130	170	180	150	150	150	600	540	218%	24.2%
420	El Capitan Wy, 100ft N of Alexander Rd	Collector (80+ ft R/W)	Minor Collector	1600	1500	1500	1500	1500	1500	1400	1400	1400	1500	-6%	-0.7%
1284	El Capitan Wy, 100ft N of Ann Rd	Collector (80+ ft R/W)	Minor Collector	1000	940	920	960	930	1000	850	850	900	1000	0%	0.0%
2002	Alexander Av, .1 mi E of CL-215	Collector (80+ ft R/W) W. of Hualapai	Minor Collector	4800	5100	4900	4100	4400	4400	4600	4900	5000	5200	8%	0.9%
2054	El Capitan Wy, .1 mi N of Tropical Pk	Collector (80+ ft R/W)	Minor Collector	680	750	800	680	700	700	700	600	600	615	-10%	-1.1%
2252	Tropical Pk, .1 mi W of Centennial Center Bl	Collector (80+ ft R/W)	Minor Collector	11000	12000	12000	11000	11000	11000	11000	11500	12000	12000	9%	1.0%
														Average Growth/Year	**4.1%**
1280	Durango Dr, .1 mi S of Ann Rd	Arterial (100+ ft R/W) S. of Ann	Minor Arterial	18000	17000	18000	19000	21000	19000	19000	19500	19000	21000	17%	1.9%
1316	Ann Rd, .1 mi E of Hualapai Wy	Arterial (100+ ft R/W)	Minor Arterial	3000	2800	3300	3700	3900	3900	3800	3900	4400	4900	63%	7.0%
1317	Ann Rd, .1 mi E of Durango Dr	Arterial (100+ ft R/W)	Minor Arterial	12000	11000	12000	12000	12000	11500	13000	12500	13000	14000	17%	1.9%
1318	Lone Mountain Rd, 150ft W of Fort Apache Rd	Arterial (100+ ft R/W)	Minor Arterial	4800	3700	4800	5400	5600	6200	6800	7000	8700	9000	88%	9.7%
1319	Lone Mountain Rd, .1 mi E of Durango Dr	Arterial (100+ ft R/W)	Minor Arterial	7100	6100	6400	6800	6800	6100	6500	6700	7400	7900	11%	1.3%
2007	Ann Rd, .1 mi E of CL-215	Arterial (100+ ft R/W)	Minor Arterial	2200	2900	2700	2900	3700	3700	3600	5100	5100	5100	132%	14.6%
2009	Ann Rd, .1 mi W of CL-215	Arterial (100+ ft R/W)	Minor Arterial	2700	2500	2600	3100	3700	3700	5200	5400	5500	8300	207%	23.0%
2045	Durango Dr, .1 mi N of Gowan Rd	Arterial (100+ ft R/W)	Minor Arterial	18000	19000	18000	14000	15000	15000	16000	15500	16000	16000	-11%	-1.2%
2048	Durango Dr, .01 mi N of Tropical Pk (shown S of Tropical on map)	Arterial (100+ ft R/W)	Minor Arterial	15000	18000	19000	16000	16000	15500	15000	15500	15500	16000	7%	0.7%
2066	Fort Apache Rd, .1 mi N of Tropical Pk	Arterial (100+ ft R/W)	Minor Collector	15000	18000	18000	14000	15000	15000	2100	2200	2300	3700	-75%	-8.4%
2063	Fort Apache Rd, .1 mi N of Gowan Rd	Arterial (100+ ft R/W)	Minor Collector	4400	5100	3900	3900	4200	4200	3800	4500	4600	4700	7%	0.8%
2136	Hualapai Wy, .1 mi N of Gowan Rd	Arterial (100+ ft R/W)	Minor Collector	4900	5400	4900	4300	4600	4600	4700	5000	5100	6300	29%	3.2%
2181	Lone Mountain Rd, .1 mi E of CC215	Arterial (100+ ft R/W)	Minor Arterial	4200	4000	4000	4400	5400	6700	6000	7800	8000	8900	112%	12.4%
2183	Lone Mountain Rd, .1 mi W of CC-215	Arterial (100+ ft R/W)	Minor Arterial	2100	2000	1600	1200	1200	1500	3700	3800	3900	2400	14%	1.6%
		****** Outlier ******												**Average Growth/Year**	**4.9%**

1.3 Project Approach

The overall Project Approach includes two phases of work. Phase 1, completed for the RTC by Wood Rogers, included research on best practices in rural street design, outreach to the community including an online survey and public meeting, and development of conceptual street cross sections. Documentation covering the effort from Phase 1 is included as a reference in Appendix F. After completion of Phase 1, the stakeholder group recognized the need to further expand the scope and study expectations.

Some of the primary feedback the Phase 2 project team received from stakeholders was the desire to have a more comprehensive list of references and best practices in design researched and to include additional stakeholder interviews. Stakeholders also desired an expanded menu of options presented to the public that are "visually-enhanced". Phase 2 included creating visually accessible concepts that effectively demonstrate potential improvements for public review and feedback. The primary content included in this report is a summary of Phase 2 scope elements such as expanded project understanding and concept development. A summary and schedule of the overall project approach and related tasks is outlined as follows:

Phase 1

- Preliminary Reference Research
- Preliminary Stakeholder Interviews
- Public Priorities Survey
- Draft Typical Sections
- Public Meeting

Phase 2

- Expanded Project Understanding
  - Additional Reference Research
  - Identify Additional Conceptual Components
  - Additional Stakeholder Meetings and Interviews (to refine list of acceptable conceptual components)
- On-Line Public Visual Survey (of refined conceptual components)
- Develop Visually-Enhanced Concepts
- Community Open House
- Develop Final Report and Guidelines

PROJECT SCHEDULE

2016 (Phase 1)----------2017 (Phase 2)----------2018----------

Preliminary Research and Interviews	Survey #1, Data Analysis	Draft Typical Sections, Public Meeting #1	Expanded Project Understanding	Expanded Concept Components, Survey #2	Enhanced Concepts, Public Meeting #2	Final Report and Guidelines

1.4 Review Existing References

Before drafting any conceptual street cross sections, the project team researched available references in the United States and around the world. These references include studies, similar projects and industry practices as they relate to improved mobility of all users (vehicle, bicycle, pedestrian and equestrian) in rural settings. One purpose of this research was to identify improvements that have been constructed elsewhere that might also be used to implement the goals of the RNP. Another was to identify planning documents, design standards and other information that would form the basis for discussion of potential design alternatives with Clark County Staff and the Public.

The above research focused on three areas: 1) Clark County planning documents related to the RNP; 2) local and national documents related to multimodal travel; and 3) local and national engineering standards related to the design of multimodal travel. The research identified 48 documents with varying degrees of applicability. These documents were organized into three categories; Planning Documents, Multimodal Documents, and Design Standards. Each document was reviewed to determine its applicability to the Rural Streets Study, and that information was briefly summarized. Also included in the list of reference materials are several other documents that fall outside of these three main categories. A complete list of the documents with summaries of each can be found in Appendix A.

The traditional engineering approach to transportation planning has been to focus on the automobile. The result has been streets that are not conducive to walking or bicycling. With population growth, many roads have become too crowded by car traffic to share the road with cars, pedestrians, bicyclists and equestrians. In response to these issues the focus has recently begun to shift to a multimodal approach. There are several multimodal references available, but often they are geared primarily toward the urban environment. The publication Small Town and Rural Multimodal Networks, was key among the multimodal documents. This recent (2016) publication prepared for the Federal Highway Administration (FHWA) was the most relevant reference and provided much of the basis for this study. It describes issues and facilities with accompanying conceptual sketches. It also includes mini case studies with photos for several of the improvements. There are two planning documents that provide good insights into the design and maintenance of equestrian facilities: Designing Shared Use Trails to Include Equestrians (2005) and Research for the Development of Best Management Practices to Minimize Trail Impacts on the Hoosier National Forest (2005).

The design of drainage improvements is outside the scope of this study. Nevertheless, drainage improvements are an important component of any street cross section. Knowing that conveyance of storm water runoff is a critical issue for the Lone Mountain RNP, the team performed an online search for drainage improvement standards that could be implemented in the area. Our research was focused on western states that might have similar hydrologic conditions to those of the RNP. The result is a matrix that identifies several potential types of drainage improvements along with notes regarding the benefits and concerns associated with each. This matrix can be found in Section 3. Because the size and type of drainage improvements is dependent upon many factors including the drainage area, design storm, runoff coefficient, and the slope and material of the conveyance structure, the design of every drainage improvement is site specific and not provided as part of this study.

The following section summarizes the approach and results of the expanded conceptual development for this study. It includes the expanded project understanding and incorporates the additional stakeholder and community feedback received.

Section 2: Outreach

2.1 Phase 1 Outreach

The Phase 2 Project Team reviewed the outreach efforts completed in Phase 1 of this study effort. Phase 1 outreach coordination included several one-on-one stakeholder interviews, a Public Meeting and an on-line public survey. For more details, please see Appendix F. Below is an outline of the key comments received from this outreach effort:

Public Input Meeting, April 19, 2016 (approximately 100 attendees)

- Passionate about keeping the rural nature of the area (no curb, gutter, sidewalk)
- Standards needed to create consistent improvements, maintain rural feel
- Drainage and flooding issues are significant issues, consider a closed drainage system
- Want few if any changes to local roads, possible changes to collectors/arterials
- Street lights are not wanted on local roads, OK for major intersections
- Residents love the Lone Mountain area, may want a town emblem or logo
- Concerned about lack of pedestrian improvements for school children and others
- Concern that new standards may be related to possible annexation
- Positive response to both roundabouts and decomposed granite multi-use trails.

DR Horton, Developer, May 17, 2016

- Having standards would streamline approval process
- Prefers a multi-agency standard vs. just Clark County
- Likes decorative rock from edge of pavement to edge of right-of-way
- Off-site improvement requirements have been inconsistent
- Interested in a closed drainage system to address flooding
- Decomposed granite best for walking paths
- Improvements will be inconsistent until existing developments brought up to new standards
- Unexpected off-site requirements have been costly
- Wants definitive answer, cul-de-sacs vs. hammerheads

Lone Mountain Citizens Advisory Council, May 18, 2016

- Standards needed for consistency of improvements
- Maintenance needs consistency also
- Flooding common on Ann, Durango, Lone Mountain
- Doesn't understand the need for raised medians
- Development walls create sight distance problems
- Riding trails discontinuous, often blocked by development
- Wants middle ground between sidewalks and bare trails
- Two way left turn lanes (TWLTL) an improvement
- Large retaining walls with screen walls impact views
- Prefer v-ditches, no curbs, sidewalks, or street lights
- Annexation a huge concern
- Speeding an issue

- Standards an opportunity for aesthetics and function, likes Grand Teton
- Consider high-tech lighting if attractive, not intrusive
- Consider decomposed granite for trails, like Lone Mountain Park
- Existing trails do not provide good connectivity
- Concerned about not getting enough participation
- Lone Mountain, Ann, and Fort Apache projects moving forward may lessen impacts of recommendations

Online Public Survey, May 19 – June 1, 2016 (295 Responses)

- Residents love the rural feel of the neighborhood
- Personal Vehicle use was the predominant means of transportation (94%) followed by Walking (78%), Bicycling (42%), Equestrian (27%)
- Most people (64%) have experienced occasional storm water issues on the roads
- Approximately half of respondents desire aesthetic improvements
- Improvements most wanted for alternative transportation:
    - Walking area or path (44%)
    - No improvements (32%)
    - Equestrian path (31%)
    - Bicycle area (31%)
    - Motorized scooters, strollers or wheelchairs (8%)
- Majority of the respondents want the roads to be unchanged, no improvements. Many want improvements for horses, biking and walking, but not a majority.

2.2 Phase 2 Outreach

Phase 2 included additional outreach to both agency stakeholders and the community. Phase 2 was guided by input from a stakeholder advisory committee. The project team revisited agency stakeholders from the Phase 1 study effort. This included a Phase 2 kick-off meeting and three stakeholder advisory committee group meetings. It also included some separate one-on-one meetings with Clark County Public Works and added new stakeholder interviews with Clark County Maintenance, the City of Las Vegas, and the Safe Routes to School representative. Summaries of these discussions are included in Appendix B Stakeholder Meeting Summaries and Appendix C Stakeholder Interview Summaries.

The project team included two community outreach efforts: an online public survey and a community open house. Because the feedback received from these two events are integral to how concepts were developed, the results are covered in Section 3: Concept Development. The Online Public Survey was live from November 7-19, 2017. It included an explanation of the project and survey purpose followed by 15 different multimodal design options and a summary of their characteristics. The community was asked to rate the options on a five-point scale ranging from “dislike very much” to “like very much”. The survey received 455 responses and is included in Appendix D.

The Community Open House was held on February 20, 2018, at Mountain Crest Community Center, 4701 N. Durango Drive, Las Vegas 89129. The project team presented several options for visually-enhanced concepts on 60ft, 80ft and 100ft right of ways (ROW). The team also presented some other considerations such as landscaping, lighting and traffic control markings. Residents who attended voted on their preferences and submitted additional comments/suggestions on comment cards. There were 31 residents who

attended the open house, 25 submitted comment cards and there were 37 comments or suggestions on the cards. There were also 2 emails received from residents not able to attend the open house. Comment cards are included in Appendix E.

A summary of the community comments received during the Phase 2 outreach effort include:

- There were 445 total responses received on the online survey which indicates a high confidence level reflecting general opinion based on the study area population.
- The online survey resulted in 9 of the 15 options being carried forward. The top five options included a multi-use side path, traffic control signs, paved shoulder, median islands and low-lighting.
- During the public meeting, of the various roadway scenarios presented, the preferred alternatives that were most preferred were those offering a balance between rural preservation and increased safety and drainage improvements.
- Drainage improvements were mentioned the most often, included in nearly 30% of the comments. Attendees wanted to preserve the rural character but were willing to have more infrastructure on the ground in order to address drainage needs such as through a concrete ditch.
- Lighting came in second being mentioned in about 20%. Residents favored low lighting on 60' roadways and increased lighting on 80' and 100' for safety reasons.
- Safety of pedestrians, bicyclists and equestrians was the third most mentioned in the comments and the safety of horses crossing Lone Mountain to the equestrian park was mentioned in one third of these comments.
- Speed control was a concern in 15% of the comments and using roundabouts or traffic circles to slow traffic was suggested in five comments.

Figure 2.1: Photos of the Community Open House Outreach Event

Section 3: Conceptual Development

3.1 Review Concept Development Approach

Below is a summary outline covering the approach for developing the concepts included in this study (also discussed in Section 1 of this report). Concepts were completed in two phases:

Phase 1, completed in 2016

- Preliminary Reference Research
- Preliminary Stakeholder Interviews
- On-Line Public Priorities Survey
- Draft Typical-Sections
- Public Meeting

Phase 2, completed in 2018

- Expanded Project Understanding
  - Additional Reference Research
  - Identify Additional Conceptual Components
  - Additional Stakeholder Meetings and Interviews (to refine list of acceptable conceptual components)
- On-Line Public Visual Survey (of refined conceptual components)
- Develop Visually-Enhanced Concepts
- Community Open House
- Develop Final Report and Guidelines

3.2 Review of Phase 1 Typical Sections

Figures 3.1 to 3.3 show the Draft Typical-Sections developed in Phase 1. For more details on Phase 1, please see Appendix F.

Figure 3.1: Phase 1 Typical Section Concept for 60-Foot Roadways

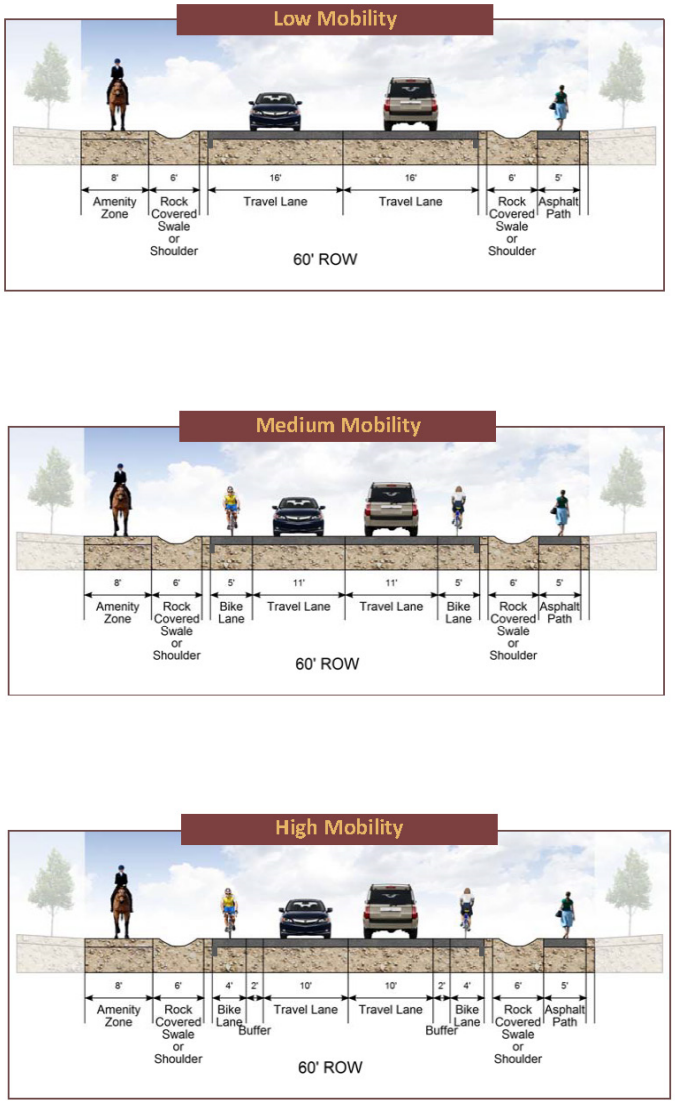


Figure 3.2: Phase 1 Typical Section Concept for 80-Foot Roadways

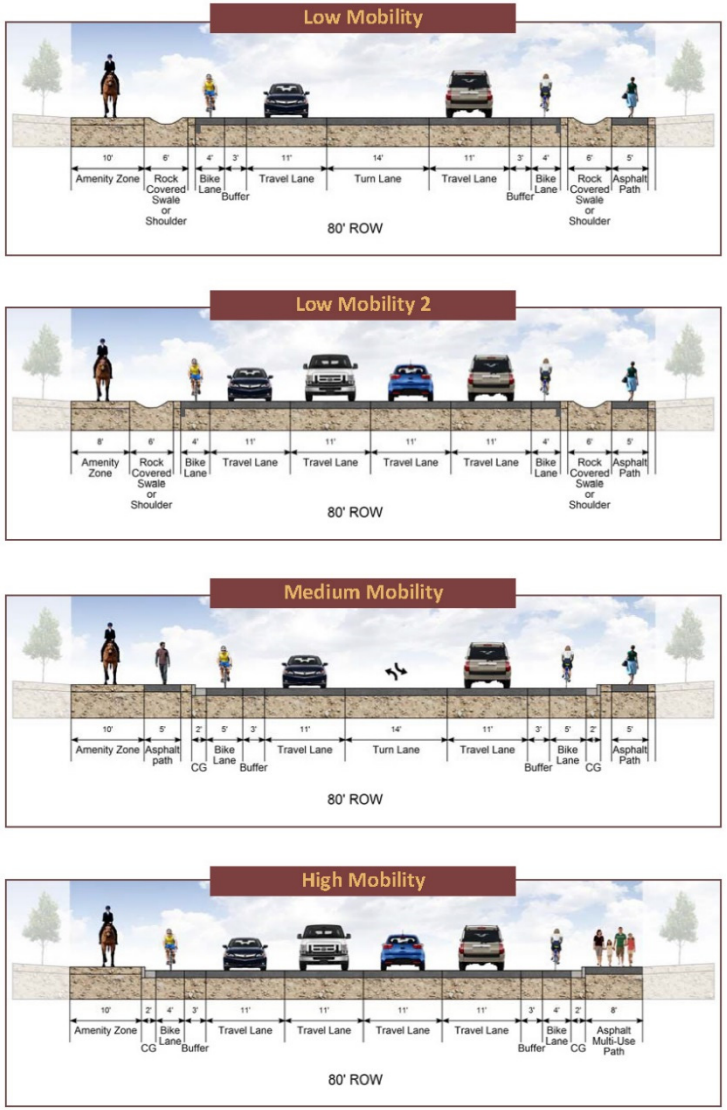
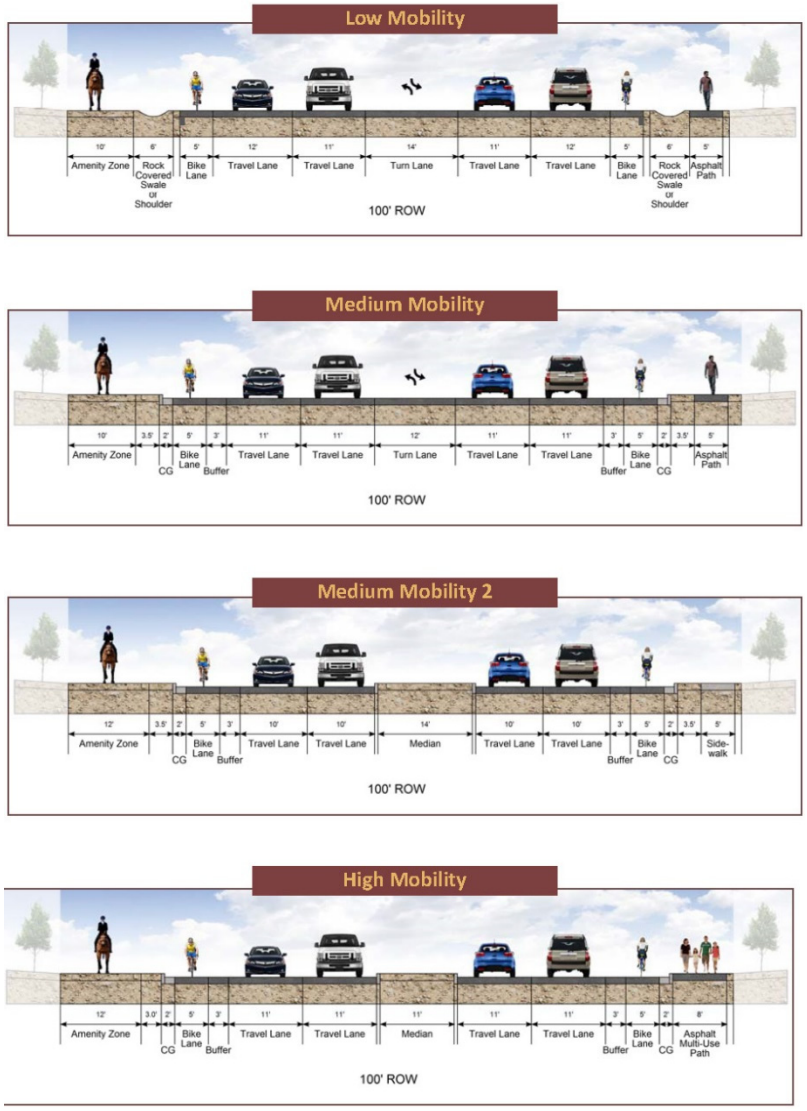


Figure 3.3: Phase 1 Typical Section Concept for 100-Foot Roadways



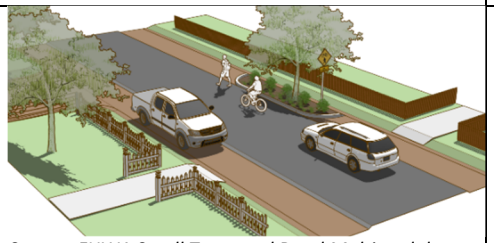
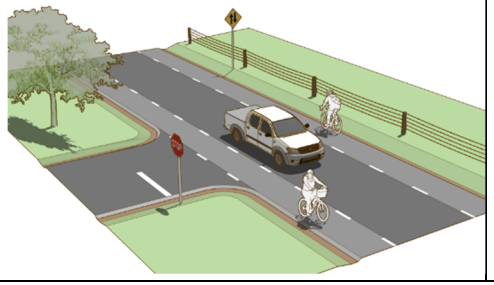
In Phase 2, the project team reviewed the Draft Cross-Sections with stakeholders to receive feedback on those. As a result, the project team eliminated the two 60-foot options not acceptable to Clark County Public Works (Medium and High Mobility options). Also, the team ensured that concepts advanced in this study met minimum requirements for lane and median widths. Any concepts developed will ultimately still need to be reviewed with the site-specific roadway programmed for improvements, so an appropriate design is applied.

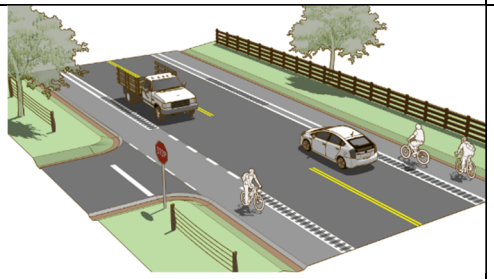
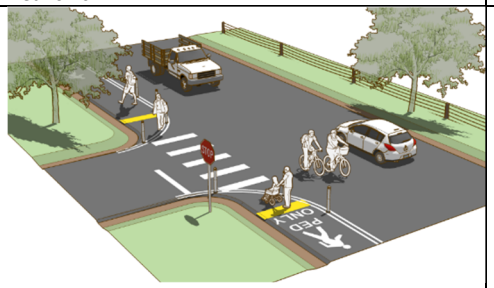
Additionally, as stated in Section 1, some of the primary feedback received in Phase 2 from stakeholders was the desire to have an expanded menu of options presented to the public that are "visually-enhanced". The following sections will summarize the process to develop concepts that met these needs. Section 3.3 discusses the development of the expanded list of options and Section 3.4 discusses how these were further refined and then incorporated into "visually-enhanced" roadway configuration options.

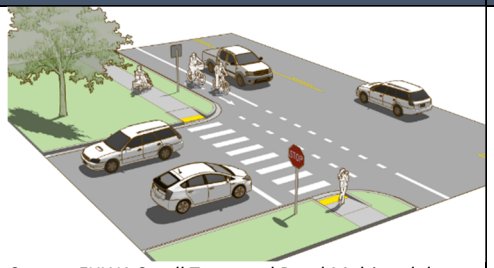
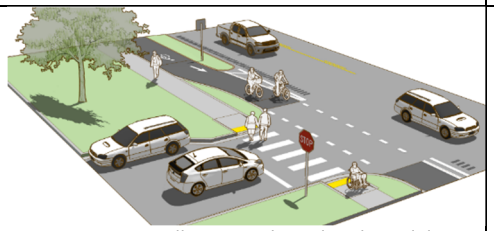
3.3 Expanded Menu of Multimodal Options

The Existing Reference Research effort is summarized in Section 1 of this report with more details and full summaries covered in Appendix A. Based on the extended reference research, the project team identified a list of multimodal and drainage options appropriate for the study area. The traffic control options proposed are supported by FHWA as safety improvements appropriate for rural and small-town communities. The project team prepared an evaluation matrix for discussion with stakeholders. The matrix outlines safety benefits and concerns, appropriate traffic conditions, preservation of rural characteristics, relative cost and maintenance, appropriate road types and some possible applicable roadways within the study area. Table 3.1 outlines the Multi-Modal Options Evaluations Matrix and Table 3.2 outlines the Drainage Options Evaluations Matrix.

Table 3.1: Expanded Multi-Modal Evaluations Matrix

OPTION	PHOTO EXAMPLE	SAFETY BENEFITS / CONCERNS	APPROPRIATE TRAFFIC (MAX SPEED/VOLUMES)	RURAL PRESRVATION	COST & MAINTENANCE (relative to other options)	APPROPRIATE ROAD TYPE (60' / 80' / 100')	Example Roadways
NO BUILD (Existing Condition Remains)	 60' ROW 80'ROW 100' ROW	No bicycle / pedestrian infrastructure, mixed traffic	N/A	High	Construct Cost: Lowest Maint. Cost: Lowest	N/A	60': Corbett Street 80': Tropical Parkway 100': Fort Apache Road
YIELD ROADWAY	 *Source: FHWA Small Town and Rural Multimodal Networks*	Little safety benefit, similar to existing condition	30 mph 2000 ADT	High (Community Input Required)	Construct Cost: Low Maint. Cost: Low	Local Road 60'	Corbett Street Azure Drive Rosada Way
BICYCLE BOULEVARD	 *Source: FHWA Small Town and Rural Multimodal Networks*	Medium Safety Benefit: Although not a separated facility, this option increases comfort for bicycling by reducing motor vehicle operating speeds and volumes, if diversion is included. Pedestrian facilities can be separated.	25 mph 3000 ADT	Medium Less visually impactful than separated facilities. (Community Input Required)	Construct Cost: Medium Maint. Cost: Medium May require additional paved surface to provide sidewalk space for pedestrians. Drainage impact is likely minimal or no impact.	Local Road 60' Striping not typically permitted on 60' roads due to maintenance, unless high traffic volumes warrant this.	60' road that provides significant connection Washburn Road is an 80' ROW road that may be an exception due to s25 mph speed limit and connection across study area.
ADVISORY SHOULDER		Little safety benefit, but possibly better than Yield Roadway. Provides a delineated but nonexclusive space available for biking on a roadway otherwise too narrow for dedicated shoulders.	35 mph 6000 ADT	High (Community Input Required)	Construct Cost: Medium-Low Maint. Cost: Medium-Low	None El Capitan Way fits speed and volume parameters, however it does not appear to be too narrow to accommodate an enhanced option.	Advisory shoulders are a new treatment type in the United States and no performance data has yet been collected to compare to a substantial body of international experience. An approved Request to Experiment is required as detailed in Section 1A.10 of the MUTCD. FHWA is also accepting

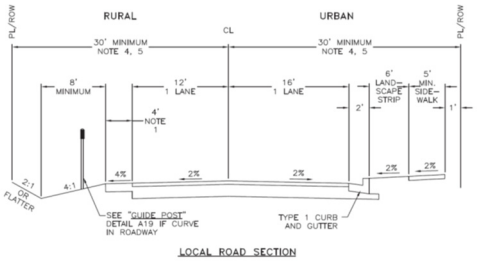
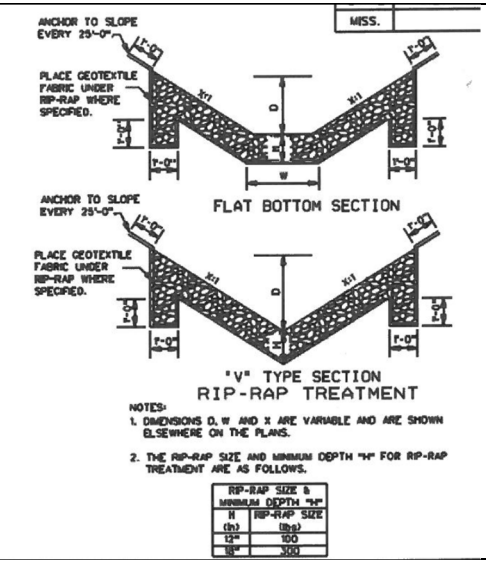
OPTION	PHOTO EXAMPLE	SAFETY BENEFITS / CONCERNS	APPROPRIATE TRAFFIC (MAX SPEED/VOLUMES)	RURAL PRESRVATION	COST & MAINTENANCE (relative to other options)	APPROPRIATE ROAD TYPE (60' / 80' / 100')	Example Roadways
	Source: FHWA Small Town and Rural Multimodal Networks					For use around built-up areas with bicycle and pedestrian demand and limited available paved roadway surface.	requests for experimentation with a similar treatment called "dashed bicycle lanes."
PAVED SHOULDER	 *Source: FHWA Small Town and Rural Multimodal Networks*	Medium benefit: Visually separated with edge line rumble strips, can reduce severe crashes	55 mph 12000 ADT	Medium (Community Input Required)	Construct Cost: Medium Maint. Cost: Medium-Low	80' and 100' Appropriate near school zones	Centennial Parkway Lone Mountain Road Fort Apache Road
PEDESTRIAN LANE *(added to FHWA document after publication)*	 *Source: FHWA Small Town and Rural Multimodal Networks*	Medium benefit: Pedestrians are visually separated from vehicles with striping.	30 mph 6000 ADT	Medium (Community Input Required)	Construct Cost: Low Maint. Cost: Low	Local Road and Collector 60' and 80' Striping not typically permitted on 60' roads due to maintenance, unless high traffic volumes warrant this.	Washburn Rd

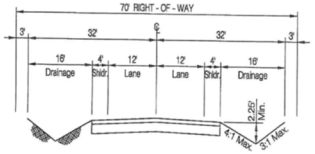
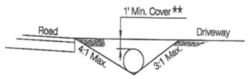
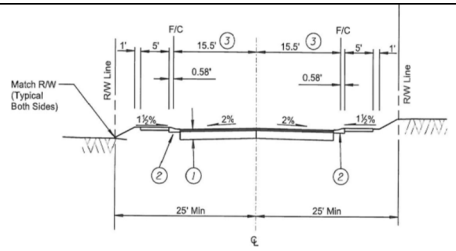
OPTION	PHOTO EXAMPLE	SAFETY BENEFITS / CONCERNS	APPROPRIATE TRAFFIC (MAX SPEED/VOLUMES)	RURAL PRESRVATION	COST & MAINTENANCE (relative to other options)	APPROPRIATE ROAD TYPE (60' / 80' / 100')	Example Roadways
BIKE LANE	 *Source: FHWA Small Town and Rural Multimodal Networks*	Medium benefit: Visually separated from vehicles with striping. May also be separated from pedestrians.	55 mph (Speed based on reference noted to the left, however RTC typically recommends maximum speeds of 35mph for bike lanes in Southern Nevada) 12000 ADT	Medium (Community Input Required)	Construct Cost: Low Maint. Cost: Low Adding pedestrian facilities increases these costs	80' and 100' Appropriate near school zones	Centennial Parkway Lone Mountain Road Fort Apache Road
SEPARATED BIKE LANE	 *Source: FHWA Small Town and Rural Multimodal Networks*	High benefit: Physically separated from vehicles and pedestrians.	55 mph 12000 ADT	Low/Medium-Low	Construct Cost: High Maint. Cost: High Adding pedestrian facilities increases these costs	Roads where there is sufficient ROW available and where moderate to high volumes of cyclists and pedestrians are expected.	Requires further evaluation
TRAFFIC CALMING - Traffic Control Devices: • Advisory speeds • Pavement speed limit marking • Speed activated sign/speed feedback sign • Optical speed bars		High Benefits: Found to reduce speeds between 2 and 10 mph. Found to reduce crashes by 13% to 46%. *FHWA Office of Safety: Speed Management A Manual for Local Rural Road Owners*	Any traffic with speeding issues	Medium/High Typically does not involve infrastructure (Community Input Required)	Low costs	Any roads with speeding issues.	Any roads with speeding issues.

OPTION	PHOTO EXAMPLE	SAFETY BENEFITS / CONCERNS	APPROPRIATE TRAFFIC (MAX SPEED/VOLUMES)	RURAL PRESRVATION	COST & MAINTENANCE (relative to other options)	APPROPRIATE ROAD TYPE (60' / 80' / 100')	Example Roadways
TRAFFIC CALMING - Road and Street Designs: • Reduced lane widths OR Road diet • Center island or median, pinch points, lateral shifts	 	High Benefits: Speeds may also decrease by one to three mph for each foot that the roadway is narrowed down to 10 feet. Found to reduce crashes by 29% to 71%. *FHWA Office of Safety: Speed Management A Manual for Local Rural Road Owners*	"In rural areas, reducing lane width on roadway segments should only be considered on lower-speed roadways."	High for striping only Low for concrete infrastructure (Community Input Required)	Low to medium	80' and/or 100'	Tropical Pkwy Washburn Rd Fort Apache Rd
TRAFFIC CALMING – Mini Roundabout		High benefits: Constructed at intersections along high-speed, two-lane rural highways reduced overall crashes by up to 68% and reduced injury crashes by up to 88%. *Publication number FHWA-SA-14-097: Roundabouts & Rural Highways* *FHWA Office of Safety: Speed Management A Manual for Local Rural Road Owners*	35 MPH or less, can be used on higher speed roads (50 mph) with proper speed reduction designs and treatments 15,000 ADT Truck percent: 3% or less	Low: Design typically includes curb, gutter, and separated sidewalks. Medium: Design can be done with only pavement markings (Community Input Required)	20% less than full-sized roundabout: $25K to $400K Cost ranges from low to high because design can range from striping only to new ROW and infrastructure. Clark County has concerns about where maintenance vehicles can park, how to shut down traffic, access to utilities.	2-lane/3-lane minor arterial roads, and high volume collector roads ICD from 50 to 90 ft (Inscribed circular diameter)	Various, further evaluation required. With the exception of Durango Drive, most 80' and 100' roads have ADT less than 15,000. Forecasted ADT and peak hour veh/d should also be reviewed. Utilities need to be considered.

OPTION	PHOTO EXAMPLE	SAFETY BENEFITS / CONCERNS	APPROPRIATE TRAFFIC (MAX SPEED/VOLUMES)	RURAL PRESRVATION	COST & MAINTENANCE (relative to other options)	APPROPRIATE ROAD TYPE (60' / 80' / 100')	Example Roadways
TRAFFIC CALMING - Lower-Speed Roadways: • Speed Humps • Speed Tables		High benefits: Speed humps have been found to reduce injury crashes by 40 to 50 percent and speeds by nine mph. Speed tables have been found to reduce speed by an average of 7.5 mph *FHWA Office of Safety: Speed Management A Manual for Local Rural Road Owners*	Less than 30 mph Generally placed on roadways where there is minimal heavy truck and farm vehicle traffic.	Medium: Design can be done with minimal paint. (Community Input Required)	Low to medium: $1000 to $8000	Typically developed zones along rural roadways.	Good for road with high pedestrian traffic such as schools and parks.

Table 3.2: Preliminary Drainage Option Evaluations Matrix

OPTION	DETAIL EXAMPLE	BENEFITS	CONCERNS	RURAL PRESRVATION	COST & MAINTENANCE	APPROPRIATE CONDITIONS	COMMENTS
OPEN DITCH, GRADED (Douglas County, NV Improvement Standards)	 LOCAL ROAD SECTION	Ditches can be maintained and/or repaired following storm events with a grader.	Heavy rains can cause major erosion, leading to significant debris in the streets and the need to haul rock/soil back uphill. Steep slopes exacerbate this problem.	High	**Construction Cost**: Low **Maint. Cost**: Medium to High, depending on frequency and intensity of storms and erosion.	Ditches with relatively flat slopes and rocky soils where erosion is not a frequent problem.	Ditches must be designed based on native soil characteristics and anticipated storm water velocities.
OPEN DITCH, ROCK LINED (Mississippi Storm Water Design Manual)		Rip-rap can reduce erosion associated with higher velocities and steeper slopes, compared to ditches constructe d of native materials.	Removal of debris from the ditch, and ditch repair when needed, can be labor intensive and time consuming.	High	**Construction Cost**: High **Maint. Cost**: Can be very high	Ditches with steeper slopes where native materials would erode frequently.	Rip-rap size must be calculated based on anticipated velocity of storm water runoff. Geotextile fabric may be required.

OPTION	DETAIL EXAMPLE	BENEFITS	CONCERNS	RURAL PRESRVATION	COST & MAINTENANCE	APPROPRIATE CONDITIONS	COMMENTS
CULVERT UNDER DRIVEWAY / INTERSECTION (Larimer County, CO Road Standards)	 • Shoulders should be 4' wide • 12' wide travel lanes • This local road section typically applies for 100 or more vehicle trips per day  ** If a culvert larger than 15' is required, the borrow ditch will need to be deeper than the minimum 2.25'.	Keeps water and debris in the roadside ditch and out of the street.	Culverts can require frequent cleaning and often fill with sediment in flash flooding type events.	High coupled with open ditches	**Construction Cost**: Medium **Maint. Cost**: High if plugging is frequent	Best where erosion problems are minimal and for medium to steep ditch gradient.	Recommend smooth walled pipes with sufficient slope to be self-cleansing. Larger pipes require more right-of-way width to satisfy maximum slope requirements.
LOW WATER CROSSING AT DRIVEWAY / INTERSECTION (N. Fort Apache Rd. at W. Ann Rd.)		Perpetuates ditch flow across the street in a localized area. Debris on street after storm event is easily removed with a grader and/or broom.	Dips in the through street are generally undesirable because of the speed of traffic.	High coupled with open ditches	**Construction Cost**: Low **Maint. Cost**: Low	Best where ditch erosion is an ongoing problem, and on streets with a "STOP" condition.	Design standards are lacking and improvements must be designed on a case-by-case basis. Cross slope of "dip" should not promote downstream erosion. Cutoff walls are often used to prevent undermining of structure. Water flowing over road can be problematic for pedestrians.
CURB, GUTTER AND STORM DRAIN (Maricopa County, AZ Details, Local Road)		Storm flows are carried in the street and storm drain so there is little or no erosion. Drainage crossing	Requires construction of continuous storm drain. Requires less right-of-way than an open ditch system.	Low	**Construction Cost**: High **Maint. Cost**: Low	Can be used in any situation regardless of slope and soil conditions.	Provides space for clearly defined areas for pedestrians and bicyclists in accordance with recognized standards but does not promote a rural atmosphere.

OPTION	DETAIL EXAMPLE	BENEFITS	CONCERNS	RURAL PRESRVATION	COST & MAINTENANCE	APPROPRIATE CONDITIONS	COMMENTS
		intersections is not a problem. The street provides excess capacity for flows that exceed the storm drain capacity.					
NOTE: Drainage options were reviewed in more detail directly with Clark County Public Works and Maintenance staff to eliminate undesirable options and include concrete swales as a preferred option for this study area. County staff additionally added that drainage ditches and facilities should be designed to be compatible with maintenance equipment.							

3.4 Refined List of Concepts and Online Survey Results

The following Table 3.3 identifies options and their evaluation matrices presented to Clark County Public Works for review and feedback, prior to distribution to the public. As a result, the list of concepts was refined with a summary shown in Table 3.3. Each option is identified as "Not Acceptable", "Acceptable" or "Preferred" as defined by Clark County Public Works staff. The table also includes a column for comments and further clarification from stakeholders.

The refined list of concepts was then organized into an online survey for the community to provide feedback. The survey included a stand-alone page for each option being considered. Each page included a brief description, a photo for visual preference and explanation, appropriate road types, and a brief list of advantages and disadvantages. The survey did not include drainage options so the results could focus on multimodal options. The next section displays the options and format presented to the public. The full survey is included in Appendix D.

Table 3.3: Stakeholder Feedback on List of Concepts

Concept	Not Acceptable	Acceptable	Preferred	Additional Comments
Advisory Shoulder	X			Remove since this requires experimental approval from FHWA.
Horse Path		X		Only permitted using existing terrain or with a shared use paved path. Decomposed granite, gravel, or similar materials, are not permitted in this study area due to extensive maintenance requirements from drainage impacts.
Horse Crossing		X		Only when justified by CCPW, on a case-by-case basis.
Paved Shoulder			X	
Pedestrian Lane		X		
Bike Lane		X		
Traffic Circle		X		
Sidewalk with Curb and Gutter			X	
Asphalt Side Path			X	No gravel since it would wash away.
Roundabouts		X		Suggest combining these into a single option for public review. Must consider that full roundabouts often have right-of-way constraints. Must also consider concerns with truck and trailer use. If turning radius is not sufficient, there are safety and maintenance concerns.
Mini-Roundabouts		X		
Curb Extension			X	
Raised Intersection	X			Not permitted per CCPW policy. They conflict requirements of emergency vehicles. These also have issues with drainage and the requirement to maintain a dry lane. *County will permit the Speed Hump/Speed Table option as part of the survey but design for these options must mitigate the above stated issues.
Speed Hump or Speed Table*	X			
Median Island		X		
Traffic Control Signs		X		Ensure use of MUTCD standard signs
Traffic Control Pavement Markings		X		Depends on markings, striping is hard to maintain. Striping on 60-foot residential roads is not inncluded unless there are significant traffic volumes.
Lighting (Major Intersections Only)		X		If desired by community.
Landscaping		X		Acceptable in medians if installed per Title 30. Also acceptable outside of roadway and drainage improvements. HOA required to cover costs.
OTHER SUGGESTIONS…	CCPW requested that a concrete swale be included as one of the drainage options. Drainage options will not be a part of the Online Publilc Survey. Survey should include photo examples similar to Southern Nevada scenarios.			

Refined List of Concepts Included in the Online Public Survey

Paved Shoulder

Paved shoulders on the edge of roadways for bicyclists and pedestrians. This option typically includes edge lane striping and rumble strips, but does not include additional pavement markings such as those used on bike lanes.

Appropriate Road Type
- Maximum 55 mph, medium traffic
- Appropriate near schools
- Examples: Centennial Parkway, Lone Mountain Road, Fort Apache Road

Advantages
- Medium/Low costs for construction and maintenance
- Provides space for bicyclists and occasional pedestrian travel
- Rumble strips can reduce severe crashes

Disadvantages
- Striping and signs may interfere with visual character
- Requires roadway width

Bike Lane

Bike lanes are designated in the roadway by bicycle symbol pavement markings and optional signs. Bike lanes are directly adjacent to vehicle travel lanes and follow the same direction as vehicle traffic. Bike lanes do not typically include rumble strips.

Appropriate Road Type
- Maximum 55 mph, medium traffic
- Appropriate near school zones
- Examples: Centennial Parkway, Lone Mountain Road, Fort Apache Road

Advantages
- Low construction cost
- Visually differentiates the shoulder from the roadway

Disadvantages
- Higher maintenance costs due to frequent wear
- Striping and signs may interfere with visual character
- Requires a wider roadway to provide space

Pedestrian Lane

A pedestrian lane is a designated space on one or both sides of the roadway. These are intended to be temporary and not in place of a sidewalk installed in the future.

Appropriate Road Type
- Maximum 30 mph, low traffic
- Appropriate near schools
- Examples: Roads accessing Centennial, Darnell or Allen schools

Advantages
- Low construction cost
- Visually differentiates the shoulder from the roadway

Disadvantages
- Higher maintenance costs due to frequent wear
- Striping and signs may interfere with visual character
- Not intended to be an alternative to sidewalks. Potential challenges may include:
  - ADA requirements
  - Undesired use by bicyclists

Horse Crossing (At Major Roadways)

Horse path crossing with signal, waiting area, and advanced signage.

Appropriate Road Type
- Routes commonly used by equestrians
- Examples: Verde Way, Dapple Gray Road

Advantages
- Increases safety and awareness for equestrian crossings

Disadvantages
- Medium/High costs for construction and maintenance
- Possible impacts to vehicle traffic

Sidewalk With Curb

Concrete sidewalk with curb and gutter adjacent to the roadway. This option is intended for pedestrians only.

Appropriate Road Type
- Roads with highest pedestrian volumes and near schools and parks

Advantages
- Physically separated and raised pedestrian facility increases safety
- Reduces maintenance costs
- Option to include gutter offers improvements for drainage control

Disadvantages
- Medium/high costs for construction

Roundabouts / Mini-Roundabouts

Roundabouts are circular intersections with a center island. These options include design methods that help guide traffic flow more effectively than traffic circles.

Appropriate Road Type
- **Roundabout**: Any speed, any traffic volume, replaces signalized intersection
- **Mini**: 35 mph or less, on higher speed roads with proper speed reduction designs, medium traffic, unsignalized intersection

Advantages
- Slows traffic
- May reduce congestion
- Reduces crashes by up to 68%

Disadvantages
- Medium / high costs for construction and maintenance

Traffic Circle

A traffic circle is a raised island, placed within an unsignalized intersection, around which traffic circulates.

Appropriate Road Type
- Maximum 30 mph, Low traffic, unsignalized intersection
- Local residential roads

Advantages
- Opportunity for landscaping or decorative rocks
- Slows traffic, which increases safety for all users and comfort for non-motorized users

Disadvantages
- Medium costs for construction and maintenance

Multi-Use Side Path

A paved path typically using asphalt separated from the roadway. May be used by pedestrians, cyclists and equestrians. When there is sufficient space, equestrians will have a separate path. This option does not include concrete curb and gutter.

Appropriate Road Type
- Roads with highest pedestrian volumes and near schools and parks

Advantages
- Separated facility increases safety
- Lower infrastructure costs than full sidewalk
- Opportunity to replace current paths with new ones designed to meet standards and ADA requirements

Disadvantages
- Does not include vertical curb separation for increased safety
- Does not include gutter for improved drainage control, although swales could be used instead

Curb Extension

A curb extension is a curbed island extending into the street resulting in a narrower roadway section. This may be used at a corner or midblock where curbs exist along roadway.

Appropriate Road Type
- 35-40 mph or less, medium traffic
- Typically on roads with on-street parking
- Examples: El Capitan Way, Grand canyon Drive

Advantages
- Slows traffic
- Reduces pedestrian crossing distance

Disadvantages
- Only for roadways where there is curb and sidewalks
- Medium / high costs for construction and maintenance

Median Island

A median island is a raised island located along the center of the street. Median islands narrow the travel lanes, which gives the visual appearance of a narrowed roadway and encourages slower speeds.

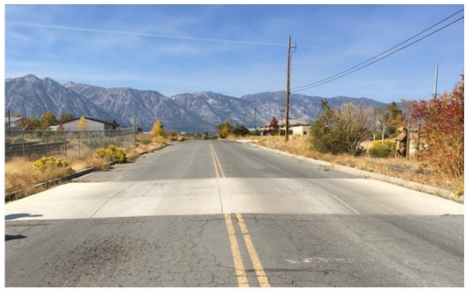
Appropriate Road Type
- 45 mph or less, all traffic
- Examples: Lone Mountain Road, Ann Road

Advantages
- Speeds can decrease by 1-3 mph for each foot of roadway narrowed
- Can reduce crashes by 29% to 71%
- Opportunity for aesthetic enhancement

Disadvantages
- Medium costs for construction and maintenance

Speed Hump or Speed Table

A speed hump is an elongated mound in the roadway pavement surface extending across the travel way at a right angle to the traffic flow (typically 3 inches in height and 12 feet in length). A speed hump that is 20 feet in length and flat in the middle is considered a speed table.



Appropriate Road Type
- 30 mph or less, low traffic volumes
- Examples: Washburn Road, Tropical Parkway near school zone

Advantages
- Speed humps can reduce injury crashes by 40-50% and speeds by 9 mph
- Speed tables can reduce speed by an average of 7.5 mph
- Minimal infrastructure

Disadvantages
- Medium costs for construction and maintenance
- Impacts to emergency trucks

Traffic Control Signs

Speed activated sign/speed feedback sign

Priority Sign

Advisory speeds

Crossing Signs

Appropriate Road Type
- Any roads with speeding issues.

Advantages
- Reduces traffic speeds
- Lower cost construction and maintenance

Disadvantages
- Not as effective as other physical infrastructure concepts
- Typically requires periodic law enforcement

Low Lighting (Major Intersections Only)

One light hung over center of intersection

Light pole adjacent to intersection

Light affixed to utility pole at intersection

Appropriate Road Type
- Major intersections at Lone Mountain Rd, Tropical Parkway, Ann Road

Advantages
- High safety benefit, increasing night-time visibility of all users

Disadvantages
- Higher costs for construction and maintenance

Traffic Control Pavement Markings

May include:
- Pavement speed limit marking
- Optical speed bars

Appropriate Road Type
- Any roads with speeding issues.

Advantages
- Reduces traffic speeds
- Lower cost construction

Disadvantages
- Higher maintenance costs due to frequent wear
- Not as effective as other physical infrastructure concepts
- Typically requires periodic law enforcement

Landscaping

Landscaping along property walls. Native desert plants with low water requirements should be considered.

Appropriate Road Type
- Streets requiring property walls

Advantages
- Consistency along streets
- Aesthetic enhancements soften visual environment
- May provide shading
- May help erosion

Disadvantages
- Increased construction and maintenance cost
- Would require forming home owner associations to cover costs and maintenance

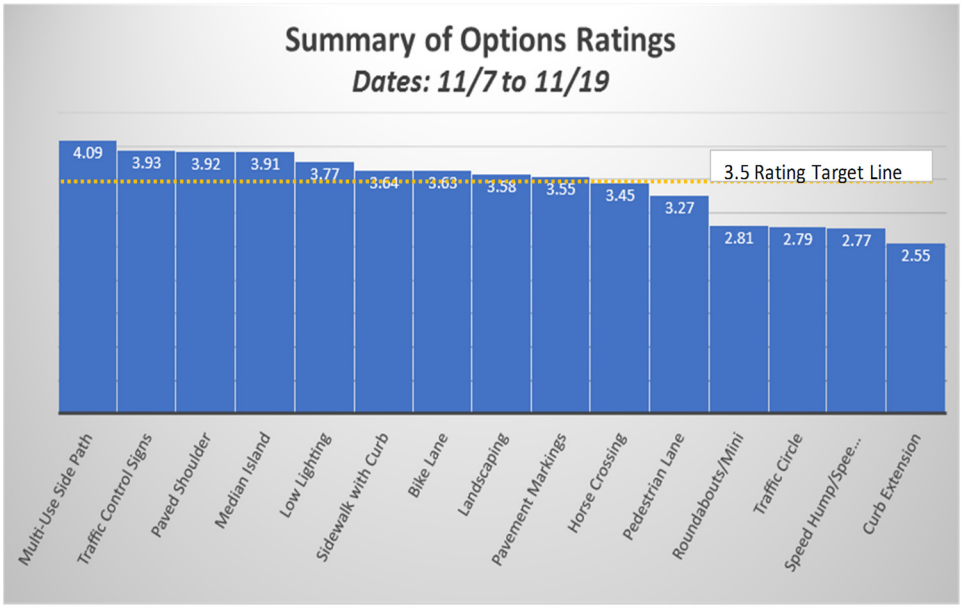
On-Line Survey Results

An online survey was available for the RNP community participation including the options discussed above from November 7th to 19th, 2017. There were 445 total responses received which indicates a high confidence level reflecting general opinion based on the study area population. The community was asked to rate the options on a five-point scale ranging from “dislike very much” to “like very much” (rating from 1 to 5). The project team summarized the results and selected a target cut -off line of 3.5 (or higher) for identifying which options would advance for the “visually enhanced” roadway configuration options. This indicates options that generally had favorable results. Figure 3.4 shows a summary of the online public survey results and the options advanced for further conceptual development.

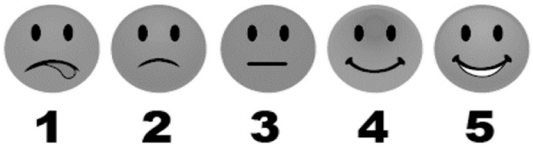
Figure 3.4: Summary of On-Line Public Survey Results

Survey Period: November 7-19, 2017
Total Respondents: 445

No.	Option	Ave Rating
1	Multi-Use Side Path	4.09
2	Traffic Control Signs	3.93
3	Paved Shoulder	3.92
4	Median Island	3.91
5	Low Lighting	3.77
6	Sidewalk with Curb	3.64
7	Bike Lane	3.63
8	Landscaping	3.58
9	Pavement Markings	3.55
10	Horse Crossing	3.45
11	Pedestrian Lane	3.27
12	Roundabouts/Mini	2.81
13	Traffic Circle	2.79
14	Speed Hump/Speed Table	2.77
15	Curb Extension	2.55



Rating Legend



1 2 3 4 5

dislike very much somewhat dislike neutral somewhat like like very much

3.5 Visually-Enhanced Concepts and Community Feedback

The online survey resulted in 9 of the 15 options being carried forward. The top five options included a multi-use side path, traffic control signs, paved shoulder, median islands and low-lighting. Although there were six options not advanced for purposes of the enhanced concepts, these may still be considered on future design projects where warranted and desired by the community on a case-by-case basis.

Three configuration concepts were developed for each of the roadway types (60, 80 and 100-foot). Option 1 generally provided a configuration that maintained the highest preservation of rural characteristics, however, it typically included the least benefit in terms of drainage mitigation and safety for all users. At the other end, Option 3 generally provided a configuration with the greatest benefit in terms of drainage mitigation and safety for all users, however, it typically offered the least rural preservation. Option 2 typically fell in between both these alternatives in terms of these criteria.

In addition to the configuration options, the project team developed “before and after” photo renderings to provide a visual representation of how the improvements may actually look within the study area.

Figures 3.5 to 3.17 in the following pages show the full range of concepts developed. The sequence starts with the three configuration options followed by the sample rendering, for each of the roadway types. The last figure shows some examples of other considerations that ranked high in the survey.

Figure 3.5: 60-Foot ROW Option 1

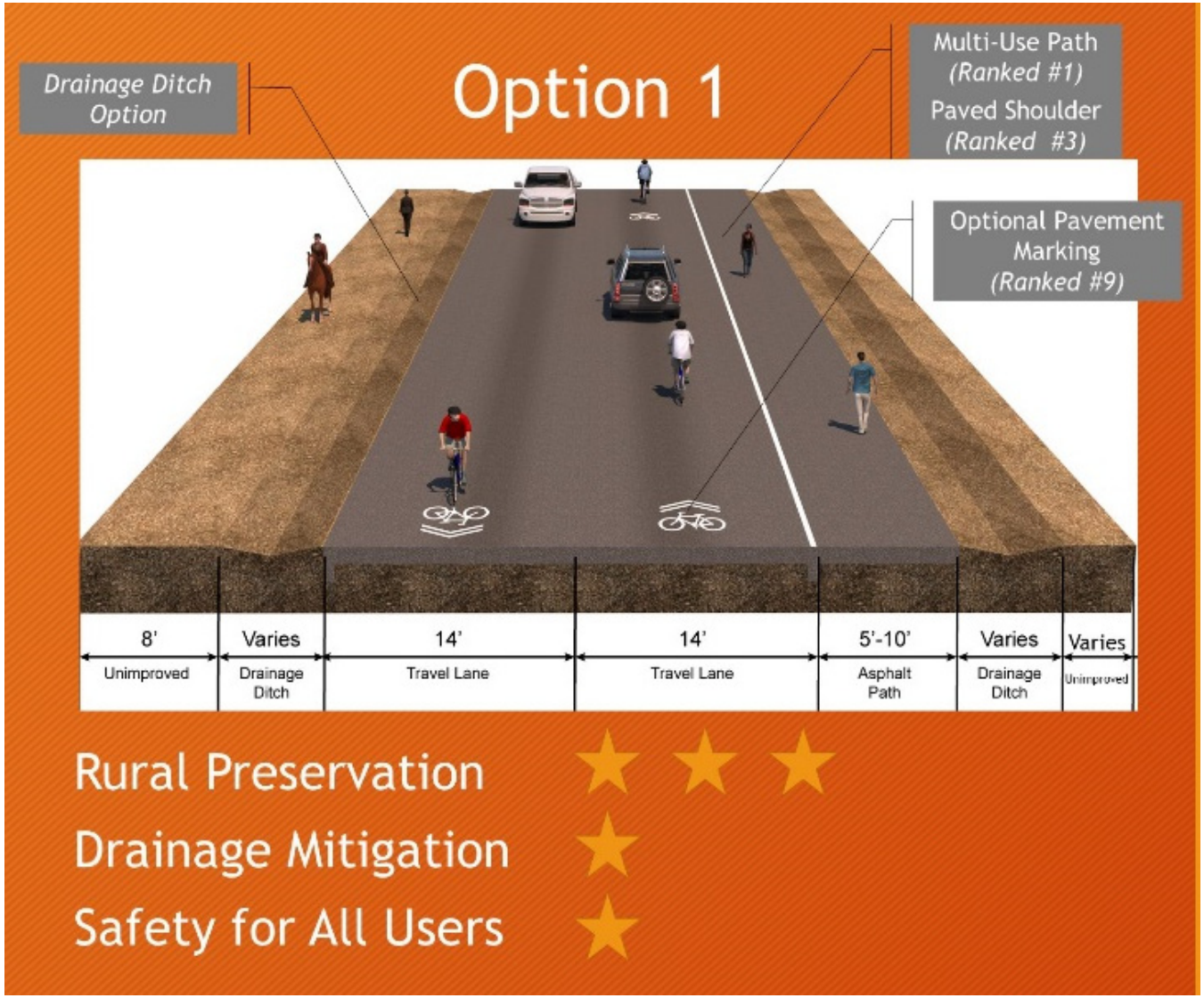


Figure 3.6: 60-Foot ROW Option 2

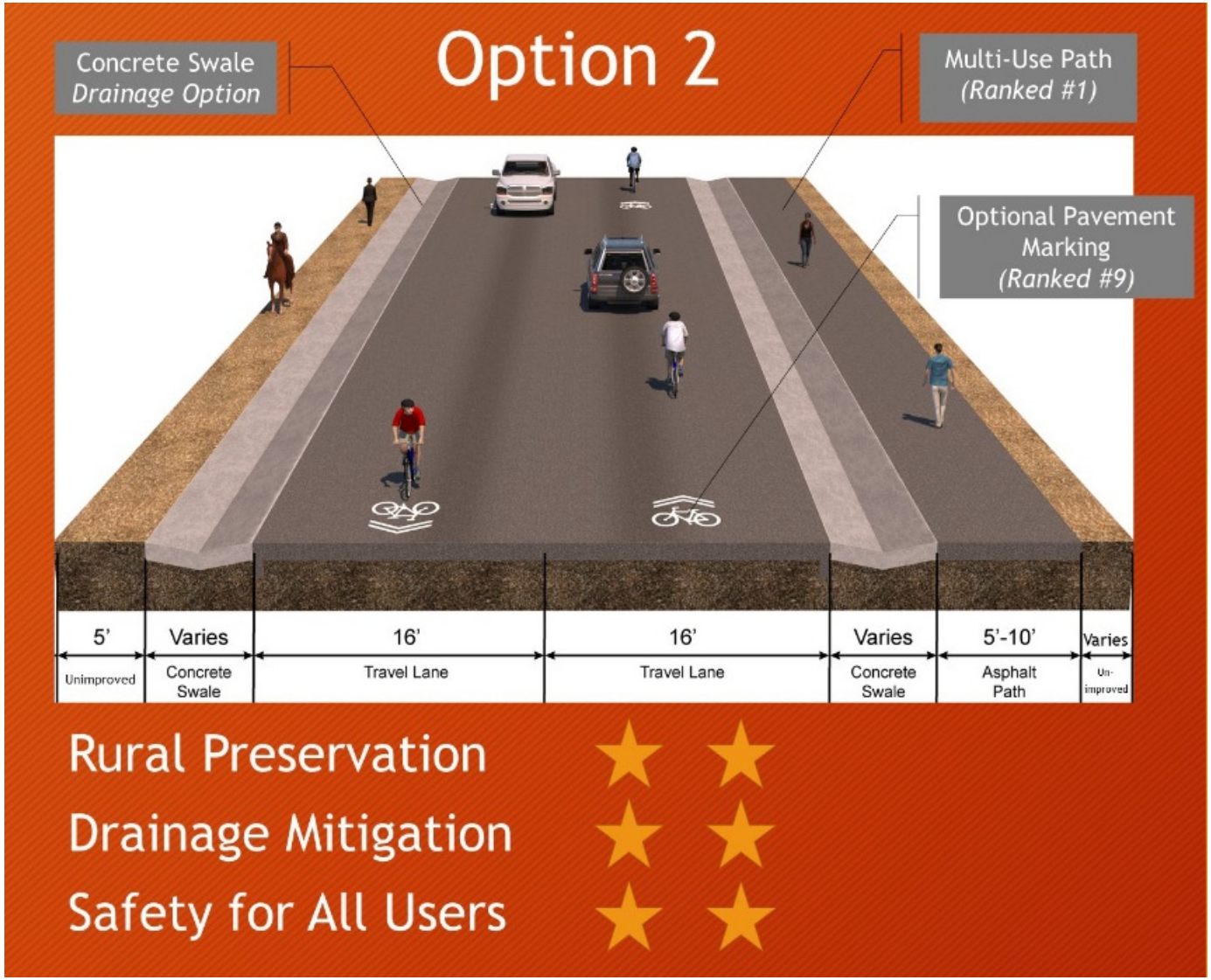


Figure 3.7: 60-Foot ROW Option 3

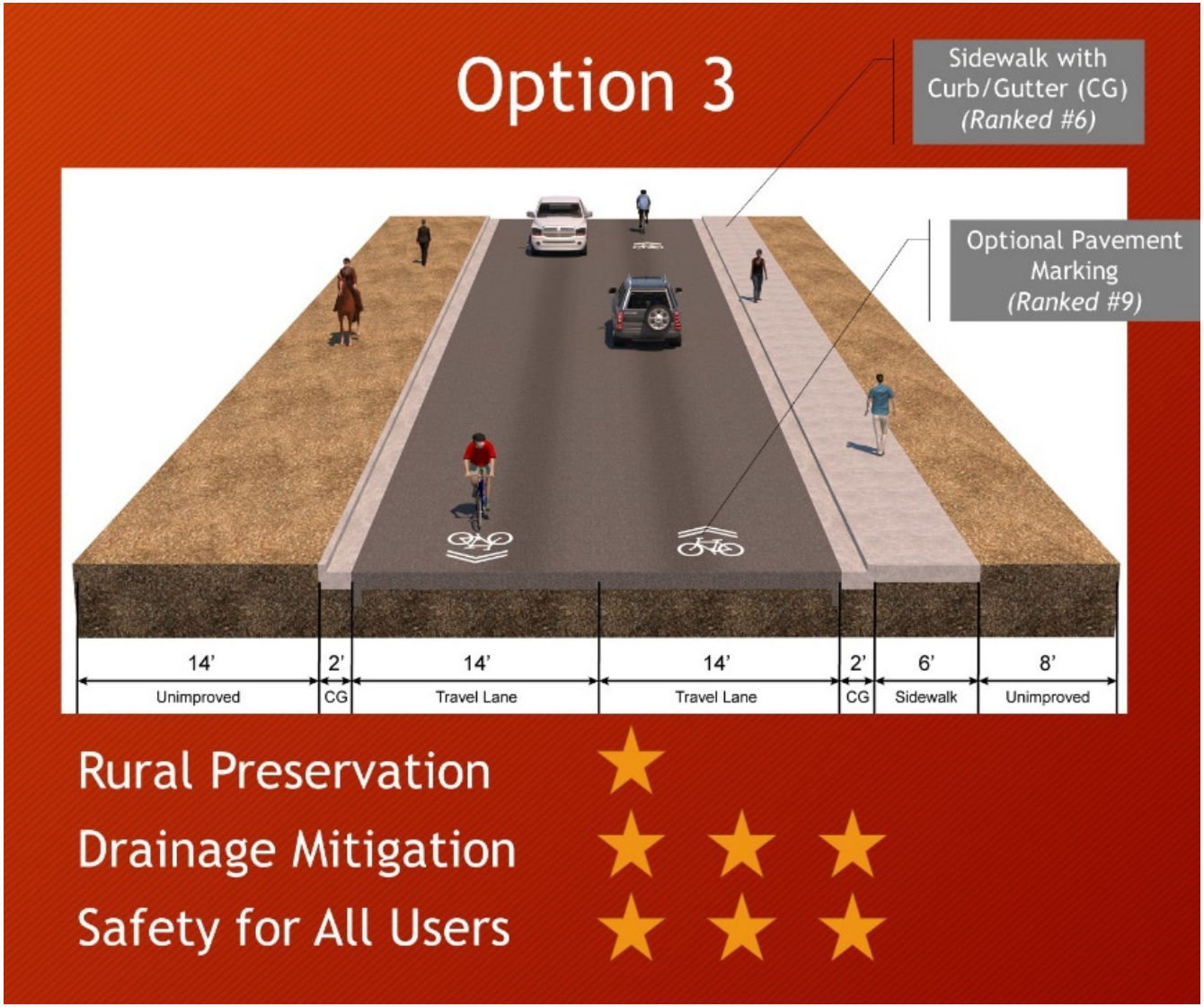


Figure 3.8: 60-Foot ROW Sample Rendering

Figure 3.9: 80-Foot ROW Option 1

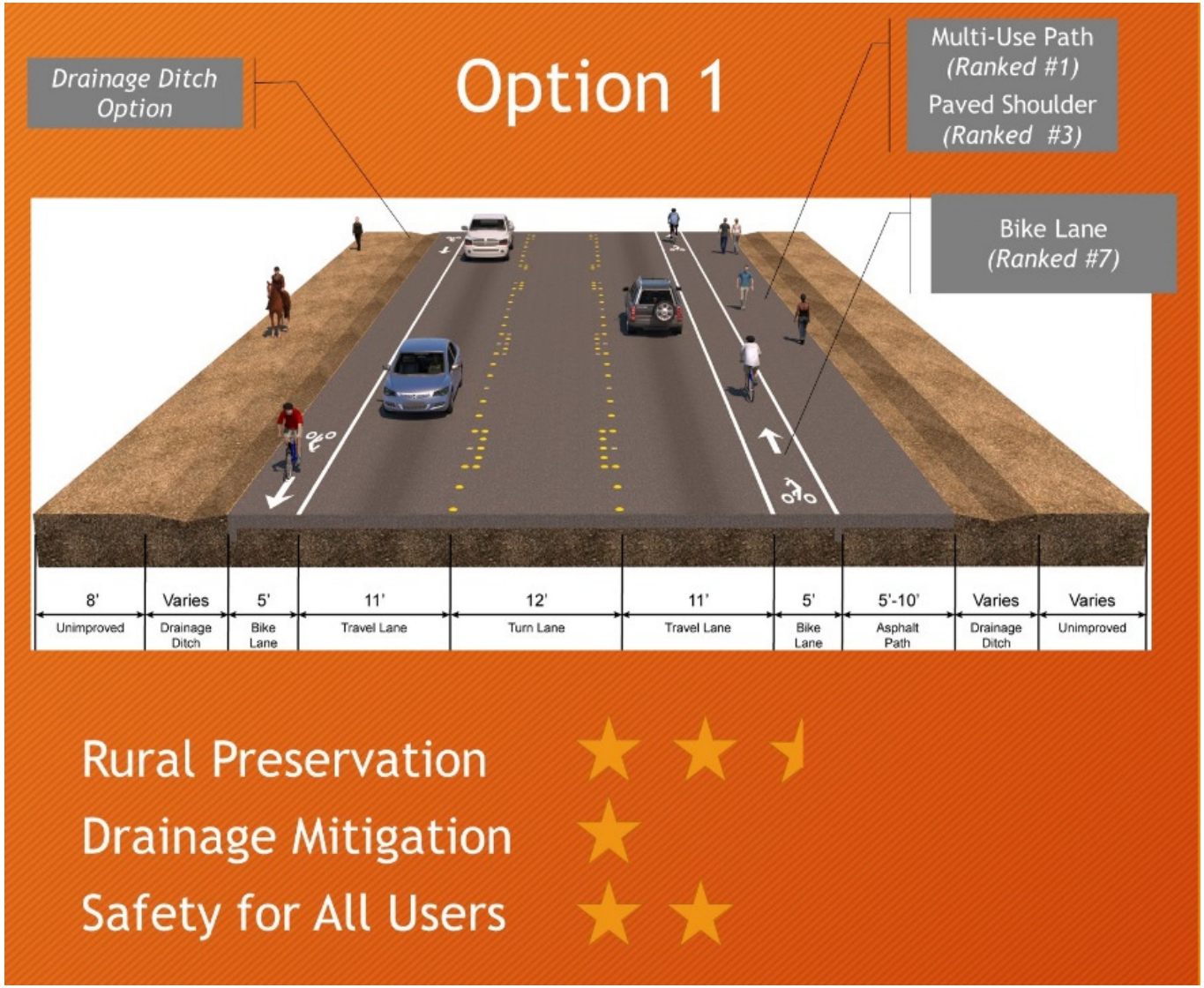


Figure 3.10: 80-Foot ROW Option 2

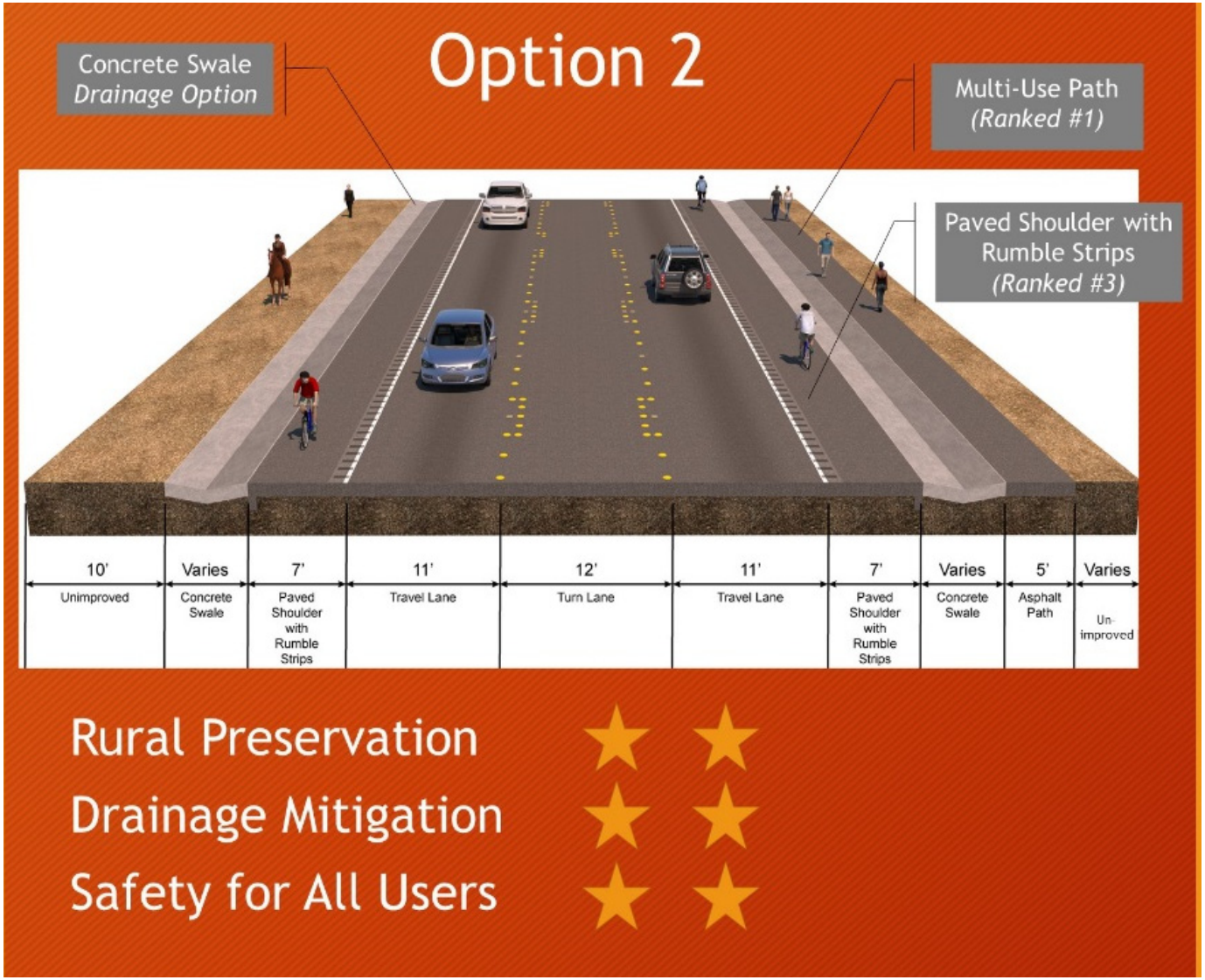


Figure 3.11: 80-Foot ROW Option 3

Figure 3.12: 80-Foot ROW Sample Rendering

Figure 3.13: 100-Foot ROW Option 1

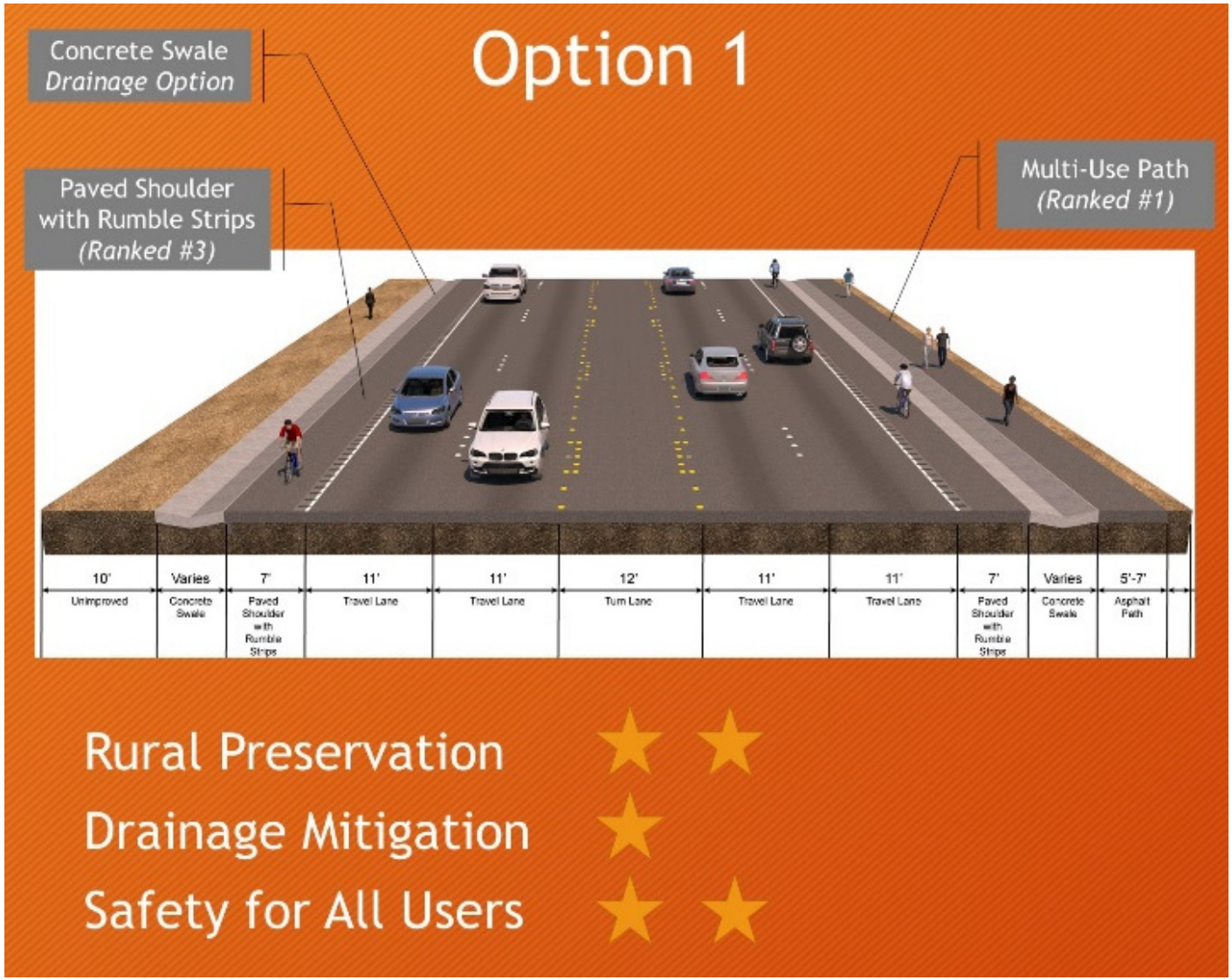


Figure 3.14: 100-Foot ROW Option 2

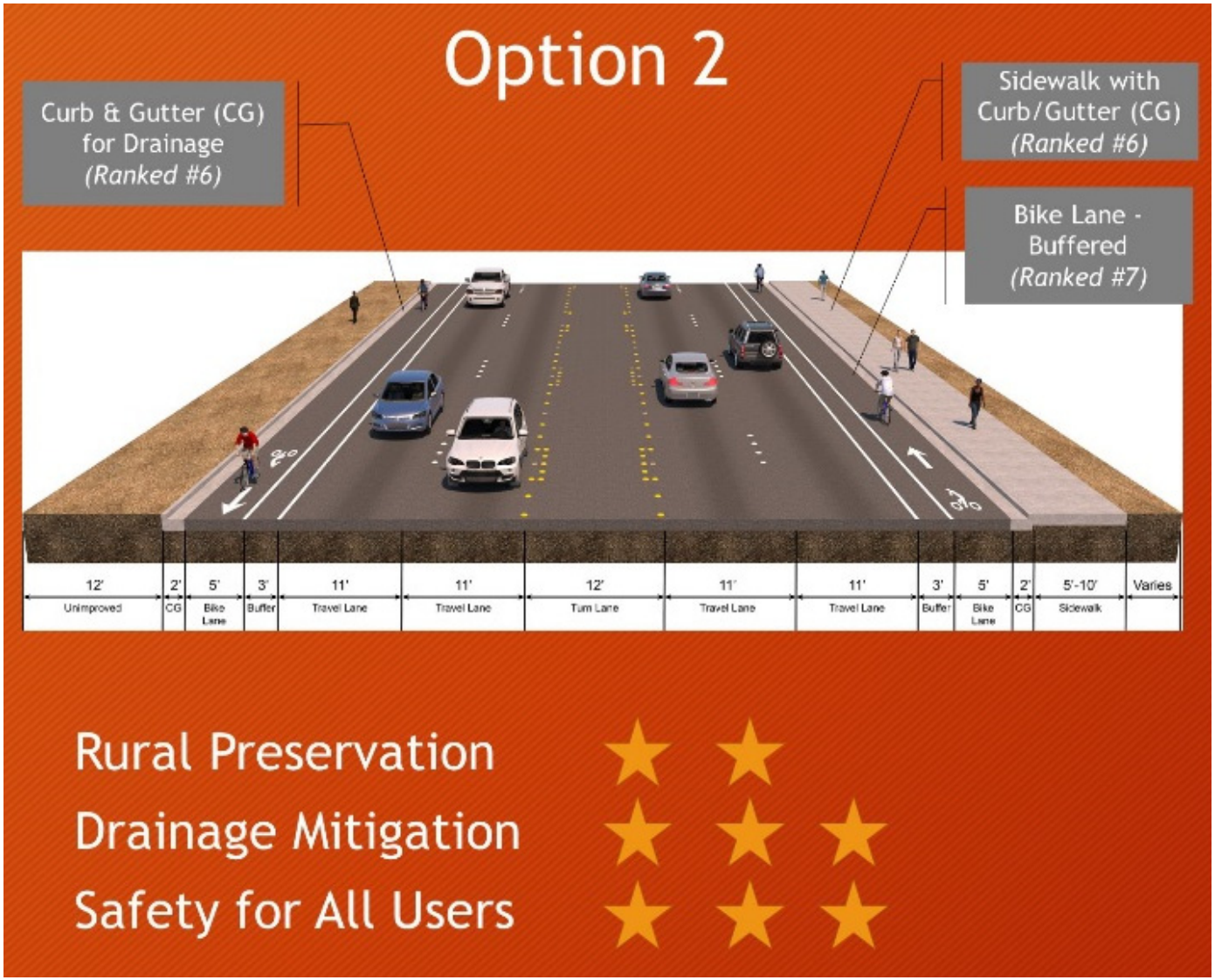


Figure 3.15: 100-Foot ROW Option 3

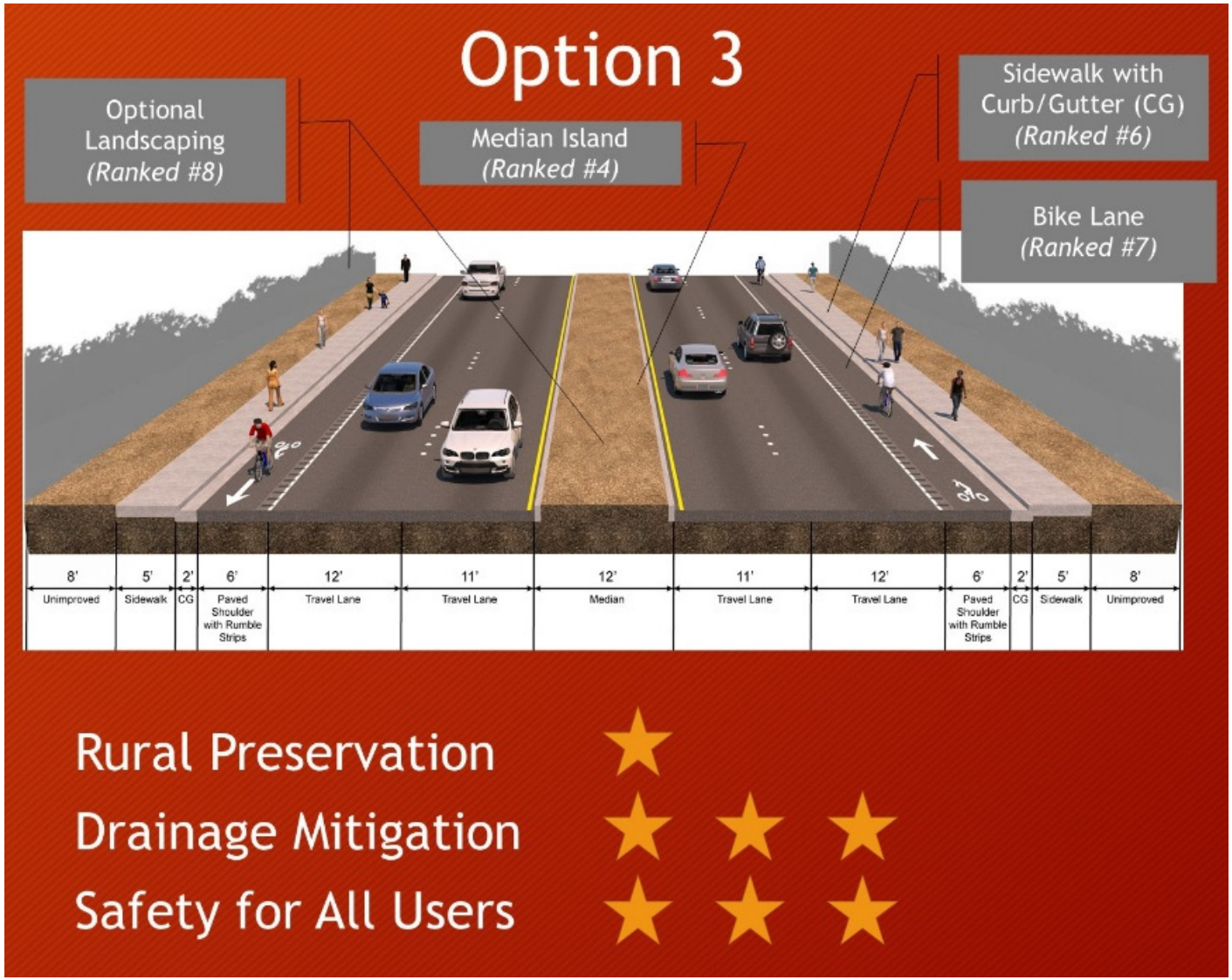


Figure 3.16: 100-Foot Sample Rendering

Figure 3.17: Other Considerations

OTHER CONSIDERATIONS

Traffic Control Signs
(Ranked #2)

- Provides regulatory information
- Provides information on priority of users on roadway
- Encourages reduced speeds

Low Lighting at Major Intersections Only
(Ranked #5)

Dark Sky Compliant Lighting Fixtures

- Only on when needed
- Light only the area that needs it
- No brighter than necessary
- Minimize light pollution
- Fully shielded (pointing downward)

Landscaping
(Ranked #8)

- Must be maintained by a Homeowners' Association (HOA)
- Can be placed on median or adjacent to pedestrian paths

Feedback from Community Open House

The project team presented the visually enhanced alternatives at a Community Open House on February 20, 2018, at Mountain Crest Community Center, 4701 N. Durango Drive, Las Vegas, 89129. Each attendee was provided with a sticker to place on their preferred option for each roadway type (60, 80 or 100-foot roadways). Thirty-three total votes were received for each of the three roadway options. On all three roadway scenarios, Option 2 was the preferred alternative. A summary of the votes is included in the table below.

Table 3.4: Voting Results for Alternative Roadway Options

Cross-Section	Option	No. of Votes	Figure No.
60' ROW	1	12	Fig. 3.5
60' ROW	2	15	Fig. 3.6
60' ROW	3	7	Fig. 3.7
80' ROW	1	6	Fig. 3.9
80' ROW	2	19	Fig. 3.10
80' ROW	3	8	Fig. 3.11
100' ROW	1	4	Fig. 3.13
100' ROW	2	22	Fig. 3.14
100' ROW	3	7	Fig. 3.15

The project team also reviewed the hand-written comments received during the public meeting and some received by email following the public meeting. Drainage improvements were mentioned the most often, included in nearly 30% of the comments. Attendees wanted to preserve the rural character but were willing to have more infrastructure on the ground in order to address drainage needs such as through a concrete ditch. Lighting came in second being mentioned in about 20%. Residents favored low lighting on 60' roadways and increased lighting on 80' and 100' for safety reasons.

Safety of pedestrians, bicyclists and equestrians was the third most mentioned in the comments and the safety of horses crossing Lone Mountain to the equestrian park was mentioned in one third of these comments. Speed control was a concern in 15% of the comments and using roundabouts or traffic circles was suggested in five comments to slow traffic.

The last section of this report makes recommendations for next steps. It also provides a summary list of guidelines and considerations when applying this study to future design projects.

Section 4: Final Recommendations

4.1 Study Applicability

The concepts developed in this study offer various alternatives that balance the input from many different stakeholders. The goal for this study is to provide recommendations to improve mobility for all users (vehicle, bicycle, pedestrian, and equestrian) while balancing considerations from best practices in engineering design, benefits to the community, adopted plans, and community input.

However, the concepts presented in this study are not intended to act as standards and requirements. RTC Board approval is required before new concepts become a part of the standard drawings for Southern Nevada. These concepts should be used as guidelines for consideration when a roadway in the study area is programmed for design and construction of improvements.

The visually-enhanced alternatives demonstrate the options most preferred by stakeholders and the community. The top nine improvement options favored by the community are highlighted again in the table in this section. Other options presented may also still be considered on a case-by-case basis, including ones that did not make the cutoff from the survey rankings. The project team does not recommend eliminating these concepts completely if they are acceptable to CCPW. For example, roundabouts (or mini-roundabouts) may be good options but would require an appropriate scenario, proper design and a robust public education campaign.

Table 4.1: Top Improvement Options Preferred by the Community

No.	Option	Ave Rating
1	Multi-Use Side Path	4.09
2	Traffic Control Signs	3.93
3	Paved Shoulder	3.92
4	Median Island	3.91
5	Low Lighting	3.77
6	Sidewalk with Curb	3.64
7	Bike Lane	3.63
8	Landscaping	3.58
9	Pavement Markings	3.55

Additionally, the concepts included in this study may have some applicability to other rural or RNP areas, however, some of the development factors are unique to the Lone Mountain RNP for two primary reasons:

- Concepts were developed based on feedback from residents specific to this RNP study area.
- Drainage issues that exist here were a strong determinant on the roadway configuration and these limitations may not exist in other RNPs. For example, separated pedestrian and bicycle facilities are not feasible in this study area because the infrastructure gets washed away if it is not attached to the roadway pavement. However separated facilities may be possible and preferred in other RNP areas where the drainage impacts are not significant.

4.2 Checklist of Guidelines and Considerations

The refined list of concepts developed in this study have been generally accepted by Clark County, the City of Las Vegas and other stakeholders. When a roadway within this study area is programmed to receive improvements, it is suggested the designers refer to the guidelines and considerations on the following page as a reference.

Clark County Public Works

Clark County Public Works had no additional comments beyond those we made at the meeting. We support the preferred alternatives the public selected in the survey and the overall outcome of the guidelines. Thank you and the team for your work on this study!

City of Las Vegas

Overall, we are in agreement with the report and with the refined list of concepts. We do favor landscaping, curb/gutter/sidewalk, Dark Sky lighting, and appropriate traffic calming/markings/signage. CLV Planning and Public Works concurred with 60, 80 ,100 foot ROW options and guidelines that favored, included, or incorporated appropriate drainage, curb and gutter, that was ADA compliant, and to the extent practicable, could be consistent with a section that transitioned between the County and City. Thank you for including us as a stakeholder in this study – we hope to continue working on these and other issues for these portions of town to ensure proper planning and development for new and existing residents and businesses.

Table 4.2: Checklist of Guidelines and Considerations

Category	Consideration
General	When developing design improvements, refer to the community's comments located in Appendices D and E.
General	Facilities should not be physically separated. Pedestrian or bicycle facilities should be part of a seamless roadway structure. Separated facilities will erode from drainage issues.
General	Ensure safe design of bike facilities adjacent to a concrete swale. Considerations include ensuring the swale surface is flush with the pavement of bike facility and that the slope requirement of the adjacent swale are not a hazard to cyclists. Also consider a buffered bike lane for additional protection when possible.
General	Traffic forecasts and upcoming projects.
General	Roadways that are divided by both Clark County and the City of Las Vegas should match and roadways that transition between the entities should have good transitional design.
General	Advisory Shoulder – were eliminated since this option requires experimental approval from FHWA. However, since this study is a guideline for developing new standards, this may be considered in the future if there is sufficient data from FHWA supporting its effectiveness
General	Clark County and City of Las Vegas prefer designated equestrians facilities (unimproved paths) remain on raodways with lower traffic speeds and volumes.
General	Roadways with the same ROW widths may differ in functionality due to having different traffic volumes and speeds. Refer to Table 3.1: Expanded Multi-Modal Evaluations Matrix for guidelines on selecting options based on traffic conditions. Another good resource is the information found at www.safety.fhwa.dot.gov/speedmgt/traffic.calm.cfm.
60-Foot Roadways	Striping is not preferred on 60-foot roadways unless there is significant traffic.
60-Foot Roadways	Rumble strips – not permitted on residential roadways due to noise impacts. These may impact safety for cyclists due to ridges in design. As an alternative, designers may consider “mumble strips” on a case-by-case basis. These are not yet approved as a standard.
Adjacent Properties	Some residents are on different elevations which can impact design of drainage facilities, residential access, uniformity and other cross-section elements.
Adjacent Properties	Impacts to driveways. Culverts are not preferred by County. Concrete ditches need to accommodate vehicles crossing them without causing damage to the vehicles.
Adjacent Properties	Landscaping – permitted only when costs are covered by local HOA.
Drainage	Drainage study to determine flows and mitigation. This will be a driving determinant to what other facility options may be included due to right-of-way limitations and potential maintenance issues. Adjustments may be needed if the swale is adjacent to pathway or unimproved path. Clark County will make further comments on maintenance considerations when a cross-section with a swale goes to design.
Drainage	The County may require developers to handle all drainage mitigation issues as part of their site plan approval process, even if this means constructing new facilities to ensure all flows are properly carried to a drainage basin outside of their development area.
ROW Availability & Use	Dimensions shown in the concepts have some flexibility as long as they meet Clark County Standards, including requirements for minimum lane and median widths. Some roadways may be designed for 2 or 4 lane configurations.
ROW Availability & Use	Sizing of drainage facilities can significantly impact available right-of-way space for additional roadway features like facilities for pedestrians, bicyclists, and equestrians. Additionally, capacity requirements for drainage facilities may increase as flows are collected, especially when considering concrete swales which have no permeability.
ROW Availability & Use	Impacts to private residents parking.
ROW Availability & Use	Impacts to trash removal and dumpster placement.