MARYLAND PARKWAY

HIGH CAPACITY TRANSIT PROJECT

LAS VEGAS, NEVADA

ENVIRONMENTAL ASSESSMENT

NOVEMBER 2018

FEDERAL TRANSIT ADMINISTRATION
U.S. DEPARTMENT OF TRANSPORTATION

AND

REGIONAL TRANSPORTATION
COMMISSION OF SOUTHERN NEVADA

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LAS VEGAS, NEVADA
ENVIRONMENTAL ASSESSMENT

November 2018

Prepared by
U.S. Department of Transportation
Federal Transit Administration
and
Regional Transportation Commission of Southern Nevada

Pursuant to:

National Environmental Policy Act of 1969 (42 U.S.C § 4321 et seq.), as amended
Federal Transit Act (49 U.S.C § 5301 et seq.), as amended
Title 23 U.S.C Highways
Title 49 U.S.C Transportation
Title 49 U.S.C § 303 (formally Department of Transportation Act of 1966), Section 4(f)
Executive Order 11990 (Protection of Wetlands)
Executive Order 11988 (Floodplains Management)
Executive Order 12898 (Environmental Justice)
National Historic Preservation Act of 1966, Section 106 (16 U.S.C § 407f et seq.)
Fixing America's Surface Transportation Act, or "FAST" Act (December 4, 2015)

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ACRONYMS

ADA	Americans with Disabilities Act
APE	Area of Potential Effect
ASTM	American Society Testing Materials
BRT	Bus Rapid Transit
BTC	Bonneville Transit Center
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CNG	compressed natural gas
CRM	Community Resources Management
dB	decibels
dBA	A-weighted decibels
DOT	U.S. Department of Transportation
EA	Environmental Assessment
EO	Executive Order
ESA	Environmental Site Assessment
F	Fahrenheit
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
GHG	greenhouse gas
GPS	global positioning system
HOME	Home Investment Partnerships
HUD	U.S. Department of Housing and Urban Development
L_{dn}	day-night noise level
L_{eq}	equivalent continuous noise levels
L_{max}	maximum noise levels
LOS	level of service
LRT	light rail transit
LUST	leaking underground storage tank
$\mu g/m^3$	micrograms per cubic meter
mph	miles per hour
mphps	miles per hour per second (acceleration/deceleration)
NAAQS	National Ambient Air Quality Standards
NDEP	Nevada Division of Environmental Protection
NDOT	Nevada Department of Transportation
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NDEP	Nevada Division of Environmental Protection
NOAA	national Oceanic and Atmospheric Administration

ACRONYMS

NPL	National Priorities List
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NTD	National Transit Database (FTA)
NVCRIS	Nevada Cultural Resource Information System
NVRHP	Nevada Register of Historic Places
O&M	operation and maintenance
Parsons	Parsons Transportation Group, Inc.
$PM_{2.5}$	particulate matter 2.5 microns or less in diameter
PM_{10}	particulate matter 10 microns or less in diameter
ppb	parts per billion
ppm	parts per million
RCRA	Resource Conservation and Recovery Act
RTC	Regional Transportation Commission of Southern Nevada
SARA	Superfund Amendments and Reauthorization Act of 1986
SCS	Soil Conservation Service
SDX	Strip to Downtown Express
SHPO	State Historic Preservation Office
SNRHA	Southern Nevada Regional Housing Authority
SNRPC	Southern Nevada Regional Planning Coalition
SNWA	Southern Nevada Water Authority
TIBP	Transportation Investment Business Plan
TIP	Transportation Improvement Program
TSP	Transit Signal Priority
UMC	University Medical Center of Southern Nevada
UNLV	University of Nevada Las Vegas
UPRR	Union Pacific Railroad
U.S.	United States
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USEPA	United States Environmental Protection Agency
USECA	U.S. Endangered Species Act
USFWS	U.S. Fish and Wildlife Service
VdB	velocity in decibels vibration
VMT	vehicle miles traveled

EXECUTIVE SUMMARY

Maryland Parkway is a vital corridor for the Las Vegas Valley that extends between downtown Las Vegas and McCarran International Airport and connects many activity centers, such as the University of Nevada, Las Vegas (UNLV), Sunrise Hospital, the Boulevard Mall, and numerous commercial and residential areas. Carrying over 9,000 transit riders and 33,000 cars per day, investments in transportation infrastructure along this major corridor could improve the community's mobility by enhancing vehicle, transit, pedestrian, and bicycle access. Also identified as an opportunity site for reinvestment in the Southern Nevada Strong Regional Plan, Maryland Parkway is a key regional corridor for employment, transit connectivity, and potential revitalization.

The Regional Transportation Commission of Southern Nevada (RTC), in cooperation with the City of Las Vegas and Clark County, proposes the construction of the Maryland Parkway High Capacity Transit Project, an 8.7-mile-long route that will replace the existing local Route 109 bus service with an enhanced transit system that will provide speed and service quality improvements and enhance the viability of transit as a transportation choice. The project is subject to federal environmental review requirements because it may involve the use of federal funds from the Federal Transit Administration (FTA). An Environmental Assessment (EA) has been prepared in compliance with the National Environmental Policy Act (NEPA); FTA is the federal lead agency and RTC is the regional lead agency for this NEPA process.

Projects receiving federal funding must complete an environmental analysis under NEPA to ensure that significant aspects of a proposal are examined and that the public agencies and tribes are informed about potential impacts before a decision is made. NEPA also requires project proponents to provide an opportunity for public comment. The Maryland Parkway High Capacity Transit Corridor Project is subject to NEPA because it will receive funding from FTA, the lead federal agency. FTA has determined that an EA is the appropriate level of documentation for the project. The EA is being developed to satisfy NEPA requirements.

The project alignment extends from the Las Vegas Medical District to the Bonneville Transit Center and through downtown Las Vegas, along Maryland Parkway to north of Russell Road. A 0.25-mile buffer zone on either side of the proposed alignment was chosen to analyze potential impacts in the environmental study area, as shown in Figure ES-1. The EA determined whether significant impacts would occur from the proposed project and alternatives. Table ES-1 summarizes the environmental resources that were evaluated and a determination of impacts.

PURPOSE AND NEED

The purpose of the proposed project is to improve corridor mobility and transit. The intent is to better address the current travel demand, traffic congestion, and travel delay in the corridor, as well as the additional population/employment and travel demand growth that will be added to the area by the year 2040. Improved rapid transit service along the project corridor will help RTC achieve its long-range goals to cost-effectively enhance mobility and accessibility, improve transit operations, support economic growth and redevelopment, conserve non-renewable resources, and improve corridor safety.

Figure ES-1 Proposed Alignment and Environmental Study Area

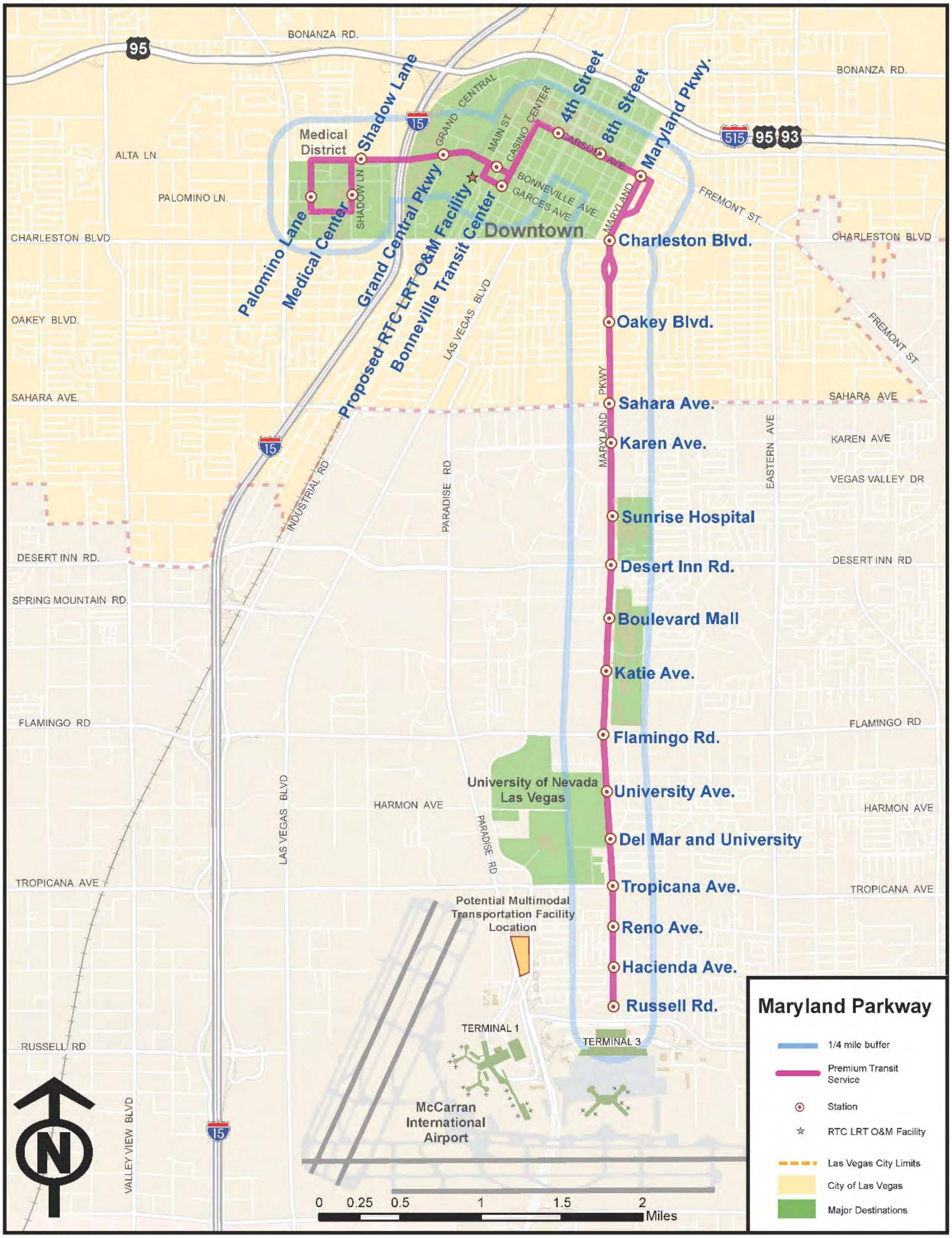


Table ES-1 Maryland Parkway Environmental Assessment Evaluation Summary

Resource	Impacts to Resource
Land Use	Minimal impacts with mitigation
Socioeconomics	Minimal impacts with mitigation
Environmental Justice	No impacts with mitigation
Visual Resources	Minimal impacts with mitigation
Cultural Resources	Minimal impacts with mitigation
Water Resources/Water Quality	No impacts with mitigation
Floodplains	No impacts
Soils and Geology	No impacts with mitigation
Hazardous Materials	Minimal impacts with mitigation
Air Quality	No impacts with mitigation
Noise and Vibration	Minimal impacts with mitigation
Safety and Security	Minimal impacts with mitigation
Wetlands/Jurisdictional Waters	No impacts
Biological Resources	No impacts with mitigation
Section 4(f)	Minimal impacts with mitigation
Cumulative Impacts	Minimal impacts with mitigation
Traffic	Minimal impacts with mitigation

The purpose of the project is to:

- Improve mobility in the Maryland Parkway corridor between Las Vegas Medical District, downtown Las Vegas, UNLV, McCarran International Airport, and other key activity centers;
- Enhance transit service to increase ridership by reducing travel time, improving reliability, and providing an attractive alternative to the automobile;
- Make transportation infrastructure investments that enable and support redevelopment of the corridor and encourage new economic development;
- Help transform the corridor into a more vibrant, accessible, and economically-viable community within the Las Vegas Valley; and
- Integrate transportation improvements that maximize the capacity to move people, and provide safe and convenient access for all users, including pedestrians and bicyclists.

The corridor is currently served by local bus Route 109 for 24 hours per day, seven days per week; with 15-minute headways during the majority of the service span; and with stops spaced an average of 0.25-mile apart. Route 109 generates the 8th highest ridership of all RTC routes, the 2nd highest ridership of all north-south routes, and the highest productivity in terms of passengers per service-hour and per mile, after the Las Vegas Strip Routes 301 and 502. Route 109 is oriented towards residents, employees, and students with time-sensitive trip needs; disabled persons and persons in wheelchairs who use the transit system to access various medical facilities in the corridor; and employees making critical connections to the east-west routes going to/from the major employment centers along the Resort Corridor. All of these conditions demonstrate the need for a higher level of service with shorter headways over an extended daily period.

The Route 109 buses operate in mixed-flow traffic along the 2-lane to 6-lane streets along the route and are subject to the peak hour congestion that occurs at several of the major intersections where average daily traffic reaches levels of 35,000-40,000 vehicles. In addition, the number of transit-dependent households in the corridor is high; approximately 32 percent of all households have no vehicle available.

Land use forecasts indicate expected growth in population and employment over the next 25 years that will likely generate higher traffic volumes and additional congestion, as well as higher transit ridership and the need for improved transit service in the corridor. The Las Vegas metropolitan area continues to grow; specifically, the latest forecasts indicate population growth of more than 700,000 new residents by 2040, or a 34 percent increase, over the next 25 years.

In summary, there is need for faster, more reliable transit service in the Maryland Parkway corridor, not only to meet current and projected needs, but also to provide an attractive alternative to the automobile. Further, there is a need for an enhanced transit system that will serve as a catalyst to support the corridor vision and implementation strategy of new economic development, revitalization, and transit-oriented development with excellent pedestrian and bicycle connections to/from stations.

ALTERNATIVES

Previous RTC studies considered a wide variety of technology and configuration alternatives for the Maryland Parkway corridor. Some of the alternatives that were considered, but were dropped after initial screening included subway, monorail, and heavy rail transit that would have relatively low additional ridership compared to their higher capital and operations and maintenance costs; an express bus overlay, which would be confusing for passengers trying to distinguish between express and local bus, plus lower ridership compared with bus rapid transit (BRT) or rail; a trolley bus, which would be similar to BRT; mixed traffic flow operation, which would lack transit travel time improvement; and a center-running fixed guideway, which would have unacceptable impact on traffic operations with conversion of two general purpose traffic lanes to dedicated transitway.

Extensive analysis was completed from June 2015 through September 2016 to evaluate options, refine the initial Locally Preferred Alternative developed during the original Alternatives Analysis that was completed in December 2014, and define the potential "Build" project with significant input from RTC, City of Las Vegas, Clark County, numerous corridor stakeholders, and the general public. Refinement of the initial Locally Preferred Alternative included:

- Refinement of the downtown alignment;
- Extension from downtown to the Las Vegas Medical District;
- Airport connection alignment and end-of-line station options;

- Rail or BRT technology selection;
- Station locations and station canopy design options;
- Refinement of center- or curbside-running configuration including additional traffic operations analysis;
- Potential economic development opportunities associated with BRT versus rail;
- Refinement of capital and operation and maintenance costs;
- Consideration of "Smart City" approaches to emerging transit technologies; and
- Application of Complete Streets multi-modal considerations.

The Locally Preferred Alternative refinement analysis, informal public meetings, stakeholder meetings, and Corridor Vision were used to develop a purpose and need statement and narrow the final alternatives for further evaluation in the EA to light rail transit (LRT) Build Alternative, BRT Build Alternative, Enhanced Bus Alternative, and No Build Alternative.

Both LRT and BRT Build Alternatives consist of an 8.7-mile alignment extending from the Las Vegas Medical District to the Bonneville Transit Center, through downtown Las Vegas, and along Maryland Parkway to north of Russell Road (Figure ES-1). The LRT Build Alternative will utilize electrically-powered rail in a dedicated, side-running configuration in the curb lane that allows right-turning vehicles, as illustrated in Figure ES-2 and Figure ES-3, with 12-minute peak and 15-minute off-peak headways with service offered for 24 hours per day, seven days per week. The BRT Build Alternative would utilize upgraded buses, similar to the existing RTC's SDX BRT (Figure ES-4), that utilize compressed natural gas (CNG) that have lower emissions than diesel and also operate in dedicated curbside-running lanes with 12-minute peak and 15-minute off-peak headways with service offered for 24 hours per day, seven days per week.

Figure ES-2 Curbside-running LRT Configuration with Raised Bicycle Lane

Figure ES-3 Curbside-running LRT Configuration with Right Turn Lane

Figure ES-4 RTC SDX Center-running BRT

For both LRT and BRT Build Alternatives, there will be 24 station locations spaced approximately 0.35-mile apart on average, with a total of 44 split platforms typically placed on the far side of intersections to minimize travel delay. Station design elements may include: pylon/station marker, bench, trash receptacle, bicycle rack, variable message sign to display real-time arrival information, security cameras, light fixtures, shelter/canopy with wind screen, public art (at select stations), landscaping, urban design elements, map/schedule/advertising illuminated display case (two-sided), pedestrian wayfinding signage, and public-address system.

Figure ES-5 shows three alternative station canopy design concepts for the LRT and BRT Build Alternatives, which may include pedestrian and bicycle improvements for access within a 0.5-mile of each of the 24 stations. A proposed rail vehicle maintenance and storage facility will be located on an RTC-owned 6.1-acre site adjacent to the Union Pacific Railroad (UPRR) mainline tracks just west of the Bonneville Transit Center.

Figure ES-5 Conceptual Station Designs

Both the Build Alternative's LRT and BRT technologies are expected to have approximately the same levels of impact given the similar footprint of the transit guideway and the station platforms.

Capital cost estimates were developed for the LRT and BRT Build Alternatives. The capital cost elements and unit costs were determined based on the planning and conceptual design completed to date, with estimates of lane and track miles, number of vehicles required, right-of-way acquisition needed, and the estimated amount of physical construction required. Table ES-2 summarizes the screening of the technology options for the two Build Alternatives. The BRT Build Alternative would cost approximately $298 million in 2016 dollars and the LRT Build Alternative would cost approximately $574 million in 2016 dollars. Because the project is currently anticipated to be built in 2020-2022, the BRT capital cost may increase by 23 percent to approximately $366 million by 2022, or $42 million per mile, and the LRT capital cost may increase to approximately $705 million by 2022, or $81 million per mile.

Table ES-2 Technology Screening Analysis

	Bus Rapid Transit (BRT)	Light Rail Transit (LRT)
Meets Corridor Vision, Purpose and Need	Fair	Best
Average weekday ridership (Present/2040)	13,300 / 16,800	16,100 / 20,700
Capital cost (2016 $)	$298M	$573M
Annual O&M cost (2016 $) *	$7.2M	$11.5M
Cost effectiveness (O&M cost per boarding)	$2.11	$2.79
Traffic impacts	Minimal	Minimal
Transit-oriented development and economic development	Fair	Best
Consistency with regional plans	Fair	Best
Public preference	Fair	Best

*current Route 109 operation and maintenance (O&M) cost is approximately $5.8M per year

The Enhanced Bus Alternative would attempt to maximize service without any major capital improvements. The Enhanced Bus Alternative would be a limited stop service with the same 24 stations included in the Build Alternative, with average spacing of 0.35-mile and the same span of service, but the buses would operate in the existing mixed flow traffic curb lanes, like the existing Route 109 buses. Headways would be reduced during the weekday peak periods (3 hours in the morning and 3 hours in the afternoon) to every 10 minutes. This would increase the level of bus service by 50 percent over the existing condition, from 4 buses to 6 buses per hour in each direction during peak periods. In addition, the 24 bus stops in the corridor would be enhanced with shelters, benches and information displays, as appropriate, but with minimal capital expenditure.

The No Build Alternative proposes no improvements to the existing local bus services. The existing Route 109 local bus service would maintain current service with 15-minute headways (total of 4 buses per hour in each direction), operating in curbside lanes with mixed traffic flow, and with stops spaced every 0.25-mile on average.

PUBLIC INVOLVEMENT

The original Alternatives Analysis process included extensive public involvement and stakeholder engagement throughout the 18-month process, completed in December 2014. There was strong support for a fixed guideway, high capacity BRT or rail transit service in the corridor. Subsequent public meetings were held in September and October 2015 to help inform the Locally Preferred Alternative refinement process; approximately 50 people attended those meetings, including a mix of residents, business owners, and other stakeholders.

Further, as part of the NEPA process, an Intent-to-Study letter was distributed on February 25, 2016, to notify a broad range of recipients including business owners, stakeholders, and residents in the corridor. The letter indicated RTC's and FTA's intention to study potential transportation improvements in the corridor, invited comments until April 15, 2016, and reported the dates of three public meetings about the proposed project. The three information meetings were held on March 15 and 16, 2016, to inform interested individuals, groups, and agencies about the proposed project and to receive comments and suggestions from them during the meetings. Approximately 85 people attended the informational meetings, including a mix of residents, business owners, and other stakeholders.

Throughout this EA process, RTC has held ongoing meetings with the project-specific Technical Working Group and Community Stakeholder Group, which together represent local agencies and jurisdictions, business and property owners, members of the Maryland Parkway Coalition, and other key stakeholders such as UNLV, in order to solicit input to help inform the Locally Preferred Alternative refinement process. These groups have indicated strong support for the proposed project.

Copies of the EA document will be made available online and in a variety of public locations along the corridor in February 2019. Additional public meetings will be held in February 2019 after the release of the EA to review the draft EA document as part of a 30-day public review and comment period.

SUMMARY OF ENVIRONMENTAL IMPACTS

Based on the technical studies and analysis completed, there would be no impacts from the Build Alternatives on the following environmental resources: environmental justice, water quality, floodplains, soils and geology, air quality, noise and vibration, wetlands and jurisdictional waters, and biological resources. Environmental resources that could have direct or indirect impacts are summarized below.

Based on preliminary design, the LRT and BRT Build Alternatives would result in the acquisition of approximately 2.7 acres of additional right-of-way from 87 residential, commercial, and institutional properties and the loss of 496 commercial and institutional parking spaces along the corridor to accommodate the 24 new stations, sidewalk enhancements, intersection improvements, and traction power substations. However, there would be no loss of or displaced business revenue, jobs, or property tax revenue. Two residential properties would be displaced as a result of the LRT Build Alternative track alignment. If the project were to move forward into final design, RTC will negotiate with the property owners who will be directly impacted by partial or full property acquisitions in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act, ensuring they will receive fair market value for the acquired right-of-way and appropriate relocation assistance. Clark County and RTC conducted parking studies in 2015 to examine the parking supply and demand within the County. Four sites were selected along the Maryland Parkway study area for the parking studies, which concluded that there was surplus parking occupying land that could be better used to accommodate additional homes, businesses, or recreational opportunities.

Under Section 4(f), which protects publicly-owned parks, recreational areas, wildlife and waterfowl refuges, and public or private historical sites, no publicly-owned parks would be impacted as part of this project. However, three private historical sites along the project corridor would have minor right-of-way property acquisitions resulting from new right turn lanes, sidewalk and bicycle path expansions, and new stations. No historic buildings would be directly impacted. Therefore, *de minimus* impacts (too minor to merit consideration) will occur to the historic sites. Indirect impacts may include growth-induced effects related to changes in land use patterns, population densities and growth rate, and economic development surrounding the Section 4(f) properties. These indirect effects are considered insignificant because the corridor stakeholders, including the Maryland Parkway Coalition, developed a vision for the corridor with higher land use densification and identity as a "place" rather than just a thoroughfare, with significant improvements in transit, pedestrian and bicycle facilities to reduce the reliance on automobile travel.

The LRT and BRT Build Alternatives provide pedestrian amenities for convenience and safety, including crosswalks, sidewalks, and mid-block crossings. The conceptual designs for the proposed stations took safety and security into consideration and incorporate crime prevention through environmental design principles. For example, the open nature of the stations would prevent hiding places, but still provide shade for riders. The 24 proposed stations in the corridor would be enhanced with shelters, benches, public address system, and security cameras, as well as real-time passenger information.

During construction of the LRT or BRT Build Alternative, short-term degradation of air quality may occur due to the release of particulate emissions (airborne dust) generated by excavation, grading, hauling, and other construction-related activities. Because construction activities may increase traffic congestion in the area, emissions from traffic would increase slightly while those vehicles are delayed. These emissions would be temporary and limited to the immediate area surrounding the construction site. Construction noise could also create short-term impacts to receptors located along the alignments, near station locations, and along designated construction access routes. It is possible that some construction could occur at night to minimize disruption to traffic. The primary source of construction noise is expected to be diesel-powered trucks and earthmoving equipment.

In summary, the relatively few direct, indirect, and construction impacts from either the LRT or BRT Build Alternatives along the Maryland Parkway corridor would be considered insignificant when mitigation measures, discussed below, are put in place.

The Enhanced Bus Alternative would attempt to maximize service without any major capital improvements. The Enhanced Bus Alternative would be a limited stop service with the same 24 stations as those included in the Build alternative with average spacing of 0.35-mile. No right-of-way or property acquisition will be required for the Enhanced Bus Alternative. Construction impacts of the 24 new stations would include upgrading shelters and lighting, which would be minimal. Therefore, the Enhanced Bus Alternative along the Maryland Parkway corridor would cause minimal direct, indirect, or construction impacts. In fact, more frequent bus service would be a positive direct attribute.

Under the No Build Alternative, the transit system along the Maryland Parkway corridor would not be improved. The No Build Alternative is likely to contribute to lower density development and increase in auto-oriented land uses, with greater traffic congestion and subsequent impacts. Traffic congestion would continue to increase and potentially affect air quality and transit travel times. In addition, safety concerns within the corridor with the existing bus service would continue.

PROPOSED MITIGATION

Mitigation measures will be implemented as part of the project to avoid, reduce, or otherwise mitigate environmental impacts associated with the Maryland Parkway project. A summary of proposed mitigation measures is listed in Table ES-3. Mitigation measures and compliance with federal, state, and local regulations with regards to noise, air quality, water quality, hazardous materials, and cultural resources will be specified in the contract documents.

PERMITS

Permits that may be required for either the LRT or BRT Build Alternatives are summarized in Table ES-4. An expected timeframe for obtaining those permits from the various agencies is also included in the table. The BRT Build Alternative and Enhanced Bus Alternative would not be subject to as many of the permits that may be required for the LRT Build Alternative, because no electric catenary system or power substations would be needed. In addition, less utility relocations and grading would occur, because there is no rail that would be constructed in the roadway. Construction is anticipated to start October 2021.

Table ES-3
Maryland Parkway Proposed Mitigation Measures

Resource	Mitigation Measure Description
Land use	If partial or full property acquisitions are needed, negotiations with property owners will occur in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act, ensuring they will receive fair market value for the acquired right-of-way and appropriate relocation assistance. The removal of parking spaces within the corridor would require compensation and/or replacement of those parking spaces on the same property or adjacent property. Access to adjacent businesses and residences during construction will be maintained.
Socioeconomics	Implementation of the following measures will result in insignificant socioeconomic impacts: • For appraisal, acquisition, and displacement of households, the project would comply with the policies and procedures in the Uniform Relocation Assistance and Real Property Acquisition Policy Act of 1970. • Full property acquisitions will include fair market value for the property along with displacement and relocation benefits, which could include reimbursement of moving expenses, supplemental housing payments, and relocation counseling. • Partial property acquisitions will be negotiated by RTC to ensure property owners receive fair market value for the acquired right-of-way. • Traffic maintenance plans would be created in coordination with the city of Las Vegas and Clark County. RTC would work closely with the local businesses to ensure that alternatives access and circulation are provided during construction activities. RTC will also work closely with businesses and media regarding temporary closures and inconveniences that would be scheduled around business hours. • To achieve successful revitalization of the Maryland Parkway corridor and adjacent areas, a concerted effort must be undertaken by Clark County, the City of Las Vegas, and local housing authority to preserve and enhance opportunities for low income households to have access to affordable housing and jobs. This can be accomplished by developing public/private partnerships to create affordable housing, especially along transit corridors and transit-oriented developments and to continue to conduct modernization and energy efficiency upgrades to affordable housing to maintain the character of the existing residential areas in the corridor.

Table ES-3 (continued)
Maryland Parkway Proposed Mitigation Measures

Environmental Justice	Implementation of the following measures will result in insignificant environmental justice impacts: • The project would comply with the policies and procedures for acquisition of real property and households in the Uniform Relocation Assistance and Real Property Acquisition Policy Act of 1970. • RTC will negotiate with the property owners who will be directly impacted by partial or full property acquisition, ensuring they will receive fair market value for the acquired right-of-way and appropriate relocation assistance. Displacement and relocation benefits may also include reimbursement of moving expenses, supplemental housing payments, and relocation counseling. • Construction notices and schedules will be given to residents and businesses within the corridor to ensure the public is informed of potential detours or closures.
Visual Resources	Implementation of the following measures will result in insignificant visual impacts: • Enhance design of the project elements to fit within the character of the corridor. • Improve the visual character along the alignment. • Work with the stakeholders, including residents and businesses, to ensure urban design elements improve the visual experience along the corridor. • Prohibit or minimize the use of advertising on the interior and exterior surfaces of vehicles and stations. Advertising should not be allowed to dominate transit experience. • Provide design continuity in paving patterns, colors, and materials from station platform paving onto adjacent sidewalks, plazas, and pedestrian crosswalks. • Design vertical shade screens to blend appropriately with station architecture and site the screen so as to fit contextually with adjacent land uses. • Use of landscapes at station locations and along street medians and sidewalks provide a sense of oasis for the desert environment. Use landscape in very wide streets or streets without pedestrian context to help identify the separation between pedestrian spaces and vehicular spaces.

Table ES-3 (continued)
Maryland Parkway Proposed Mitigation Measures

Resource	Mitigation Measure Description
Visual Resources (continued)	• Minimizing the number of trees and shrubs that are removed to the extent possible and replacing trees and shrubs that are removed. • Design lighting to the current standards for shielding to prevent light trespasses into adjacent areas. • Provide a visually non-intrusive overhead contact system within the streetscape environment. Space the poles as far as part as possible, limiting their number. Limit the number of pole and cross-arm types in order to create a system of identity. • For the power transformer substation locations, use landscaping, screens, artwork, enclosures, or other buffer treatments to minimize the visual appearance to passersby. • Design of the maintenance and storage facility should blend in with the nature of the surrounding buildings, reinforce a sense of the RTC's identity, and provide an efficient and enjoyable work environment for those employed.
Cultural Resources	• The preferred mitigation is avoidance. Avoidance preserves the integrity of cultural resources and protects their research potential (*i.e.*, their NRHP eligibility) and also, avoids costs and potential construction delays associated with data recovery. • The contractor will use appropriate traffic control measures to protect properties, which typically include orange construction safety fence and concrete barriers. • FTA will consult with the Nevada State Historic Preservation Office (SHPO) for concurrence on the determination of no adverse effects to historic properties. • In the event that archaeological deposits or features are identified or unanticipated buried cultural resources were to be discovered during construction, work will be halted or redirected to other locations in the project area and the Contractor would contact RTC immediately. RTC would contact a qualified archaeologist to make an assessment for the proper treatment of those resources. If human remains are discovered, RTC would notify the County Coroner and FTA for the possibility of tribal consultation. All archaeological deposits and cultural resources would be preserved at the State Historical Museum.

Table ES-3 (continued)
Maryland Parkway Proposed Mitigation Measures

Resource	Mitigation Measure Description
Water Resources and Water Quality	Best management practices would be utilized by the contractors to prevent sediment from entering the storm sewers or Flamingo Wash during construction activities. Permits are required by the local agencies to ensure compliance with water quality standards. A Stormwater Pollution Prevention Plan would be prepared prior to construction to avoid or mitigate potential water quality impacts. If groundwater is encountered during construction, it may require a Groundwater Discharge Permit to properly dispose of groundwater onsite after if it has been water quality tested or disposed offsite at an approved disposal facility.
Soils and Geology	Expansive soils, if present, will be mitigated with appropriate selection of material, site grading, drainage, and irrigation control. Collapsible and corrosive soils will be over excavated to remove unsuitable soils, replaced with suitable soils, and site grading to direct surface water flows away from foundations and stations.
Hazardous Materials	If it is determined that property acquisition is needed, a formal Phase I Environmental Site Assessment (ESA) and Phase II ESA will be conducted for those properties. The Phase II ESA will determine if a Phase III ESA is needed. Contingency measures will be developed by the construction contractor that outline site worker protection and management requirements if contaminated soil or groundwater is encountered. Mitigation of any contaminated material will be required to conform to the applicable local, state, and federal regulations. The contractor will provide qualified and trained personnel and personal protective equipment to perform operations that require disturbance of hazardous materials.
Air Quality	Implementation of the following measures, some of which may also be required for other purposes such as storm water pollution control, will reduce any air quality impacts resulting from construction activities: • Minimize land disturbance. • Water or dust palliative will be applied to the site and equipment as often as necessary to control fugitive dust emissions. • Construction equipment and vehicles will be properly tuned and maintained. • A dust control plan will be developed documenting sprinkling, temporary paving, speed limits, and timely revegetation of disturbed slopes, as needed.

Table ES-3 (continued)
Maryland Parkway Proposed Mitigation Measures

Resource	Mitigation Measure Description
Air Quality (continued)	• Equipment and materials storage sites will be located away from residential and park uses, as practicable. • Gravel pads will be used at project access points to minimize dust and mud deposits on roads affected by construction traffic. All transported loads of soils and wet materials will be covered during transportation. • Dust and mud that are deposited on paved, public roads due to construction activity and traffic will be promptly and regularly removed to decrease particulate matter. • To the extent feasible, construction traffic will be scheduled and routed to reduce congestion and related air quality impacts caused by idling vehicles along local roads during peak travel times.
Noise and Vibration	The following is a listing of procedures that have been shown to minimize noise and vibration disturbances at sensitive areas during construction: • Use newer equipment with improved noise muffling and ensure that all equipment items have the manufacturers' recommended noise abatement measures, such as mufflers, engine covers, and engine vibration isolators intact and operational. All construction equipment should be inspected at periodic intervals to ensure proper maintenance and presence of noise control devices (*e.g.*, mufflers and shrouding). • Perform all construction in a manner to minimize noise and vibration. Use construction methods or equipment that will provide the lowest level of noise and ground vibration impact near residences or other sensitive buildings and consider alternative methods that are also suitable for the soil condition. The contractor should be required to select construction processes and techniques that create the lowest noise and vibration levels. • Perform noise and vibration monitoring to demonstrate compliance with the noise and vibration limits. Independent monitoring should be performed to check compliance in particularly sensitive areas. Require contractors to modify and/or reschedule their construction activities if monitoring determines that maximum limits are exceeded at residential land uses. If construction occurs next to buildings, vibration monitoring may be needed to ensure no damage to the structures.

Table ES-3 (continued)
Maryland Parkway Proposed Mitigation Measures

Resource	Mitigation Measure Description
Noise and Vibration (continued)	• Conduct truck loading, unloading, and hauling operations so that noise and vibration are kept to a minimum by carefully selecting routes to avoid going through residential neighborhoods to the greatest possible extent. • When possible, limit the use of construction equipment that creates high vibration levels, such as vibratory rollers operating within 140 feet of residential structures. • Design ingress and egress to and from the staging area to be on streets designated as collectors or higher street designations (preferred), and through routes for trucks will be designed to the extent feasible to minimize the potential for back-up alarm disturbances. • Turn off idling equipment. • Use temporary noise barriers, as practicable, to protect sensitive receptors against excessive noise from construction activities. Consider mitigation measures, such as partial enclosures, around continuously operating equipment or temporary barriers along construction boundaries. • Minimize construction activities within residential areas during evening, nighttime, weekend, and holiday periods. Restrict the hours of vibration-intensive equipment usage such as vibratory rollers so that impacts to residents are minimal (*e.g.,* weekdays during daytime hours only when as many residents as possible are away from home). • Provide an active community liaison program.
Safety and Security	Provide security cameras at stations and on transit vehicles for monitoring, provide adequate lighting and increase security personnel patrols during peak and off-peak times to make riders feel more secure. Provide pedestrian and bicyclist access improvements around stations and along streets to enhance pedestrian and bicycle safety. A traffic management plan will be prepared by the contractor prior to construction activities that will be reviewed and approved by RTC, the City of Las Vegas, and Clark County. Provide traffic control personnel and measures to maintain safety for construction workers and the traveling public.
Wetlands and Jurisdictional Waters	Prior to construction, a wetland survey will be performed to ensure no wetlands have formed. Best management practices would be utilized by the contractors to prevent sediment from entering the storm sewers or Flamingo Wash during construction activities. A Stormwater Pollution Prevention Plan would be prepared prior to construction to avoid or mitigate potential water quality impacts.

Table ES-3 (continued)
Maryland Parkway Proposed Mitigation Measures

Resource	Mitigation Measure Description
Biological Resources	Before construction begins, active migratory bird nest surveys should be completed by a qualified biologist to determine if active nests (e.g., eggs, young) are located in trees and shrubs that will be removed or trimmed as part of the project. If construction activities are scheduled during prime nesting periods, the vegetation should be removed ahead of construction during non-nesting periods. A noxious weed management plan will be prepared and implemented by the contractor to prevent noxious weeds from entering the project corridor. Earthmoving and hauling equipment will be washed at the contractor's storage facility prior to arriving onsite to prevent the introduction of noxious weed seeds. Disturbed areas will be landscaped or reseeded with a certified weed-free mix. Best management practices would be utilized by the contractors to prevent sediment from entering the storm sewers or Flamingo Wash during construction activities. A Stormwater Pollution Prevention Plan would be prepared prior to construction to avoid or mitigate potential water quality impacts.
Section 4(f) Properties	Mitigation measures will be used adjacent to the parks and historic sites to avoid and minimize harm to those resources. Temporary construction barriers, which typically include orange construction fence or concrete barriers, will be used to exclude construction vehicles and workers from accidentally disturbing the adjacent parks and historical buildings. The contractor will monitor and minimize temporary vibration impacts from heavy construction equipment adjacent to the historical buildings. The land being used for temporary construction will be fully returned to existing conditions.
Climate Change	Reasonable mitigation measures to reduce or mitigate greenhouse gas (GHG) emissions and climate change effects can include enhanced energy efficiency, lower greenhouse-emitting technology, and increase carbon sequestration, such as planting additional trees in road medians and along the project corridor. Other mitigation strategies include increasing public transit facilities, improving pedestrian and bicycle routes to encourage alternate forms of transportation, and providing attractive and affordable public transportation to reduce the number of vehicles on the streets.

Table ES-3 (continued)
Maryland Parkway Proposed Mitigation Measures

Resource	Mitigation Measure Description
Traffic	Permanent mitigation measures for pedestrian and bicycle improvements for access to new stations may include wider sidewalks, ADA-compliant boarding areas at each station, and connecting ADA-accessible pathways within a 0.25-mile radius of all stations. Project elements may include repair or replacement of sidewalk, curb ramps, removal or relocation of sidewalk obstructions, and enhancements of pedestrian crossings with striping, signage, hybrid pedestrian beacons, or traffic signals to improve access to the stations and along the corridor. Bicycle access improvements may include standard or separated bicycle lanes or other facilities such as raised bike tracks where feasible and bicycle parking racks or lockers at identified stations. A traffic management plan will be prepared by the contractor prior to construction activities that will be reviewed and approved by RTC, the City of Las Vegas, and Clark County. The plan will identify the necessary measures and best management practices to minimize disruption to vehicle and bus traffic, pedestrians, and access to businesses and residences. Maintenance of traffic measures and best management practices during construction to minimize impacts will be applied throughout the corridor. Specific temporary best management practices could include: • Constructing the transitway on only one side of the street at a time would allow ample traffic-carrying capacity in the remaining travel lanes to maintain acceptable level of service. • Apprizing public works, police, fire, and other emergency response agencies of construction activities, detours, and road blockages throughout the construction process. • Providing for emergency access on roadways that would be temporarily affected during the construction period. • Alerting the public and local businesses about detours, lane blockages, and truck entrances. These locations would be well signed. • Providing flaggers to route traffic around detours and managing construction equipment and vehicles into and out of traffic lanes. • Developing pedestrian and bicycle detours around work areas and maintaining pedestrian and bicycle traffic on one side of street. • Timing and sequencing of construction activities to avoid, as much as possible, the primary business hours at certain locations.

Table ES-3 (continued)
Maryland Parkway Proposed Mitigation Measures

Traffic (continued)	• Utilizing bollards and barriers to protect structural elements, buildings, and existing landscaping from construction vehicle damage.

Table ES-4 Permits Required for the Build Alternatives

Agency	Permit	Timeframe
U.S. Army Corps of Engineers	Clean Water Act Section 404 permit	45-60 days
Nevada Division of Environmental Protection (NDEP)	Clean Water Act Section 401 certification, air quality permit	60 days
Clark County Regional Flood Control	National Pollutant Discharge Elimination System Permit (NPDES)	60 days
Clark County	Dust control permit, construction permits	30 days
City of Las Vegas	Building permits, electrical permits	60 days

Note: Construction is anticipated to start October 2021. Therefore, the permitting process should begin a minimum of 90 to 120 days (June 2021) in advance of the start of construction date to allow for the preparation of the permit applications, review by regulatory agencies, and issuance of permits.

1.0 PURPOSE AND NEED FOR THE PROJECT

Maryland Parkway is a vital corridor for the Las Vegas Valley that extends between downtown Las Vegas and McCarran International Airport and connects many activity centers, such as University of Nevada Las Vegas (UNLV), Sunrise Hospital, the Boulevard Mall, and numerous commercial and residential areas. Carrying over 9,000 transit riders and 33,000 cars per day, investments in transportation infrastructure along this major corridor could improve the community's mobility by enhancing vehicle, transit, pedestrian, and bicycle access.

The Regional Transportation Commission (RTC) is proposing to construct and operate High Capacity Transit service between the Las Vegas Medical District, downtown Las Vegas and north of Russell Road. Planning for premium transit service in the corridor has occurred over the past 15 years, as described in Section 1.3, culminating in this Environmental Assessment (EA) document that includes refinement of the Locally Preferred Alternative that is consistent with the corridor vision and the *Southern Nevada Strong Regional Plan* (Southern Nevada Strong, 2015) that identifies the Maryland Parkway corridor as a key "opportunity site" for improved transit, to better serve low and moderate-income residential areas, and to complement economic development and revitalization.

This section documents the need for transportation improvements in the Maryland Parkway corridor and the purpose that the project is intended to serve. It also describes the overall context of the corridor in terms of location, setting, population, employment, land uses, existing transportation facilities and services, and previous studies that help define the transportation problems in the corridor that the project is intended to resolve. The project is subject to federal environmental review requirements because it may involve the use of federal funds from the Federal Transit Administration (FTA). All project documentation, including this EA, has been prepared in compliance with National Environmental Policy Act (NEPA); FTA is the federal lead agency and RTC is the regional transit authority and Metropolitan Planning Organization lead agency for this NEPA process.

RTC, in cooperation with the City of Las Vegas and Clark County, proposes the construction of the Maryland Parkway High Capacity Transit system, an 8.7-mile-long premium transit route that will replace the existing local fixed Route 109 bus service. The proposed project is intended to be an enhanced transit system that will provide reduced travel times and service quality improvements for the surrounding area, significantly increase the viability of transit as a mobility option, and strongly contribute to the corridor vision of revitalization and new economic development and densification in concert with local policies and preferences.

1.1 PROJECT LOCATION AND SETTING

The project corridor is wholly located within Clark County and partially located within jurisdiction of the City of Las Vegas, as shown in the project vicinity map in Figure 1.1-1. The corridor extends on various local streets from the Las Vegas Medical District through downtown Las Vegas to the Maryland Parkway

Figure 1.1-1 Project Vicinity Map with Maryland Parkway Corridor

corridor, where it would serve major activity centers and landmarks including the Sunrise Hospital/Medical Center, the Boulevard Mall, UNLV campus, and McCarran International Airport; several of which are illustrated on Figure 1.1-1 and Figure 1.1-2. Land uses in the project vicinity include residential, commercial, airport, educational institutions, recreation, utility, civic/government, public service facilities (*e.g.,* fire stations, hospitals, and churches), transportation, and vacant land. The corridor is one of the highest transit ridership corridors in the metropolitan area, providing mobility options for an ethnically and financially diverse population, including many transit dependents.

Figure 1.1-2 Major Activity Centers and Landmarks along the Corridor

Southern Segment

McCarran International Airport

Siegfried and Roy Park

University of Nevada at Las Vegas (UNLV)

UNLV Transit Center

Thomas and Mack Center at UNLV

University Gateway (new development)

Figure 1.1-2 Major Activity Centers and Landmarks along the Corridor (continued)


University Park Apartments (new development)


New Student Housing at UNLV

The Boulevard Mall


Sunrise Hospital


Huntridge Circle Park

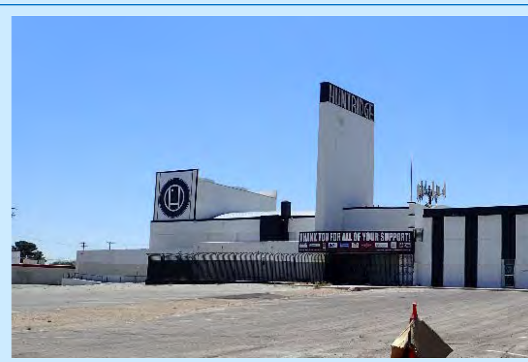

Huntridge Theater

Figure 1.1-2 Major Activity Centers and Landmarks along the Corridor (continued)

Downtown (Northern) Segment

Downtown Container Park Commercial Center

Downtown Las Vegas Event Center

Fremont Street Experience

Bonneville Transit Center


Cleveland Clinic for Brain Health

Children's Discovery Museum at Symphony Park

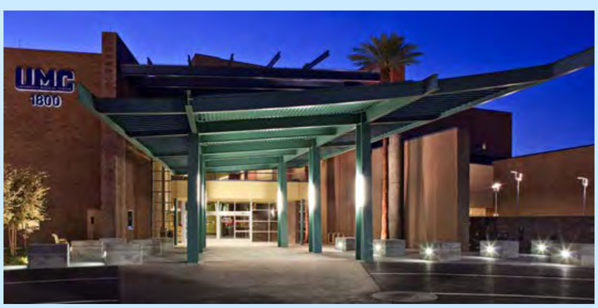
Figure 1.1-2 Major Activity Centers and Landmarks along the Corridor (continued)


Regional Justice Center

World Market Center Las Vegas

Las Vegas Premium Outlets North


Clark County Government Center



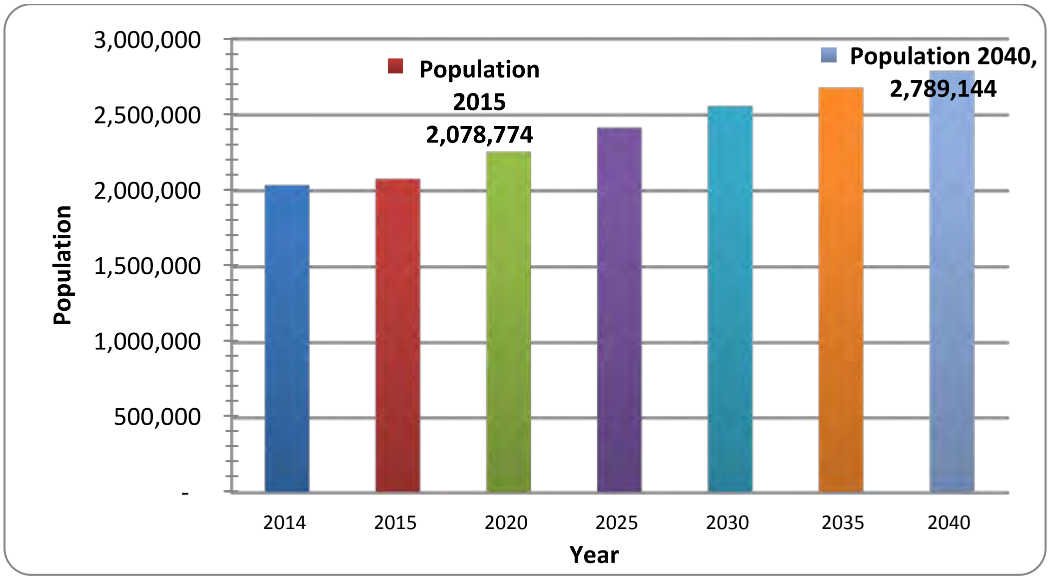
University Medical Center

Valley Hospital

Maryland Parkway is a six-lane roadway currently served by local bus Route 109, which operates 24 hours per day, seven days per week, with primarily 15-minute headways and stops spaced an average of 0.25-mile apart. The buses operate in mixed flow traffic and are subject to the peak hour congestion that occurs at several of the major intersections where average daily traffic varies by segment, but can reach levels of 35,000-40,000 vehicles. High traffic volumes are fairly consistent throughout the day, with the highest levels during the am and pm peak periods.

The Las Vegas metropolitan area continues to grow, as illustrated in Figure 1.1-3; specifically, the latest forecasts indicate population growth of more than 700,000 new residents by 2040. The projected growth in population and employment over the next 25 years will likely generate higher traffic volumes and additional congestion, as well as higher transit ridership and the need for improved transit service.

Figure 1.1-3 Las Vegas Area Population Growth



Source: UNLV Center for Business and Economic Research

The proposed alignment includes three planning areas composed of multiple traffic analysis zones used to quantify population and employment, and to forecast transit ridership and traffic volumes in the regional travel demand model. The alignment includes the Maryland Parkway planning area, the downtown planning area, and the Las Vegas Medical District planning area; all three areas have significant population, employment, and transit ridership. The downtown planning area is the second most densely developed center in the metropolitan area after the Las Vegas Resort Corridor. The Maryland Parkway and the Las Vegas Medical District planning areas are also significant activity centers and are two of the four "Opportunity Sites" identified in the *Southern Nevada Strong Regional Plan* (Southern Nevada Strong, 2015) for high potential economic growth and diversification, as well as higher transit ridership.

The most recently available population and employment data for 2015 and forecasts for 2040 are detailed in Table 1.1-1. The data are the most recently RTC-adopted regional forecasts by traffic analysis zone; these population and employment numbers are higher than those in the Alternatives Analysis since the alignment was expanded during the refinement of the Locally Preferred Alternative in this EA process. As noted in the table, the study area represents 4.6 percent of the population and 10 percent of the employment in the metropolitan area. Those percentages of the total region are expected to decline somewhat over the next 25 years, as growth is projected to occur at a faster rate in other areas. However, the population in the vicinity is expected to grow by nearly 20 percent and employment is expected to grow by more than 30 percent over the next 25 years. The population and employment data in the table were developed from traffic analysis zone-level information that reflects the latest travel demand model numbers adopted by the RTC.

Table 1.1-1 Maryland Parkway Corridor Population and Employment (2015-2040)

PLANNING AREA	POPULATION 2015	POPULATION 2040	EMPLOYMENT 2015	EMPLOYMENT 2040
1 Maryland Parkway	75,501	88,515	41,258	51,189
2 Downtown	13,265	16,498	23,470	32,132
3 Medical Center	4,330	6,520	19,957	27,500
Corridor Total	**93,096**	**111,533**	**84,685**	**110,821**
Total Metro Area	2,078,774	2,789,139	845,999	1,226,187
Growth Rate (2015-2040)		36.9%		44.9%
Corridor Percent of Total	**4.6%**	**4.0%**	**10.0%**	**9.0%**
Corridor Growth Rate (2015-2040)		**19.8%**		**30.9%**

Source: RTC

1.2 PLANNING BACKGROUND

Maryland Parkway was first identified for premium transit service in the ***Las Vegas Valley Transit System Development Plan*** (Parsons, 2002) along with 10 other major transit corridors. RTC has been implementing improved transit service, primarily with bus rapid transit (BRT) and express bus, in the identified corridors over the past 15 years. Maryland Parkway is one of the last corridors from that plan to be addressed.

The ***Maryland Parkway BRT Feasibility Study*** (G.C. Wallace, Inc., 2009), studied the corridor for potential implementation of BRT. The study evaluated six transitway configurations and concluded that BRT would be feasible to provide premium transit service with a combination of side- and center-running dedicated BRT lanes.

The ***Maryland Parkway Alternatives Analysis***, (Atkins, 2014), studied the corridor and developed an initial Locally Preferred Alternative that included the following components:

- Alignment: Downtown to McCarran International Airport; approximately 7 miles
- Station spacing: 0.35-mile on average
- Guideway: Center-running configuration in the Maryland Parkway "core corridor" from Charleston Boulevard to north of Russell Road
- Technology: BRT or rail (modern streetcar or light rail transit [LRT])
- Travel lanes: Four general-purpose lanes and bike lanes in the core corridor
- Add right and left-turn lanes at intersections as needed to preserve capacity

In 2014, the ***Southern Nevada Strong Regional Plan*** (Southern Nevada Strong, 2015) was developed and included the ***Maryland Parkway Implementation Strategy Plan*** (Southern Nevada Strong, 2014) that identified opportunities for improved transit (specifically LRT), and pedestrian and bicycle facilities in the corridor to better serve low and moderate-income residential areas, to complement economic development and revitalization, and to better connect residential areas with shopping, education, and healthcare facilities.

RTC (2016b) adopted the ***Transportation Investment Business Plan (TIBP)*** that addressed a myriad of transportation improvements in the valley's core economic area, the Resort Corridor. Maryland Parkway was included in the recommendations as a high-capacity transit link between downtown Las Vegas and the airport.

The ***Clark County Comprehensive Master Plan*** (Clark County Department of Comprehensive Planning, 2015) is a long-term, general policy plan for the physical development of unincorporated Clark County. The Growth Management policies of the Land Use Element are especially important to the future of the Maryland Parkway study area because they include transit-oriented development and mixed-use development, neo-traditional design that encourages compact urban forms along transit corridors, infill intensification to be balanced with a strong sensitivity to protecting existing neighborhoods, and encouragement of pedestrian use.

The recently updated ***Vision 2045 Downtown Las Vegas Master Plan*** (City of Las Vegas, 2016) is a comprehensive planning process with emphasis on land use and community development and includes LRT and BRT services as integral to connecting downtown with the Strip, UNLV, and the airport. The Plan devotes considerable emphasis to a rail-based system as a necessity for successful development of the mixed-use hub concept (transit-oriented development). LRT has been proven to have the best potential for transit-oriented development and will have the greatest economic impact and/or influence on land use. Major areas of the plan include a transportation study looking at the connection between land use and mobility with an emphasis on supporting development in concert with a multimodal network; focusing on building higher density urban areas that meet the everyday needs of Las Vegas residents and visitors; and creation of distinct districts that are well-linked and accessible. The *Vision 2045 Downtown Las Vegas Master Plan* identifies ten mixed-use hubs along LRT/BRT corridors aiming to promote a compact, mixed-use development pattern. Four of the hubs occur adjacent to the proposed Maryland Parkway alignment, including the Medical District hub, the downtown Civic and Business hub adjacent to the Bonneville Transit Center and City Hall, the Fremont East District hub near Carson Avenue and Maryland Parkway, and the Founders District hub around Maryland Parkway and Charleston Boulevard.

The ***Maryland Parkway Public Art Strategic Design Plan*** (BUNNYFiSH Studio, 2016) creates an outline of potential public art sites and spaces which can be incorporated into the RTC transit plan for Maryland Parkway. Designed to unify the route connecting downtown Las Vegas to north of Russell Road, both the City of Las Vegas and Clark County have also taken interest in utilizing the design plan for their future planning and development efforts, including major landowners along the corridor such as UNLV, Boulevard Mall, and Sunrise Hospital. Through site analysis, community outreach engagements, and case study research, a distilled selection of the commonalities found between the appropriate case studies and community input provide 10 strategic guidelines that became major drivers for the project. A tiered development plan was created to allow for immediate implementation of art and community events, while planning for future large-scale commissions and improvements.

Each iteration of the plan adds to the context of Maryland Parkway - growing the uniqueness of the corridor in layers of development. TIER 1 provides a mapping of the existing, unique context of the corridor. TIER 2 emphasizes immediate development projects and events to spur opportunities. TIER 3 focuses on specific art opportunities for current and future RTC transit plans, from mass transit vehicles to their respective stations. TIER 4 incorporates major art commissions, along with conceptual street and landscape improvements to establish a comfortable environment to experience art along the corridor. The design plan also suggests multiple interventions that create a unified visual language for the corridor, from a pseudo-guerilla art wayfinding system to an initial art installation. The installation proposes painting the existing utility power poles, and any available vertical utility elements, in a gradient of paint swatches, changing each 0.25-mile from Hacienda Avenue to US-95 – establishing a visual wayfinding system and community branding by creating a simple and consistent, yet highly effective, element that unifies Maryland Parkway. Finally, the design plan creates enlarged maps of each 0.25-mile section of Maryland Parkway, allowing easy referencing for current and future developments.

The current ***Maryland Parkway EA*** process documented herein began in 2016; it includes more detailed analysis and refinement of the initial Locally Preferred Alternative to address the unanswered questions from the Alternatives Analysis, namely:

- Downtown alignment and end-of-line station
- Airport connection alignment and end-of-line station options
- LRT or BRT technology selection – the “Build” Alternative
- Specific station locations and canopy design concepts
- Center- or curbside-running guideway configuration including additional traffic analysis
- Potential economic development opportunities associated with BRT versus LRT
- Refinement of capital and operation and maintenance costs
- Consideration of “Smart City” approaches to transit such as emerging technologies

Extensive analyses (documented in separate technical memos and summarized in this EA Section 2 - Alternatives Considered) were completed from June 2015 through September 2016, to evaluate options, refine the Locally Preferred Alternative , and define the project area to be considered in this EA, with significant input from RTC, City of Las Vegas, Clark County, the Clark County Department of Aviation, UNLV, numerous stakeholders with interests along or proximate to the proposed alignment, and the general public.

1.3 Corridor Vision

During the development of the *Maryland Parkway Implementation Strategy Plan* (Southern Nevada Strong, 2014) and the *Maryland Parkway Alternatives Analysis* (Atkins, 2014), a group of private sector individuals, property owners, businesses, and agencies formed a community-based forum known as the Maryland Parkway Coalition to engage corridor stakeholders, discuss issues, and provide information to the two processes above. The Coalition met on a quarterly basis during the original Alternatives Analysis and Southern Nevada Strong efforts in 2012 through 2014 and has continued to meet to discuss corridor-specific topics of interest, including a high capacity transit project, as well as receive information and provide input to this EA process (2015 to present). Most recently, RTC provided an update of the EA process at the Coalition's March 2, 2017, meeting. Supporting documentation for the Coalition meetings is provided in Appendix A. With input from the general public, property and business owners, and a wide variety of corridor stakeholders, the Coalition helped develop the following vision for the Maryland Parkway corridor including significant goals for complementary land use and transit improvements:

- Improve mobility between downtown Las Vegas, UNLV, and the airport;
- Implement premium transit to catalyze redevelopment in the corridor;
- Complement transit investment with higher density mixed-use development;
- Transition the identity of Maryland Parkway from a roadway to a Complete Streets corridor that instills a sense of place; and
- Support the City's Downtown Master Plan, the UNLV Campus Master Plan, Clark County's development overlay, and McCarran International Airport's Master Plan.

The intent of the proposed project is to improve the quality of transit along Maryland Parkway to achieve the vision outlined above, specifically through implementation of either LRT or BRT, and to help transform the corridor into a more vibrant, accessible and economically viable community within the Las Vegas Valley. High-quality transit service is essential for serving the anticipated higher development densities. This is consistent with all of the previous planning efforts and reflects stakeholder consensus in the corridor. In addition, Clark County is creating a development overlay for Maryland Parkway to encourage revitalization efforts and higher density redevelopment.

1.4 Project Need

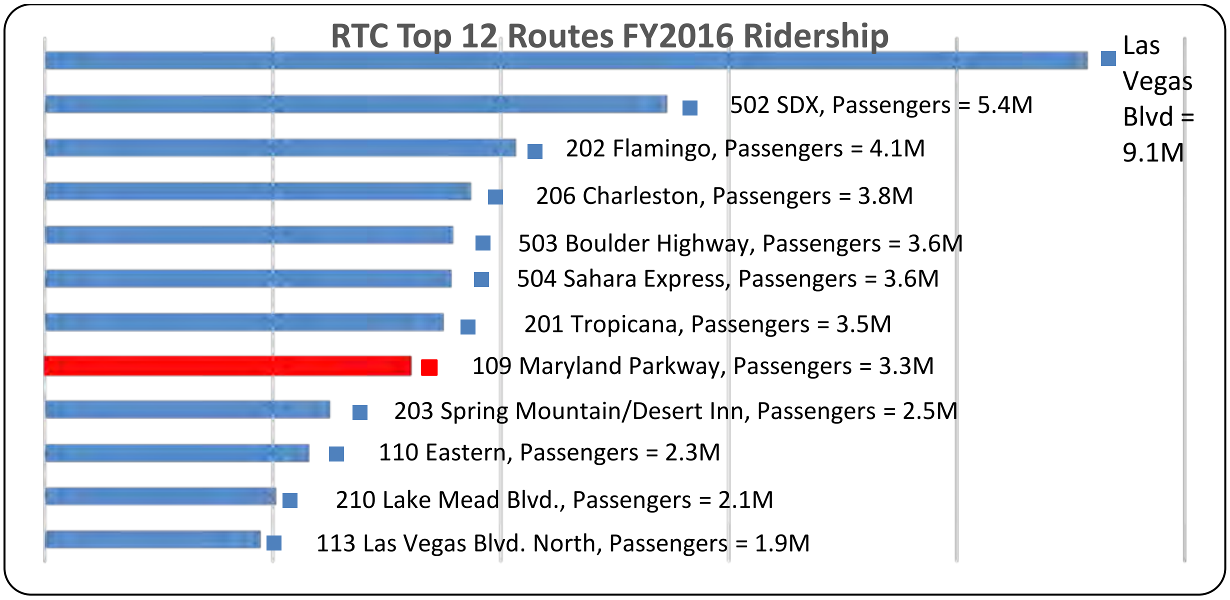
The purpose and need provide the reasons the project is being considered. They also form the basis for comparing the alternatives, so that when an alternative is selected for construction, not only are the environmental impacts considered, but so is the alternative's ability to meet the project's intended objectives. The need for the project is discussed first as it sets the stage for the purpose of the project, which is discussed in the next section. Maryland Parkway connects a wide range of destinations and activity centers, providing mobility options for a diverse population that includes many sensitive populations and Environmental Justice groups. The number of transit-dependent households in the study area is high; approximately 32 percent of all households have no car available. The proposed route also serves a number of disabled persons and persons in wheelchairs who use the transit system to access various facilities such as Sunrise Hospital, University Medical Center of Southern Nevada (UMC), Valley Hospital, and a number of adjacent complementary facilities.

Per U.S. Census Bureau's 2010 Census Data, Clark County comprises 49 percent white, 23 percent Hispanic or Latino, 8 percent Black of African American, 7 percent Asian, 1 percent Native American, 1 percent Hawaiian or Pacific Islander, and 11 percent Other populations. In comparison, the Maryland Parkway study area population is 55.1 percent minority. According to Executive Order 12898, the project area is considered predominately a minority population because the percentage of minorities in the study area (55 percent) is higher than the minority population for Clark County (51 percent). In addition, the Maryland Parkway Corridor has a majority of low to very low-income households as compared to the Clark County.

Serving the busy Maryland Parkway transit corridor, Route 109 generates the 8th highest ridership of all RTC routes, the 2nd highest ridership of all north-south corridors, and the highest productivity in terms of passengers per mile after the Las Vegas Strip routes 301 and 502, as shown in Figure 1.4-1. The Route 109 ridership, at 3,283,417 passengers in fiscal year 2016 (approximately 9,000 boardings per day), is nearly 40 percent higher than the next highest north-south corridor (Eastern Avenue) ridership in the RTC system. Route 109 has a very efficient 57 percent farebox recovery ratio and ridership is growing. There is a clear need for additional, enhanced transit service in the corridor.

As shown in Figure 1.4-2, Route 109 intersects the five highest ridership east-west routes in the system (202 Flamingo, 206 Charleston, 504 Sahara, 201 Tropicana, and 203 Spring Mountain/Desert Inn) providing access to the Las Vegas Strip, which results in many transfers between those routes and Maryland Parkway. While the north-south Las Vegas Strip bus routes are oriented primarily to visitors/tourists and carry the highest numbers of passengers, the Maryland Parkway Route 109 is oriented towards residents, employees, and students with time-sensitive trip needs, and provides the critical connections to the east-west routes, particularly for employees going to/from the major employment centers along the Resort Corridor. Route 109 also connects directly with the Bonneville Transit Center (BTC) in downtown Las Vegas. The BTC serves as the central, regional hub for all bus service throughout the valley and provides key connections with a wide range of residential, commuter express, limited stop, and resort corridor routes.

Figure 1.4-1 RTC Transit Ridership by Route



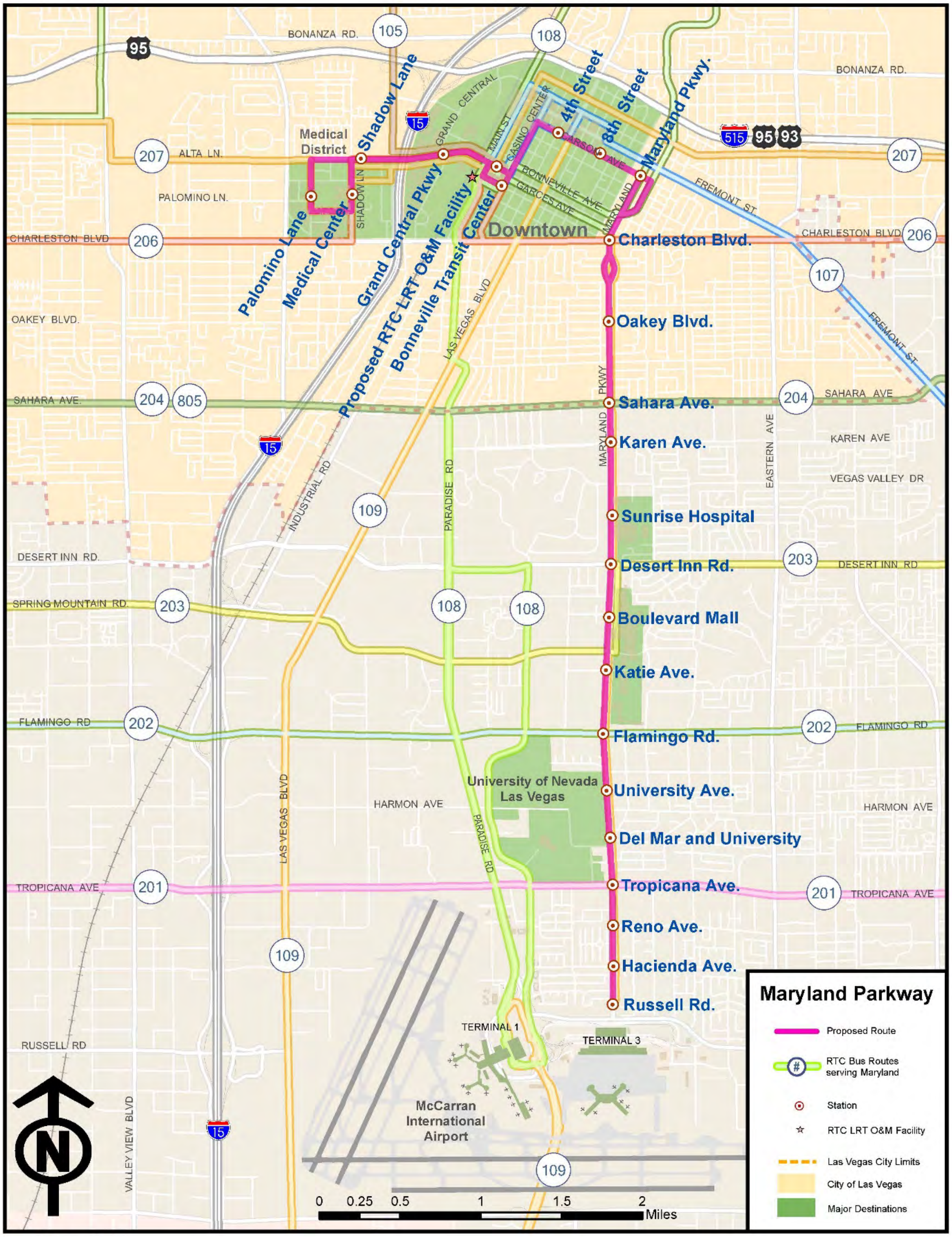
Source: RTC

Route 109 ridership, at 55.54 passengers per service hour and 5.18 passengers per service mile, exceeds the systemwide averages by 26 percent and 51 percent, respectively. The Route 109 farebox recovery of 57 percent also exceeds the systemwide average. The service is clearly well patronized and could be improved to better serve existing users and to attract new customers.

The Maryland Parkway corridor also experiences significant traffic volumes and high levels of congestion, particularly during peak periods, that over time have increasingly affected bus travel times. Peak period level of service in the corridor is generally level of service D-E, but worse during late afternoon (pm) peak hours. After the Las Vegas Strip routes, Route 109 buses operating in curbside-running mixed flow traffic lanes on Maryland Parkway currently experience the slowest speed of all RTC routes, at an average of only 10.7 miles per hour (mph), compared with the system wide average bus speed of 12.9 mph. This is partly due to traffic congestion and partly due to the high number of mobility-impaired transit users that require longer loading/unloading times. The corridor level of service is expected to worsen by 2040, which would further reduce speeds, degrade bus travel times, and reduce transit effectiveness.

As stated in the Corridor Vision above, there is strong desire, demonstrated by recent planning efforts and stakeholder consensus, to transform Maryland Parkway from a 6 -7 lane arterial with relatively low density suburban development and local bus service, to a more vibrant, higher density urban corridor that is oriented toward, and better served by, premium transit service. This is important to serve the transit dependent population and to attract riders who have a choice of travel mode. In summary, there is need

Figure 1.4-2 RTC Routes Connecting with Maryland Parkway Corridor



for faster, more reliable transit service in the Maryland Parkway corridor, not only to meet current and projected needs, but also to provide an attractive alternative to the automobile. Further, there is need for a premium transit system that will serve as a catalyst to support the corridor vision and implementation strategy of new economic development, revitalization, and transit-oriented 7development, along with excellent pedestrian and bicycle connections to/from stations and destinations along Maryland Parkway. Based on the type and amount of growing transit demand in the corridor, and the nature of the desired redevelopment in the corridor, LRT would provide the best solution to satisfy the project needs, due to its higher capacity and higher catalytic effect on economic development.

1.5 PROJECT PURPOSE

The purpose of the proposed project is to meet the need for improved mobility with a premium high-capacity transit system to address growing traffic congestion and the projected growth in population/employment in the study area by 2040. High capacity transit service along the project route will help RTC achieve its long-range goals to: cost effectively enhance mobility and accessibility, improve transit operations, support economic growth and redevelopment, conserve non-renewable resources, and improve safety. The purpose of the project is to:

- Improve access to, from, and along Maryland Parkway between Las Vegas Medical District, downtown Las Vegas, UNLV, the airport, and other key activity centers;
- Enhance transit service to increase ridership by reducing travel time, improving reliability, and providing an attractive, viable alternative to the automobile;
- Make transportation infrastructure investments that enable and support redevelopment of the corridor and encourage new economic development;
- Help transform the corridor into a more vibrant, accessible, and economically viable community within the Las Vegas Valley; and
- Integrate transportation improvements that maximize the capacity to move people and provide attractive, safe, and convenient access for all users, including pedestrians and bicyclists.

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2.0 ALTERNATIVES CONSIDERED

This section presents the alternative technologies and transit configurations that are being evaluated in this Maryland Parkway EA. It also describes the alternatives considered during previous studies.

2.1 ALTERNATIVES PREVIOUSLY CONSIDERED

Previous studies, including the *Maryland Parkway Alternatives Analysis* (Atkins, 2014) completed in December 2014, considered a wide variety of transit options. A summary of the original Alternatives Analysis process and recommendations is included in Appendix B. The original Alternatives Analysis considered all the following transit options and evaluated them in terms of their appropriateness in meeting the purpose and need, including their technical and economical feasibility, and determined the following:

- **Subway / heavy rail transit** was considered, but was removed from further evaluation due to relatively low additional ridership potential and much higher capital and operation and maintenance costs compared with LRT.
- **Monorail** was considered, but was removed from further evaluation due to relatively low additional ridership potential and much higher capital and operation and maintenance costs compared with LRT and BRT.
- **LRT** was considered and identified as an appropriate potential technology for the corridor.
- **Modern Streetcar** was considered and identified as an appropriate potential technology for the corridor.
- **BRT** was considered and identified as an appropriate potential technology for the corridor.
- **Express Bus Overlay** was considered, but was removed from further consideration due to confusion that would be created for passengers trying to distinguish between express and local bus, and lower ridership compared with BRT or rail.
- **Trolley Bus** was considered, but was discarded due to its similarity to BRT, with the difference in electric propulsion and the need for an overhead contact system at a higher cost.
- **Mixed traffic flow operation** for BRT and rail options was considered, but was removed from further consideration due to the lack of transit travel time improvement.

Based on the initial screening of available transit technologies, the only transit options considered potentially appropriate to meet the project purpose and need were BRT, LRT, and modern streetcar based on their ability to enhance service levels in the corridor, increase ridership, and cost effectiveness. Selection of the Locally Preferred Alternative was carried forward into the EA.

2.2 Locally Preferred Alternative Refinement during Environmental Assessment

As discussed above, the original *Maryland Parkway Alternatives Analysis* (Atkins, 2014) studied the corridor and developed an initial Locally Preferred Alternative; however, there were numerous undefined elements in the original Alternatives Analysis that would be needed for an EA analysis. An early and very important part of this EA was the need to refine the initial Locally Preferred Alternative from the Alternatives Analysis and establish the project definition for evaluation in this EA, including the following undefined elements:

1. Refinement of downtown alignment
2. Extension from downtown to Las Vegas Medical District
3. Airport connection alignment and end-of-line station options
4. Rail or BRT technology selection
5. Station locations and station canopy design options
6. Refinement of center- or curbside-running guideway configuration including additional traffic operations analysis
7. Potential economic development opportunities associated with rail versus BRT
8. Refinement of capital and operation and maintenance costs
9. Consideration of "Smart City" approaches to emerging mobility options and transit technologies.
10. Application of Complete Streets design principles and a multi-modal approach to the corridor, including consideration of motorists, transit patrons, pedestrians, and bicyclists

The objective of the analyses was to define a more specific Locally Preferred Alternative in order to ensure a focused EA process. This is consistent with recent FTA guidance. Consequently, extensive analyses (documented in separate technical memos and summarized in Appendix C) were completed from June 2015 through September 2016, to evaluate options, refine the Locally Preferred Alternative, and define the project to be addressed by this EA, with significant input from RTC, City of Las Vegas, Clark County, numerous corridor stakeholders, and the general public. This included development of conceptual design plans for the alignment on aerial base maps at 50-foot scale with station platform placement and cross sections including improved pedestrian/bicycle connections.

Results of the Locally Preferred Alternative refinement analyses are provided below:

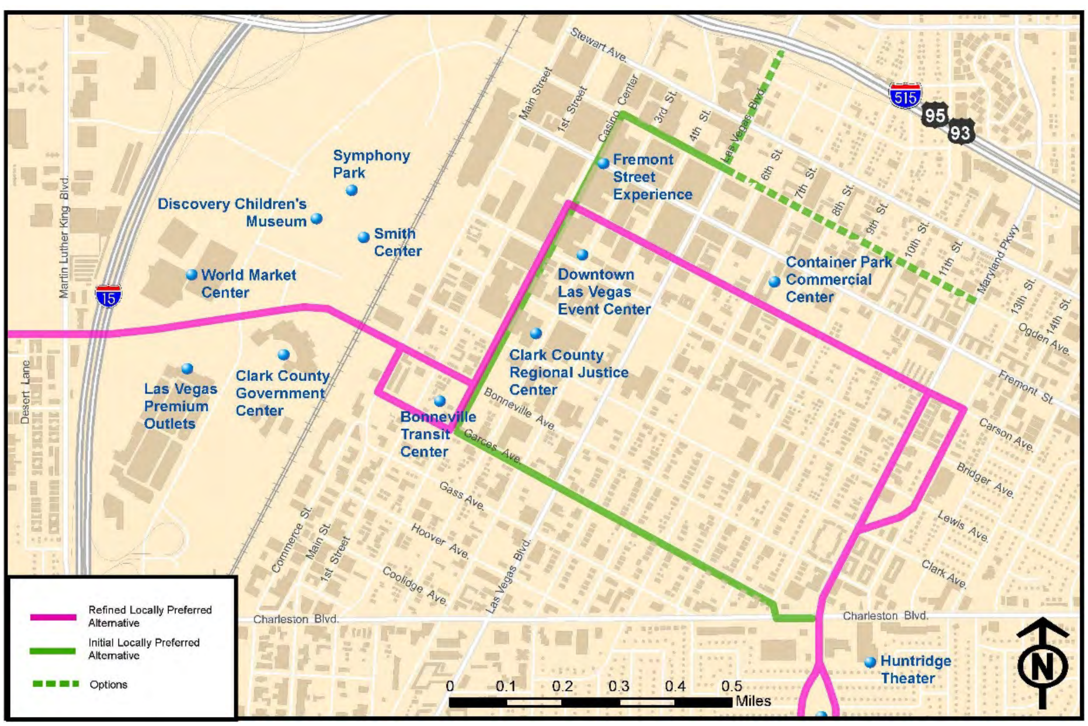
1. <u>Refinement of downtown alignment</u>

The original Alternatives Analysis process developed an initial Locally Preferred Alternative that identified an alignment through the downtown area that first served the Bonneville Transit Center from the south (in a clockwise direction) using one of the east-west streets between Hoover Avenue and Garces Avenue to access Casino Center Boulevard and proceeding northward to Ogden Avenue/7th Street. This alignment was recommended in order to allow the high number of transfers at Bonneville Transit Center to occur first before serving the rest of the downtown area. It would also simplify future extensions to the north to serve any future redevelopment of Cashman Field and to the east to serve additional downtown redevelopment opportunities and perhaps allow a future loop back to Maryland Parkway.

As part of this EA process, RTC held several coordination meetings with the key stakeholders in June through September 2015 to update assumptions from the process and solicit input to refine the Locally Preferred Alternative. On July 8, 2015, RTC staff and the Parsons team met with City of Las Vegas representatives who identified several new developments in the downtown area including 1,000 residential units to be built along Fremont Street between 9th and 15th Streets. The City representatives indicated a preference for the Maryland Parkway alignment to serve the proposed developments as well as more directly serve the Fremont Street experience and other developments in the east downtown area as a higher priority than possible future extensions to the north or east.

Based on the City's input and additional analysis, the Locally Preferred Alternative alignment was refined for the downtown area to respond to the City's preferences by directing the Maryland Parkway alignment north to Carson Street, then turning west along Carson Street to Casino Center Boulevard, then turning south along Casino Center Boulevard to the Bonneville Transit Center between Bonneville Avenue and Garces Avenue, as illustrated in Figure 2.2-1. Both LRT and BRT could use the existing dedicated center-running lanes on Casino Center Boulevard; the LRT option would simply add embedded track and possibly overhead contact system equipment and appurtenances.

Figure 2.2-1 Initial and Refined Locally Preferred Alternatives in Downtown Las Vegas



The Refined Locally Preferred Alternative alignment would more directly serve the larger Fremont Street area and future residential area. It would also generate higher transit ridership; specifically, that alignment would produce 300 to 500 more daily boardings in the downtown area than the initial Locally Preferred Alternative alignment. After further review and discussion, RTC and the City agreed that the refined Locally Preferred Alternative alignment is most appropriate.

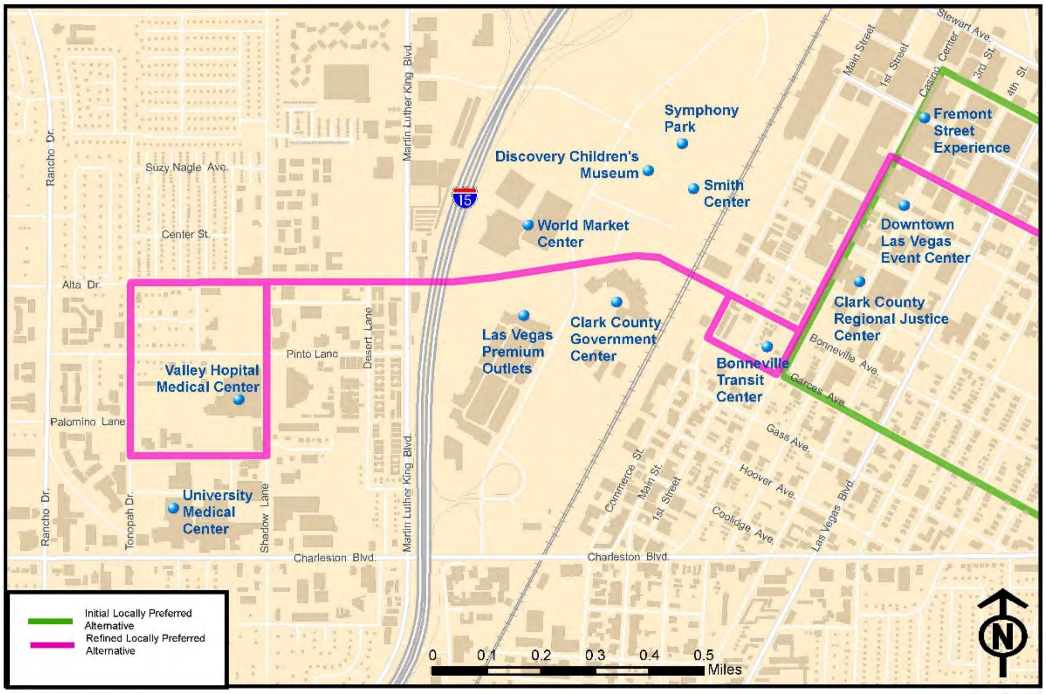
Analysis result and recommendation: the downtown alignment with the best travel time and ridership benefits uses Maryland Parkway to Carson Street, then to Casino Center Boulevard, then to the Bonneville Transit Center. This alignment serves the largest population and employment base, including the Fremont Street experience area, multiple residential, office and commercial areas, and other planned development. It also has the potential to generate the highest transit ridership, making the project more cost effective.

2. Extension from Downtown to Las Vegas Medical District

Part of the Locally Preferred Alternative refinement analysis included extending the downtown alignment to include the Las Vegas Medical District as an "opportunity site" as identified in the *Southern Nevada Strong* Regional *Plan* (Southern Nevada Strong, 2015). The Las Vegas Medical District is a key destination, as it includes the UMC, Valley Hospital, numerous complementary medical offices and facilities, as well as the UNLV Charleston campus and future home of the University's medical school. The area is currently served by the Charleston Boulevard Route 206 and Alta Drive Route 207. To the east of the Las Vegas Medical District are other medical facilities, including the Cleveland Clinic Lou Ruvo Center for Brain Health; institutional facilities, including the Clark County Government Center and Regional Transportation Commission of Southern Nevada; entertainment venues, including the Smith Center for Performing Arts and Children's Discovery Museum; and retail with the Las Vegas Premium Outlets North Mall.

In considering alternative ways of serving the downtown area and through discussions with the City, an extension of the Maryland Parkway service west approximately 1.5 miles to the Las Vegas Medical District was a way to address some of the City's goals for improved transit connections. Specifically, the alignment would extend from the Bonneville Transit Center along Bonneville Boulevard/Alta Drive to Tonopah Drive, then proceed (in a one-way loop) south along Tonopah to Wellness Way, then proceed east to Shadow Lane, then proceed north to Alta Drive (Figure 2.2-2). With this extension to the Las Vegas Medical District, stations would be located at Grand Central Parkway near the Las Vegas Premium Outlets North and Clark County Government Center; on Alta Drive between Martin L. King Boulevard and Shadow Lane; on Tonopah Drive at Palomino Lane; and on Shadow Lane near the UNLV campus, just north of Charleston Boulevard.

Figure 2.2-2 Refined Locally Preferred Alternatives to Medical District



The population and employment in the Las Vegas Medical District area and west of the Union Pacific Railroad (UPRR) mainline is similar in size to the downtown area as shown in Table 2.2-1. This extension of the Maryland Parkway service could provide more of a direct link between key destinations and would generate significant additional transit ridership. Based on available data, the larger service area would add 44 percent more population and 80 percent more employees that could be served by the high capacity transit service extension. The Medical District extension would produce from 430 to 570 more daily boardings in the corridor.

Table 2.2-1 Las Vegas Downtown and Medical District Population and Employment

2014 data	Total Dwelling Units	Total Employment
East of UPRR (Downtown)	8,872	22,770
West of UPRR (Medical District)	3,872	18,311

Source: RTC

In addition, this extension between the Las Vegas Medical District and the Maryland Parkway service would provide key transit linkages between:

- Downtown areas and the Las Vegas Medical District
- Las Vegas Medical District and the main UNLV campus
- Las Vegas Medical District and residences along the Maryland Parkway corridor

- Maryland Parkway corridor and future LRT service envisioned by the City of Las Vegas along W. Charleston Boulevard, between downtown Las Vegas and downtown Summerlin

After further review and discussion, RTC and the City agreed that the Medical District extension should be incorporated into the Maryland Parkway corridor project.

Analysis result and recommendation: The addition of the Las Vegas Medical District adds only 1.5 miles of additional length and two minutes of additional travel time, but serves a significantly larger population and employment base, potentially serving higher transit ridership and increasing the project's cost effectiveness.

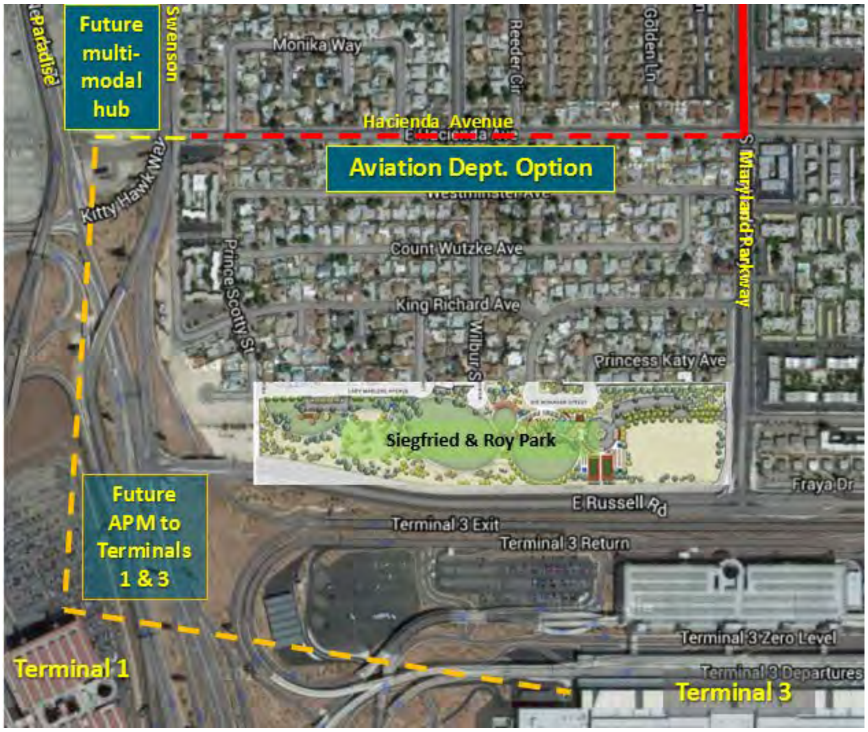
3. Airport connection alignment and end-of-line station options

In the initial Locally Preferred Alternative presented in the Alternatives Analysis, the connection to the airport depended on the selected transit technology. If BRT was chosen, then these vehicles could easily use the existing roadways to directly serve Terminal 1, as does Route 109 today. Otherwise, the southernmost station north of Russell Road was identified as the terminus for either streetcar or LRT service, with a potential pedestrian bridge connection to the airport Terminal 3 parking structure.

On July 7, 2015, RTC team met with Clark County Department of Aviation representatives who indicated that the initial Locally Preferred Alternative concept of a pedestrian bridge connection from the end-of-line transit station across Russell Road and the airport circulation roadways into the Terminal 3 parking structure is not compatible with airport plans. Further, the Department of Aviation indicated that a transit end-of-line station "inside the fence" and adjacent to the airport circulation roadways (south of Russell Road) to connect directly with bus shuttles to the terminals is also not compatible with airport plans.

Rather, the Clark County Department of Aviation had identified a potential 23-acre multimodal transportation facility site (a former car rental lot) on Hacienda Avenue between Paradise Road and Swenson Street as a possible end-of-line station for Maryland Parkway rail service if that technology is selected (Figure 2.2-3). The multimodal facility option would serve a variety of transportation services and move a portion of the airport transfers away from the "front doors" of Terminals 1 and 3, thereby reducing congestion. Although there is no defined timeline for specific siting and development of the multimodal center, the airport could include automated people mover connections or shuttle bus service between the multimodal facility site and Terminals 1 and 3; both options would require a transfer between the rail service and the connection to the airport. Impacts of the multimodal facility option were not evaluated in this EA, but will be evaluated in the future if the option is selected.

Figure 2.2-3 Potential Airport End-of-Line Station - Multimodal Transportation Facility



4. Rail or BRT technology selection

The Maryland Parkway corridor is approximately 8.7 miles long and includes 24 station locations at an average spacing of 0.35-mile. The corridor is planned as curbside-running, dedicated transitway allowing right-turns (*i.e*., mixed traffic operations), with exception to the Casino Center Boulevard segment, which is planned for use of the existing center-running transitway. More detailed discussion of the curbside- versus center-running configuration in Section 2.2, Item 6.

The initial Locally Preferred Alternative identified either BRT or rail as appropriate technologies for implementation in the Maryland Parkway corridor. The rail category included both LRT and modern streetcar (both typically referred to as "trams," in European cities), which are nearly identical in terms of vehicle type, size, capacity, propulsion, system requirements, transitway configuration, and application in an urban environment. Modern streetcar is the term typically applied to relatively short (1 to 5 miles) alignments with closely spaced (0.25-mile to 0.75-mile) stations and mixed traffic operation. LRT is typically used to describe longer corridors with station spacing ranging from 0.5-mile to 1.5 miles, with a transitway configuration that can include exclusive right-of-way and/or mixed traffic operation. Given the similarities in the two rail technologies, the length of the Maryland Parkway corridor, and the intended transitway configuration, LRT was identified as the most appropriate rail technology to be carried through the EA for further evaluation and comparison with the BRT option.

The photos below (Figure 2.2-4 and Figure 2.2-5) illustrate the similarities in LRT vehicles and modern streetcars, which typically range from 66 feet to 90 feet in length. However, streetcar vehicles are typically shorter than LRT, which would result in a shorter station platform. Streetcars often have governors to limit their speeds to levels that are lower than typical LRT vehicles. The capacity of both these vehicles is typically 120-160 passengers (seated plus standing); a coupled 2-car train obviously has double the capacity or 240-320 passengers. In addition, LRT allows for more cars to be coupled together than streetcars.

Figure 2.2-4 Inekon Modern Streetcar Vehicle Interior and Exterior Views in Seattle

Figure 2.2-5 Siemens LRT Vehicle Interior and Exterior Views in Portland

BRT vehicles, such as the 60-foot articulated bus, currently operating on the Strip to Downtown Express (SDX) BRT corridor in Las Vegas (Figure 2.2-6) typically have capacity for 70-90 passengers (seated plus standing). Single LRT vehicles thus have 40-60 percent more capacity than BRT vehicles.

Figure 2.2-6 RTC SDX Center-running BRT

As previously indicated, either LRT or BRT technology could accommodate the planned Maryland Parkway corridor configuration as well as the close station spacing. Selection of the most appropriate transit technology for the corridor was based on comparisons of the two options using the following evaluation criteria:

- **Corridor Vision and Purpose and Need,** which is the basis for all of the analysis and reflects how the selected technology should serve the corridor, including: 1) Improve mobility in the Maryland Parkway corridor and between Las Vegas Medical District, downtown Las Vegas, UNLV, the airport, and other key activity centers; 2) Enhance transit service to increase ridership by reducing travel time, improving reliability, and providing an attractive alternative to the automobile; 3) Make transportation infrastructure investments that catalyze redevelopment encourage new economic development in the corridor; and 4) Integrate transportation choices that maximize the capacity to move people and provide safe and convenient access for all users.

  As stated in the Corridor Vision, there is strong desire, demonstrated by recent planning efforts and stakeholder consensus, to transform the Maryland Parkway corridor from a 6 to 7 lane arterial with relatively low-density development and local bus service, to a more vibrant, higher density urban corridor. This transformation is better oriented to and supported by premium transit service that will better serve the current transit dependent riders and attract riders who have a choice of travel mode. The LRT investment would more closely align with each of these objectives than BRT, as explained in further detail below.

- **Ridership,** which is the average weekday boardings from the regional travel demand model and annualized for the cost effectiveness comparison, including current and 2040 estimates. The results of ridership forecasts for the Maryland Parkway corridor technology options indicate 21 percent higher initial ridership with LRT than BRT (16,100 versus 13,300 average daily boardings, respectively), with an additional increase over time of 23 percent higher ridership with LRT than BRT by 2040.

- **Capital cost,** which is the total capital cost of implementation (hard and soft costs). The results of capital cost estimates for the Maryland Parkway corridor indicate higher capital costs of LRT due to more expensive vehicles (although they have twice the useful life of BRT vehicles), the track and overhead contact system requirements, and the somewhat larger and more complicated stations. The LRT option has a capital cost of approximately $573 million and the BRT option has a capital cost of approximately $298 million in 2016 dollars.

- **Annual Operation and Maintenance cost,** which is calculated based on annual hours of service and expected cost per hour. The results for operation and maintenance cost estimates for the Maryland Parkway corridor technology options indicate higher operation and maintenance costs for LRT due to significant increases in frequencies (50 percent) with the new service, higher maintenance cost per vehicle revenue hour, and the additional costs of off-board fare collection and the cost of fare checkers. The LRT option has an operation and maintenance cost of approximately $11.5 million per year and the BRT option has an operation and maintenance cost of approximately $7.2 million per year in 2016 dollars. The LRT operation and maintenance cost may be reduced if RTC privately contracts the service, similar to the current bus operations.

- **Cost effectiveness,** which is calculated as the operation and maintenance cost per passenger. The results indicate very little difference in the cost effectiveness of LRT and BRT due to the higher ridership expected with LRT that would offset the higher operation and maintenance costs. The LRT operation and maintenance cost per boarding is approximately $2.79 and the BRT operation and maintenance cost per boarding is $2.11. The LRT cost effectiveness may be improved if RTC privately contracts the service, similar to the current bus operations.

- **Traffic impacts** as calculated in the operations analysis for the core and downtown segments of the corridor, for the side- and center-running transitway configurations in 2022 and 2040. The results of the traffic analysis for the Maryland parkway corridor indicate minimal traffic impacts from the implementation of either curbside-running LRT or BRT, particularly with the identified mitigation measures, namely continued use of the curb-side lanes for right-turning vehicles, which increases total capacity compared with center-running transit that completely eliminates two general purpose traffic lanes.

- **Transit-oriented Development** and other economic development opportunities attributable to premium transit implementation. The results from transit-oriented development and economic development attributable to BRT, modern streetcar, and LRT implementation indicate that LRT would generate a significantly higher level of transit-oriented development and economic development in the corridor than implementation of BRT. Consequently, LRT would better serve the Maryland Parkway Corridor Vision.

- **Consistency with regional plans** including the TIBP (RTC, 2016), the *Southern Nevada Strong Regional Plan* (Southern Nevada Strong, 2015), and the Clark County Maryland Parkway Design Overlay District (Clark County, 2017). Either LRT or BRT in the Maryland Parkway corridor are consistent and fit with the regional plans.

- **Public preference** as indicated in surveys and public input meetings. The input received for the Maryland Parkway corridor technology options indicate that LRT is the preferred technology for the corridor.

Table 2.2-2 summarizes the screening of the technology options for the Maryland Parkway corridor. The RTC and the City of Las Vegas have identified other corridors for potential LRT implementation including the Las Vegas Strip resort corridor (from the airport to downtown Las Vegas) and Charleston Boulevard (from downtown Las Vegas to downtown Summerlin).

Table 2.2-2 Technology Screening Analysis

	Bus Rapid Transit (BRT)	Light Rail Transit (LRT)
Meets Corridor Vision, Purpose and Need	Fair	Best
Average weekday ridership 2014/2040	13,300 / 16,800	16,100 / 20,700
Capital cost (2016 $)	$298M	$573M
Annual O&M cost (2016 $) *	$7.2M	$11.5M
Cost effectiveness (O&M cost per boarding)	$2.11	$2.79
Traffic impacts	Minimal	Minimal
Transit-oriented development and economic development	Fair	Best
Consistency with regional plans	Fair	Best
Public preference	Fair	Best

*current Route 109 O&M cost is approximately $5.8M per year based on 15-minute peak headways

LRT serving the Maryland Parkway corridor could be readily coordinated with other LRT corridors in the future, including the opportunities for "one-seat ride" interlining of LRT vehicles along two or more corridors (*e.g.*, Maryland Parkway and Charleston Boulevard).

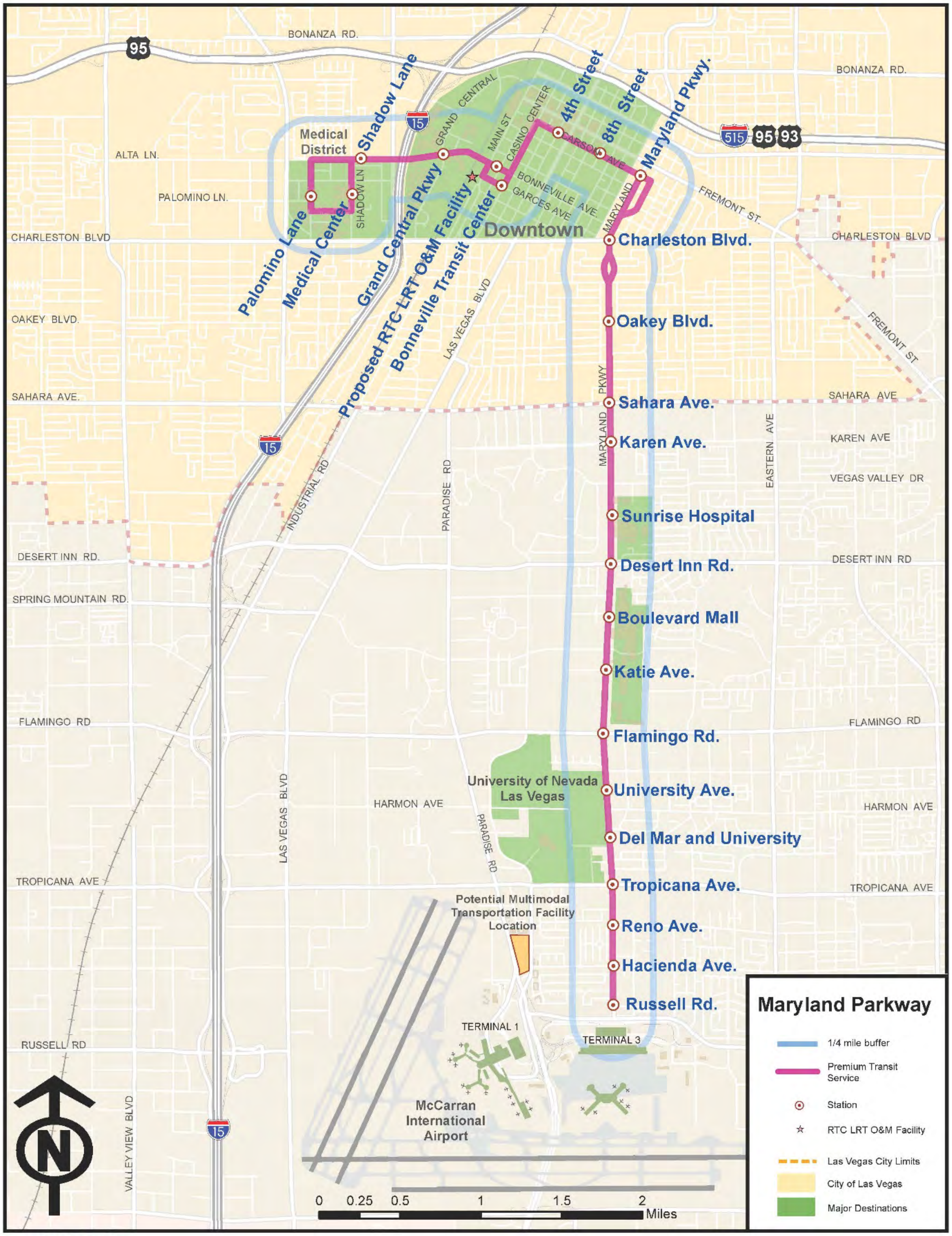
Analysis result and recommendation: Based on all the analysis, input received to date, consideration of various regional plans, and the screening criteria evaluation, LRT is the better technology for the Maryland Parkway corridor if sufficient funding is available to support its implementation. If sufficient funding is not available to implement LRT, then BRT would be implemented in the corridor. Analysis of potential funding to support LRT or BRT is the subject of the Financial Plan for the Maryland Parkway project.

5. Station locations and station canopy design options

The 20 station locations identified in the initial Locally Preferred Alternative from the Alternatives Analysis served the 7-mile alignment from the Bonneville Transit Center to the station at Maryland Parkway and north of Russell Road, with average 0.35-mile station spacing. During the Locally Preferred Alternative refinement phase of the EA, the alignment was extended as described above, additional station sites were added for a total of 24, and several station locations were modified slightly to optimize their physical fit, improve proximity to key destinations, and minimize their potential impacts in terms of adjacent business access.

The specific station locations with all curbside-running platforms (except the center platform on Casino Center Boulevard at Carson Street) include the following which are shown on Figure 2.2-7 and on the aerial base alignment drawings (Appendix D). The station locations include:

Figure 2.2-7 Project Corridor Map with Station Locations and 0.25-mile EA Study Area



1. On Shadow Lane between Pinto Lane and Wellness Way– single side platform northbound; adjacent to UNLV's Charleston Campus and future medical school and across the street from University Medical Center and Valley Hospital Medical Center.
2. On Tonopah Drive at Palomino Lane – single side platform southbound; adjacent to Radiation Oncology Center of Nevada.
3. On Alta Drive just east of Shadow Lane – dual side platforms eastbound and westbound.
4. On Bonneville Avenue at Grand Central Parkway – dual side platforms; eastbound adjacent to Clark County Government Center and westbound adjacent to World Market Center.
5. At Bonneville Transit Center – single side platform; westbound on Bonneville Avenue just west of S. 1st Street.
6. At Bonneville Transit Center – single side platform; eastbound on Garces Avenue just east of South 1st Street.
7. On Carson Avenue - dual side platforms; eastbound and westbound at S. 4th Street.
8. On Carson Avenue – dual side platforms; eastbound and westbound at between S. 8th and 9th Streets.
9. On Carson Avenue – dual side platforms; eastbound at S. 13th Street and Maryland Parkway, westbound on Maryland Parkway just south of Carson Avenue.
10. On Maryland Parkway – dual side platforms; northbound just north of Charleston Boulevard and southbound just south of Charleston Boulevard.
11. On Maryland Parkway – dual side platforms; northbound and southbound just south of Oakey Boulevard.
12. On Maryland Parkway – dual side platforms; northbound just north of Sahara Avenue and southbound just south of Sahara Avenue.
13. On Maryland Parkway – dual side platforms; northbound just north of Karen Avenue and southbound just south of Karen Avenue.
14. On Maryland Parkway – dual side platforms; northbound and southbound just south of Sunrise Hospital main entrance.
15. On Maryland Parkway – dual side platforms; northbound just north of Desert Inn Road and southbound just south of Desert Inn Road.
16. On Maryland Parkway – dual side platforms; northbound and southbound just north of Dumont Boulevard.
17. On Maryland Parkway – dual side platforms; northbound just north of Katie Avenue and southbound just south of Katie Avenue.

18. On Maryland Parkway – dual side platforms; northbound just north of Flamingo Road and southbound just south of Flamingo Road.
19. On Maryland Parkway – dual side platforms; northbound just north of University Avenue and southbound just south of University Avenue.
20. On Maryland Parkway – dual side platforms; northbound and southbound just south of University Road.
21. On Maryland Parkway – dual side platforms; northbound just north of Tropicana Avenue and southbound just south of Tropicana Avenue.
22. On Maryland Parkway – dual side platforms; northbound and southbound just north of Reno Avenue.
23. On Maryland Parkway – dual side platforms; northbound just north of Hacienda Avenue and southbound just south of Hacienda Avenue.
24. On Maryland Parkway – dual side platforms; northbound and southbound just north of Russell Road.

As part of the Locally Preferred Alternative refinement effort, alternative station canopy/shelter design concepts were developed, as shown in Figure 2.2-8, that indicate the designs would fit naturally into the streetscape, similar to the BRT stations that occur along various downtown Las Vegas streets. A preferred design concept will be selected by RTC based on stakeholder and public input during subsequent design development phases.

Analysis result and recommendation: The 24 identified station locations will provide a high level of access and will serve all major activity centers throughout the corridor. The station locations will also have improved pedestrian and bicycle access to/from the adjoining neighborhoods. The station design concepts will be refined through subsequent stages of design development. Public input and preferences will be solicited throughout the design process. With their larger size and more substantial appearance, the LRT station design concepts offer more opportunity to help transform the urban design character of the corridor as part of the vision to create a more vibrant, accessible, and economically viable community within the Las Vegas Valley.

6. Refinement of center- or curbside-running guideway configuration including additional traffic operations analysis

Currently, local bus Route 109 operates in the curbside general-purpose traffic lanes throughout the corridor, including in the core corridor segment along Maryland Parkway between Charleston Boulevard and north of Russell Road. In the initial Locally Preferred Alternative developed during the Alternatives Analysis, the center-running configuration was identified as the preferred option in the core corridor, both for the

Figure 2.2-8 Conceptual Station Designs

LRT and BRT options, as shown below in Figure 2.2-9. The center-running configuration would convert the two-center general-purpose traffic lanes to dedicated transit lanes, reducing the roadway capacity to two general purpose travel lanes in each direction, as illustrated in the typical section and rendering below. A benefit of the center running configuration would be dedicated lanes for the LRT or BRT. The initial Locally Preferred Alternative also identified the need for additional right-turn lanes at each of the major intersections in the core corridor to provide sufficient traffic capacity and level of service.

Figure 2.2-9 Center-running Configuration

During the course of the Locally Preferred Alternative refinement and conceptual design, Clark County Public Works Department expressed concern about the center-running configuration and the loss of roadway capacity and reduction in level of service. Clark County Public Works Department requested analysis of a curbside-running configuration in the core corridor to determine if it could satisfy the LRT or BRT operating requirements while also allowing increased roadway capacity and minimizing impacts to traffic operations.

In response, a curbside-running configuration was developed that would dedicate the two-curbside general-purpose traffic lanes to transit lanes (one in each direction). While these lanes would be dedicated to transit operations, automobiles and other vehicles would still be able to use those lanes for right turning movements at minor intersections and driveways, as illustrated in the typical section and rendering in Figure 2.2-10. Similar applications of curbside-running transit lanes with allowances for right-turn movements have been successfully implemented locally on other corridors, including Boulder Highway, Sahara Avenue, and Flamingo Road. This configuration on Maryland Parkway would also maintain two general purpose lanes in each direction. As with the initial Locally Preferred Alternative, separate right-turn lanes would also be provided as needed at all major intersections outside (to the right) of the dedicated transit curb lanes (Figure 2.2-10).

Figure 2.2-10 Curbside-running Configuration

The curbside-running configuration addresses both traffic and transit operations in the corridor and helps demonstrate how both LRT and BRT can be accommodated with minimal impacts and with significant benefits in terms of higher transit ridership and helps traffic operations.

- Existing Route 109 speed ranges from 9.5 to 10.5 mph (median speed of 10 mph)
- Curbside-running BRT median speed is 12.2 mph (nearly 22 percent faster than Route 109)
- Center-running LRT median speed is 13.5 mph (nearly 35 percent faster than Route 109)
- Curbside-running LRT median speed is 13.1 mph (nearly 30 percent faster than Route 109)
- Curbside-running BRT ridership = 13,300
- Center-running LRT ridership = 16,500 due to slightly faster speed
- Curbside-running LRT ridership = 16,100

The evaluation matrix in Table 2.2-3 was developed to screen the side- versus center-running LRT configuration options, BRT, and existing Route 109 service.

Table 2.2-3 Side- versus Center-running Configuration Analysis

Alternatives Considered	**Center-running LRT with 4 General Purpose Lanes**		**Curbside-running LRT with 4 General Purpose Lanes**		**Curbside-running BRT with 4 General Purpose Lanes**		**Existing Bus Route 109**	
Evaluation Criteria	**Value**	**Rating**	**Value**	**Rating**	**Value**	**Rating**	**Value**	**Rating**
Transit Service Quality	Good	3	Good	3	Good	3	Fair	2
Traffic Operations Quality (level of service - current/2040)	E/F	1	D/E	2	D/E	2	D/E	2
Transit travel time: BTC to Russell Rd (minutes)	29.1	3	31.8	3	40.8	2	44.0	1
Average Daily Transit Ridership	16,500	3	16,100	3	13,300	2	9,000	1
Additional Right-of-way Required (ac)	3.23	1	2.70	2	2.70	2	0	3
Average Station Spacing (mile)	0.35	3	0.35	3	0.35	3	0.25	3
Peak Headway (minutes/vehicles per hour)	12/6	3	12/6	3	12/5	3	12/4	2
Capital Cost - from Medical District to Russell Rd	$573M	2	$573M	2	$298M	3	$0	3
Annual O&M cost - from Medical District to Russell Rd	$11.5M	1	$11.5M	1	$7.2M	2	$5.8M	3
Economic Development Potential	Good	3	Good	3	Fair	2	Poor	1
Pedestrian/Bicycle Accommodations	Good	3	Good	3	Good	3	Poor	1
Overall Rating	**SCORE:**	**26**	**SCORE:**	**28**	**SCORE:**	**27**	**SCORE:**	**23**

Ratings: 3 = High/Good;
2 = Medium/Fair; 1 = Low/Poor

As shown in Table 2.2-3 and based on consideration of the eleven evaluation criteria, the curbside-running LRT option performs as well as center-running LRT option in terms of:

- Transit service quality,
- Transit travel time,
- Ridership,
- Economic development potential,

- Urban/station design and corridor enhancement,
- Pedestrian/bike connectivity improvements, and
- Capital and operation and maintenance costs.

The curbside-running LRT option performs better than center-running LRT option in terms of:

- Curbside-running does not restrict left-turns the way center-running does,
- Curbside-running requires slightly less station space than center-running,
- Better traffic operations/ level of service with shared use of transit lanes for right-turns,
- Less right-of-way required, and
- Direct pedestrian access, particularly in terms of ADA accessibility, with the adjacent sidewalk. In addition, some transit riders may be uncomfortable waiting on an island in the middle of the street on center-running station platforms.

The curbside-running LRT option has slightly slower travel speed due to right-turning vehicles also using the curb lane, and therefore, slightly lower ridership, than the center-running LRT option. However, the additional traffic capacity available with the curbside-running option makes it more attractive and acceptable to Clark County. In addition, at most, if not all, major intersections, additional right-turn lanes will be provided to accommodate the higher numbers of turning vehicles and minimize impact from queued vehicles on transit operations and associated travel delay.

Analysis result and recommendation: As shown in the evaluation matrix, the curbside-running LRT configuration received the highest evaluation score, closely followed by the center-running LRT option and curbside-running BRT option. Given the Clark County Public Works Department's primary concern with traffic operations and maintaining sufficient level of service for traffic operations, the Public Works Department prefers the curbside-running configuration. RTC determined that the curbside-running configuration is appropriate for the core corridor and most of the remaining corridor. The only exception is the center-running segment on Casino Center Boulevard between Carson Avenue and Garces Avenue, where the new high capacity transit service would use the existing center-running SDX lanes. The complete corridor traffic operations analysis is detailed in a separate technical memorandum (see Section 4).

7. Potential economic development opportunities associated with Rail versus BRT

Potential economic development opportunities in the Maryland Parkway corridor that might be associated with BRT versus LRT were evaluated by analyzing similar corridors in various cities where either technology has been implemented. The analysis included an extensive literature search of previous studies that considered market and physical development outcomes.

Market-Value Outcomes

Economic development can be measured in many ways. One is by evaluating how the market responds to the presence of transportation investments, such as rail stations. Higher values closer to stations imply market capitalization of economic benefits, which can occur only when economic activity increases. Various measures of market value include property value effects near transit stations, effect of transit attracting jobs, and the effect of transit accessibility on market rents and property values. The current evidence is clear that rail-based (LRT and modern streetcar) implementations tend to not only generate higher job share increases and higher rental prices than BRT, but also that these effects extend farther outward from LRT stations than from BRT stations. In other words, the most positive (75 percent of the increase in) market effects of rail typically extend as far as 1.5 miles from the line; whereas, the same most positive (75 percent of the increase in) market effects of BRT typically extend only as far as 0.12-mile from the line. So, the overall market-value outcomes associated with rail are considerably greater than those associated with BRT.

Physical Development Outcomes

There is a growing body of evidence on the physical development outcomes of BRT, LRT, and streetcar transit systems. The most sweeping assessment of BRT-LRT-streetcar related development is offered by the Institute for Transportation and Development Policy (Hook, Lotshaw, and Weinstock, 2013). Their key findings include:

- BRT, streetcar, and LRT all leverage significant transit-oriented development investment. Cleveland's HealthLine BRT and Portland's MAX Blue Line LRT leveraged the most overall transit-oriented development investment of all the corridors studied — $5.8 billion and $6.6 billion, respectively. Yet, because the HealthLine BRT cost significantly less to build than the MAX Blue Line LRT, Cleveland's HealthLine BRT leveraged approximately 31 times more transit-oriented development investment per dollar spent on transit than Portland's MAX Blue Line LRT.

- Both LRT and BRT can leverage many times more transit-oriented development investment than they cost. Of the 21 corridors studied, 14 leveraged greater than $1 of transit-oriented development investment per $1 of transit (funds) spent. Five of them were BRT, four of them were LRT, two were streetcars, and three were improved bus (non-BRT) corridors.

More recently, the LA Metro Gold Line Foothill Extension LRT involved a $3 billion transportation investment that generated $7 billion in development investment along the line. The Phoenix LRT investment of $1 billion generated $8.9 billion development investment proximate to the route. Clearly, LRT implementation has a very strong influence in helping to transform corridors into more vibrant, accessible, and economically viable communities.

Physical development results associated with transit investment depend on the economic health of the corridor to begin with. Cleveland's HealthLine, for instance, connects downtown to the medical centers east of downtown and is one of the strongest corridors in the metropolitan area. Because the Institute for Transportation and Development Policy study did not employ controls, there is no way of knowing whether the investment that occurred would have happened regardless of the transit investment. It is important to note that these are not cause-and-effect outcomes. Some, most, or all investment near transit stations may have occurred anyway, or may have merely located near stations rather than elsewhere in the metropolitan area resulting in no net development gain. This is an area of future research.

Moreover, the differences in investment outcomes are based substantially on where transit goes and how it is aligned. In the United States, streetcar systems are found only in downtowns. They run relatively short stretches in existing travel lanes in high-value real estate environments, so their costs are low while collateral development is high. Whether modern streetcars will be successful modes serving the vast distances LRT and BRT cover has not been tested. For its part, BRT has the advantage of also being built in existing travel lanes at relatively low cost. LRT systems are not only the most expensive to construct, but if they are co-located within freight rail corridors or along freeways or freeway/expressway medians, their opportunities to stimulate collateral private investment will be diminished.

Application to Maryland Parkway

There may be nothing comparable to the Maryland Parkway corridor with which to apply prior studies or the analysis presented herein. The anticipated high capacity transit line would connect a major international airport to one of the nation's largest universities to one of the world's premier tourist destinations. There are certainly transit systems connecting airports to major universities and/or downtowns, such as the LRT systems serving Los Angeles, Phoenix, Dallas, Minneapolis, and Salt Lake City, all are many times longer than the Maryland Parkway corridor. The following observations are relevant.

LRT Systems appear to perform best overall when serving regions. Analysis suggests that when LRT systems are integrated into the urban fabric rather than disconnected from it–for example by being built along freight rail lines or down the medians of major highways—they may affect new firm and job location to a greater extent than the other systems. For instance, LRT corridors captured the largest share of change in new office development after the Great Recession (51 percent) than BRT or streetcar transit systems at 33 percent and 34 percent, respectively. If the ultimate aim of the Las Vegas metropolitan area is to build a transit network connecting its suburbs to downtown, LRT may have greater promise for influencing development patterns than the other modes. Based on the analysis, up to a quarter and perhaps more of a region's new office development may occur along such a regional LRT corridor.

Street Car Systems appear to perform best when serving mostly downtowns and nearby areas, such as in Portland, Seattle, Atlanta, Kansas City, Tucson, Cincinnati, and Tampa. Streetcar transit systems enjoyed the highest market rent premiums for office, retail and multifamily apartment development, as well as the highest annualized change in jobs among the three systems; but they also have the smallest service areas, limited to the most densely developed and highest value landscapes of the metropolitan area they serve. If the transit decision anticipates serving only the Maryland Parkway area with no expansion regionally, the streetcar transit system may be the preferred option.

BRT Systems perform well in terms of their association with market rents and annual average job growth in their corridors. But when compared to LRT systems they did not perform as well in influencing development patterns and when compared to streetcar transit systems, do not fare as well in terms of rent premiums and annualized average job change. On the other hand, they are often the least expensive mode to build, so their benefit to cost outcomes may exceed those of streetcar transit and LRT.

The literature search indicates that various cities have realized the highest economic development and transit-oriented development implementation with rail corridors, and to a lesser degree, with BRT corridors. However, it is important to note that the analysis does not establish causation. That is, although there are statistical associations between transit investments and economic development outcomes, the analysis does not conclusively say that transit investments caused the outcomes. In choosing between options, what seems to matter most is maximizing accessibility between origins and destinations, taking best advantage of growth and demand, minimizing physical and social barriers, assuring a sufficient supply of buildable land along corridors and within station areas, and facilitating private sector investment through public-private partnerships. The role of transit investments is thus to facilitate and grow underlying economies; this is part of the Maryland Parkway Coalition's vision for the corridor.

Maryland Parkway Design Overlay District

Recognizing the relationships between land development and high capacity transit investments, Clark County recently created the Maryland Parkway Design Overlay as a supplement to the underlying zoning district regulations. The intent of the overlay is to implement and encourage design standards and incentives for transit-oriented, walkable, and sustainable development and redevelopment of properties within the Maryland Parkway Design Overlay District (Clark County, 2017).

The components of the Maryland Parkway Design Overlay District are consistent with the *Southern Nevada Strong Regional Plan* (Southern Nevada Strong, 2015), the *Maryland Parkway Implementation Strategy Plan* (Southern Nevada Strong Date, 2014), and the *Clark County Comprehensive Master Plan* (Clark County Department of Comprehensive Planning, 2015). The Design Overlay District offers good incentives for private redevelopment, new economic development, and transit-oriented development that will, in concert with transit investment, achieve the corridor vision for higher density, mixed-use development served by premium transit.

Analysis result and recommendation: The analysis of various BRT, LRT, and streetcar corridors around the United States indicates no direct causality between transit technology implementation alone and higher levels of economic development, increased density, and transit-oriented development. However, there is ample evidence that high capacity transit implementation supports other measures to encourage such development to different degrees, and that LRT and streetcar technologies generate significantly higher development levels than BRT. Consequently, LRT technology implementation would best support the new economic development and transit-oriented development envisioned in the Maryland Parkway corridor vision, the project purpose and need, and the Clark County Design Overlay District. LRT implementation in the Maryland Parkway corridor will also help to transform the area into a more vibrant, accessible and economically viable community within the Las Vegas Valley, as desired by the stakeholders and the general public.

If LRT could not be implemented, at least initially, then BRT should be considered, as BRT systems typically perform well in terms of their association with market rents and annual average job growth in their corridors and provide high benefits compared to their much lower cost.

8. <u>Refinement of capital and operation and maintenance costs</u>

Table 2.2-4 includes the capital and operation and maintenance costs for the initial Locally Preferred Alternative from the Alternatives Analysis identified for the BRT and rail-based options for the 7-mile, 20-station corridor. It also includes the capital and operation and maintenance costs from the refined Locally Preferred Alternative from this EA for the 8.7-mile, 24-station corridor, with explanation of how they were derived in the following sections.

Table 2.2-4 Initial Locally Preferred Alternative and Refined Locally Preferred Alternative Capital and Operation and Maintenance Costs

	BRT	Rail/LRT
Alternatives Analysis Capital Cost (2014 dollars)	$123.2M	$324.5M
Alternatives Analysis O&M Cost (2014 dollars)	$6.9M/year	$10.9M/year
Refined Locally Preferred Alternative Capital Cost (2016 dollars)	**$297.8M**	**$573.5M**
Refined Locally Preferred Alternative O&M Cost/year (2016 dollars)	**$7.2M/year**	**$11.5M/year**

Sources: Maryland Parkway Alternatives Analysis (Atkins, 2014 and Parsons, 2016a)

By escalating the capital costs to 2016 dollars, the initial Locally Preferred Alternative capital cost for BRT was $18.9 million per mile and for rail was $49.9 million per mile. The refined Locally Preferred Alternative capital cost for BRT is $34.2 million per mile and the capital cost for LRT is $65.9 million per mile, based on more detailed project definition, additional design effort, and recent LRT and BRT experience in other United States (U.S.) projects.

The analysis below includes the methodology used to develop conceptual level capital costs and operation and maintenance costs for the refined Locally Preferred Alternative for the full 8.7-mile corridor extending from the Las Vegas Medical District through the downtown area, along Maryland Parkway between Charleston Boulevard and north of Russell Road, with a total of 24 station locations.

Capital Cost Estimation Methodology

Capital costs are one-time, up-front costs associated with the construction and implementation of a project. The capital costs are expressed in current year (2016) dollars and are escalated, by means of an annual inflation factor, to year-of-expenditure dollars to provide realistic estimates of what the project will actually cost to implement, depending on the timing of construction. The Maryland Parkway improvements are currently estimated to be constructed by 2022.

The methodology used to estimate the capital costs for the Maryland Parkway LRT and BRT Build Alternatives included the following steps:

- Identify LRT and BRT elements for curbside-running dedicated transitway configuration
- Determine appropriate capital cost categories for each LRT and BRT element per FTA guidance
- Determine conceptual unit cost for each element/category based on current costs and recent experience
- Calculate capital costs in 2016 dollars
- Escalate capital costs to year-of-expenditure dollars, assuming 3.5 percent per year escalation

Parsons developed order of magnitude estimates for the Maryland Parkway transit project based on the conceptual design plans developed to date. Costs were based on RS Means Building Construction Cost Data 2016, Nevada historical roadway costs and subcontract quote data, as well as Parsons' recent experience on similar rail and BRT projects in the U.S., and input from RTC and its Program Management consultant. Labor and equipment rates were taken from the Nevada Division of Labor 2015-2016 publications. The Maryland Parkway corridor capital cost estimates were developed with Parsons' standard construction cost estimating spreadsheets. Additional items such as vehicles, right-of-way, professional services, and financing costs were added to the construction cost estimates, along with unallocated contingency.

Quantities were derived from the design plans where possible and limited field checks. Parametric quantities from similar projects were used in the absence of detailed design plans. These estimates have been prepared using best practices, skill, and care typical of similar projects and estimating standards. They will be refined during subsequent phases of design development.

The construction cost estimates include all of the civil elements (utilities, drainage, grading, pavement removal, etc.), general conditions, required demolition work, roadway, track, systems and station costs, plus 25 percent contingency. The study team added 30 percent support costs (including professional services, design/engineering, agency administration, program management and construction management) to the construction totals, plus the cost of right-of-way and vehicles, as well as an operation and maintenance facility for the LRT option since RTC currently does not have the necessary facility. The construction estimates also include a significant budget for landscape/streetscape improvements that support the corridor vision.

Capital Cost Elements

The primary capital cost elements include:

- **Running ways** – curbside-running lanes dedicated for LRT or BRT operations. The dedicated LRT/BRT lanes are generally 12 feet wide. The running ways include reconstruction of the existing curbside general-purpose traffic lanes, including grading, base course and steel-reinforced concrete pavement, as well as curb and gutter replacement. The LRT running ways include embedded track, switches and turnouts as required, and noise and vibration dampening.
- **Stations** – the 24 stations for both technologies considered include split platforms on the far side of each intersection location (*i.e.*, two platforms per station location) with the exception of one platform on either side of the Bonneville Transit Center (on Bonneville Avenue and on Garces Avenue) and one platform at two locations along the one-way track segments on Tonopah and Shadow Lane in the Medical District, for a total of 44 platforms.
- **Sitework** improvements include required demolition, utility relocations, landscape and streetscape improvements, and pedestrian/bicycle access to the stations.
- **Vehicles** – the required number of LRT or BRT vehicles is based on the operating plan; a total of 14 new 60-foot buses or 11 new LRT vehicles would be required, including a 20 percent spare vehicle ratio (*i.e.*, 20 percent of the peak vehicle requirement).
- **Systems** – includes Transit Signal Priority (TSP) technology and traffic signal coordination to improve operations and reduce transit travel time; this is applicable at most intersections within the City of Las Vegas and at the minor intersections along Maryland Parkway. Systems also include communications and off-board fare collection for LRT and BRT, signals for the LRT option, as well as the overhead contact system and traction power substations for electrical propulsion of the LRT vehicles.
- **Right-of-Way** – includes acquisition of additional land to accommodate all of the proposed transit improvements.

Other costs typically included with capital construction costs are professional services, contingency, and financing charges as described below.

Conceptual Capital Cost Estimates

Based on the methodology described above and using FTA's Standard Cost Codes, capital cost estimates were developed for the LRT and BRT Build Alternatives. The capital cost elements and unit costs were determined based on the planning and conceptual design completed to date, with estimates of lane and track miles, number of vehicles required, right-of-way acquisition needed, and the estimated amount of physical construction required. More detailed cost estimates will be developed based on detailed quantities that will be available when additional engineering design is completed in future stages of the project development.

The capital cost estimates for the Maryland Parkway corridor improvements for the LRT and BRT Build Alternatives to be carried forward were developed based on conceptual design drawings for the following elements:

- Typical cross sections of alignment segments including dedicated BRT transit lanes with approximate levels of civil/physical improvements and all elements of site infrastructure.
- Conceptual Station plans, including split platforms on opposite sides of the intersections, canopies, lighting, fare collection, benches, trash receptacles, stationary and variable message signs, art, landscaping, security cameras, and other materials.
- Conceptual details of unique conditions in the corridor.

Table 2.2-5 provides the capital cost estimates for each of the two alternative technologies for the Maryland Parkway corridor. As shown, the BRT alternative would cost approximately $298 million in 2016 dollars and the LRT alternative would cost approximately $574 million in 2016 dollars.

The 2016 capital cost estimates were also escalated to determine year-of-expenditure costs up to 2025; the project is currently anticipated to be built in 2021-2023. The year-of-expenditure estimates provide a more accurate estimate of the actual construction costs and are required by FTA to determine the potential level of New Starts funding required to support the project implementation. Actual construction and right-of-way costs may increase at a faster or slower pace, but application of an escalation factor provides a reasonable estimate of the year-of-expenditure costs.

Table 2.2-5 Maryland Parkway Corridor Capital Cost Estimates

SCC	Capital Item	LRT Cost per unit	LRT curbside-running from Medical District to Russell Rd No.	LRT curbside-running from Medical District to Russell Rd Cost	BRT Cost per unit	BRT curbside-running from Medical District of Russell Rd No.	BRT curbside-running from Medical District of Russell Rd Cost
10	*Guideway and Track Elements*						
10.02	Semi-exclusive Lanes (allows cross traffic) per lane mile	$ 2,715,000				17	$ 46,155,000
10.04	Guideway: aerial structure	$ 8,473,000	1	$ 8,473,000			
10.10	Track – embedded; cost per track mile (curb lanes)	$ 4,850,000	17	$ 82,450,000			
10.12	Track - special (switches, turnouts) per track mile	$ 399,500	17	$ 6,791,500			
10.12	Track - vibration and noise dampening cost per track mile	$ 404,500	17	$ 6,876,500			
20	*Stations (split platforms)*						
20.01	Stations - at-grade platforms	$ 1,100,000	44	$ 48,400,000	$ 719,489	44	$ 31,657,500
20.02	Stations - aerial/elevated platform	$ 2,462,000	1	$ 2,462,000			
30	Support Facilities (O&M Facilities, yards, shops, admin. bldgs.)	$ 28,350,000	1	$ 28,350,000			
40	Sitework (demolition, utility relocations, landscape, ped/bike access)	$ 60,000,000	1	$ 60,000,000	$ 51,444,000	1	$ 51,444,000
50	Systems (TSP, Communications, overhead contact system / traction power substations, fare collection) per track mile	$ 3,700,000	17	$ 62,900,000	$ 1,827, 824	17	$ 31,073,000
Construction Subtotal (10 - 50)				**$ 306,703,000**			**$160,329,500**
60	Right-of-way, Land, relocations	$ 20,000,000	1	$ 20,000,000	$19,000,000	1	$ 19,000,000
70	Vehicles (including 20% spares)	$ 4,500,000	11	$ 49,500,000	$ 1,125,000	14	$ 15,750,000
80	Prof. Services costs, design, legal, insurance, PM/CM	(30% of 10-50)		$ 92,010,900			$ 48,098,850
90	Unallocated contingency	(25% of 10-70)		$ 94,050,750			$ 48,769,875
100	Finance Charges	(3% of 10-70)		$ 11,286,090			$ 5,852,385
	Total capital cost (2016 dollars)			**$ 573,550,740**			**$ 297,800,610**

Source: Parsons, 2016a

Table 2.2-6 illustrates how the conceptual cost estimates will increase with the 3.5 percent per year escalation assumption that is suggested by FTA, based on a conservative expectation of construction cost increases. As shown, under this scenario, the BRT capital cost may increase by 23 percent to approximately $366 million by 2022, or $42M per mile, and the LRT capital cost may increase by 23 percent to approximately $705 million by 2022, or $81 million per mile.

Table 2.2-6 Maryland Parkway Corridor Escalated Capital Costs at 3.5 Percent per Year

Cost escalation at 3.5 percent per year to Year-of-Expenditure	LRT Curbside-running	BRT Curbside-running
2016	$ 573,550,740	$ 297,800,610
2017	$ 593,625,016	$ 308,223,631
2018	$ 614,401,891	$ 319,011,458
2019	$ 635,905,958	$ 330,176,859
2020	$ 658,162,666	$ 341,733,050
2021	$ 681,198,359	$ 353,693,706
2022	**$ 705,040,302**	**$ 366,072,986**
2023	$ 729,716,713	$ 378,885,541
2024	$ 755,256,798	$ 392,146,534
2025	$ 781,690,786	$ 405,871,663
Total increase by 2022	**$ 131,489,562**	**$ 68,272,376**

Source: Parsons, 2016a

Comparison with Alternatives Analysis Capital Cost Estimates

The capital cost estimates developed during the Maryland Parkway Alternatives Analysis included BRT and rail (streetcar or LRT) options, albeit for a slightly shorter alignment (7 miles) than the alignment currently contemplated (8.7 miles). Specifically, the Locally Preferred Alternative corridor did not include the Las Vegas Medical District, as it terminated at the Bonneville Transit Center, nor did it include an extension beyond Maryland Parkway/Russell Road to the airport. The total estimated capital cost for BRT was $123,232,239 and for LRT was $324,490,039 in 2014 dollars. These estimates equate to $17.6 million per mile for BRT and $46.6 million per mile for streetcar/LRT. By escalating these costs by 3.5 percent per year to 2016 dollars, the BRT cost per mile would be $18.9 million and the LRT cost per mile would be $49.9 million.

In comparison, the current Maryland Parkway cost estimates detailed in the previous section are $34.2 million per mile for BRT and $65.9 million per mile for LRT in 2016 dollars. The current costs per mile are approximately 81 percent higher for BRT and 32 percent higher for LRT than the Alternatives Analysis estimates, which is appropriate given the additional conceptual design developed as part of the EA effort.

Comparison with Other Agencies' LRT Capital Costs per Mile

As stated above, the LRT capital cost estimate for Maryland Parkway is $65.9 million per mile in 2016 dollars; the project involves relatively simple roadway reconstruction and only one short elevated segment. This is a reasonable estimate compared with other LRT projects built by other U.S. agencies since 2008 which have ranged from $46 million to $232 million per mile in 2016 dollars, depending on the overall project complexity. Additional cost comparisons to other agencies' transit systems are provided in Appendix C.

In conclusion, the estimated costs per mile for the Maryland Parkway Build Alternatives appear reasonable. The capital cost estimates will be further refined at each stage of design and engineering development.

Operation and Maintenance Cost Estimates

LRT operation and maintenance costs are derived from a cost "build-up" model that estimates specific expense items based on peer system cost structures. Peers provide the best basis for constructing LRT costs as RTC does not currently operate rail service. Expenses are categorized into the four main cost classifications used in the National Transit Database (NTD) (FTA, 2016) reporting:

- Vehicle Operations - activities that a transit agency requires to dispatch and run vehicles in revenue service.
- Vehicle Maintenance - activities that ensure revenue vehicles and service vehicles are operable, cleaned, fueled, inspected, and repaired.
- Non-Vehicle Maintenance - activities that ensure buildings, grounds and equipment (garages, passenger stations, shelters, and administration buildings), fare collection equipment, communications systems, track, structures, tunnels, and power systems are operable.
- General administration - managerial activities that support the direct provision of transit service.

The individual expense line items are based on the unit cost of a resource used (*e.g.,* labor rate per job classification) times the level of resources needed. The resource requirements are based on an associated input supply variable (*i.e.,* revenue service hours, alignment length, number of stations served, etc.) times a peer-based productivity factor.

BRT costs are initially derived using current RTC BRT costs. A cost build-up model may be required for FTA submissions and will need to be based on RTC's current agreement with its service provider and their cost structures. This would help account for any differences between the existing BRT services and those proposed for the Maryland Parkway corridor.

Table 2.2-7 presents the operating plan variables that determine the cost model input variables and Table 2.2-8 summarizes these variables.

Table 2.2-7 Operating Plan Variables

Direction	BRT				LRT	
	Off-Board Fare Pmt.		On-Board Fare Pmt.			
	Distance (miles)	Travel Time (minutes)	Distance (miles)	Travel Time (minutes)	Distance (miles)	Travel Time (minutes)
Southbound (Medical Center to Russell Rd)	9.44	48.11	9.44	54.78	7.92	36.60
Northbound (Russell Rd to Medical Center)	9.50	46.53	9.50	53.53	8.62	37.88
Round Trip[1]	18.94	95.3	18.94	109.65	16.54	74.81

Source: Nelson/Nygaard, 2016

Notes: [1]Round trip travel times include passenger boarding dwell time with end-of-line stations at Russell Road and Medical Center.

Table 2.2-8 Cost Model Input Variables

Alternative	Number of Stations[1]	Round Trip Cycle Time (minutes)[2]	Peak Vehicles in Operation	Fleet Size[3]	Annual Revenue Service Hours	Annual Revenue Service Miles
LRT to Russell Rd	44	87	8	10	52,618	551,460
BRT (Off-Board Fare Payment)	44	110	10	12	66,682	631,479
BRT (On-Board Fare Payment)	44	127	11	14	75,442	631,479

Source: Nelson/Nygaard, 2016

Notes: [1]Station count includes 4 one-way or EOL stations at the Medical Center Loop (2) and BTC (2). [2]Cycle Time includes 15 percent recovery/layover time. [3]Fleet size includes 20 percent spare ratio.

Table 2.2-9 summarizes the resulting operation and maintenance cost estimates for LRT and BRT.

Table 2.2-9 LRT and BRT Estimated Operation and Maintenance Costs

Alternative	Estimated Annual O&M Cost	Cost per Revenue Hour	Cost Per Revenue Mile
LRT to Russell Rd	$11.5 million	$219.23	$20.92
BRT (Off-Board Fare Payment)	$5.2 million $6.4 million (based on estimated revenue hours)	$95.98	$8.24
BRT (On-Board Fare Payment)	$5.2 million $7.2 million (based on estimated revenue hours)	$95.98	$8.24

Source: Nelson/Nygaard, 2016

Note: BRT costs per revenue hour and revenue mile are based on 2014 NTD data.

The following points need to be considered when evaluating these estimates:

- Many peer cities operate multiple rail lines, over much longer distances. This provides an economy of scale with respect to fixed costs and those expenses that can allocated to the overall system. The model's high percent of costs in the non-vehicle maintenance category relative to the peer may reflect this condition.
- RTC's low-cost structure will help control costs, especially those in the non-vehicle maintenance and general administration categories.
- While NTD reporting procedures attempt to provide consistent allocation of costs to the various categories, the degree to which RTC shares resources (especially staff) between service units, may result in lower costs being allocated to the Maryland Parkway service. This may be particularly applicable to the sharing of facilities, general administration positions, and contracted services.
- Local labor markets and RTC's policies on fringe benefits will impact the labor rates used in the model.
- The job classifications and labor rates used in the model can be refined as further definition of service operation becomes available.
- If RTC contracts for LRT operation, as it currently does for bus operations, the terms of its agreement with its provider will impact and could reduce the cost structure.
- The model assumes additional services will be contracted for (internally within the agency or with third-party firms) for security, fare enforcement, etc. These service cost line items need to be verified and/or moved to additional line items and allocated to dedicated Maryland Parkway LRT staff.

Net Changes in Operation and Maintenance Costs

As previously indicated, the current annual operation and maintenance cost for Route 109 is approximately $5.8 million, which is offset by approximately $3.1 million in farebox revenue for a net annual cost of $2.7 million. The proposed LRT operations and maintenance cost is estimated at $11.5 million per year, but the projected farebox revenue (based on higher forecast ridership) is approximately $5.4 million per year for a net annual cost of $5.9 million; this would be about $3.2 million per year higher than the current Route 109 net operations and maintenance cost. Similarly, the BRT operation and maintenance cost is estimated at $7.2 million per year, but the projected farebox revenue is approximately $4.5 million for a net annual cost of $2.7 million; this is essentially the same net cost as the current Route 109. The high farebox recovery ratio assumed here is based on experience with the existing Route 109 and the added cache or attractiveness of rail versus bus as evidenced in other cities.

It is important to note that RTC may privately contract LRT operations and maintenance in the same way current bus and BRT operations and maintenance are contracted out to the private sector. The result of current privatization has positions RTC's transit system as one of the lowest bus operation and maintenance operation and maintenance cost operations in the U.S. In the same way, privatizing LRT operations may produce lower operation and maintenance costs than those described above, making that choice even more cost effective.

Analysis result and recommendation: The capital and operation and maintenance cost estimates for LRT and BRT vary considerably for the Maryland Parkway, just as they do in corridors throughout the U.S. They both represent a significant investment in high capacity transit that is justified in heavily traveled corridors like Maryland Parkway. As discussed in previous sections, the LRT investment is approximately twice the BRT investment, but it attracts significantly higher ridership, enables more economic development and complementary transit-oriented development, and supports the Maryland Parkway vision and project purpose and need. These estimates are based on the current level of design and operational planning completed to date and will continue to be refined throughout the project development process.

9. Consideration of "Smart City" approaches to emerging mobility options and transit technologies

The RTC and its constituent local agencies are actively pursuing "Smart City" principles and systems to foster an environment for innovation and deployment of new transportation technologies. A Smart City uses information and communication technologies and other means to improve quality of life, efficiency of city operations and services, and economic competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social, and environmental considerations.

As a regional agency, RTC's particular emphasis is on smart mobility, by achieving the best balance of public transportation, sustainable mobility, intelligent V2X (vehicle to vehicle [V2V] or vehicle to infrastructure [V2I]) technology and traffic management. In particular, the RTC is focusing on emerging transit technologies and business models to improve the public transportation system, including global positioning system (GPS)-based transit signal priority, LRT, driverless vehicles, and partnerships with ride-sharing companies like Uber and Lyft. Driverless technologies continue to advance and the RTC will be monitoring the market for opportunities to implement such systems in driverless shuttles, buses, and LRT. To improve safety and free up resources for increased service. Together, these pursuits are intended to provide residents and visitors with sustainable transportation choices that are affordable, equitable, and environmentally friendly, while also enhancing the customer experience.

Analysis result and recommendation: While there is much interest in the potential of connected and autonomous vehicles, including passenger cars, freight trucks, transit bus, and LRT systems, it may be several years before the technology reaches maturity and becomes available in the U.S. While driverless cars could be integrated into the transportation market, the technology cannot practically replace the capacity benefits from mass transit. Aside from the safety benefits driverless technologies may bring, increasing the number of passenger cars in a limited roadway network will ultimately result in higher levels of congestion and reduced travel speeds.

RTC will continue monitoring the development and deployment of connected and autonomous technologies, particularly for transit systems, as they could potentially help improve safety and reduce operational costs, allowing the RTC to deploy resources toward expansion of service, increased frequencies, safety and security, and customer service.

10. Application of Complete Streets design principals and multimodal approach to the corridor, including consideration of motorists, transit patrons, pedestrians, and bicyclists

Throughout the Locally Preferred Alternative refinement process, the project corridor was evaluated in terms of Complete Streets design principles and considered multimodal needs, including high capacity transit service, pedestrian and bicycle access and facilities, and traffic operations. Two technical reports were prepared for this EA effort; titled *Complete Streets Approach for Maryland Parkway* (Parsons, 2017a) located in Appendix E and *Maryland Parkway Bicycle Facilities Options* (Parsons, 2017b) located in Appendix F.

RTC defines a Complete Street as a road designed to be safe for all users, including design features that aim to make streets pleasant places for all users. Users include vehicle drivers, transit riders, pedestrians of all ages and abilities, and bicyclists. The RTC has also identified significant Complete Streets benefits, such as:

- Making walking, biking, and transit riding more attractive.
- Improving travel options for groups that have limited access to cars.
- Improving safety of various modes.
- Increasing the likelihood of physical activity.
- Reducing vehicle emissions to improve air quality.

- Improving the economic situation for communities.

Complete Streets are comprised of a variety of roadway design components. Typical features include improvements such as traffic calming, dedicated transit lanes, protected bicycle lanes, pedestrian crossings, landscaping beautification, enhanced sidewalks, and safety enhancements. Nevada Department of Transportation (NDOT) completed a Road Safety Assessment in 2013 in cooperation with the RTC, City of Las Vegas, Clark County, and other relevant stakeholders. The report analyzed crash data along the Maryland Parkway corridor, identified high incident locations, and made recommendations for improvements that can be implemented to have the greatest positive impact in increasing safety, or decreasing the quantity and severity of crashes (NDOT, 2013). Complete Streets recommendations for multimodal safety in the Maryland Parkway corridor included:

- Move bus stop locations closer to marked and unmarked crosswalks.
- At pedestrian refuge islands, install yellow flexible bollards, and "look before crossing" signs.
- Review the signal timing parameters, splits, and offsets at the signalized intersections.
- Repair sidewalk upheaval and repair tactile strips on ramps.
- Enhance bicycle facilities in corridor.
- Reduction of traffic lane widths to provide more width for pedestrian and bicycle facilities and buffer zones.
- Relocate utilities to below ground to free up sidewalk for pedestrians.

Analysis results and recommendations:

After reviewing the corridor for possible mode gaps, the primary mode that was not currently well supported in the Maryland Parkway corridor was bicycles, generally having no facilities within the core section of the corridor. Based only on existing conditions and if no additional right-of-way is acquired beyond what is currently required for the side-running LRT system, the majority of the corridor can accommodate a 5-foot non-buffered bike lane between the transit track and the curb, a 5-foot elevated cycle track with 1-foot curb, or a widened sidewalk path (8-foot or more) that would accommodate both cyclists and pedestrians.

Sidewalks exist along the entire Maryland Parkway corridor, including the downtown and Medical District; however, they are generally just meeting minimum standards and often have obstructions narrowing the path and are of need of some repairs. Americans with Disabilities Act (ADA) ramps are updated whenever improvements are made that impact pedestrian ramps. The same applies with any intersections not yet having ADA-compliant, pedestrian-activated crossings. Finally, the landscaping varies along the corridor and the entire corridor could be improved with landscaping along the medians to provide a calming effect. Other recommendations include designing narrower (11-foot or 10-foot) traffic lanes that are considered just as safe as 12-foot lanes for posted speeds of 45 mph and adding designated bicycle lanes.

11. Summary.

Based on the analyses described in this section and in Appendix C, the Refined Locally Preferred Alternative for evaluation is defined as an 8.7-mile-long high capacity transit alignment, as depicted in the project corridor map in Figure 1.3-1, extending from the Las Vegas Medical District to the Bonneville Transit Center, through downtown Las Vegas, and along Maryland Parkway to Sunrise Hospital, the Boulevard Mall, UNLV, and Russell Road Station, with the identified 24 station locations. Station and canopy designs will continue to be refined through the design process. The final end-of-line station location and guideway alignment to the airport is pending direction from the Clark County Department of Aviation. RTC will make a decision whether LRT or BRT technology will be used in the Maryland Parkway corridor after the EA public review and comment period.

2.3 Alternatives to be Evaluated During Environmental Assessment

The analysis conducted as part of this EA narrowed the final alternatives for further evaluation to the No Build, Enhanced Bus, BRT Build Alternative, and LRT Build Alternative. A summary of the alternatives evaluated in this EA document is provided below.

2.3.1 No Build Alternative

The No Build Alternative proposes no improvements to the existing local bus services. Under the No Build Alternative, the existing Route 109 local bus service would maintain current service with 15-minute headways (total of 4 buses per hour in each direction), operating in curbside lanes with mixed traffic flow, and with stops spaced every 0.25-mile on average.

2.3.2 Enhanced Bus Alternative

The Enhanced Bus Alternative would attempt to improve service without any major capital improvements. The Enhanced Bus alternative would be a limited stop service with the same 24 stations as those included in the Build Alternative with average spacing of 0.35-mile and the same span of service, but the buses would operate in the existing mixed flow traffic curbside lanes, like the existing Route 109 buses.

The Enhanced Bus Alternative operating plan would be similar to that of the LRT and BRT Build Alternatives, with headways that would be reduced during the weekday peak periods to every 12 minutes. This would increase the level of bus service by 25 percent over the existing condition, from 4 to 5 buses per hour in each direction during peak periods. In addition, the 24 bus stops in the corridor would be enhanced with shelters, benches, and information displays, as appropriate, but with minimal capital expenditure.

2.3.3 Build Alternatives

The Build Alternatives consist of an 8.7-mile-long high capacity transit project that extends from the Las Vegas Medical District through the downtown area and connects with Maryland Parkway to serve numerous residential and employment centers. Key destinations include the UMC, Valley Hospital, UNLV's Charleston Campus, Fremont Street, Sunrise Hospital/Medical Center, the Boulevard Mall, and UNLV's main campus. The proposed project is intended to increase the speed, capacity, and quality of the public transit service along the identified route and to help transform the corridor into a more vibrant, accessible and economically viable community within the Las Vegas Valley. This EA considered available transit technologies and, through a screening process, narrowed the focus to two specific transit modes (LRT and BRT). The alignment, configuration, service plan, and station locations are the same for both technologies, with the only exception being how they serve the airport. While sufficient funding is anticipated to be available for developing either Build Alternative, the potential impacts of both technologies were evaluated in case funding availability constrains either of the options.

2.3.3.1 LRT Build Alternative

Preliminary plans for the LRT Build Alternative are located in Appendix D. LRT service will operate in dedicated lanes through the corridor, primarily curbside-running lanes, with the exception of the segment along Casino Center Boulevard between Carson Avenue and Garces Avenue in downtown Las Vegas, where the LRT vehicles will operate in the existing dedicated center-running lanes currently used by the SDX. Those existing dedicated lanes will be reconstructed to install embedded track for joint LRT/bus operation. All of the curbside-running lanes will be reconstructed to install embedded track for LRT operation. Automobiles and other vehicles will be allowed to use the curbside-running lanes for right-turn movements at major/minor intersections and driveways. New, separate right-turn lanes will be provided at major intersections so that the LRT vehicles are not blocked by queued right-turning vehicles as they wait for pedestrians crossing the side streets.

This EA evaluation for the southern endpoint of the LRT Build Alternative will end at Maryland Parkway and north of Russell Road, north of the airport, at Russell Road Station. The airport is currently revising their airport planning document and are exploring possible connection points for the LRT to the airport terminals or a potential multimodal transportation facility. When the terminus point is determined by the airport, additional environmental evaluations will occur on the selected route and terminus station.

Features of the LRT Build Alternative include:

- LRT service on 12-minute to 15-minute headways with service for 24 hours per day, seven days per week.
- Single, electrically-powered LRT vehicles are expected to provide sufficient capacity, but will have the option to be coupled into 2-car trains if necessary to serve ridership demand in the future. Various vehicle technologies are being considered, including off-wire options with onboard batteries and station charging to reduce or eliminate the overhead wire requirements. Where possible, the overhead contact system will be integrated with street light poles and street trees to minimize the visual impact, as shown in the photos below. A "low profile" overhead contact

system will be used with only 2-feet between the catenary (support) wire and the contact wire, as shown in the photos below.

- While vehicle technologies are being considered to eliminate the need for an overhead contact system, the LRT system will include traction power substations. Based on current technology requirements, the traction power substations will be 1 megawatt up to 2.5 megawatt units installed about 1.25 miles apart, for a likely total of eight units in the corridor. Each traction power substations unit will be designed for the specific system requirements, but generally will not exceed 15-foot by 20-foot or 300 square feet each, as illustrated in the photos below.

- Curbside-running dedicated lanes that allow vehicular right-turns at minor cross street intersections and at driveways to maintain traffic operational flexibility and capacity. The project also includes separate right-turn lanes at major cross street intersections along northbound and southbound Maryland Parkway to ensure that transit vehicles are not delayed by the volume of right-turning vehicles or those queued as they wait for crossing pedestrians, and to otherwise maintain intersection capacity and improve traffic operations.

- There are 24 station locations spaced 0.35-mile apart on average, with split platforms typically placed on the far side of intersections to minimize travel delay. Station design elements may include: pylon/station marker, lighting, bench, trash receptacle, bicycle rack, variable message sign to display real-time arrival information, security cameras, passenger shelter/canopy with wind screen, public art (at select stations), landscaping, map/schedule/advertising illuminated display case (two-sided), pedestrian wayfinding signage, and public-address system.

- TSP with traffic signal coordination to reduce transit delay through minor intersections where possible, with minimal effect on traffic operations.

- Pedestrian and bicycle improvements for access to stations within a 0.25-mile of each of the 24 stations. Pedestrian access improvements may include wider sidewalks, ADA-compliant boarding areas at each station and connecting ADA-accessible pathways within a 0.25-mile radius of all stations. Project elements may include repair or replacement of sidewalk, curb ramps, removal or relocation of sidewalk obstructions, and enhancements of pedestrian crossings with striping, signage, hybrid pedestrian beacons, or traffic signals to improve access to the stations and along the corridor. Bicycle access improvements may include standard or separated bicycle lanes or other facilities such as raised bike tracks where feasible and bicycle parking racks or lockers at identified stations.

- Street improvements as needed, including pavement replacement, repair and/or reinforcing; rebuilding the curb lanes with embedded track; street lighting, utility relocations, new or modified traffic signals and equipment; raised, landscaped median along Maryland Parkway, and separate right-turn lanes at major intersections.

- Construction of a rail vehicle maintenance and storage facility, to be located on RTC-owned 6.2-acre site adjacent to the UPRR mainline tracks just west of the Bonneville Transit Center. If BRT is selected, no additional maintenance facility will be required.

Operating Plan Parameters for LRT

The premium transit service design and operating plan proposed for the Maryland Parkway corridor includes the following assumptions:

- LRT will operate in curbside-running dedicated lanes
- LRT will have TSP at minor intersections
- LRT will have level boarding
- LRT may have off-board fare collection machines and fare enforcement personnel; station dwell times are estimated to be 30 seconds when using off-board fare payments
- LRT will accelerate/decelerate to/from stations at 3.0 miles per hour per second (mphps)
- LRT will operate with one-car vehicles; however, light rail vehicles will have couplers to allow two-car trainsets if needed in the future
- LRT service through the corridor will provide convenient transfer connections with all crossing routes and with all connecting routes at the Bonneville Transit Center

The premium service will operate 24 hours per day, seven days per week with the following headways:

- 13 hours of peak service (12-minute headways) Monday through Saturday (6 am – 7 pm)
- 2 hours of off-peak service (15-minute headways) Monday through Saturday (7 pm – 9 pm)
- 3 hours of shoulder service (20-minute headways) Monday through Saturday (5 am – 6 am & 9 pm – 11 pm)
- 6 hours of late night service (30-minute headways) Monday through Saturday (11 pm – 5 am)
- 12 hours of off-peak service (15-minute headways) Sunday
- 5 hours of shoulder service (20-minute headways) Sunday
- 7 hours of late night service (30-minute headways) Sunday

Operating days will be 200 Monday-Thursdays, 51 Fridays and 57 Saturdays, and 57 Sundays/Holidays.

2.3.3.2 BRT Build Alternative

For the BRT Build Alternative, the alignment, configuration, service plan, and station locations are the same as for LRT. Of course, if the airport plans a potential multimodal facility in the future, the bus routes may be changed to accommodate any future facilities but are outside the scope of this EA evaluation.

There are two RTC maintenance facilities available for use: Sunset Maintenance Facility/Mobility Training Center, which is located approximately 4.5 miles to the southwest of the study area, and Integrated Bus Maintenance facility, which is located approximately 3.75 miles to the northwest of the study area. No new bus maintenance facility will be constructed. The BRT analysis includes two alternatives with respect to fare payments: off-board similar to the LRT Build Alternative, and on-board, similar to RTC's current Route 109 and other BRT corridor operations. Features of the BRT Build Alternative include:

- Curbside-running dedicated lanes that allow vehicular right-turns at minor cross street intersections and at driveways to maintain traffic operational flexibility and capacity. The project also includes separate right-turn lanes at major cross street intersections along northbound and southbound Maryland Parkway to ensure that transit vehicles are not delayed by the volume of right-turning vehicles or those queued as they wait for crossing pedestrians and to otherwise maintain intersection capacity and improve traffic operations.

- There are 24 station locations spaced 0.35-mile apart on average, with split platforms typically placed on the far side of intersections to minimize travel delay. Station design elements may include: pylon/station marker, lighting, bench, trash receptacle, bicycle rack, variable message sign to display real-time arrival information, security cameras, passenger shelter/canopy with wind screen, public art (at select stations), landscaping, map/schedule/advertising illuminated display case (two-sided), pedestrian wayfinding signage, and public-address system.

- TSP with traffic signal coordination to reduce transit delay through minor intersections where possible, with minimal effect on traffic operations.

- Pedestrian and bicycle improvements for access to stations within 0.25-mile of each of the 24 stations. Pedestrian access improvements may include wider sidewalks, ADA-compliant boarding areas at each station and connecting ADA-accessible pathways within a 0.25-mile radius of all stations. Project elements may include repair or replacement of sidewalk, curb ramps, removal or relocation of sidewalk obstructions, and enhancements to pedestrian crossings with striping, signage, hybrid pedestrian beacons, or traffic signals to improve access to the stations and along the corridor. Bicycle access improvements include standard or separated bicycle lanes or other facilities such as raised bike tracks where feasible and bicycle parking racks or lockers at identified stations.

- Street improvements as needed, including pavement replacement, repair and/or reinforcing; rebuilding the curb lanes with reinforced concrete bus pads at BRT stations; street lighting, utility relocations, new or modified traffic signals and equipment; raised, landscaped median along Maryland Parkway, and separate right-turn lanes at major intersections.

Operating Plan Parameters for BRT

The premium transit service design and operating plan proposed for the Maryland Parkway corridor includes the following assumptions:

- BRT will operate in curbside-running dedicated lanes
- BRT will have TSP at minor intersections
- BRT will require wheelchair ramp deployment for mobility-impaired passengers and will require driver assistance in securing wheelchair-bound passengers, assumes 3 minutes per run for BRT
- BRT may include and is evaluated with either off-board or on-board fare payment systems:
  - Station dwell times are estimated to be 30 seconds when using off-board fare payments
  - A dwell time of 40 seconds is estimated with the on-board fare payments
- BRT will accelerate/decelerate to/from stations at 2.0 mphps
- BRT service through the corridor will provide convenient transfer connections with all crossing routes and with all connecting routes at the Bonneville Transit Center

The premium service will operate 24 hours per day, seven days per week with the following headways:

- 13 hours of peak service (12-minute headways) Monday through Saturday (6 am – 7 pm)
- 2 hours of off-peak service (15-minute headways) Monday through Saturday (7 pm – 9 pm)
- 3 hours of shoulder service (20-minute headways) Monday through Saturday (5 am – 6 am & 9 pm – 11 pm)
- 6 hours of late night service (30-minute headways) Monday through Saturday (11 pm – 5 am)
- 12 hours of off-peak service (15-minute headways) Sunday
- 5 hours of shoulder service (20-minute headways) Sunday
- 7 hours of late night service (30-minute headways) Sunday

Operating days will be 200 Monday-Thursdays, 51 Fridays and 57 Saturdays, and 57 Sundays/Holidays.

3.0 ENVIRONMENTAL IMPACTS AND MITIGATION

This section examines the affected environment, potential impacts, and proposed mitigation for the Maryland Parkway corridor. It includes descriptions of existing demographics, the living and working environments of the people within the corridor, and the natural and built environments. Each section of this section addresses specific resources as a different topic of study. The discussion is organized as follows:

Affected Environment: Summarizes the resource condition that exists for the project study area transit-oriented development today (at the time the analysis was conducted) and describes the study area boundaries. Study area definitions vary according to the issues under evaluation.

For topics such as land acquisition and relocations, the study area is the limits of construction for the proposed improvements. For other topics, the study area is larger to ensure that potential effects are captured. For example, for visual effects, the extent of the study area changes along the corridor depending on the nature of the views and locations of those viewsheds. This subsection also addresses the legal and regulatory context (when applicable) and the methods used to make the assessment.

Environmental Consequences: Describes potential direct, indirect, construction-related, and cumulative impacts for the LRT Build Alternative, BRT Build Alternative, Enhanced Bus Alternative, and No Build Alternative, for each resource.

- Direct impacts: Occur immediately with implementation of the proposed action.
- Indirect impacts: Caused by the proposed action are later in time, but are reasonably foreseeable, or impacts farther removed in distance from the alignment. Transit-oriented development surrounding station areas may develop over time, for example.
- Construction impacts: Result from the actual project construction and may include noise, dust, clearing, excavation, visual intrusion, traffic congestion, temporary detours, and access implications.
- Cumulative impacts: Cumulative effects are a result of the incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future actions. While cumulative effects may be minor when viewed as individual direct and indirect effects, they can add to the effects of other actions and eventually lead to substantial changes. It can be difficult to measure and assess cumulative effects because they can be separate from a proposed project in time and location. Cumulative effects can be positive or negative.

Mitigation: Describes proposed mitigation to be implemented to avoid, minimize, or compensate for impacts identified under environmental consequences. This section will also include a summary of best management practices that, when implemented, often eliminate or reduce project impacts.

There are four alternatives that will be evaluated for this EA, including the LRT Build Alternative, BRT Build Alternative, Enhanced Bus Alternative, and the No Build Alternative. The environmental resources that will be evaluated in the EA are listed in Table 3-1. Based on the technical analyses conducted, the proposed Build Alternatives (LRT and BRT) will not have significant effects on the resources in Table 3-1.

Table 3-1
Maryland Parkway Environmental Assessment Evaluation Summary

Resource	Impacts to Resource
Land Use	Minimal impacts with mitigation
Socioeconomics	Minimal impacts with mitigation
Environmental Justice	No impacts with mitigation
Visual Resources	Minimal impacts with mitigation
Cultural Resources	Minimal impacts with mitigation
Water Resources/Water Quality	No impacts with mitigation
Floodplains	No impacts
Soils and Geology	No impacts with mitigation
Hazardous Materials	Minimal impacts with mitigation
Air Quality	No impacts with mitigation
Noise and Vibration	Minimal impacts with mitigation
Safety and Security	Minimal impacts with mitigation
Wetlands/Jurisdictional Waters	No impacts
Biological Resources	No impacts with mitigation
Section 4(f)	Minimal impacts with mitigation
Cumulative Impacts	Minimal impacts with mitigation
Traffic	Minimal impacts with mitigation

3.1 LAND USE

This section describes the current land use and zoning, as well as the local plans and policies relevant to the Maryland Parkway project. The study area for the land use evaluation includes a 0.5-mile buffer extending from the centerline of Maryland Parkway. Refer to the *Maryland Parkway: Land Use and Economic Development Evaluation* (MIG, 2017) in Appendix G for a detailed land use analysis.

Maryland Parkway is a key employment, commercial, residential, transit and educational corridor. Given its length and adjacencies to a diverse set of land uses, Maryland Parkway plays a critical role in both the City of Las Vegas and Clark County municipalities.

3.1.1 Existing Conditions

The study corridor was broken down into seven segments for the land use evaluation (Figure 3.1-1) and includes, from north to south:

- **Medical District:** This segment is within the jurisdiction of the City of Las Vegas and includes a large residential component, retail uses such as the Las Vegas Premium Outlets North Mall, the Smith Center for the Performing Arts, Discovery Children's Museum, Clark County and RTC administrative offices, and a heavy concentration of medical related uses, such as the Lou Ruvo Center for Brain Health, UMC, Valley Hospital Medical Center, and UNLV Shadow Lane Campus, whose expansion will include the university's new medical school.

- **Downtown:** This segment is within the jurisdiction of the City of Las Vegas and includes primarily institutional/community facilities and commercial uses with a heavy concentration of tourism related uses, including the Fremont Street Experience. The area is also seeing an expansion of its residential uses.

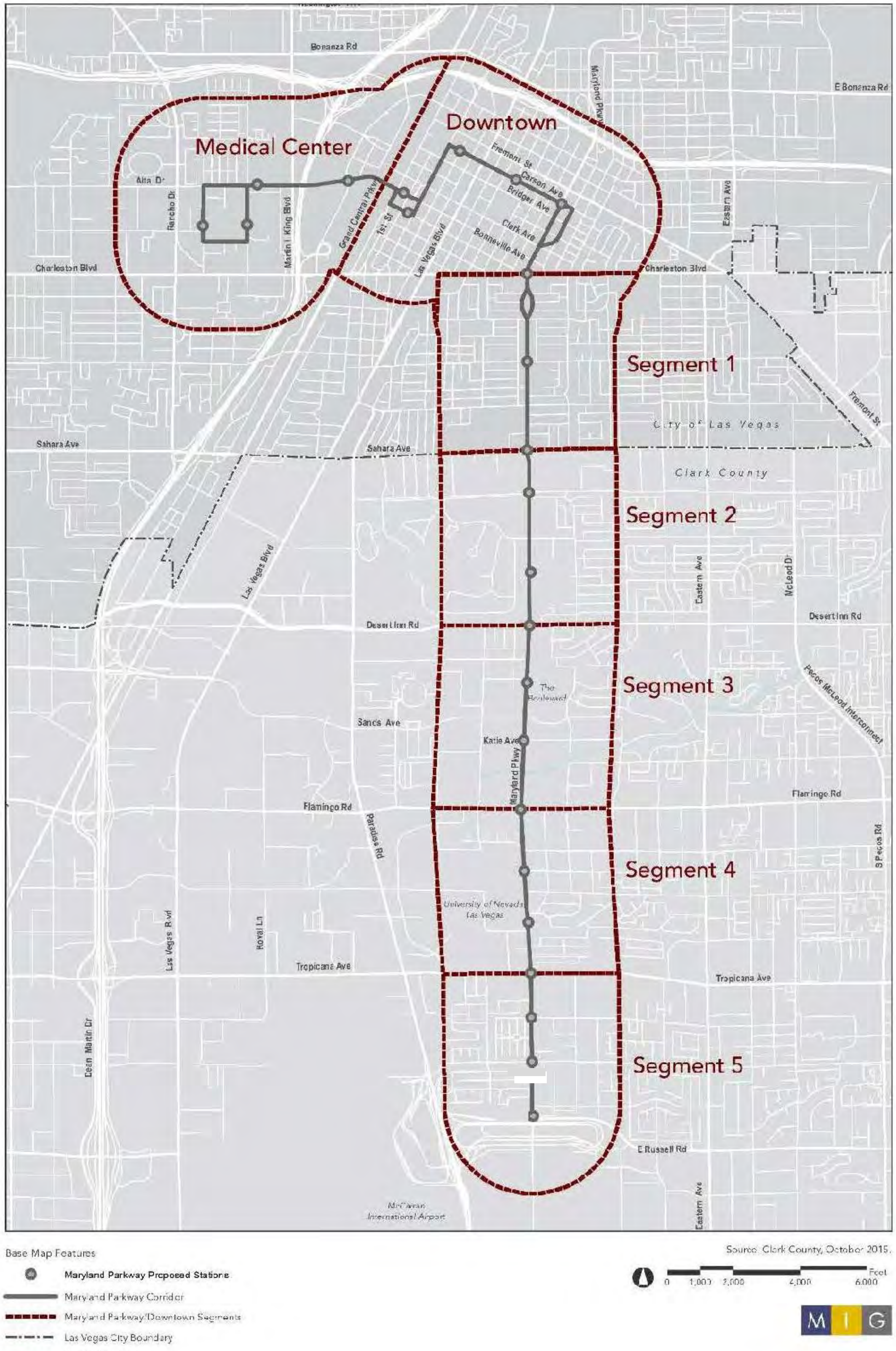
- **Segment 1. Charleston Boulevard to Sahara Avenue:** This segment is within the jurisdiction of the City of Las Vegas and includes primarily residential uses transitioning to commercial uses along the frontage and at the south end.

- **Segment 2. Sahara Avenue to Desert Inn Road:** This segment is within the jurisdiction of Clark County and includes primarily hospital and medical-serving commercial uses, including Sunrise Hospital, as well as residential uses in proximity to the corridor.

- **Segment 3. Desert Inn Road to Flamingo Road:** This segment is within the jurisdiction of Clark County and the frontage primarily comprises more traditional strip commercial development with the largest frontage belonging to the Boulevard Mall, as well as a wide array of business types. There are residential uses and community facilities in proximity to the corridor.

- **Segment 4. Flamingo Road to Tropicana Avenue:** This segment is within the jurisdiction of Clark County and primarily comprises the UNLV and campus-serving uses, as well as a mix of residential and retail uses.

Figure 3.1-1 Maryland Parkway Route Alignment and Study Area Segments



- **Segment 5. Tropicana Avenue to Russell Road:** This segment is within the jurisdiction of Clark County and primarily comprises multi-family residential development, McCarran International Airport, and some commercial uses.

The corridor study area includes a 0.5-mile buffer extending from the centerline of the proposed transit alignment and encompasses over 4,330 acres of commercial, communication/utilities, community facilities, industrial, residential, and undeveloped parcels (Figure 3.1-2). Table 3.1-1 summarized the total acres by segment for each of the land use types. Residential land use has the highest amount of area in the study corridor at 1906 acres, representing 44 percent of the total area. Commercial land use comes in second with 1,231 acres (28 percent) and community facilities, such as municipal buildings, schools, libraries, museums, hospitals, and churches comes in third with 578 acres (13 percent).

Table 3.1-1 Existing Land Use: Maryland Parkway Corridor Study Area

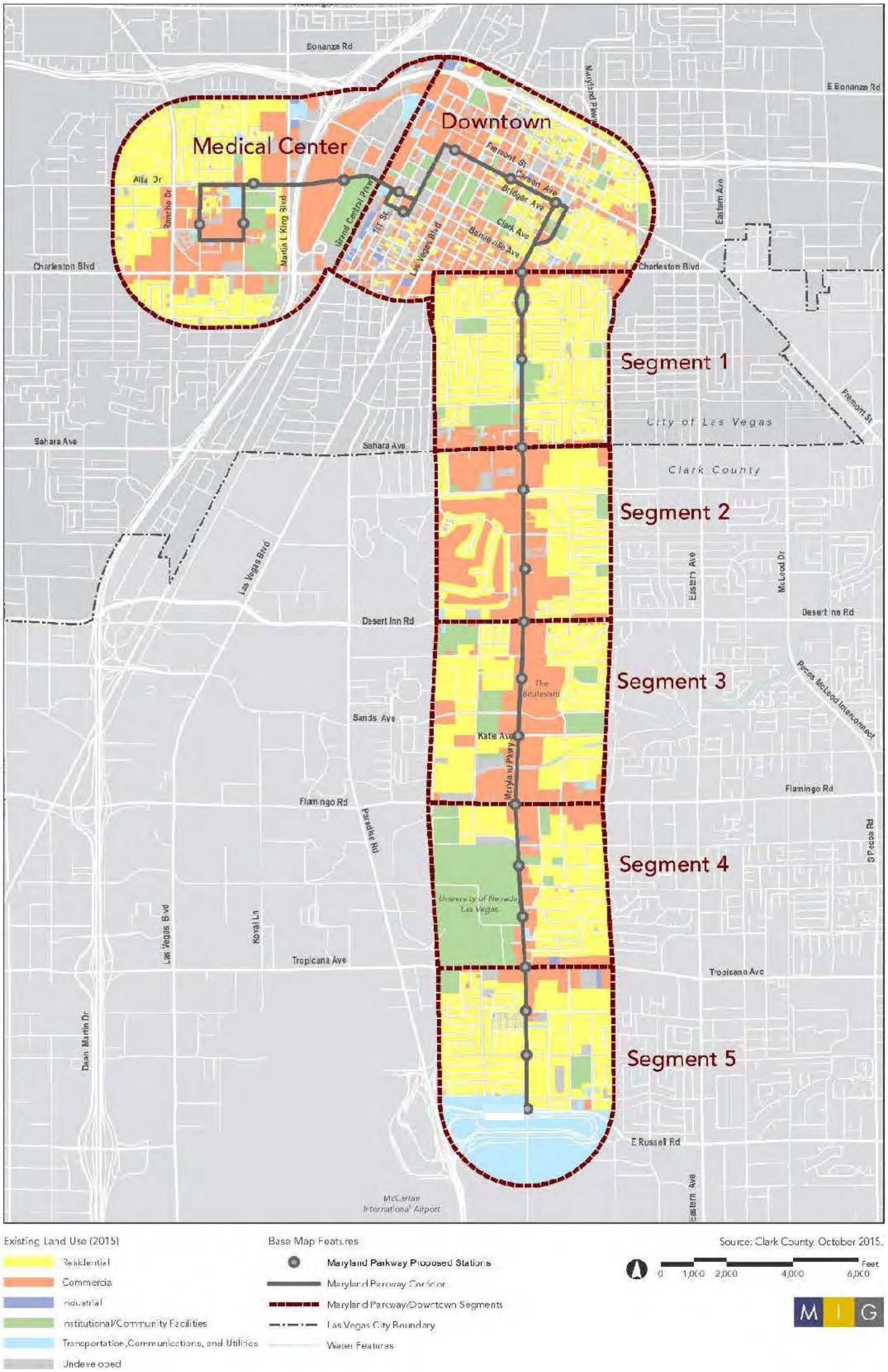
Study Areas	Existing Land Use by Acre						
	Commercial	Comm/Trans/ Utilities	Community Facilities	Industrial	Residential	Undeveloped	Totals Acres
Medical Center	304.35	23.1	92.05	5.27	346.72	118.37	889.86
Downtown	284.77	22.3	76.64	16.44	188.83	88.71	677.69
Segment 1	71.46	8.76	54.83	0	354.77	13.68	503.51
Segment 2	253.34	3.04	12.9	0	247.72	15.96	532.95
Segment 3	202.33	3.01	70.42	0	278.86	14.88	569.5
Segment 4	76.55	1.44	249.39	2.89	190.51	8.066	528.85
Segment 5	38.65	239.65	22.34	2.45	298.99	32.76	634.84
Total Acres	1231.45	301.3	578.57	27.05	1906.4	292.43	4337.2

The City of Las Vegas portion of the study area (Medical District, Downtown, and Segment 1) is characterized mainly by residential land uses with densities ranging from apartments and high-density housing to single-family residences followed by commercial and professional offices and civic land uses. Many old (pre-1960's) single-family homes have been converted to offices and small businesses along Maryland Parkway, especially in the Huntridge neighborhood, south of Charleston Boulevard. The Clark County portion of the study area is characterized by suburban-type development with auto-oriented arterial uses including strip malls, gas stations, and surface parking lots in addition to public facilities. The southern portion of the Corridor also has an abundance of single-family, high density, and multi-family residential units.

3.1.1.1 Land Use Plans and Policies

Below is an evaluation of the plans and policies currently in place that will help to increase transit corridor and station area development and improve pedestrian facilities.

Figure 3.1-2 Maryland Parkway Land Use Segments



Clark County Comprehensive Master Plan

The *Clark County Comprehensive Master Plan* (Clark County Department of Comprehensive Planning, 2015) is a long-term, general policy plan for the physical development of unincorporated Clark County. The Growth Management policies of the Land Use Element are especially important to the future of the Maryland Parkway study area. They include:

- Transit-Oriented Development: Encouraging transit-oriented development through moderate to higher density development along existing or planned regional transit systems, mixed uses within proximity to transit systems and other developments, and the centralized development of retail facilities, parks, day care, and civic services.
- Neo-Traditional Design: Encouraging compact urban forms along transit corridors or town centers.
- Infill: Encouraging the intensification of infill sites to be balanced with a strong sensitivity to protecting existing neighborhoods, encouraging pedestrian use, compact development, and the reduction of air pollution.
- Mixed-use: Encouraging mixed-use development that locates complementary land uses such as housing, retail, offices, services, and public facilities within walking distance of each other.

Southern Nevada Strong Regional Plan

The *Southern Nevada Strong Regional Plan* (Southern Nevada Strong, 2015) purpose is to develop regional support for long-term economic success, establishing stronger communities in South Nevada. The plan's main themes are improving economic competitiveness and education, increasing transportation choice, and investing in complete communities. The process took three years with extensive public outreach and constructed a shared vision and Regional Plan. Goals and policy strategies were recommended to enhance Southern Nevada's capability of implementing the Regional Plan.

The *Southern Nevada Strong Regional Plan* recognizes Maryland Parkway and the Las Vegas Medical District as two of four Opportunity Sites expecting economic growth and mixed-use diversification, as well as higher transit ridership. Additionally, one of the Plan's policy strategies is to continue evaluating Maryland Parkway as a BRT or rail corridor considering its geographical position as a candidate for future transit enhancements.

Las Vegas Downtown Master Plan

The City of Las Vegas recently updated their current *Vision 2045 Downtown Las Vegas Master Plan* (City of Las Vegas, 2016). It is a comprehensive planning process with emphasis on land use and community development. Major areas of the plan include:

- A transportation study looking at the connection between land use and mobility with an emphasis on supporting development in concert with a multimodal network;
- Focusing on building higher density urban areas that meet the everyday needs of Las Vegas residents and visitors; and
- Creation of distinct districts that are well-linked and accessible.

The *Vision 2045 Downtown Las Vegas Master Plan* (City of Las Vegas, 2016) was adopted in August 2016. Per the updated plan, downtown is confronted with a series of challenges including high land cost, lack of affordability, too little local-serving retail and services, too few parks and open spaces, overabundance of vacant and underutilized land, and auto-oriented mobility pattern. LRT and BRT transit is an integral part of the Master Plan to connect downtown with the Strip, UNLV, and the airport.

The *Vision 2045 Downtown Las Vegas Master Plan* identifies ten mixed-use hubs along LRT/BRT corridors aiming to promote a compact, mixed-use development pattern. Four of the hubs occur adjacent to the proposed Maryland Parkway High Capacity Transit Project, including the Medical District hub that will accommodate the UNLV Medical Campus along with making the district the center of clinical care, research, wellness, education, and training; the downtown Civic and Business hub adjacent to the Bonneville Transit Center and City Hall with planned hotels, courthouse complex, tech offices, mixed use residential and retail, community sports park, and an LRT maintenance and operations yard; the Fremont East District hub near Carson Avenue and Maryland Parkway that will focus on affordable housing with retail and service amenities, community centers, continuing education, temporary housing, senior center, and senior housing; and the Founders District hub around Maryland Parkway and Charleston Boulevard with mixed residential and commercial/retail development and the Huntridge Theater renovation project. LRT and BRT transit is an integral part of the Master Plan to connect downtown with the other hubs, as well as the Strip, UNLV, and the airport.

RTC Regional Transportation Plan 2017-2040

The RTC's *Regional Transportation Plan for Southern Nevada 2017-2040* (RTC, 2017) is a comprehensive and long-range plan for transportation systems in the Las Vegas metro area and promotes multimodal transportation options. The Regional Transportation Plan is also the guiding document for making the best use of federal transportation funds. Per the *Regional Transportation Plan*, Southern Nevada population in households will grow from 2.1 million in 2015 to 2.8 million by 2040, an increase of 700,000 residents (34 percent population growth over the next 25 years). To address the growing population, RTC is looking to improve transit options to provide attractive alternatives to the automobile, make transit systems faster and more reliable, and to improve the experience of customers riding transit. The RTC Plan lists Maryland Parkway from Russell Road to Charleston Boulevard as an unfunded regional strategic investment to implement improved transit. RTC has established four primary strategies: improve safety, manage congestion, enhance multimodal connectivity, and maintain current infrastructure.

Maryland Parkway Alternatives Analysis

The RTC completed an Alternatives Analysis (Atkins, 2014) for Maryland Parkway in December 2014 which analyzed the need for premium transit service and developed an initial Locally Preferred Alternative that included the following components:

- Alignment: Downtown to McCarran International Airport; approximately 7 miles;
- Station spacing: 0.33-mile on average;
- Guideway: center-running configuration in the Maryland Parkway "core corridor" from Charleston Boulevard to Russell Road;
- Technology: BRT or rail (modern streetcar or LRT transit);
- Travel lanes: 4 general purpose lanes plus bike lanes in the core corridor; and
- Add right and left-turn lanes at intersections as needed in the core corridor to preserve capacity.

University of Nevada Las Vegas Campus Master Plan

UNLV is actively pursuing a public-private partnership to create a revitalized university district along Maryland Parkway that will serve as a gateway to the campus. The UNLV Master Plan (2012) recommended perimeter improvements to improve access to the campus, to unify the university's urban identity, and to integrate the campus with the surrounding community. The plan specifically identifies a need to develop an inviting signature entrance to the campus where Harmon Avenue meets Maryland Parkway, which includes the demolition of Frazier Hall, and describes the development of a multi-modal transit center in cooperation with the RTC. The UNLV Transit Center was subsequently developed by RTC on University Road, just west of Maryland Parkway. UNLV updated their Master Plan in 2015 (SmithGroup JJR, 2015). The area's current residential population is bolstered by the 30,000 students who attend UNLV, many of whom commute to campus. UNLV is currently building new student and faculty housing on the north side of campus along Maryland Parkway.

South of Sahara Avenue District Standards and Guidelines

The South of Sahara Avenue Standards and Guidelines (RBF Consulting Urban Design Studio, 2008) were developed for Clark County and apply to the western edge of Maryland Parkway corridor, between Sahara Avenue and Karen Avenue. The vision for this district includes a pedestrian-oriented urban neighborhood that has a mixture of compatible residential and commercial uses, a vibrant nightlife, and attractive and inviting central gathering spaces. Major elements that impact the Maryland Parkway study area corridor include:

- Reducing block lengths and adding additional streets to connect with Maryland Parkway between Sahara and Karen avenues;

- Improving the western sidewalk of Maryland Parkway with a landscape strip, street trees, streetscape furniture, and a new sidewalk; and
- Locating residential flats and commercial block buildings along the majority of the planned area's frontage on Maryland Parkway.

3.1.1.2 Zoning

The Maryland Parkway study area (Figure 3.1-1) falls in two jurisdictions: The City of Las Vegas (Medical District, Downtown, and Segment 1) and Clark County (Segments 2-5). The City of Las Vegas portion of Maryland Parkway corridor accounts for roughly 2,058 acres. The Clark County portion of Maryland Parkway corridor accounts for roughly 2,643 acres.

Development within the Maryland Parkway study area corridor is regulated by the zoning requirements of the City of Las Vegas and Clark County. Tables 3.1-2 and 3.1-3 show existing zoning categories in City of Las Vegas and Clark County, respectively. As is evident in the existing land use pattern, zoning within the study area is predominantly residential and commercial. The noticeable exception is the large amount of land designated for public facilities near UNLV and McCarran International Airport. In addition, the Medical District segment of the study area is designated as Planned Development. Planned Development Districts are created to permit and encourage comprehensive planned development with the purpose of redevelopment, economic development, cultural enrichment, or to provide a multi-use planned development. The Las Vegas Medical District has created its own master plan to provide for future and continued development in an area of interrelated and cohesive mix of uses, including medically-related services.

The Development Codes for both Clark County (Title 30) and the City of Las Vegas (Title 19) provide ratios for required off-street and on-site parking based on use. The development code also allows for alternative parking arrangements if specific conditions exist including: common ownership of properties, shared parking, and proximity to off-street parking area. The Clark County Maryland Parkway Design Overlay District encourages incentives for transit-oriented development in the future, including development located within walking distance along the nearest pedestrian access to a planned RTC transit stop may be eligible for a density bonus of up to 20 percent and to reduce number of parking spaces required by code.

Clark County and RTC conducted parking studies in 2015 to examine the parking supply and demand within the County (Jacobs Engineering Group, 2015). Excessive parking supply is a barrier to smart-growth and sustainable development; and, therefore, in conflict with the policies in the *Clark County Comprehensive Master Plan* and the *Regional Transportation Plan*. The parking study looked at 24 sites around the county, including large, medium, and small shopping centers, industrial/commercial properties, strip resort hotels, and places of worship. Along the Maryland Parkway study area, three sites were selected for parking studies, including a medium shopping center (70,000 square feet gross floor

Table 3.1-2 Existing Zoning for the City of Las Vegas in the Maryland Parkway Corridor

City of Las Vegas Existing Zoning	**Study Area (acres of zoning use)**			
	Medical Center (acres)	Downtown (acres)	Segment 1 (acres)	**Totals Acres**
Civic	45.52	64.86	49.76	**160.14**
Commercial/ Industrial	0.0	24.19	0.0	**24.19**
Designed Commercial	14.03	0.0	1.46	**15.49**
General Commercial	3.67	292.77	9.11	**305.55**
Limited Commercial	78.16	44.07	59.45	**181.68**
Industrial	37.04	36.65	0.0	**73.69**
Office	7.15	0.0	0.37	**7.52**
Professional Office	20.69	30.31	13.48	**64.48**
Planned Development	346.58	0.0	0.0	**346.58**
Residential Planned Development	43.19	8.09	4.27	**55.55**
Neighborhood Service	0.0	0.0	0.18	**0.18**
Apartment	0.79	4.44	0.0	**5.23**
High Density Residential	0.17	53.56	0.69	**54.42**
Medium Density Residential	0.0	35.11	0.0	**35.11**
Medium Low Density Residential	0.0	13.44	28.79	**42.23**
Single Family Residential	140.12	62.88	336.02	**539.02**
Residential Estates	59.5	0.0	0.0	**59.5**
Ranch Acres	87.23	0.0	0.0	**87.23**
Total Acres	**883.84**	**670.37**	**503.58**	**2057.79**

Table 3.1-3 Existing Zoning for Clark County in the Maryland Parkway Corridor

Clark County Existing Zoning	Study Area (acres of zoning use) Segment 2 (acres)	Segment 3 (acres)	Segment 4 (acres)	Segment 5 (acres)	Totals Acres
Local Business	14.4	12.56	33.98	11.82	**72.76**
General Commercial	144.22	215.6	65.61	44.14	**469.57**
Office and Professional	1.53	2.88	1.17	3.82	**9.4**
Commercial Residential Transitional	0.0	0.8	0.0	0.0	**0.8**
Limited Resort and Apartment	43.58	97.94	0.13	0.0	**141.65**
Multi Layer Zone	3.54	0.02	0.083	0.0	**4.39**
Public Facility	10.01	55.1	257.42	259.62	**582.15**
Single Family Residential	269.63	127.19	18.61	175.05	**590.48**
Medium Density Residential	18.63	0.0	2.29	12.52	**33.44**
Multiple Family Residential	39.36	2.33	65.35	91.75	**198.79**
High Density Multiple Family Residential	74.92	64.66	103.42	84.77	**327.77**
Apartment	15.24	91.33	28.06	9.93	**144.56**
Rural Estates	0.0	0.0	25.72	40.46	**66.18**
Urban Village	0.0	1.47	0.0	0.0	**1.47**
Total Acres	**635.06**	**671.88**	**602.59**	**733.88**	**2643.41**

area) at the southwest corner of Tropicana Avenue and Maryland Parkway with a grocery store, several smaller retail stores, and a fast-food restaurant; a second medium shopping site (200,000 square feet gross floor area) at the northeast corner of Flamingo Road and Maryland Parkway with a grocery store, a drug store, a medium size department store, a gas station, and several smaller retail stores and restaurants; and a place of worship that is located east of Maryland Parkway on E. Flamingo Road and S. Eastern Avenue.

For the first medium shopping center at the corner of Tropicana Road and Maryland Parkway, there was a total of 339 parking spaces with an average parking occupancy of 38 percent on a normal weekday. For the second medium shopping center at Flamingo Road and Maryland Parkway, there was a total of 905 parking spaces and had an average parking occupancy of 29 percent during a normal weekday in January and 40 percent during a holiday peak weekend in December. For the place of worship near Maryland

Parkway and Flamingo Road, there were 343 parking spaces and an 87 percent parking occupancy during typical service days.

The County parking study determined that minimum parking requirements in the Clark County Code provides more parking than necessary in most instances. Parking is land-intensive and minimum parking requirements that do not recognize different urban development types like transit-oriented and neo-traditional design, as outlined in the County's *Comprehensive Master Plan* create a barrier to smart growth. Large surface parking lots are not pedestrian or transit friendly. They reduce connectivity and the feeling of "community." These surface lots are generally unattractive and utilitarian due to the high cost associated with constructing and maintaining parking. They also generally lack pedestrian connections between adjacent uses, transit facilities, and the sidewalk, further discouraging the use of other modes of transportation. The space and money devoted to unnecessary parking could be better used to accommodate additional homes, businesses, or recreational opportunities (Jacobs Engineering Group, 2015).

3.1.1.3 Parks and Recreation

Parklands are important community resources that need to be protected. Because of their importance to community vitality, the impacts to publicly-owned parks, recreation areas, trails, and wildlife refuges, and public or private historical sites resulting from federally-funded transportation projects are regulated through Section 4(f) of the U.S. Department of Transportation (DOT) Act of 1966, and associated amendments. See Section 3.15 for the Section 4(f) evaluation on parks in the project corridor.

There are two publicly-owned parks and no recreational areas (ball fields, trails, golf courses, etc.) located adjacent to the project corridor. The Huntridge Circle Park, located on Maryland Parkway just south of Charleston Boulevard, is owned by the City of Las Vegas. The Siegfried and Roy Park, near the McCarran International Airport, opened in March 2016 and is owned by Clark County. Neither park will be directly impacted by the high capacity transit project.

3.1.2 Impacts

Significant impact could occur when a project creates impacts that are incompatible with existing and/or future planned uses in a study area. For example, significant impacts to land use could occur if the project requires incompatible or non-conforming changes to zoning and land use classifications, requires significant property acquisitions, or creates a loss of access for businesses and residents. Potential impacts for each alternative are discussed below.

3.1.2.1 Build Alternatives

The Build Alternatives are consistent with community development and land use plans including:

- The Maryland Parkway corridor benefits from a strategic location near the center of the valley's urbanized area connecting the Las Vegas Medical District, downtown, UNLV, the Boulevard Mall, Sunrise Hospital, and the McCarran International Airport that could be leveraged to help meet demand for housing and supporting commercial services near these major destinations. It is also in proximity to the resort corridor in the downtown area.

- Existing land uses along the Maryland Parkway corridor range from single-family to high density residential, from commercial to industrial, and from community facilities to undeveloped open space. This mix of land uses in the corridor fully support the need for transit-oriented modes of transportation.
- There is momentum to transform the corridor due to ongoing transit planning, and investments in proximity to the UNLV Transit Center, the Boulevard Mall, Sunrise Hospital, Flamingo corridor improvements, and downtown improvements.
- The corridor's diverse mix of uses increase the potential to establish a truly walkable area for pedestrians and planned improvements for transit make the area easily accessible from other areas within the region.
- Limited right-of-way and high transportation demand will force compromise in roadway design (*i.e.*, Maryland Parkway cannot be all things to all travelers). The corridor stakeholders, including the Maryland Parkway Coalition, developed a vision for the corridor with higher land use densification and identity as a "place" rather than just a thoroughfare, with significant improvements in transit, pedestrian, and bicycle facilities to reduce the reliance on automobile travel.
- Some existing development regulations, such as the Maryland Parkway Design Overlay District, are generous and offer flexibility for future growth potential.
- Some commercially zoned areas have conservative height limits of 35 to 50 feet, which make additional intensification, mixing of uses, and structured parking difficult. Intensification means the development of a property at a higher density than currently exists. This is especially the case in Segment 4, which has the most amount of height-restrictive zoning (Local Business District, C-1, 35-foot height restriction).
- There is no construction equipment (*e.g.*, cranes) height restriction in the project area, except near the airport.
- Design and development guidelines encourage development that is consistent and compatible with adjacent residential uses and encourage compact, transit-oriented development. As an example, commercial zoning requires a height setback ratio when commercial uses are adjacent to residential zoning districts. The proposed Maryland Parkway Design Overlay District allows for zero setbacks, except for properties that are adjacent to single-family residential properties. Developments within walking distance of transit stops and that allow wider pedestrian areas may be eligible for density increase bonuses.

- There is extensive development capacity based on existing residential density requirements and allowances and non-residential zoning regulations.
- While the corridor has a wide variety of activity generating uses and several anchors (Las Vegas Medical District, downtown, the airport, UNLV, the Boulevard Mall, and Sunrise Hospital), there are very few concentrated nodes of activity today except for downtown and UNLV. *Southern Nevada Strong Regional Plan* advocates for strategic station locations near major activity centers that will spur development and redevelopment around those major nodes of activity, which will eventually infill development along the entire corridor to maximize connectivity of the major nodes.

Proposed improvements associated with both Build Alternatives are the same and generally within public right-of-way. Based on preliminary design of the Build Alternatives some additional right-of-way is needed. Table 3.1-4 lists 87 properties along the proposed alignment that may be affected by requirements for additional right-of-way (2.7 acres) and property acquisition for station construction, sidewalk enhancements, intersection improvements, and in the case of the LRT Build Alternative, traction power substations. Two residential properties would be displaced (0.16 acre). Property acquisition would result in a direct impact for either of the Build Alternatives. No publicly-owned parks will be directly impacted by either of the Build Alternatives.

The location of the LRT tracks, new stations, roadway improvements, and acquisition of additional right-of-way would result in the loss of a total 496 parking spaces (including 170 on-street parking spaces owned by the City of Las Vegas) for residential, commercial, institutional, and public properties for the LRT Build Alternative. Based on an analysis of number of total parking spaces within the affected parcels (over 8,000), loss of 496 spaces would result in a 6 percent reduction and would be considered a minimal direct impact. The Development Codes for both Clark County (Title 30) and the City of Las Vegas (Title 19) provide ratios for required off-street (on-site) parking based on use. The proposed Clark County Overlay District would allow a reduction in the number of parking spaces required for a non-residential property and/or for alternative parking arrangements if specific conditions exist including, common ownership of properties, shared parking, and proximity to an off-street parking area. In addition, RTC's parking studies indicated that excess parking exists for medium-sized commercial/retail sites along Maryland Parkway. Given that high-capacity transit service is planned along Maryland Parkway in the future, there is a rationale for a reduction in parking requirements for residential, commercial, and institutional uses.

Table 3.1-4 Potential Property Acquisition for the Build Alternatives

Type	Property Size (acres)	Percentage of Possible Property to be Acquired	Full or Partial Acquisition	Number of Removed Parking Spaces	Percentage of Possible Parking Spaces to be Removed	Property Needed For
Maryland Parkway Segment						
Multi-Family Residential	0.64	1.4%	Partial	0	0%	Extend ROW for station
Business	4.42	0.1%	Partial	0	0%	Extend ROW for turnlane, curb, and sidewalk
Business	0.22	2.1%	Partial	0	0%	Extend ROW for turnlane, curb, and sidewalk
Business	1.23	0.3%	Partial	0	0%	Extend ROW for turnlane, curb, and sidewalk
Business	0.83	4.6%	Partial	0	0%	Extend ROW for turnlane, curb, and sidewalk
Business	0.47	3.2%	Partial	0	0%	Extend ROW for station and sidewalk
Business	0.93	2.3%	Partial	0	0%	Extend ROW for turnlane, curb, and sidewalk
Business	0.5	3.9%	Partial	0	0%	Extend ROW for station
Business	0.59	1.2%	Partial	4	19%	Extend ROW for turnlane
Business	0.47	0.4%	Partial	0	0%	Extend ROW for turnlane
Business	0.73	1.7%	Partial	0	0%	Extend ROW for station
Business	1.004	0.9%	Partial	0	0%	Extend ROW for station
Public Facility	138.07	0.03%	Partial	0	0%	Extend ROW for turnlane, curbcut, and power transformer substation
Public Facility	72.07	0.04%	Partial	3	0.03%	Extend ROW for curbcuts, driveway, and power transformer station
Institutional	4.01	0.2%	Partial	0	0%	Extend ROW for station
Business	2.3	0.6%	Partial	0	0%	Extend ROW for station
Business	0.48	2.3%	Partial	4	100%	Extend ROW for turnlane, parking for building is currently on adjacent property parcel
Business	2.21	0.8%	Partial	0	0%	Extend ROW for turnlane
Business	0.58	7.1%	Partial	6	35%	Extend ROW for turnlane, parking for building is currently on adjacent property parcel
Business	7.25	0.03%	Partial	0	0%	Extend ROW for bike lane and sidewalk
Business	1.28	1.8%	Partial	0	0%	Extend ROW for station
Business	1.77	1.8%	Partial	0	0%	Extend ROW for turnlane
Business	0.28	1.6%	Partial	0	0%	Extend ROW for sidewalk
Business	0.79	1.8%	Partial	0	0%	Extend ROW for station
Business	43.1	0.2%	Partial	0	0%	Extend ROW for station, sidewalk, bike lane, and power transformer substation
Business	0.51	6.5%	Partial	0	0%	Extend ROW for turnlane. Move 6 affected parking spots to the west by 8 feet and restripe

Table 3.1-4 Potential Property Acquisition for the Build Alternatives (continued)

Type	Property Size (acres)	Percentage of Possible Property to be Acquired	Full or Partial Acquisition	Number of Removed Parking Spaces	Percentage of Possible Parking Spaces to be Removed	Property Needed For
Business	1	2.5%	Partial	17	49%	Extend ROW for bus stop, optional vacant land south of building for additional parking
Business	0.51	2.4%	Partial	10	27%	Extend ROW for station, offset parking mitigation available
Business	17.34	0.4%	Partial	4	0.01%	Extend ROW for turnlanes, bike lane, and sidewalk
Business	0.75	6.1%	Partial	23	44%	Extend ROW for turnlane, bus stop on Desert Inn Rd, adequate existing parking on adjacent parcel
Business	1.25	1.6%	Partial	6	12%	New drive lane, expand bus stop sidewalk, adequate parking on property
Business	0.52	3.9%	Partial	3	+10%	Extend ROW for station, entrance moved so gain 3 parking spaces on property
Business	0.54	9.1%	Partial	10	34%	Extend ROW for turnlane, parking for building is already on adjacent parcel
Business	0.48	1.6%	Partial	8	31%	Extend ROW for station, shopping mall parking lot on parcel, adequate parking available
Institutional	5.18	0.4%	Partial	0	0%	Extend ROW for turnlane
Institutional	4.26	0.3%	Partial	0	0%	Extend ROW for station
Institutional	11.69	0.04%	Partial	0	0%	Extend ROW for sidewalk
Institutional	5.44	0.1%	Partial	0	0%	Extend ROW for curbcut
Business	1.35	0.9%	Partial	0	0%	Extend ROW for station
Business	1.23	1.0%	Partial	0	0%	Extend ROW for turnlane
Business	0.71	4.5%	Partial	9	24%	Extend ROW for turnlane, adequate existing parking available on adjacent parcel
Business	0.38	1.8%	Partial	0	0%	Extend ROW for station
Business	3.68	0.4%	Partial	12	6%	Extend ROW for station
Civic District	8.17	0.1%	Partial	0	0%	Extend ROW for power transformer substation
Parking Lot	2.29	0.7%	Partial	13	4%	Extend ROW for station
Business	0.45	4.2%	Partial	7	44%	Extend ROW for turnlane - adequate parking available on adjacent parcel
Business	1.97	2.0%	Partial	12	12%	Extend ROW for turnlane
Business	0.18	1.3%	Partial	0	0%	Extend ROW for rail tracks and sidewalk around corner
Public ROW	-	-	-	8	-	Street parking to be removed, between E Carson Ave and E Bridger Ave, adequate adjacent parking lots available
Public ROW	-	-	-	99	50%	Parking on one side of the street will be removed for tracks, on Maryland Pkwy and S. 13 St between Clark Ave and Carson Ave, on Bridger St between Maryland Pkwy and S. 13th St, and Carson Ave between Maryland Pkwy and S. 13th St.

Table 3.1-4 Potential Property Acquisition for the Build Alternatives (continued)

Type	Property Size (acres)	Percentage of Possible Property to be Acquired	Full or Partial Acquisition	Number of Removed Parking Spaces	Percentage of Possible Parking Spaces to be Removed	Property Needed For
Downtown District Segment						
Business	0.18	1.3%	Partial	0	0%	Sidewalk expansion for track to make turn on to Maryland Pkwy
Public ROW	-	-	-	43	100%	Street parking to be removed for track on Carson, both sides of the street, from S. 10th St to Maryland Pkwy, adequate parking available
Public ROW	-	-	-	56	100%	Street parking to be removed on either side of Carson from S. 6th St to Las Vegas Blvd, adequate parking available.
Public ROW	-	-	-	8	100%	Street parking to be removed on either side of Carson from Casino Center Blvd to Las Vegas Blvd, adequate parking available.
Public ROW	0.05	100%	Easement	0	0%	New station location and widen sidewalk
Public ROW	-	-	-	10	63%	Remove street parking on one side of street.
Public ROW	0.03	-	Easement	0	0%	Widen sidewalk with 5' shade trees
Vacant Lot	0.08	51.7%	Partial	0	0%	Extend ROW for sidewalk adjacent to new track
Business	0.6	32.0%	Partial	19	73%	RTC in negotiation with business for land swap for additional parking. Parking loss will be mitigated
Vacant Lot	6.49	-	-	0	0%	RTC owns two parcels for future maintenance facility
Public Facility	38.8	0.2%	Partial	0	0%	Extend ROW for station and sidewalk
Public ROW	0.02	100%	Easement	0	0%	Extend ROW for new bus stop and sidewalk
Commercial	38.94	0.03%	Partial	0	0%	Extend ROW for new bus stop and sidewalk
Commercial	8.61	1.4%	Partial	0	0%	Extend ROW for station and sidewalk
Commercial	7.21	2.7%	Partial	0	0%	Extend ROW for sidewalk adjacent to new track
Las Vegas Medical District Segment						
State	0.51	4.5%	Partial	0	0%	Extend ROW for sidewalk and right turn lane
Parking Lot	0.87	3.0%	Partial	0	0%	Extend ROW for sidewalk adjacent to new track
Public ROW	0.7	3.4%	Easement	0	0%	Extend ROW for sidewalk adjacent to new track
Business	0.93	1.5%	Partial	0	0%	Extend ROW for sidewalk adjacent to new track
Business	2.0	1.5%	Partial	17	16%	Extend ROW for sidewalk adjacent to new track, adequate parking available
Public Facility	13.75	0.2%	Partial	0	0%	Extend ROW for sidewalk and right turn lane
Public Facility	1.61	4.0%	Partial	0	0%	Extend ROW for sidewalk
Multi-Family Residential	15.37	0.3%	Partial	0	0%	Extend ROW for station and sidewalk

Table 3.1-4 Potential Property Acquisition for the Build Alternatives (continued)

Type	Property Size (acres)	Percentage of Possible Property to be Acquired	Full or Partial Acquisition	Number of Removed Parking Spaces	Percentage of Possible Parking Spaces to be Removed	Property Needed For
Residential	0.15	100%	Full	7	100%	Extend ROW for sidewalk, full property acquisition needed for track curve
Business	0.45	2.6%	Partial	0	0%	Extend ROW for sidewalk
Business	0.45	2.6%	Partial	9	19%	Extend ROW for sidewalk, adequate parking available
Business	0.5	1.8%	Partial	3	5%	Extend ROW for sidewalk, adequate parking available
Business	0.5	1.1%	Partial	0	0%	Extend ROW for sidewalk on opposite side of track
Parking Lot	1.0	1.1%	Partial	0	0%	Extend ROW for sidewalk on opposite side of track
Public Facility	9.14	0.4%	Partial	0	0%	Extend ROW for sidewalk adjacent to new track
Public ROW	0.18	10.2%	Easement	0	0%	Extend ROW for sidewalk adjacent to new track
Public ROW	0.18	6.4%	Easement	0	0%	Extend ROW for sidewalk adjacent to new track
Public ROW	0.024	100%	Easement	0	0%	Extend ROW for sidewalk adjacent to new track
Residential	0.05	100%	Full	0	0%	New ROW for sidewalk adjacent to new track, full property acquisition needed
Public ROW	0.15	3.8%	Easement	0	0%	Extend ROW for sidewalk adjacent to new track
Public ROW	0.09	10.2%	Easement	0	0%	Extend ROW for sidewalk adjacent to new track
Residential	0.09	2.6%	Partial	0	0%	Extend ROW for sidewalk
Commercial	0.22	3.9%	Partial	0	0%	Extend ROW for sidewalk on opposite side of track
Commercial	0.22	2.1%	Partial	0	0%	Extend ROW for sidewalk on opposite side of track
Commercial	0.31	1.5%	Partial	0	0%	Extend ROW for sidewalk on opposite side of track
Residential	0.39	1.5%	Partial	0	0%	Extend ROW for sidewalk on opposite side of track
Public ROW	-	-	-	13	48%	Remove street parking on west side of street for track
Residential	0.23	2.5%	Partial	0	0%	Extend ROW for sidewalk on opposite side of track
Residential	0.23	2.5%	Partial	0	0%	Extend ROW for sidewalk on opposite side of track
Commercial	0.69	1.0%	Partial	0	0%	Extend ROW for sidewalk on opposite side of track
Commercial	1.58	0.5%	Partial	0	0%	Extend ROW for station and sidewalk
Parking Lot	0.28	1.6%	Partial	0	0%	Extend ROW for sidewalk adjacent to new track
Public ROW	-	-	-	16	38%	Remove street parking on west side of street for track
Public ROW	-	-	-	24	44%	Remove street parking on south side of street for track
Public Facility	15.55	0.6%	Partial	16	6%	Extend ROW for bus stop and sidewalk, adequate parking available
Commercial	1.29	0.2%	Partial	0	0%	Extend sidewalk around street corner

Table 3.1-4 Potential Property Acquisition for the Build Alternatives (continued)

Type	Property Size (acres)	Percentage of Possible Property to be Acquired	Full or Partial Acquisition	Number of Removed Parking Spaces	Percentage of Possible Parking Spaces to be Removed	Property Needed For
Commercial	0.47	1.8%	Partial	0	0%	Extend ROW for sidewalk on opposite side of track
Institutional	18.68	0.3%	Partial	0	0%	Extend ROW for sidewalk on opposite side of track
Vacant Lot	0.86	17.1%	Partial	0	0%	Realign street and add sidewalks east of Shadow Ln. Intersection by others.
Commercial	0.22	2.6%	Partial	0	0%	Extend ROW for new station and sidewalk
Commercial	1.66	0.7%	Partial	0	0%	Extend ROW for sidewalk adjacent to new track
Public Facility	9.11	0.3%	Partial	0	0%	Extend ROW for sidewalk and existing bus stop adjacent to new track
Totals		**2.7 acres**	**87 (partial/full)**	**496**	**6%**	

ROW = right-of-way

Indirect impacts may include effects related to induce changes in the pattern of land use, demand for higher population density, increase in growth rate, economic development, and related effects on resources. For example, improved transit service results in an increase in transit ridership and an associated decrease in automobile usage. A positive example of indirect impacts would be an increase in property values and demand for higher density development. Potential zoning changes to height restrictions for commercial structures adjacent to residential properties could have indirect impacts to those residential properties, especially older neighborhoods.

Improvements to the transit service that increase the speed, frequency, and convenience of travel along the Maryland Parkway corridor will provide benefits to patrons and may be capitalized into land values, as will the value of other streetscape and public-realm improvements related to the build alternative. Higher land values result from higher rents, and higher rents relative to construction costs make redevelopment more feasible. Simulation of the impacts of transit on development estimates that the type of investments in transit being considered in the study corridor could (roughly and potentially) double to triple the amount of redevelopment that would otherwise occur in the corridor over the next 20 years; an additional 175,000 square feet of commercial space and 80 residential units annually over the 20-year forecast period (ECONorthwest, 2015). Therefore, the indirect impacts would not be significant.

3.1.2.2 Enhanced Bus Alternative

No right-of-way or property acquisition will be required for the Enhanced Bus Alternative. The 24 new stations will be spaced about 0.35-mile apart. The Enhanced Bus Service along the Maryland Parkway corridor would cause minimal direct, indirect, or construction impacts. In fact, more frequent bus service would be a positive direct attribute. Construction impacts of the 24 new stations would include upgrading shelters and lighting, which would minimal. Without the project, local population, employment, and development patterns are likely to continue along historic trends, which have been generally auto-oriented, lower-density development.

3.1.2.3 No Build Alternative

No right-of-way or property acquisition will be required for the No Build Alternative. Without the project, local population, employment, and development patterns are likely to continue along historic trends, which have been generally auto-oriented, lower-density development.

3.1.3 Mitigation

If the project were to move forward with either of the Build Alternatives, the RTC will negotiate with the property owners who will be directly impacted by partial or full property acquisitions in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act, ensuring they will receive fair market value for the acquired right-of-way and appropriate relocation assistance. The removal of parking spaces within the corridor would require compensation and/or replacement of those parking spaces on the same property or adjacent property. Access to adjacent businesses and residences during construction activities will be maintained. The Build and Enhanced Bus Alternatives are consistent with the local policy and planning documents, so no mitigation is needed to revise policy and planning documents.

3.2 SOCIOECONOMICS

This section focuses on social and community factors in the project study area, including trends in population, population density, household size, and the potential for impacts to neighborhoods and community facilities. It also presents an evaluation of potential impacts to low-income populations. Refer to the *Maryland Parkway: Land Use and Economic Development Evaluation Report* (MIG, 2017) for a detailed economic analysis. The study area for socioeconomics is considered a 0.5-mile buffer around the centerline of the project alignment.

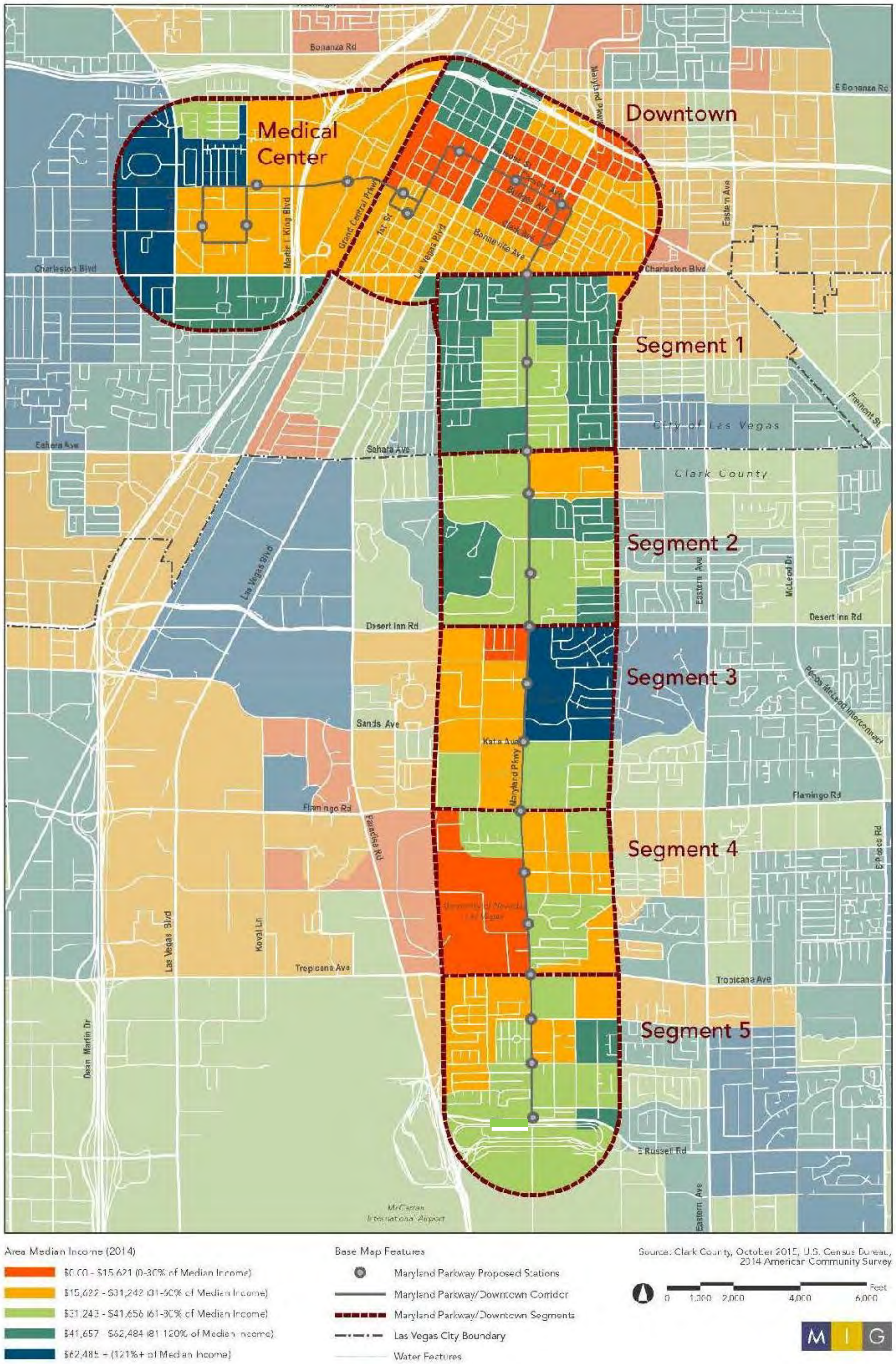
3.2.1 Existing Conditions

Land use forecasts indicate population growth in the Maryland Parkway study area and employment over the next 25 years that will likely generate higher traffic volumes and additional congestion, as well as higher transit ridership and the need for improved transit service along Maryland Parkway. The Corridor is expected to see a roughly 4 percent increase in population by 2040. Clark County is expected to grow by 26 percent by 2040, which is 6 times the baseline Corridor growth rate.

The Maryland Parkway corridor, centrally located within the region, is an important job center. In 2015, the study area had 10 percent of the region's employment. Major employers along for proposed route include McCarran International Airport, UNLV, the Boulevard Mall, Sunrise Hospital, the City of Las Vegas, Clark County, the Lou Ruvo Center for Brain Health, Las Vegas Premium Outlets North Mall, UMC, Valley Hospital, the Southern Nevada Water Authority (SNWA), and dozens of casinos and hotels in downtown. Employment through 2040 in the study area is forecast to grow at a slower rate (30.9 percent) than employment in Clark County overall (39.3 percent). The largest change in employment (3,223 new employees) is forecasted for Segment 3 between Desert Inn Road and Flamingo Road due to 195 acres that could be redeveloped on underutilized parking lots near strip development (ECONorthwest, 2015).

Based on the most recently available data, the median income for Clark County for 2015 is $59,200, while the Las Vegas-Paradise Metro area median income for 2015 was $51,552. Figure 3.2-1 shows the distribution of average household income as a percent of area median household income. U.S. Department of Housing and Urban Development (HUD) defines households at 30 percent of the area median income as "extremely low income"; 50 percent of the area median income as "very low income"; and 80 percent as "low income" (ECONorthwest, 2015). A breakout of each segment (as shown in Figure 3.2-1) is summarized below.

Figure 3.2-1 Median Household Income



Note: 2014 Clark County median income is $52,070.

Medical District contains a large disparity in household income. The western portion of the segment contains higher earning households with incomes 121+ percent above the median income, while the eastern portion is populated with households defined as extremely low income.

Downtown has the highest percentage of extremely low-income households, but it also contains a small portion of households on the northern edge of the study boundary that make more than the median income in the City of Las Vegas.

Segment 1 contains predominately very low to low income households, with many households falling at or just below the area median income.

Segment 2 consists of very low to low income households. The low-income households are concentrated adjacent to the corridor.

Segment 3 contains the greatest disparity of household incomes with areas of extremely low to low income households bordering areas with households overall 120 percent above the median income.

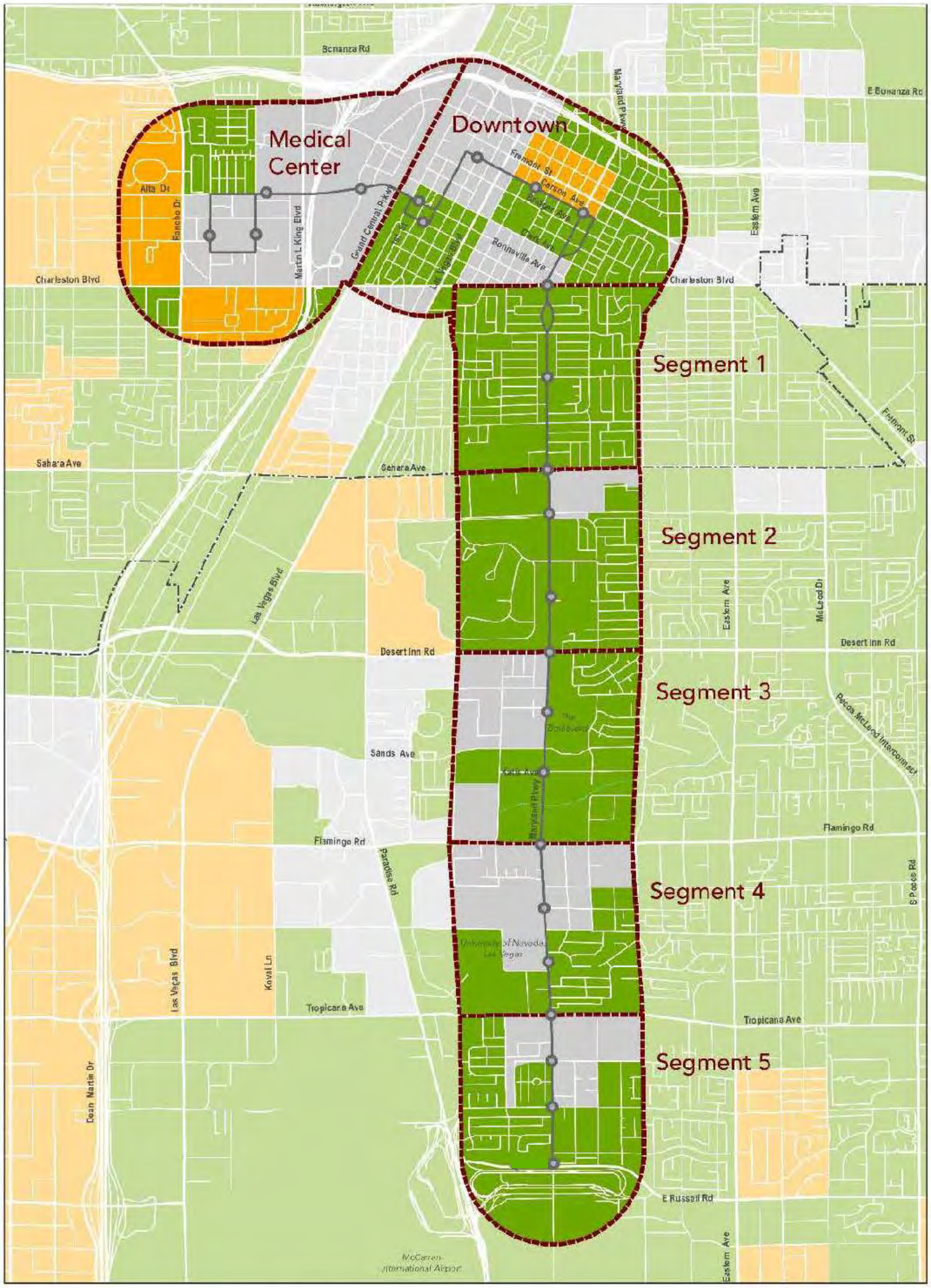
Segment 4 contains a large portion of extremely low-income households, but it also contains a high number of students from UNLV. Since college students are not earning full-time income while attending classes, it may explain the area adjacent to UNLV contains low income households. At the same time, there is still a populate number of low income households.

Segment 5 borders the southern edge of UNLV, which partially explains the very low-income households in the north-western quadrant. Since college students are not earning full-time income while attending classes, it may explain the area adjacent to UNLV contains low income households. At the same time, there is still a populate number of low income households.

Based on the Clark County's median household income of $59,200 and monthly mortgage payments of each segment, areas of affordable housing were identified within the study area (Figure 3.2-2). Housing affordability is high throughout the Medical District and Downtown segments; therefore, contain the least affordable housing (i.e., the most expensive homes). Both Clark County and City of Las Vegas are actively working to add or preserve affordable housing in the Las Vegas area and will continue to do so into the future along the Maryland Parkway corridor.

Per the *Clark County Comprehensive Master Plan* Housing Policy, the County will promote housing, including workforce and affordable housing, along transit corridors, particularly in proximity to transit stops by pursing public, private, and non-profit partnerships. The Community Resources Management (CRM) Unit of Clark County Social Service provides high quality housing that is safe, decent, and affordable.

Figure 3.2-2 Affordable Housing in Project Corridor



Housing Affordability

- No Value
- $1.00 - $231,500
- $231,501 +

Note: Based on median income of $52,070 (2014) with 30% devoted to affordable housing costs. $231,500 or less constitutes home affordability. This number assumes a 20% down payment toward the purchase of a home and $1,302 monthly mortgage payment.

Base Map Features

- Maryland Parkway Proposed Stations
- Maryland Parkway/Downtown Corridor
- Maryland Parkway/Downtown Segments
- Las Vegas City Boundary
- Water Features

Source: Clark County, October 2015; U.S. Census Bureau, 2014 American Community Survey

0 1,000 2,000 4,000 6,000 Feet

MIG

CRM manages several federal and state housing programs and uses these resources to increase the supply of affordable housing, accessible housing, and permanent supportive housing in Clark County (Clark County, 2018). The Southern Nevada Regional Housing Authority (SNRHA) was formed in January 2010 through the consolidation of the three housing authorities in the Las Vegas Valley. SNRHA currently owns and manages public housing properties and affordable housing units (non-subsidized) in Clark County and the City of Las Vegas. Per the *SNRHA Annual Plan for Fiscal Year 2019* (SNRHA, 2018), the HUD-approved five-year goals are to expand the supply of low income and affordable housing in Clark County and the City of Las Vegas. This will be accomplished by developing public/private partnerships to create affordable housing, especially along transit corridors and transit-oriented developments; continue to conduct modernization and energy efficiency upgrades to affordable housing to maintain the character of the existing residential areas; and redevelop of SNRHA properties to improve neighborhood character where needed.

The City of Las Vegas, Office of Community Services works with public, private, and regional efforts to meet the affordable housing needs of the community. The National Affordable Housing Act of 1990 created the HOME Investment Partnerships (HOME) Program. This federal program is designed to strengthen public-private partnerships and to expand the supply of decent, safe, sanitary, and affordable housing. The City of Las Vegas receives an annual allocation of federal HOME, State HOME, and Low-Income Housing Trust Funds. The City works with non-profit developers to utilize these funds to acquire, finance, and develop affordable single and multifamily housing opportunities.

Households within the study area are more transit dependent relative to the region. RTC transit route 109 (running along Maryland Parkway) is the eighth busiest route in the region and carries nearly 9,000 passengers per day with direct connections to some of the valley's busiest transit routes. In areas adjacent to Maryland Parkway, about 32 percent of households have no vehicle available, compared with 4.5 percent of households in the Las Vegas Metro Area and 4.0 percent of Clark County residents in 2016 (MIG, 2017). Figure 3.2-3 and Figure 3.2-4 depict current vehicle ownership by household and percent of non-vehicle commuting households along the corridor, respectively.

3.2.2 Impacts

3.2.2.1 Build Alternatives

Direct economic impacts would be associated with the Build Alternatives because there will be right-of-way and residential property acquisitions, but no resulting loss or displaced business revenues, jobs, and property tax revenues. Property acquisition was discussed in Section 3.2.1. RTC will work with all landowners and businesses to acquire the additional right-of-way and properties required and offer relocation services, as needed.

The installation of the proposed high capacity transit stations will provide for decreased car dependency, increased mobility choices, and better service for those residents that are already transit dependent along the corridor as residents will have access to a dependable improved public transit options. A summary of the analysis results includes:

Figure 3.2-3 Households with Limited Access to Vehicles

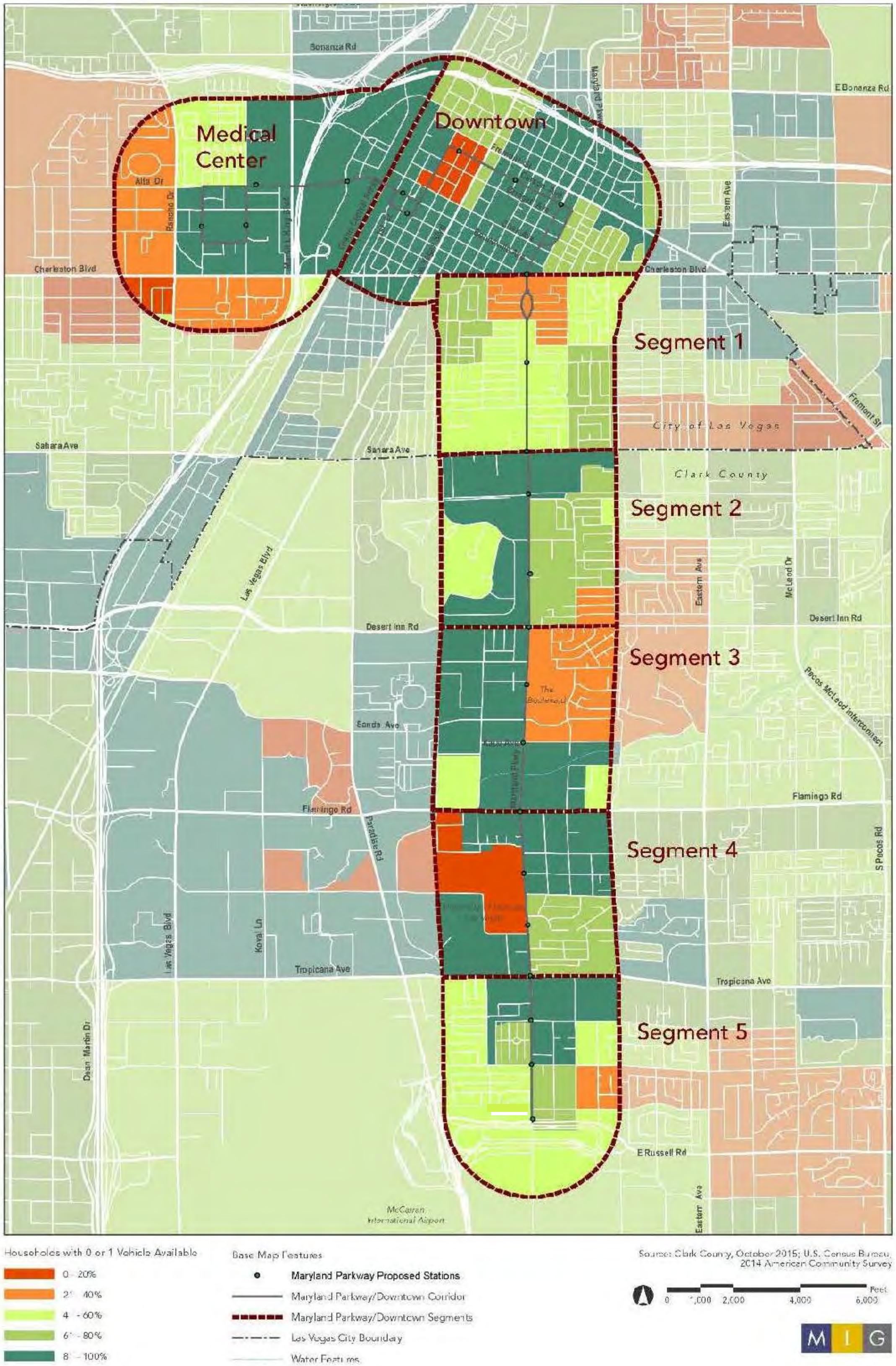
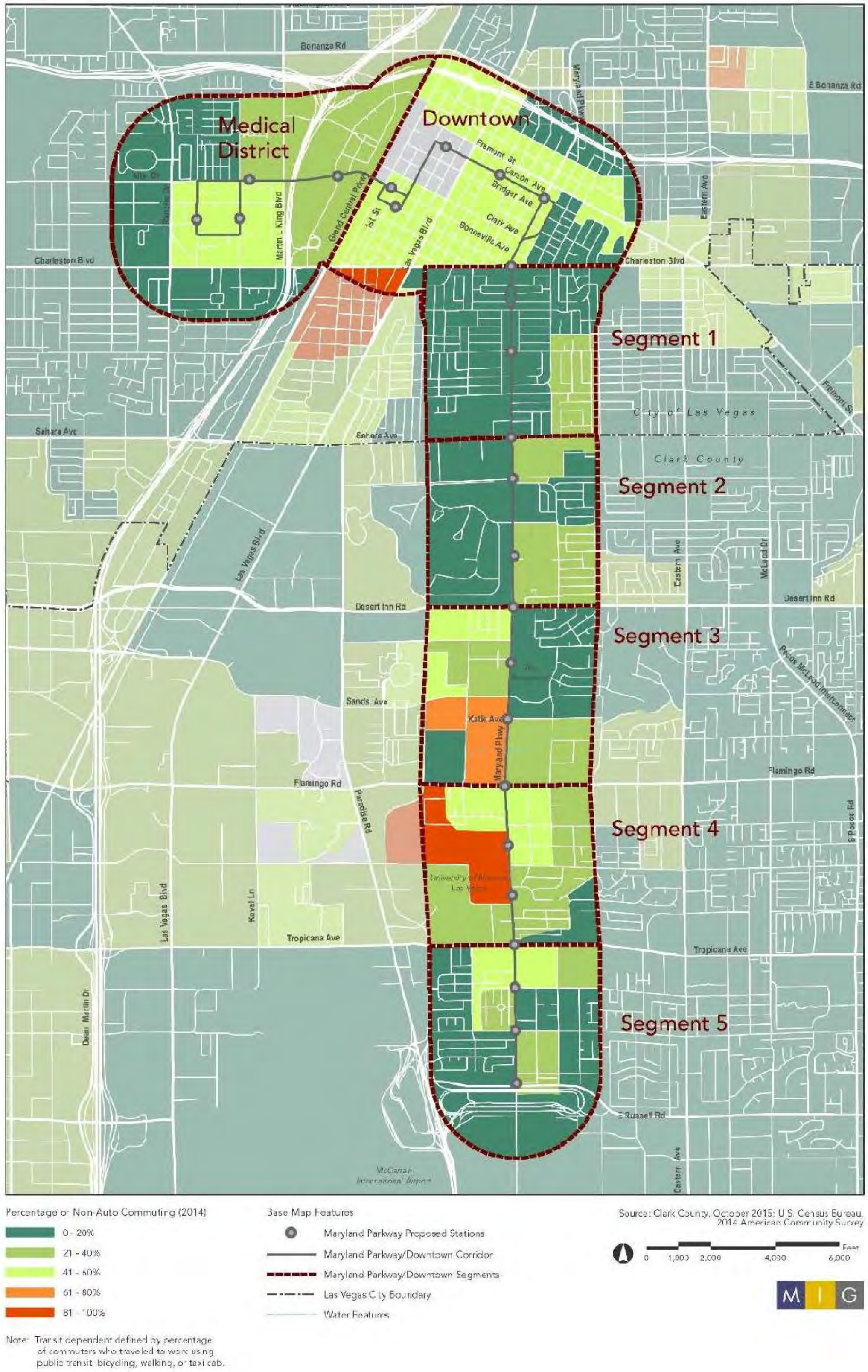


Figure 3.2-4 Non-Auto Commuting Households in Project Corridor



- 11 of the 24 proposed stations border areas where 32 percent or more of households have no cars;
- The most transit-dependent population and the highest levels of non-vehicle commuting occur in Segment 4, near the UNLV Campus, and on the southwestern portion of the Downtown segment; and
- The lowest levels of non-vehicle commuting occurred in Segments 1 and 5.

Permanent jobs with RTC will be created by the operation and maintenance of either Build Alternative. The estimated number of jobs is based on the need for operators, supervisors, security, administrative staff, and maintenance staff. The current estimate of new jobs for the LRT Build Alternative is approximately 60 to 70 staff, while the estimate BRT Build Alternative is estimated to generate fewer new jobs.

Indirect effects may include increases in property values, creation of jobs, and increases in population and employment within the study area. Higher residential and commercial property values are regularly observed in high transit capacity corridors. New and existing businesses would benefit because of more accessibility to customers in the corridor. The presence of transit-oriented development is unlikely to cause changes in the economic and employment base of the wider regional area, although the presence of stations is likely to encourage shifts in development patterns in the study area. Another potential outcome could be gentrification, a process of renovation and revival of deteriorated urban neighborhoods by means of influx of more affluent residents, which can result in increasing property values and the displacement of lower-income families and small businesses. Policies, such as requiring developers to meet affordable housing/business requirements or providing public-funded beautification and façade upgrade projects in older, historic neighborhoods adjacent to future development sites can be used to minimize displacement of low-income populations.

Construction of either Build Alternatives would result in temporary noise increases, construction traffic and detours, and other inconveniences for approximately 3 years. Temporary road closures may be needed, which would limit accessibility in portions of the study area for short periods of time. Construction activities would also provide a temporary economic stimulus to the area. During mobilization and peak construction, up to 250-350 full-time construction staff would be devoted to the project, which assumes a 3-year construction schedule.

3.2.2.2 Enhanced Bus Alternative

The Enhanced Bus Alternative would provide enhanced bus service and 24 new stations along the proposed route. This alternative is anticipated to cause minimal direct and indirect socioeconomic impacts. In fact, increased bus service could have a positive effect to the traveling public. Construction of the 24 new stations would cause minimal temporary impacts to adjacent businesses and residences.

3.2.2.3 No Build Alternative

Under the No Build Alternative, future land values and resulting property tax collections could be reduced, because of decreased development opportunities, creation of fewer new jobs, and stagnant population increases. Moreover, with the No Build Alternative, the region would not benefit from the positive impacts created from permanent operations and maintenance jobs or temporary construction jobs and their multiplier impacts. The study area could be negatively impacted because of increased congestion and its associated impacts and would become less attractive to new businesses and residents.

3.2.3 Mitigation

Implementation of the following measures will result in insignificant socioeconomic impacts:

- For appraisal, acquisition, and displacement of households, the project would comply with the policies and procedures in the Uniform Relocation Assistance and Real Property Acquisition Policy Act of 1970.
- Full property acquisitions will include fair market value for the property along with displacement and relocation benefits, which could include reimbursement of moving expenses, supplemental housing payments, and relocation counseling.
- Partial property acquisitions will be negotiated by RTC to ensure property owners receive fair market value for the acquired right-of-way.
- Traffic maintenance plans would be created in coordination with the City of Las Vegas and Clark County. RTC would work closely with the local businesses to ensure that alternative access and circulation are provided during construction activities. RTC will also work closely with businesses and media regarding temporary closures and inconveniences that would be scheduled around business hours.
- To achieve successful revitalization of the Maryland Parkway corridor and adjacent areas, a concerted effort must be undertaken by Clark County, the City of Las Vegas, and local housing authority to preserve and enhance opportunities for low income households to have access to affordable housing and jobs. This can be accomplished by developing public/private partnerships to create affordable housing, especially along transit corridors and transit-oriented developments and to continue to conduct modernization and energy efficiency upgrades to affordable housing to maintain the character of the existing residential areas in the corridor.

3.3 Environmental Justice

All projects involving a federal action (funding, permit, or land) must comply with Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,* signed on February 11, 1994. This EO directs federal agencies to take the appropriate and necessary steps to identify and address disproportionately high and adverse effects of federal projects on the health or environment of minority and low-income populations to the greatest extent practicable and permitted by law.

Particular attention was paid to ensuring that all notifications of public meetings were delivered to all households within two blocks on either side of the corridor, posted in numerous locations throughout the corridor such as libraries, churches, and community centers, and included in all local and neighborhood newspapers and television news channels.

The purpose of the EOs is to ensure that minority and low-income communities do not suffer a disproportionate share of adverse environmental impacts resulting from actions that are not offset by project benefits. EO 12898 also requires that these parties have adequate access and opportunity to participate in project planning by receiving information, attending meetings, or providing input into public decisions. For this project, the following methodology was used to identify any minority and low-income populations in the study area, and the potential for disproportionate impacts on these populations:

- The study area was identified to include a 0.25-mile-wide corridor from the centerline of the proposed alignment.
- U.S. Census tracts, block groups, and blocks were identified within the study area, and 2010 demographic and income information for minority and Hispanic populations was gathered. Per U.S. Census Bureau 2010-2014 American Community Survey 5-Year Estimates shows that the Las Vegas-Henderson-Paradise Metro Area includes 49 percent white and 51 percent minority populations.
- Public meetings and outreach activities were conducted and are described in Section 5.
- The U.S. Census Bureau defines a minority individual as one who identifies himself or herself as belonging to at least one of the following groups: Black/African American, Asian or Pacific Islander (including Native Hawaiian), Native American or Alaskan Native, or of Hispanic or Latino origin, regardless of race.
- Council on Environmental Quality (CEQ) guidance states that the environmental justice requirements apply to populations that have minority and/or low-income populations in the specific study area over 50 percent or “meaningfully greater” than the minority or low-income population percentage in the general population or other appropriate unit of geographic analysis (e.g., at the county level).
- Low-income means a person whose median household income is at or below the Department of Health and Human Services poverty guidelines. A low-income population means any readily identifiable group of low-income persons who live in geographic proximity and geographically dispersed/transient persons (e.g., migrant workers or Native Americans) who will be similarly affected by a proposed FTA program, policy, or activity (FTA, 2012).

3.3.1 Existing Conditions

Per U.S. Census Bureau's 2010 Census Data, Clark County comprises 49 percent white, 23 percent Hispanic or Latino, 8 percent Black or African American, 7 percent Asian, 1 percent Native American, 1 percent Hawaiian or Pacific Islander, and 11 percent Other populations. In comparison, the Maryland Parkway study area population is 55.1 percent minority. According to FTA's definition, the project area is considered predominately a minority population because the percentage of minorities in the study area (55 percent) is higher than the minority population for Clark County (51 percent).

Low- and moderate-income data for the Maryland Parkway study area is presented in Section 3.2. The 2015-2019 HUD Consolidated Plan and 2015 Action Plan outlines a strategy for Clark County, North Las Vegas, Boulder City, and Mesquite to: secure affordable housing, provide suitable living environments for all residents, and expand economic opportunities for low and moderate-income households. The plan utilizes the following programs to achieve these goals: Community Development Block Grant, HOME Investment Partnership Act, Housing Opportunities for Persons with AIDS, and Emergency Solutions Grant. This Plan is significant because it recognizes the need for long-term affordability in the region. With only 6,456 housing units set aside for households at 50 percent area median income or below, there is a tremendous gap in what is available and what is required. The report estimates a need of 42,002 affordable housing units based on the 48,458 low and extremely-low income households that are severely cost burdened in the region.

There is a range of existing housing supply within the Maryland Parkway study area boundary, offering convenient proximity to current and future institutional and employment uses within the corridor. The existing housing supply is primarily located in Segment 1 and Segment 5. Over three-quarters (77 percent) of households are renter-occupied in the study area, whereas in Las Vegas and Clark County, the rates are 46.6 percent and 47.5 percent, respectively. This is a unique aspect of the study area corridor and presents both opportunities and barriers for development and redevelopment. Average rent per multi-family unit is $679 ($0.83 per square foot) in the study area, compared to about $775 per unit for the region.

3.3.2 Impacts

3.3.2.1 Build Alternatives

The Maryland Parkway study area is identified as an Environmental Justice community based on minority populations and low-income. No adverse impacts have been identified that are disproportionately impacting this population for either Build Alternatives. Further, none of the neighborhoods in the study area would experience physical isolation or barrier effects from either Build Alternative; nor would community cohesion effects occur. The neighborhoods located adjacent to the proposed alignment would have minimal impacts from noise and vibration, visual/aesthetic changes, or traffic impacts resulting from either of the Build Alternatives. The detailed assessment of these minor impacts is presented in Section 3.4, Visual and Aesthetic Resources; Section 3.11, Noise and Vibration; and Section 4, Traffic Impacts.

Transit-oriented development at new station locations could result in greater employment opportunities within the project area and local development opportunities within existing and emerging neighborhoods. Increasing access with improved pedestrian and bicycle facilities, as well as transit, would benefit minority and non-minority businesses along the corridor. The long-term effects of providing transit access and development opportunities can be viewed overall as positive for the local communities. This potential for growth has already been accounted for by Clark County and the City of Las Vegas through their land use and community planning efforts. There are ongoing efforts by state, regional, and local governments to retain and increase options for affordable and mixed income housing in the Maryland Parkway Corridor.

Construction of either of the Build Alternatives would result in temporary noise increases, construction traffic and detours, and other inconveniences for approximately 3 years. Temporary road closures may be needed, which would limit accessibility in portions of the study area for short periods of time. Construction activities would also provide a temporary economic stimulus to the area. During mobilization and peak construction, up to 250-350 full-time construction staff would be devoted to the project, which could benefit the Environmental Justice community.

Overall, the Build Alternatives would contribute to improved transit access, support mixed-use development, and increase connectivity of neighborhoods to community facilities and employment within the study area and throughout the region.

3.3.2.2 Enhanced Bus Alternative

Under the Enhanced Bus Alternative, the new development planned for the study area, and its associated population and employment increases, may follow a different pattern and rate of completion than is expected if a Build Alternative is implemented. Development under an Enhanced Bus service could be characterized by lower transit-oriented development and economic development and possibly less affordable housing opportunities in the corridor than what is currently anticipated with the Build Alternative. However, any increase in bus service, reduced travel time, improved reliability, and safe access with the Enhanced Bus Alternative would be beneficial for the Environmental Justice community.

3.3.2.3 No Build Alternative

Under the No Build Alternative, the existing bus service would remain and the Maryland Parkway corridor would continue to grow and change at its current rate. No direct, indirect, or construction impacts would occur with this alternative.

3.3.3 Mitigation

Both Build Alternatives would comply with the policies and procedures for acquisition of real property and households in the Uniform Relocation Assistance and Real Property Acquisition Policy Act of 1970. RTC will negotiate with the property owners who will be directly impacted by partial or full property acquisition, ensuring they will receive fair market value for the acquired right-of-way and appropriate relocation assistance. Displacement and relocation benefits may also include reimbursement of moving expenses, supplemental housing payments, and relocation counseling. For the Build Alternatives and Enhanced Bus Alternative, construction notices and schedules will be given to residents and businesses within the corridor to ensure the public is informed of potential detours or closures.

3.4 VISUAL RESOURCES

NEPA establishes that the federal government use all practicable means to ensure all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings (42 United States Code [U.S.C] 4331[b][2]). To further emphasize this point, the Federal Highway Administration (FHWA) directs that final decisions on projects are to be made in the best overall public interest; taking into account adverse environmental impacts, including, among others, the destruction or disruption of aesthetic values. NEPA requires Federal agencies to undertake an assessment of the environmental effects of their proposed actions prior to making decisions. Visual impacts are included among those environmental effects. FHWA's environmental regulations state the Administration's policy that alternatives for its proposed actions are to be evaluated, and resulting decisions be made, in the best overall public interest which is based upon a balanced consideration of the need for safe and efficient transportation; the social, economic, and environmental impacts of the proposed improvement; and on national, State, and local environmental protections goals. (23 Code of Federal Regulations [CFR] 771.105(b)).

Typical views, called key viewpoints, are selected to represent the views to/from the project. Existing visual quality from the viewpoints is judged by three criteria: vividness, intactness, and unity, as follows:

- **Vividness**: the memorability of the landscape components as they combine to form striking or distinctive patterns.
- **Intactness**: the integrity of visual order in the view and its freedom from visual encroachment.
- **Unity**: the visual coherence and composition of the landscape viewed to form a harmonious visual pattern.

These criteria provide a method for describing how the form, line, color, and texture of the components found within a view create the visual quality of that view. As in all things aesthetic, "beauty is in the eye of the beholder" and therefore, a subjective component exists in this or any visual analysis evaluation. However, as outlined in the FHWA methods (FHWA, 2015), the use of these descriptors provides a basis for understanding the evaluator's rationale behind a visual quality determination. It is important to note that visual character terms are descriptive and non-evaluative, meaning that they are based on defined attributes which are neither good nor bad by themselves. Changes in visual character cannot be described as having good or bad attributes until compared with viewer responses to the change.

Visual sensitivity is based on the number and types of users, viewers, or sensitive receptors typically found in the study area. Generally, viewers in parks and residential areas are assumed to be the most sensitive to visual and aesthetic impacts, and viewers in industrial areas would be the least sensitive. The level of sensitivity for viewers from an adjacent roadway or transit corridor varies depending on the number of viewers and the corridor's landscape context.

Visual quality is evaluated based on consideration of landscape qualities related to natural and/or man-made features, specifically:

- Interest in the visual environment and their distance/angle of view to the source of the impact to the extent of screening/filtering of the view;
- Magnitude of change in the view (i.e., loss/addition of features that change the view's composition);
- Integration of changes within the existing view (form, mass, height, color, and texture);
- Duration of the effect (temporary/permanent, intermittent/continuous); and
- Effectiveness of the proposed mitigation.

Parsons (2018e) prepared a *Visual Impact Assessment* for FTA and RTC. The project was evaluated for the visual quality of existing conditions as well as for the viewers' visual sensitivity.

3.4.1 Existing Conditions

The project area is characterized by visual elements associated with highly urban commercial, light industrial, residential, and transportation development (buses). Structures adjacent to the Maryland Parkway corridor include hotels, hospitals and medical facilities, apartment buildings, office buildings, university buildings, and single-family and multi-family homes. The topography is flat and there are no unique natural visual resources in the horizons. The character of the study area is dominated by existing transportation corridors.

Viewer groups are described below.

- **Community Residents**: Residents can be expected to have the highest sensitivity and be the most aware of any groups, since the project is located within their immediate environment or surroundings. In the case of the project, residents in Segment 1 and 5 would have the greatest sensitivity.
- **Transit patrons, bicyclists and pedestrians**: This user group includes those using the transit system, those walking or bicycling to/from the transit stations, and other pedestrians and bicyclists traveling through the corridor. These viewers have the most direct exposure to the physical environment and awareness of the visual environment.
- **Business Owners, Employees, and Customers**: This user group would be associated with the existing offices and business within the study area. A principal concern is likely to be the effect of

any construction on business access for employees or customers. These viewers are anticipated to have a low level of concern regarding the changes to the visual environment.

- **Regular Motorists**: Included in this user group are commuters and local residents/workers who frequently travel within the study area. These motorists would be aware of any changes to the visual environment because of their repeated exposure. Motorists would be moderately sensitive to the change in the visual environment.
- **Occasional Motorists**: Occasional motorists include tourists and regional residents from outside the immediate area who infrequently travel the area. These viewers generally have a low exposure and awareness of changes to the visual environment.

3.4.2 Impacts

The visual impact of project alternatives is determined by assessing the visual resource change due to the project and predicting viewer response to that change. Visual resource change is the total change in visual character and visual quality. The first step in determining visual resource change is to assess the compatibility of the proposed project with the existing visual character of the landscape. The second step is to compare the visual quality of the existing resources with the projected visual quality after the project is constructed. Viewer response to the changes is the sum of viewer exposure and viewer sensitivity to the project. The resulting level of visual impact is determined by combining the severity of resource change with the degree to which people are likely to oppose the change.

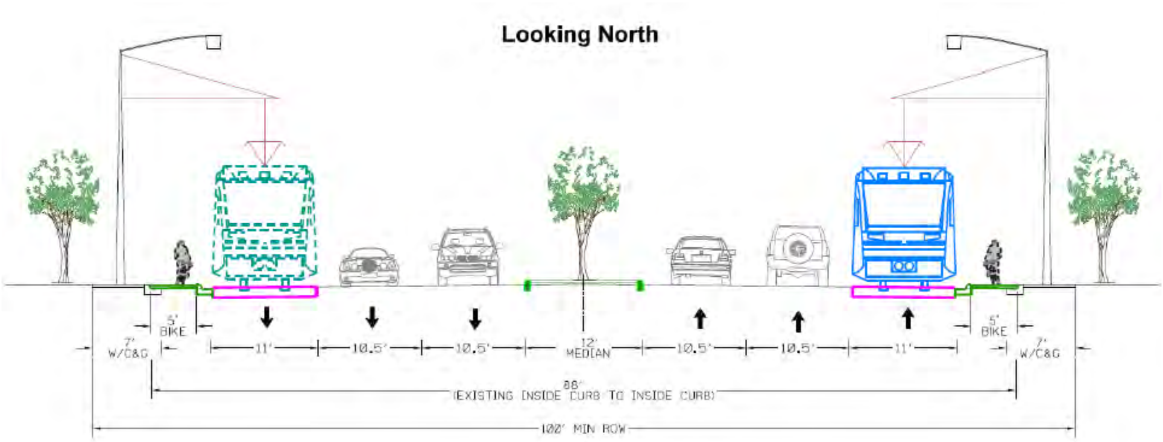
High-capacity transit options, like LRT and BRT, in the urban Maryland Parkway corridor would contribute positively to the visual quality of the corridor. LRT and BRT have demonstrated the ability to convey a strong positive image in a city. LRT supports the creation of pedestrian zones with an overall facelift of the public space along the corridor and the introduction of new elements of aesthetic value, such as unique stations and monuments.

Creating a quality urban environment through building and streetscape design will inherently promote the Maryland Parkway as pedestrian friendly and foster a sense of place, safety, and human scale. Streets, sidewalks, building facades, and street trees and furniture are all elements that comprise the urban streetscape. Urban environmental components should contribute to place-making and enhance Las Vegas' unique character and identity. Public art, benches, trash receptacles, bike racks, and other amenities enhance the quality of the pedestrian experience. Station design and its related elements should enhance, preserve, or exceed the current urban design qualities of the station area and surrounding neighborhoods.

3.4.2.1 Build Alternatives

Renderings for the LRT Build Alternative along Maryland Parkway are shown in Figures 3.4-1 and 3.4-2. This view would be consistent along most of the corridor, showing the track and catenary poles. The BRT Build Alternative would be similar in appearance without the catenary poles. Some locations will have middle street medians with trees or shrubs and landscaping along the sidewalks along many portions of the corridor. Figure 3.4-3 shows a BRT vehicle that is currently operating on the SDX BRT corridor in Las Vegas.

Figure 3.4-1 Elevation View of Side-running LRT along Maryland Parkway with Bike Lane



Note: Typical configuration in Segments 1 through 5.

Figure 3.4-2 Typical View of Side-running LRT along Maryland Parkway with Bike Lane

Note: Typical configuration in Segments 1 through 5.

Figure 3.4-3 Existing RTC SDX BRT and Station

To undertake an assessment of visual impacts, a series of key sensitive receiver viewing locations have been selected to represent the points from which visual receivers are likely to perceive the project. The viewing locations are located in residential, business, educational, or recreational areas. The area also includes views that are transient such as from a vehicle. Design of the both the LRT and BRT systems took into consideration the overall visual characteristics of the corridor. Visual impacts focus on the visibility of both the construction and operation phases of the Build Alternatives.

Location 1 (in Segment 5) Maryland Parkway and Rawhide Street

The Location 1 photographs were taken at Maryland Parkway and Russell Street looking north. Residential neighborhoods are located on the east and west sides of the street and McCarran International Airport is south of this location. Potential future stations would be located on either side of Maryland Parkway.

Landform: The residential properties are at-grade with the proposed transit corridor.

Vegetation: Mature street trees occur occasionally along alignment.

Land Use: Predominantly low density, single- and multi-family housing.

Visual Context: Residential properties along both sides of the street at the south end of Maryland Parkway are in close proximity to the proposed transit corridor. Their views vary depending on the housing orientation, vegetation, fencing, and distance from the corridor. Views from this location are experienced by residents and visitors to those homes with prolonged viewing opportunities toward the corridor and road users and pedestrians passing through the area.

Construction and Operational Impacts: Machinery and construction activities occurring within the transit corridor would provide short-term visual impacts to all viewers. Adverse landscape impacts could occur in the short-term construction phase and long-term operational phase if existing mature vegetation is removed at station locations and along the alignment. Overhead contact system poles, electrical lines, rail track, and stations for the LRT Build Alternative would be visible to all the viewers and a change from the existing transit environment. The proposed stations would be visible to all the viewers for the BRT Build Alternative; however, buses currently occur along the corridor and would not change the transit nature of the corridor.

Visual Assessment: For the LRT Build Alternative, this viewing location has a potential for high viewing sensitivity to adjacent residents and their visitors and low visual sensitivity to the casual recreational users, road traffic, and pedestrians. For the BRT Build Alternative, there would be low visual sensitivity to residents and their visitors, casual recreational users, road traffic, and pedestrians because of the existing bus traffic along the corridor.

Location 2 (in Segment #5) Maryland Parkway and E. Reno Avenue

The Location 2 photograph was taken at Maryland Parkway looking north at a future southbound station location north of E. Reno Avenue. Single-family and multi-family residential housing occurs on both sides of Maryland Parkway.

Landform: The residential and commercial properties are at-grade with the proposed transit corridor.

Vegetation: Mature street trees occur occasionally along alignment.

Land Use: Predominantly low density, single- and multi-family housing.

Visual Context: Single-family villas occur on the west side of Maryland Parkway as shown in the photo and two-story apartment buildings occur on the east side of the street in close proximity to the proposed transit corridor. Their views vary depending on the housing orientation, vegetation, fencing, and distance from the corridor. Views from this location are experienced by residents and visitors to those homes with prolonged viewing opportunities toward the transit corridor and road users and pedestrians passing through the area.

Construction and Operational Impacts: Machinery and construction activities occurring within the transit corridor would provide short-term visual impacts to the all viewers. Adverse landscape impacts could occur in the short-term construction phase and long-term operational phase if existing mature vegetation is removed at station locations and along the alignment. Overhead contact system poles, electrical lines, rail track, and stations for the LRT Build Alternative would be visible to all the viewers and a change from the existing transit environment. The proposed stations would be visible to all the viewers for the BRT Build Alternative; however, buses currently occur along the corridor and would not change the transit nature of the corridor.

Visual Assessment: For the LRT Build Alternative, this viewing location has a potential for high viewing sensitivity to adjacent residents and their visitors and low visual sensitivity to the casual recreational users, road traffic, and pedestrians. For the BRT Build Alternative, there would be low visual sensitivity to residents and their visitors, casual recreational users, road traffic, and pedestrians because of the existing bus traffic along the corridor.

Location 3 (in Segment #4) Maryland Parkway and E. University Avenue

The Location 3 photograph was taken at Maryland Parkway and E. University Avenue looking north at a future southbound station location in front of a UNLV building on the west side of the street. An office building occurs on the east side of the street.

Landform: The campus and office buildings are at-grade with the proposed transit corridor.

Vegetation: Limited and small street trees occur occasionally along alignment.

Land Use: Commercial and civil facility (UNLV).

Visual Context: Commercial and UNLV buildings occur along Maryland Parkway. Parking lots are typically located on the street side of the buildings along this segment of Maryland Parkway. Their views vary depending on the window orientation, vegetation, and distance from the corridor. Views from this location are experienced by UNLV and office workers with prolonged viewing opportunities toward the transit corridor and road users and pedestrians passing through the area.

Construction and Operational Impacts: Machinery and construction activities occurring within the transit corridor would provide short-term visual impacts to the all viewers. Adverse landscape impacts could occur in the short-term construction phase and long-term operational phase if existing mature vegetation is removed at station locations and along the alignment. Overhead contact system poles, electrical lines, rail track, and stations for the LRT Build Alternative would be visible to all the viewers and a change from the existing transit environment. The proposed stations would be visible to all the viewers for the BRT Build Alternative; however, buses currently occur along the corridor and would not change the transit nature of the corridor.

Visual Assessment: For both Build Alternatives, this viewing location has a low visual sensitivity to all the viewers.

Location 4 (in Segment #2) Maryland Parkway and Sunrise Hospital

The Location 4 photograph was taken at Maryland Parkway near the entrance to Sunrise Hospital looking southeast at a future northbound station location in front of a hospital building. An office building occurs on the east side of the street.

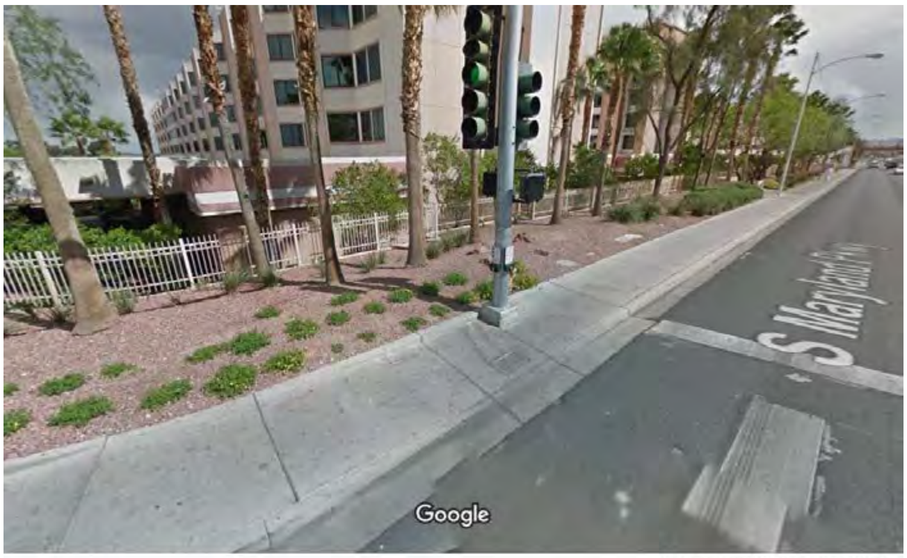


Image capture: Apr 2016 © 2016 Google

Landform: The hospital is at-grade with the proposed transit corridor.

Vegetation: Street trees and irrigated landscaping occur in this area.

Land Use: Institutional.

Visual Context: Sunrise Hospital is one of the major employers along the Maryland Parkway corridor. Views from this location are experienced by hospital workers with prolonged viewing opportunities toward the transit corridor, both patients and their visitors for short to long periods of viewing time, and road users and pedestrian passing through the area.

Construction and Operational Impacts: Machinery and construction activities occurring within the transit corridor would provide short-term visual impacts to the all viewers. Adverse landscape impacts could occur in the short-term construction phase and long-term operational phase if existing mature vegetation is removed at station locations and along the alignment. Overhead contact system poles, electrical lines, rail track, and stations for the LRT Build Alternative would be visible to all the viewers and a change from the existing transit environment. The proposed stations would be visible to all the viewers for the BRT Build Alternative; however, buses currently occur along the corridor and would not change the transit nature of the corridor.

Visual Assessment: For both Build Alternatives, this viewing location has a low to moderate visual sensitivity to all the viewers.

Location 5 (in Segment 1) Maryland Parkway and Jessica Avenue

The Location 5 photographs were taken at Maryland Parkway and Jessica Avenue looking south. Residential homes converted to commercial businesses are located on the west sides of the street and Huntridge Circle Park, owned by the City of Las Vegas is located on the east side of the street.

Landform: The commercial properties and park are at-grade with the proposed transit corridor.

Vegetation: Mature street trees occur occasionally along alignment and in the park.

Land Use: Predominantly low density, single-family housing converted to businesses and recreational.

Visual Context: Residential buildings, many of which have been converted to commercial properties, occur along both sides of Maryland Parkway surrounding Huntridge Circle Park, which is located in the center median of Maryland Parkway. Views from this location are experienced by residents or business customers to the buildings and park users with prolonged viewing opportunities toward the corridor and road users and pedestrians passing through the area.

Construction and Operational Impacts: Machinery and construction activities occurring within the transit corridor would provide short-term visual impacts to all viewers. Adverse landscape impacts could occur in the short-term construction phase and long-term operational phase if existing mature vegetation is removed along the alignment. Overhead contact system poles, electrical lines, rail track, and stations for the LRT Build Alternative would be visible to all the viewers and a change from the existing transit environment. Buses currently occur along the corridor and would not change the transit nature of the corridor.

Visual Assessment: For the LRT Build Alternative, this viewing location has a potential for high viewing sensitivity to adjacent residents and moderate to low visual sensitivity to the casual recreational users, road traffic, and pedestrians. For the BRT Build Alternative, there would be low visual sensitivity to residents and their visitors, casual recreational users, road traffic, and pedestrians because of the existing bus traffic along the corridor.

Location 6 (in Downtown Segment) Carson Avenue and South 4th Street

The Location 6 photographs were taken at Carson Avenue and South 4th Street in the downtown area looking west at a future northbound station location (first photo) with parking garage on the north side of Carson Avenue and the Downtown Las Vegas Event Center (second photo) which is located on the south side of Carson Avenue. A casino hotel can be seen in the background of the second photo.

Landform: The buildings and parking lots are at-grade with the proposed transit corridor.

Vegetation: Street trees and irrigated landscaping occur along this segment of the corridor.

Land Use: Commercial.

Visual Context: Views from this location are experienced by office, hotel casino, and retail employees with prolonged viewing opportunities toward the transit corridor depending on their location; by pedestrian and road users passing through the area with short viewing times, and visitors to the surrounding hotels and casinos with varied viewing opportunities.

Construction and Operational Impacts: Machinery and construction activities occurring within the transit corridor would provide short-term visual impacts to the all viewers. Adverse landscape impacts could occur in the short-term construction phase and long-term operational phase if existing mature vegetation is removed at station locations and along the alignment. Overhead contact system poles, electrical lines, rail track, and stations for the LRT Build Alternative would be visible to all the viewers and a change from the existing transit environment. The proposed stations would be visible to all the viewers for the BRT Build Alternative; however, buses currently occur along the corridor and would not change the transit nature of the corridor.

Visual Assessment: For both Build Alternatives, this viewing location has a low visual sensitivity to all the viewers.

Location 7 (in Medical Center Segment) Alta Drive and Shadow Lane

The Location 7 photograph was taken on Alta Drive at Shadow Lane in the Medical District area looking west at future northbound and southbound station locations on either side of the Alta Drive. An apartment complex occurs on the right side of the photo (north side of Alta Drive) and a County office building is located on the left side of the photo (south side of Alta Drive).

Landform: The buildings are at-grade with the proposed rail corridor.

Vegetation: Street trees and irrigated landscaping occur along this segment of the corridor.

Land Use: Commercial and multi-family residential.

Visual Context: Views from this location are experienced by residents and their visitors with prolonged viewing opportunities toward the transit corridor depending on their location and distance; by office employees that have limited windows overlooking the rail line, and by pedestrian and road users passing through the area with short viewing times.

Construction and Operational Impacts: Machinery and construction activities occurring within the transit corridor would provide short-term visual impacts to the all viewers. Adverse landscape impacts could occur in the short-term construction phase and long-term operational phase if existing mature vegetation is removed at station locations and along the alignment. Overhead contact system poles, electrical lines, rail track, and stations for the LRT Build Alternative would be visible to all the viewers and a change from the existing transit environment. The proposed stations would be visible to all the viewers for the BRT Build Alternative; however, buses currently occur along the corridor and would not change the transit nature of the corridor.

Visual Assessment: For the LRT Build Alternative, this viewing location has a potential for high viewing sensitivity to adjacent residents and their visitors, but a low visual sensitivity to the casual recreational users, road traffic, and pedestrians. For the BRT Build Alternative, this viewing location has a low visual sensitivity to all the viewers.

Station concepts are shown in Figure 3.4-4 that indicate the designs would fit naturally into the streetscape, similar to the BRT stations that occur along various downtown Las Vegas streets. Configurations of the LRT showing the streets and sidewalks are shown in Section 4.0.

The overhead contact system, which includes poles and wires, would consist of a single row of poles adjacent to the trackway. They would likely be placed at approximately 90-foot centers throughout the corridor. Visually, the catenary poles and wires are minimal, as can be seen in example photographs in Section 2.3.3.

Lighting from external fixtures within the proposed new development, including the LRT stations, would create an additional lighting source, and a potential for glare within the project area. The design of the lighting would consider current energy-efficient policy for certain new outdoor lighting fixtures, per RTC or governing jurisdictions lighting code/procedures.

The direct and indirect impacts on the visual environmental are considered minimal because of the highly developed urban streetscape. Both LRT and BRT Build Alternatives will contribute positively to the visual character of the corridor. Construction impacts to visual resources would be temporary because of equipment, materials, and construction workers in the project corridor.

3.4.2.2 Enhanced Bus Alternative

Maryland Parkway and the remaining portions of the proposed alignment currently have bus service. Therefore, no additional visual impacts from the bus service are anticipated. However, new passenger shelters and other amenities along the corridor would improve the existing bus stop design, enhancing the bus rider’s and passerby’s experience. Therefore, no direct or indirect impacts on visual resources will

Figure 3.4-4 Conceptual Station Designs

occur for the Enhanced Bus Alternative. Temporary construction impacts would occur, but would be contained to the new station locations and considered minimal.

3.4.2.3 No Build Alternative

The No Build Alternative would not result in any impacts to visual and aesthetic resources. Current bus stops along the proposed route will continue to be utilized.

3.4.3 Mitigation

Avoidance, minimization, and/or mitigation measures for the Build Alternatives can lessen or compensate for a loss of visual quality. Mitigation includes the enhancement of positive effects as well as the minimization or elimination of negative effects. Proposed mitigation measures include, but are not limited to, the following:

- Enhance design of the project elements to fit within the character of the corridor.
- Improve the visual character along the alignment.
- Work with the stakeholders, including residents and businesses, to ensure urban design elements improve the visual experience along the corridor.
- Prohibit or minimize the use of advertising on the interior and exterior surfaces of the vehicles and stations. Advertising should not be allowed to dominate the transit experience.
- Provide design continuity in paving patterns, colors, and materials from station platform paving onto adjacent sidewalks, plazas, and pedestrian crosswalks.
- Design vertical shade screens to blend appropriately with station architecture and site the screen so as to fit contextually with adjacent land uses.
- Use of landscapes at station locations and along street medians and sidewalks provide a sense of oasis for the desert environment. Use landscape in very wide streets or streets without pedestrian context to help identify the separation between pedestrian spaces and vehicular spaces.
- Minimizing the number of trees and shrubs that are removed to the extent possible and replacing trees and shrubs that are removed.
- Design lighting to the current standards for shielding to prevent light trespasses into adjacent areas.
- Provide a visually non-intrusive overhead contact system within the streetscape environment. Space the poles as far as part as possible, limiting their number. Limit the number of pole and cross-arm types in order to create a system of identity.
- For the power transformer substation locations, use landscaping, screens, artwork, enclosures, or other buffer treatments to minimize the visual appearance to passersby.
- Design of the maintenance and storage facility should blend in with the industrial nature of the surrounding buildings, reinforce a sense of the RTC’s identity, and provide an efficient and enjoyable work environment for those employed.

3.5 CULTURAL RESOURCES

This section presents information on cultural resources within the project corridor. Section 106 of the National Historic Preservation Act (NHPA), 16 U.S.C. 470(f), as amended, governs federal actions that could affect historic properties. The FTA and RTC are required to formally evaluate the effects of the proposed undertaking on historic properties under Section 106 of the NHPA and implementing regulations (36 CFR § 800), because the project involves a federal action and will be federally funded.

Cultural resources are prehistoric and historic sites, structures, districts, artifacts, or any other physical evidence of human activity considered important to a culture, subculture, or community for traditional, religious, scientific, or any other reason. Cultural resources are discussed in this EA in terms of archaeological resources, including both prehistoric and historical occupations, architectural resources, and properties of religious or cultural significance to Native American Tribes, including Traditional Cultural Properties. A “historic property” means “any prehistoric or historic district, site, building, structure, or object included in, or eligible for, inclusion in the National Register of Historic Places (NRHP) maintained by the Secretary of the Interior” (National Park Service). This term includes artifacts, records, and material remains that are related to and located within such properties. Properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization may be determined eligible for inclusion in the NRHP (36 CFR § 800.16[l][1]). Properties that qualify for inclusion in the NRHP must meet at least one of the following four criteria:

- Association with events that have made a significant contribution to the broad patterns of our history;
- Association with the lives of persons of significance in our past;
- Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possesses high artistic values, or that represents a significant and distinguishable entity whose components may lack individual distinction; or
- Have yielded, or may be likely to yield, information important in prehistory or history (36 CFR § 60.4).

Properties that qualify for the NRHP also must possess integrity, defined by the following seven aspects: location, design, setting, materials, workmanship, feeling, and association. The term “eligible for inclusion in the NRHP” includes both properties listed on and formally determined eligible in consultation with the appropriate State Historic Preservation Office (SHPO). Identification of NRHP-eligible resources, including archaeological sites, architectural resources, and Native American resources, was conducted according to requirements of 36 CFR 800 for Section 106 of the NHPA. An initial scoping/intent to study letter (Appendix A) was submitted to Nevada state agencies through the Nevada State Clearinghouse on February 25, 2016. Section 106 consultation was initiated with the Nevada SHPO in April 2017 (Appendix H). The initial study area for the Area of Potential Effect (APE) and site files search was defined as extending 0.25-mile in both directions from the centerline of the proposed Maryland Parkway corridor route. The Nevada SHPO responded in a letter dated May 10, 2017, to request additional information on the APE. A viewshed analysis was conducted and the APE was revised. The Nevada SHPO concurred with the APE in a letter dated December 11, 2017 (Appendix H).

3.5.1 Existing Conditions

To identify cultural resources that could be potentially affected by the proposed action, the area within which archaeological, architectural, and Native American resources would have the potential to be affected must be determined. As defined by 36 CFR § 800.16(d) of Section 106 of the NHPA, the APE represents the "…geographic area or areas within which an undertaking could cause changes in the character or use of historic properties, if any such exists." In delineating the APE, factors taken into account include the elements of the proposed action alternatives, the existence of buildings, roadway elements, vegetation, and terrain with respect to potential visual or audible impacts, and construction activities necessary for the proposed action alternatives. Both the Build Alternatives are expected to have approximately the same construction footprint along the project corridor. Proposed new elements of either transit system would be located on both sides of the existing roadways along the project corridor. Facilities and project activities associated with either transit system may include:

- Grading and construction for 24 stations with canopies approximately 12 feet tall (similar in height to existing bus stations along the corridor) in existing roadway or sidewalk areas (potential excavation down to 20 feet deep for canopy and station footings;
- Roadway grading and resurfacing, with the addition of landscaped medians in some locations along Maryland Parkway;
- Road widening with the addition of right-hand turn lanes at several intersections along Maryland Parkway (*e.g*., Tropicana Avenue, Flamingo Road, Desert Inn Road, Sahara Avenue, and Charleston Boulevard);
- Grading and paving for new sidewalks and bike paths;
- Re-use or relocation of existing utility poles to accommodate the new stations and turn lanes;
- Relocation of utilities within right-of-way (excavation down to 20 feet deep possible);
- Installation of lighting at new station locations, up to a maximum height of 20 feet;
- Installation of sign posts at stations and for automobile turning lanes, up to a maximum height of 20 feet;
- Installation of subsurface supports for new lighting, relocated utility, and sign poles/posts (up to a depth of 10 feet).

Facilities and features associated only with the LRT alternative include:

- Subsurface installation of rails and yokes in existing roadways (up to a depth of 3 feet) in previously disturbed roadways

- Installation of subsurface supports (up to a depth of 10 feet) and 20-foot tall posts for an overhead catenary system spaced approximately 90 to 100 feet apart along the alignment
- Addition of approximately eight traction power substations , which are small utility boxes (about 5 feet high) installed on concrete pads, within a 15-foot by 20-foot area, spaced approximately 1.25 miles apart
- Construction of a maintenance facility in the former UPRR yard

The APE for archeological resources for the proposed project consists of the footprint of the existing transportation corridor, approximately 8.7-miles long and a proposed maintenance facility at the former UPRR yard. The archaeological APE follows existing roadways beginning at the southern end of the project area at the intersection of East Russell Road and South Maryland Parkway north to East Carson Avenue. The route includes a portion of 13th Street, north of Clark Avenue to East Carson Avenue, paralleling Maryland Parkway. The route then travels west to South Casino Center Boulevard, south to Garces Avenue, west to South Main Street, and north to Bonneville Avenue. From here, the path leads east to the intersection with South Casino Center Boulevard and west across South Martin Luther King Boulevard (where the road name changes to Alta Drive), south along Shadow Lane, west along Wellness Way, and north along Tonopah Drive to the intersection with Alta Drive. Implementation of the LRT Build Alternative also proposes construction of a maintenance yard on two parcels adjacent to the former UPRR railroad tracks downtown, acquired by the RTC, with an entrance located on South Main Street. The yard would extend along South Main Street from approximately South Commerce Street to just north of the intersection with Garces Avenue. The proposed yard would include a new two-story building to house a heavy service, repair, and inspection shop, car wash, and loading dock with administration and employee facilities above. Additional yard features include a traction power substation, a guardhouse, and storage and runaround tracks with storage for up to 17 cars with space for future expansion. New parking areas, and driveways would be paved and areas around buildings would be landscaped.

The former UPRR yard (currently vacant lots) will provide the primary construction staging area. The locations of other construction staging and storage areas have not been specified yet in preliminary engineering plans, but will be on parcels adjacent to the project corridor in previously disturbed areas (*e.g.,* paved lots).

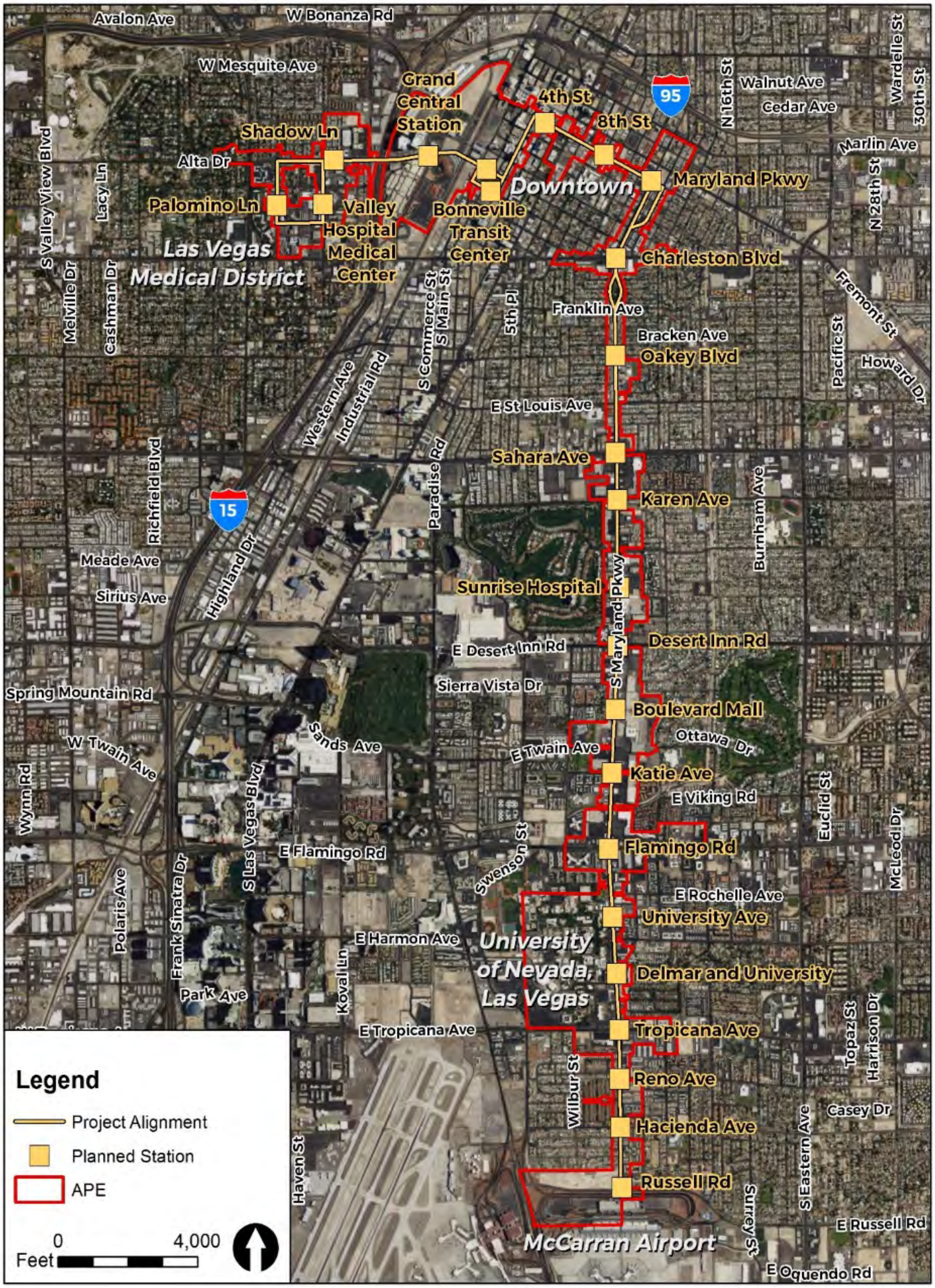
The viewshed analysis of the proposed Maryland Parkway High Capacity Transit project corridor was conducted by Parsons cultural resources and geographic information systems specialists using Light Detection and Ranging data to develop a digital surface model that represented the elevation of features above ground level. A viewshed was then created by combining an observer point (or route) with a digital surface model. The viewshed determines what features can be seen from any given point based on the provided location and elevation (approximately six feet above ground surface which is roughly equivalent to the view from riders on mass transit vehicles) of the observer.

Based on the limited potential for visual and audible intrusions from these proposed facilities and features to the project area, the architectural APE includes the footprint of the existing transportation corridor and based on the viewshed analysis, encompasses parcels along both sides of the existing corridor with unobstructed horizontal views to and from the proposed project area, in addition to "bump outs" of several parcels at intersections along the route where new stations are proposed. Parcels vary in size and shape along either side of the corridor creating an irregular boundary for the architectural APE. The APE considers the visibility of new or additional vertical intrusions to the existing landscape, including structures for stations and substations, and poles for a potential catenary system, lighting, signaling, and signage. These proposed transit elements will be similar to existing features already present in the project area (buildings, small structures such as canopied bus stations, utility poles, traffic signals, and signs). This APE is considered sufficient to include all ground-disturbing activities associated with construction of the new transit corridor and takes into account the potential for visual and audible effects to resources from the construction or operation of either the new LRT or BRT transit system (Figure 3.5-1). The Nevada SHPO approved this APE in a letter dated December 11, 2017 (Appendix H).

The cultural resources assessment consists of a site files search, a review of previous cultural resources investigations, archival research, a review of real property records for parcels in the APE, and an architectural resource windshield survey. The study includes an assessment of archaeological potential based on prior disturbance and development in the project area; research on buildings and structures that are located in and near the APE that are more than 45 years old, photo-documentation of viewsheds (vantage points) to and from the corridor to identify the potential for new visual intrusions on the landscape from new transit system elements (*e.g.,* stations, utility poles, traffic signals), and recommendations for additional investigations. The site files search was conducted using the Nevada Cultural Resource Information System (NVCRIS) and online geographic information system database services. The initial "data cut" was requested on April 21, 2016, providing information on previously recorded archaeological and architectural resources and inventories in the study area.

In January 2018, the City of Las Vegas Planning and Development Department provided reports on five surveys of historical resources in the City of Las Vegas to supplement the background research of the project area. Archival research was conducted in person at the Clark County Public Library on February 11, 2018, to provide a historical overview of development in the general project area. Historic maps and photographs, newspapers, and oral histories available online from the Special Collections Library of UNLV and University of Nevada, Reno were consulted for information on the development of various campuses in the project area, construction of specific buildings, and on specific groups and individuals involved in Las Vegas development. Additional research was conducted using online resources including several

Figure 3.5-1 Maryland Parkway APE Map



newspapers and news sites, such as the Las Vegas Review-Journal and Downtown Las Vegas, institutional and business websites, the Las Vegas Historical Society website, the Classic Las Vegas website, local neighborhood preservation groups, and roadside architecture and thematic enthusiast sites.

Property-specific research within the APE was conducted online using the Clark County Assessor's Office website. Records were reviewed to determine initial build dates, dates for subsequent modifications, and original and subsequent owners to assist with recommendations of integrity and historic association for eligibility recommendations. A review of Clark County maps and parcel data was critical in identifying resources previously documented in the NVCRIS that are no longer extant. Numerous resources recorded in the Clark County records as being 45 years old were identified in the survey as empty lots or parking lots with no current buildings or structures. A few of the parcels contained modern buildings which replaced older buildings, although original construction dates are still listed in the county data. Several of the parcels with empty lots, parking lot, or modern buildings were the locations of resources that had been previously documented in NVCRIS.

An architectural survey and inventory was conducted from February 7-11, 2018 by an architectural historian who meets the Secretary of Interior Standards Professional Qualifications Standards in Architectural History. The survey was conducted as a comprehensive windshield survey of buildings and structures over 45 years of age within the APE and an intensive survey of building adjacent to the proposed new LRT/BRT station and maintenance facility. Results of the windshield intensive surveys are located in the *Maryland Parkway Cultural Resources Survey* (Parsons, 2018c) Technical Report.

Photography of the general project area consisted of overviews that include multiple buildings along the proposed project corridor. Individual photographs of each resource in the APE were obtained from Google Streetview. The comprehensive windshield survey also included a visual inspection of surrounding resources and streetscapes along the project corridor to determine if any resources are located within a potential NRHP-eligible historic district. Several previously identified historic districts and neighborhoods comprised largely of residential buildings that are more than 45 years old occur along the project corridor.

An intensive survey was conducted based on the potential for effects from the LRT/BRT Alternatives, which has the greatest potential effects from direct visual intrusions or right-of-way encroachment on nearby properties. The parcels surveyed include those containing resources that are more than 45 years of age that are proposed for limited right-of-way extensions and additional easement for right-hand turn lanes, sidewalk expansion, and station construction; in front of or adjacent to proposed new LRT/BRT stations; or immediately adjacent/across street from the proposed new maintenance facility. In total, 41 resources were evaluated or re-evaluated for NRHP eligibility.

3.5.1.1 Archaeological Resources

One archaeological site is mapped within the archaeological APE of the project (Table 3.5-1). Site 26CK1767 is a multi-component site with a prehistoric lithic scatter and historic dump; however, it was destroyed by nearby construction. No extant archaeological sites occur within the archaeological APE.

Table 3.5-1 Previously Recorded Archaeological Sites within the Study Area

Site Number	Site Name	Temporal Association	Description	NRHP Eligibility Status	Reference	Comment
26CK1767	N/A	Prehistoric and Historic	Surface lithic scatter and mano; historic dump (bottles and cans)	Not evaluated	Acker 1979	Site likely destroyed from construction of a shopping center underway at time of survey

3.5.1.2 Archaeological Potential

The entire Maryland Parkway Corridor has been previously developed. Prior disturbance in the project area is associated with transportation improvements, including the San Pedro, Los Angeles, and Salt Lake Railroad (later UPRR), and associated railyard. The roadway grid system was designed in alignment with the railroad tracks and Clark's Las Vegas Townsite in the area north of Charleston Boulevard. Growth of the city's roadway network followed the platting of numerous additions and subdivisions. South of Charleston Boulevard, the roadway system is oriented along cardinal directions. The north end of north-south running Maryland Parkway was developed in the early 1940s forming the central axis of the new Huntridge Addition, a planned residential neighborhood of nearly 600 single-family and apartment homes. At its north end, Maryland Parkway frames an oval-shaped park in the center of the neighborhood, Huntridge Circle Park. Additional improvements in the project area include the establishment of Alamo Field, later McCarran International Airport, in 1942 at the southern end of the project area.

Development along Maryland Parkway did not occur until the 1950s, beginning with the extension of the roadway south of the Huntridge neighborhood after 1956. The Paradise Development Group built Sunrise Hospital in 1959 and later a series of professional buildings. They also built the Las Vegas International Country Club and several commercial centers along this corridor. UNLV was established in 1957 and the city's first indoor mall, the Boulevard Mall, was constructed in 1967. With the completion of Maryland Parkway to McCarran International Airport, it had become a major commercial and institutional corridor in the Las Vegas area.

Clearing and grading for initial roadway development as well as improvements, realignments, and widening over time has resulted in extensive ground disturbance within the footprint of Maryland Parkway and other roads in the proposed corridor. Subsequent development for the commercial, institutional, and residential development along the entire alignment, including paved access drives, sidewalks, parking lots, and the installation of underground utilities, has resulted in further ground disturbance.

Past clearing, grading, and surfacing for creation of the roadways likely disturbed any areas within the Maryland Parkway, connected corridor, and land adjacent with the potential for intact archaeological deposits. Past clearing and grading for construction of buildings and parking lots and installation of underground utilities also likely diminished the potential for undisturbed land with the potential for intact archaeological deposits. Nearly all the land within the current project area has been previously disturbed by construction and development.

No previous archaeological investigations have been conducted along the alignment; however, 14 archaeological investigations have been conducted of areas within the 0.25-mile study area. The project is located in an urban setting in the central Las Vegas Valley. Prior to urbanization the area was drained by the dendritic Las Vegas Creek. Prehistoric sites recorded along Las Vegas Creek and Duck Creek have demonstrated that cultural deposits to depths of 60 to 70 centimeters are common near the floodplain edges. Prehistoric sites adjacent to the project area reflect food procurement activities characterized by small lithic and ceramic assemblages. One prehistoric site was attributed to the Paiute/Numic Period (ca. 850-100 years before present). The San Pedro, Los Angeles, and Salt Lake Railroad, the first direct route from Salt Lake City to Los Angeles was completed in 1905. It was later acquired by the UPRR in 1922. Early historical land use in the northern part of the project area is associated with the sale of commercial and residential lots in the area for the Clark's Las Vegas Townsite between Stewart Street and Garces Avenue, and from Main Street to 5th Street. Historic sites would most likely represent activities associated with the railroad and subsequent surrounding commercial and residential development. With the exception of three railroad cottages and the Victory (Lincoln) Hotel, all San Pedro, Los Angeles, and Salt Lake Railroad facilities, including the Las Vegas rail yard, were demolished by 1992.

Historic aerials and maps indicate major modification and development in the northern part of the project area in downtown Las Vegas by the 1950s, extending to the south in subsequent decades, associated with construction of a major transportation corridor (Maryland Parkway) and subsequent commercial and residential development along the east and west sides of the corridor since the early 1960s. Continued construction, roadway improvements, and modern redevelopment in the downtown area have resulted in additional subsurface disturbance, resulting in the loss of archaeological sites. For example, a 1992 archaeological investigation conducted at site 26CK1493 failed to relocate the site, which was recorded in 1977, the result of subsequent and extensive ground-disturbing activities (Knight and Leavitt Associates, Inc., 1992). As such, no intact archeological resources are likely to occur in the project area.

3.5.1.3 Architectural Resources

NVCRIS provides information on architectural resources listed on the NRHP in addition to resources that have been inventoried and evaluated for NRHP eligibility. Four architectural resources listed on the NRHP or Nevada State Register of Historic Places (NVRHP) occur in the architectural APE: the El Cortez Hotel and Casino, the Huntridge Theater, and a railroad cottage and the Victory (Lincoln) Hotel, both associated with the San Pedro, Los Angeles, and Salt Lake Railroad thematic nomination. Ten resources in the APE were determined individually eligible for the NRHP and three properties were not individually eligible, but were considered contributing resources to NRHP-eligible historic districts with SHPO concurrence. Seventy-nine resources in the APE have been previously determined not eligible for the NRHP with SHPO concurrence. A proposed NRHP-eligible historic district is recommended for a portion of the Huntridge Subdivision, Tract No. 2 (Rayle and Ruter, 2017). Four resources within the boundary of this proposed district are located within the current APE, two of which are considered contributing elements. Concurrence on the eligibility of the district and contributing elements is pending Nevada SHPO review.

In total, 350 architectural resources in the APE are either listed on, eligible for listing on, or are unevaluated (considered potentially eligible) for listing on the NRHP (Table 3.5-2). An additional 186 architectural resources were determined ineligible and 102 buildings had been demolished.

Table 3.5-2 Summary of Property Types more than 45 years of age in the APE

Resource Type	NRHP-Listed	Eligible/ Contributing	Not Eligible	Unevaluated	Total
Residential	-	8	84	124	216
Commercial	4	5	66	114	189
Industrial	-	-	3	--	3
Educational	-	-	1	-4	5
Recreational	-		1		1
Civic/Government/Public	-		2	18	20
Parking Lot/Demolished	11	7	29	55	102
Total	**15**	**20**	**186**	**315**	**536**

In total, 41 architectural resources were evaluated or re-evaluated for NRHP eligibility according to Nevada SHPO Architectural and Inventory Guidelines (Table 3.5-3). The survey identified two newly identified resource that are recommended Eligible for the NRHP, Archie C. Grant Hall (4505 South Maryland Parkway; SHPO Number B15793) on the UNLV campus and the Central Telephone Building (125 South Las Vegas Blvd, SHPO Number B15769). In addition, the survey confirmed that one previously evaluated resource remains Eligible for the NRHP (501 Desert Lane; SHPO Number B10955). The remaining 38 resources are recommended Not Eligible for the NRHP. The Nevada SHPO concurred with our survey methodology and eligibility determinations in letters dated May 3, 2018 and August 21, 2018 (Appendix H).

Resources Recommended as NRHP-Eligible:

Archie C. Grant Hall (SHPO Number B15793): Archie C. Grant Hall is a flat-roofed, two-story concrete block building located on the UNLV campus. The building is representative of the International architectural style. Characteristics typical of the International architectural style include flat roofs, use of

Table 3.5-3 Intensively-Surveyed Historic Properties within the Area of Potential Effect

	Address	Parcel Number	Property Type	Year Built	Property or Community Name	Historic Name	Architectural Style	Materials	NRHP Eligibility Recommendation	SHPO ID	Comments	Parcel Location/ Project Activity
	1175 Princess Katy Ave	162-27-714-054	Residential-Single Family	1962	Paradise Valleys Southgate Tract 1	Paradise Valleys Southgate Tract 1	Contemporary	Masonry and wood siding with asphalt shingle roof and aluminum windows	Not eligible	B15814		Adjacent to station location
	5035, 5059, and 5083 S Maryland Pkwy	162-27-511-013; 162-27-511-014	Residential-Apartments	1963	Vibe Apartments	Maryland Manor Apartments	Contemporary	Stucco with asphalt composition roof and aluminum windows	Not eligible	B15797	Includes 7 buildings in the complex	New ROW for station; adjacent to station location
	1131 E Tropicana Ave	162-27-502-004	Commercial	1967	University Plaza Shopping Center (Vons)	Unknown	Commercial	Stucco with unknown roof material and aluminum windows	Not eligible	B15796		Adjacent to station location
	4966 S Maryland Pkwy	162-26-101-010	Commercial	1964	Domino’s Pizza	Kwik-Check	Commercial	Concrete block with unknown roof material and aluminum windows	Not eligible	B15795		Extend ROW for turn lane, curb, and sidewalk
	4505 S Maryland Pkwy	162-22-601-001	Educational	1959	Archie C. Grant Hall at University of Nevada, Las Vegas (UNLV) main campus	Archie C. Grant Hall	International	Concrete block with unknown roof material and aluminum windows	Eligible	B15793		Extend ROW for turn lane, curb cut, and power transformer substation; station location
	4412 S Maryland Pkwy	162-23-201-004	Community/ Public - Church	1966	University United Methodist Church	University Methodist Church	Pueblo Revival	Stucco with terra cotta roof and aluminum windows	Not eligible	B15794		Extend ROW for station; station location
	3600 S Maryland Pkwy	162-14-213-002	Commercial	1968	Boulevard Mall	Boulevard Mall	Commercial	Stucco with unknown roof material and aluminum windows	Not eligible	B15790		Extend ROW for station, sidewalk, bike lane, and power transformer substation; station location
	3542 S Maryland Pkwy	162-14-213-001	Commercial	1968	JC Penney Department Store (former)	JC Penney Department Store	Commercial	Stucco with unknown roof material and aluminum windows	Not eligible	B15789		Adjacent to station location
	3450 S Maryland Pkwy	162-14-101-003	Commercial	1968	Sears Department Store	Sears Department Store	Commercial	Stucco with unknown roof material and aluminum windows	Not eligible	B15788		Adjacent to station location
	3634 S Maryland Pkwy	162-14-213-003	Commercial	1968	Broadway, Macy’s Department Store (former)	Broadway Department Store	Commercial	Ornamental concrete block with unknown roof material and aluminum windows	Not eligible	B15791		Adjacent to station location

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Table 3.5-3 Intensively-Surveyed Historic Properties within the Area of Potential Effect (Continued)

	Address	Parcel Number	Property Type	Year Built	Property or Community Name	Historic Name	Architectural Style	Materials	NRHP Eligibility Recommendation	SHPO ID	Comments	Parcel Location/ Project Activity
	3547 S Maryland Pkwy	162-15-602-001	Commercial	1966	24 Hours Laundromat (Strip Shopping Center)	Unknown	Commercial	Stucco with concrete tile roof and aluminum windows	Not eligible	B15792		Adjacent to station location
	3186 S Maryland Pkwy	162-11-401-010; 162-11-301-008	Community/ Public - Hospital	1959	Sunrise Hospital (Building)	Sunrise Hospital	Corporate Post Modernism	Stucco with unknown roof material and aluminum windows	Not eligible	B15787	Main Hospital; North tower	Extend ROW for station and sidewalk
	3186 S Maryland Pkwy	162-11-301-007	Community/ Public - Hospital	1982	Sunrise Hospital (Parking garage and lot)	Sunrise Hospital	Commercial	Stucco with concrete roof	Not eligible	S1879	Parking garage	Extend ROW for curb cut; adjacent to station location
	2655 S Maryland Pkwy	162-10-502-010	Commercial	1967	Las Vegas Athletic Club	Unknown	Commercial	Concrete block with unknown roof material and aluminum windows	Not eligible	B15786		Adjacent to station location
	2312 S Maryland Pkwy	162-03-802-005	Commercial	1970	Kentucky Fried Chicken	Unknown	Commercial	Concrete with unknown roof material and aluminum windows	Not eligible	B15785		Adjacent to station location
	1205-1245 E Sahara Ave	162-02-401-001	Commercial	1961	Planet Fitness	Parkway Plaza, Amall Shopping Center	Commercial	Stucco with unknown roof material and aluminum windows	Not eligible	B15782		Extend ROW for station; station location
	2300 S Maryland Pkwy	162-03-802-004	Commercial	1966	Dotty’s Casino	Unknown	Commercial	Stucco with unknown roof material and aluminum windows	Not eligible	B15784		Adjacent to station location
	1100 E Charleston Blvd	162-03-513-008	Commercial	1961	Huntridge Shopping Center	Huntridge Shopping Center	Contemporary	Stucco with unknown roof material and aluminum windows	Not eligible	B15783		Station location
	1125 S Maryland Pkwy	162-02-110-018	Commercial	1958	Unknown (Vacant)	U.S. Post Office	Commercial	Concrete block with unknown roof and window materials	Not eligible	B15781		Adjacent to station location
	1200 E Charleston Blvd	162-02-110-015	Commercial	1948	Unknown (Vacant)	Bank of Las Vegas	Commercial	Concrete exterior with unknown roof material	Not eligible	B15780		Extend ROW for turn lane; adjacent to station location
	1203 E Charleston Blvd, Units #101-140	139-34-814-002	Commercial	1959	Charland Square	Unknown	Commercial	Concrete block with unknown roof material and aluminum windows	Not eligible	B15774	Charland Square (west building strip stores)	Adjacent to station location
	1205 E Charleston Blvd	139-34-814-002	Commercial	1959	Tacos Mexico Restaurant	Denny’s Restaurant	Commercial	Concrete block with unknown roof material and aluminum windows	Not eligible	B15776		Adjacent to station location
	1207-1241 E Charleston Blvd	139-34-814-002	Commercial	1959	Charland Square	Unknown	Commercial	Concrete block with unknown roof material and aluminum windows	Not eligible	B15775	Charland Square (north building strip stores)	Adjacent to station location

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Table 3.5-3 Intensively-Surveyed Historic Properties within the Area of Potential Effect (Continued)

	Address	Parcel Number	Property Type	Year Built	Property or Community Name	Historic Name	Architectural Style	Materials	NRHP Eligibility Recommendation	SHPO ID	Comments	Parcel Location/ Project Activity
	1229 E Carson Ave	139-35-310-017	Community/ Public - Church	1949	Torre Fuerte Iglesia Adventista del Septimo Dia	Jewish Community Center of Las Vegas/ Temple Beth Sholom	Neo-Traditional	Brick with asphalt roof and aluminum windows	Not eligible	B15779	Other historic name: St. John Orthodox Church	Adjacent to station location
	1200 E Bridger Ave	139-35-310-013	Residential-Apartments	1949	Ladd Addition; Desert Plaza Senior Apartments	Unknown	Neo-Traditional	Concrete/siding with asphalt composition roof and aluminum windows	Not eligible	B15778	Includes 11 buildings in the complex	Adjacent to station location
	218 S Maryland Pkwy	139-34-712-113	Commercial	1957	Ladd Addition	Unknown	Contemporary	Sandstone with asphalt composition roof and aluminum windows	Not eligible	B15773		Adjacent to station location
	214 S Maryland Pkwy	139-34-712-112	Commercial	1964	Ladd Addition	Unknown	Contemporary	Concrete block with synthetic roof and aluminum windows	Not eligible	B15772		Adjacent to station location
	210 S Maryland Pkwy	139-35-310-003	Residential-Single Family	1955	Ladd Addition	N/A	Contemporary	Brick with asphalt composition roof and wood windows	Not eligible (re-evaluated)	B7457		Adjacent to station location
	208 S Maryland Pkwy	139-35-310-004	Commercial	1963	Ladd Addition	N/A	Contemporary	Concrete block with synthetic roof and aluminum windows	Not eligible	B15777		Adjacent to station location
	201 S 9th St	139-34-712-031	Residential-Single Family	1935	Pioneer Heights	N/A	Craftsman	Stucco with asphalt composition roof and aluminum windows	Not eligible (re-evaluated)	B7371		Adjacent to station location
	207 S 9th St	139-34-712-031	Residential-Single Family	1935	Pioneer Heights	N/A	Craftsman	Stucco with asphalt composition roof and aluminum windows	Not eligible (re-evaluated)	B7372		Adjacent to station location
	207-½ S 9th St	139-34-712-031	Residential-Single Family	1940	Pioneer Heights	N/A	Ranch	Stucco with asphalt composition roof and aluminum windows	Not eligible (re-evaluated)	B7373		Adjacent to station location
	907 E Carson Ave	139-34-712-031	Residential-Single Family	1940	Pioneer Heights	N/A	Craftsman	Stucco with asphalt composition roof and aluminum windows	Not eligible (re-evaluated)	B7514	Converted garage	Adjacent to station location
	899 Fremont St	139-34-612-056	Commercial	1970	Western Hotel and Casino (vacant);	Western Hotel and Casino	Corporate Postmodernism	Concrete block with unknown roof material and aluminum windows	Not eligible	B15771		Adjacent to station location
	200 S 8th St	139-34-612-025	Residential – Apartments	1963	Bargain Hotel	Unknown	Commercial	Concrete block with unknown roof material and aluminum windows	Not eligible	B15770		Adjacent to station location

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Table 3.5-3 Intensively-Surveyed Historic Properties within the Area of Potential Effect (Continued)

	Address	Parcel Number	Property Type	Year Built	Property or Community Name	Historic Name	Architectural Style	Materials	NRHP Eligibility Recommendation	SHPO ID	Comments	Parcel Location/ Project Activity
	125 S Las Vegas Blvd	139-34-611-055	Commercial	1958	Central Telephone Company (Centel)	Southern Nevada Telephone Company	Corporate Modernism	Various exterior materials, including blue ceramic tiles with unknown roof material and aluminum windows	Eligible	B15769		Adjacent to station location
	212 S Las Vegas Blvd	139-34-610-024	Commercial	1956	EZ Pawn	Unknown	Commercial	Brick with unknown roof material and aluminum windows	Not eligible	B15768		Adjacent to station location
	304 E Carson Ave	139-34-210-081	Commercial	1965	Clark's Las Vegas Townsite	Unknown	International	Concrete with concrete roof	Not eligible	S1882	Parking garage	Adjacent to station location
	501 Desert Ln	139-33-306-001	Commercial	1963	The Neon Apartments	Unknown	International	Stucco with asphalt roof and aluminum windows	Eligible (re-evaluated)	B10955		Extend ROW for sidewalk adjacent to new track
	511 S Tonopah Dr	139-33-301-010	Commercial	1963		Unknown	Contemporary	Concrete block with concrete roof and aluminum windows	Not eligible	B15764		Extend ROW for sidewalk
	2030 Pinto Ln	139-33-302-009	Residential-Single Family	1956		Unknown	Contemporary	Stucco with asphalt roof and aluminum windows	Not eligible	B15765		Extend ROW for sidewalk

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reinforced concrete, and the absence of ornament or moldings. The second floor is accessed by a set of exterior stairwells on both the southeast and northwest facing sides of the building. On the southeast facing extent (the primary façade), the stairwell is covered by a masonry wall that extends to the full height of the building. The building's name "Archie C. Grant Hall" is mounted in aluminum letters half way up the wall that covers this stairway. This wall is a character defining feature of the building and is consistent with the building's International style. Currently providing space to the university's art department, several sculptures and artistic displays are located around and incorporated into the building, including an ear on the exterior staircase on the northwest side of the building. Alterations to the building by 1983 included the addition of a two-story elevator shaft attached to the north end of the building.

Archie C. Grant Hall, southeast (primary) façade, facing west

In 1954, the Nevada Board of Regents founded the Southern Regional Division of the University of Nevada, commonly known as Nevada Southern University. To meet the demands of the growing community of Las Vegas, the Regents of the University of Nevada acquired an 80-acre parcel on Maryland Parkway for a future university that is now the current site of UNLV. On September 10, 1957, the first classes were held on campus in a new 13,000-square-foot building, later named for Maude Frazier, a state assemblywoman and leading advocate for the establishment of Nevada Southern. The university grew quickly and added new buildings, including a classroom building named for regent Archie C. Grant in 1959. Frazier Hall was demolished in 2008, making Grant Hall the oldest surviving building on the UNLV campus. Grant was involved in civic life in Las Vegas and the State of Nevada. With the creation of the Las Vegas Housing Authority in 1947, Grant became its first citizen chairman. In 1952, Grant was elected to serve as University of Nevada regent, where he became an important advocate for the creation of the university campus in Las Vegas that would become UNLV.

Grant Hall was originally a general-use classroom building and a portion of the building was used to house the first library on the UNLV campus. As the university grew, individual schools and departments were housed in their own buildings. Grant Hall has housed the school of education in the past and now is the home of the university's art department and has studio and exhibition space, in addition to classrooms.

Grant Hall retains four of the seven aspects of integrity: location, design, materials, and association. It is situated in its original location along Maryland Parkway and it has not been altered so its original minimalist design reflective of the International style is intact. It was constructed of reinforced concrete which also has not been altered, and it maintains its association as an educational building within the UNLV campus. The Archie C. Grant Hall is recommended eligible for listing on the NRHP.

Telephone Company Building at 125 South Las Vegas Blvd (SHPO Number B15769): The commercial building was first constructed in 1958. The building occupies one third of the city-block on which it is situated. It is three stories tall on its south extent (1958 original building and 1964 addition) and at mid-block it becomes a 5-story tower (1971 addition). The building has had three major additions dating to: 1963, 1964, and 1971. The building has a flat roof and its overall shape is a stepped rectangle. The building's primary exterior characteristics are light blue rectangular tiles, a large geometrically patterned cast concrete screen on the west façade, and vertical, ribbed, aluminum sun screens located along the west and south elevations. On the south face of the tower visible from Carson Avenue, there is a large graphic mural that has been painted within the last 12 months. This building is representative of commercial and institutional architectural approaches common in the mid-1950s, which took advantage of newly available building technologies and embraced a modern aesthetic.

Central Telephone Building, facing northeast

This building was first constructed in 1958 to house Las Vegas' main telephone exchange. The original user was the Southern Nevada Telephone Company, which in 1971, became part of the Central Telephone Company (Centel). Sprint acquired the assets of Centel in 1992 and then the company was absorbed by CenturyLink in 2009. During these transitions the building continued to be used to house communications equipment that has served as the primary telecommunications exchange for Central Las Vegas. The physical growth of the Central Telephone Company building and its expansions represent a parallel to the growth of the City of Las Vegas. As Las Vegas began to urbanize in the 1950s it required new and modern telecommunications facilities. In line with this modernization, the new telephone exchange building was designed with the technological aesthetics common to commercial architecture in the 1950s. It embraced the use of new materials such as brightly colored mass produced glazed tiles, aluminum framed windows and other features that suggested that advanced technologies and functions were housed in the building itself. Las Vegas continued to grow and as a result, the region required a larger exchange building as the number of lines in the community grew as well. Interestingly, the telephone company needed to expand the building rather rapidly after its first development. In 1963 and again in 1964 the telephone exchange added significant expansions to the north and east of the original building. These additions allowed for increased capacity of telephone switching equipment and office space. The 1963 expansion included the same period design features as the original 1958 construction, including matching blue glazed tiles and decorative concrete screening. However, the 1964 addition did not include these motifs and features. By 1971, when the third and final expansion of the building occurred, an undecorated concrete structure was appended to the west end of the building. By this time, the resource had taken on a more utilitarian and a less symbolic function as a building.

The building does have distinctive design elements that are associated with the modernist movement, in particular, the metal shutters that shade the windows on the former office component of the building as well as the blue decorative tiles that primarily clad the Las Vegas Boulevard elevation. Its distinctive design elements as exemplified by the original 1958 building and the 1963 addition to the north qualify it for inclusion on the NRHP at the state or local level.

The Neon Apartments at 501 Desert Lane Description (SHPO Number B10955): The Neon Apartments are located at the southeast corner of Desert Lane and Alta Drive in the Las Vegas Medical District. The two buildings located at this address are identical two-story, International style apartment buildings constructed in 1963. The 22-unit complex comprises two "U" shaped buildings oriented north-south that are a mirror image of each other, forming a courtyard in the center. Both buildings have a flat roof with exterior walls clad in concrete stucco. The sides of the buildings which face the streets have a grid pattern created from linear rows of equally spaced aluminum slider windows, in between wide vertical stripes painted in a descending gradient of blue separated by narrow rust colored strips resulting in an ombré effect. The exterior paint color is an alteration from the tan and brown coloring identified in 2008. Landscaping consists of xeriscaping and rock gardens, and alteration from the landscape plantings of juniper bushes spaced between the windows, which was described as reinforcing the regular rhythm of the building in 2008.

501 Desert Lane, north façade (main entrance), facing east

The two buildings located at 501 Desert Lane were previously surveyed in 2008 as part of an architectural inventory for Project Neon along Interstate 15 from Sirius to Bonanza Road. The buildings were determined to be eligible for listing in the NRHP. Changes to the apartment complex in 2017 included alterations in the buildings' exterior color and landscaping. However, no structural changes to the buildings have occurred and the buildings would still be considered eligible.

NVSRHP or NRHP-listed Resources:

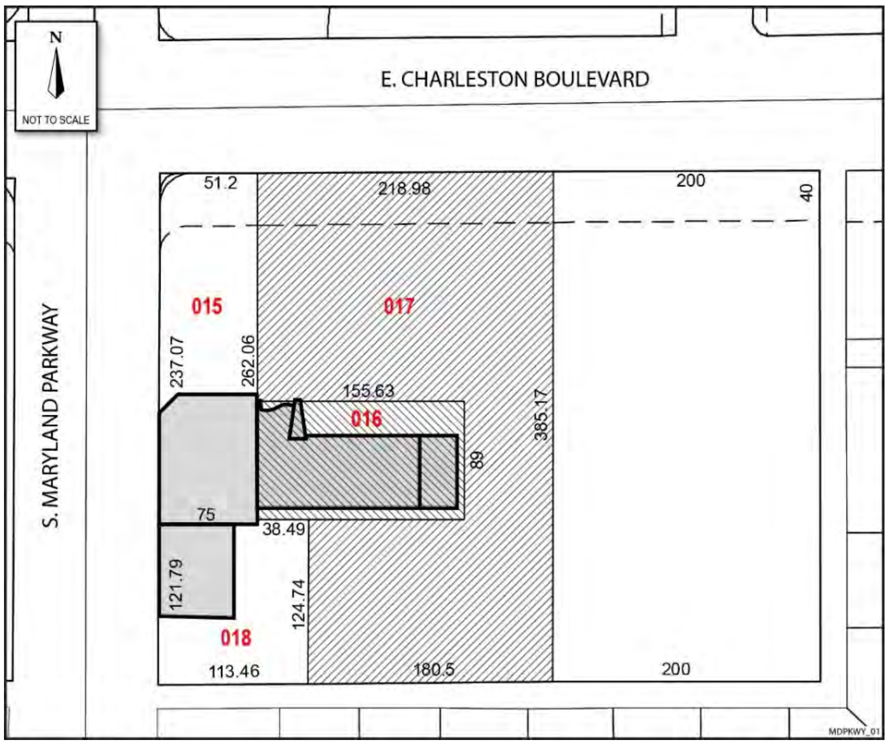
El Cortez Hotel and Casino. Located at 600 Fremont Street, the El Cortez Hotel and Casino was constructed in 1941 and renovated in 1952. It is listed on the NRHP under Criterion A for its historic association with the economic and entertainment development of Las Vegas and Fremont Street, in particular, from the early 1940s through the early 1950s. A parking garage added in the 1970s and a 15-story hotel tower completed in 1984, are not considered contributing elements to the historic property (Moruzzi and Fogelquist, 2012). The architectural style of the El Cortez Hotel and Casino is primarily Spanish Colonial Revival, characterized by asymmetrical massing, low pitched roofs covered with clay tiles, shallow eaves, arched openings, covered porches or arcades, and recessed rectangular windows with lintels. The exterior is clad in stucco and exposed brick with "weeping" mortar. Decorative elements include wrought iron balconettes, glazed tiles, clay pot chimney caps, and round towers with conical caps.

Huntridge Theater. The Huntridge Theater, located at 1208 East Charleston Boulevard, was constructed in 1943-1944 and is located at the large, busy intersection of Maryland Parkway and Charleston Boulevard, north of the Huntridge residential neighborhood (Lenz, 1993; Harmon, 1999). It served as a movie theater for almost five decades before a local non-profit group, Friends of the Huntridge Theater, purchased the theater and an adjacent building in an attempt to convert the space to a performing arts center in the 1990s. The theater is listed on both the NRHP and the NVSRHP. Alterations over time have included loss of original landscaping and changes to the interior and exterior of the original theater building. The Huntridge Theater is adjacent to a former bank building (constructed in 1948, address 1200 East Charleston Boulevard) and former post office building (constructed in 1958, address 1125 South Maryland Parkway). As documented in the NRHP and NVSRHP, the historic property consists only of the original theater building and two parcels. The attached former bank and post office buildings had not been separately evaluated for NRHP eligibility. They are documented as part of the current study. The historic property totals about two acres and includes the historically associated parcel (used as parking lots to the north, east, and south of the theater building). The historic property totals about 2 acres and includes the surrounding parcel (used as a parking lot) (Figure 3.5-2). Parking lots on parcels associated with the former bank and post office occur on the west side of the building, along Maryland Parkway.

Properties Associated with the San Pedro, Los Angeles, and Salt Lake Railroad. This historic property includes three contributing buildings (the 1910 storehouse building (Hanson Hall), the 1908 ice plant, the 1910 Victory (Lincoln) Hotel) and one, eight-building historic district, associated with the founding and early development of Las Vegas as a railroad town (Kuranda *et. al.,* 1987; Thomson, 2001). Within the current project APE, only the 1910 Victory (Lincoln) Hotel and one of the eight bungalow-style cottages (ca. 1909-1912) located at 629 South Casino Center Boulevard are extant. The cottage has been converted to a business and is categorized as a commercial building. (Two additional railroad cottages are located on South Third Street outside the APE and were not elements of the thematic nomination.)

The Victory (Lincoln) Hotel is located at 307 South Main Street and was constructed in 1910. This Mission-style two-story hotel was used by rail passengers as it was located directly across the street from the train depot (Kuranda *et. al.,* 1987).

Figure 3.5-2 Huntridge Theater Building and Original Parking Lot



Note: The Huntridge Theater building and original parking lot (B916;990103;93000686) occupies the hatched parcels (016 and 17). Parcels 015 and 018 are associated with non-contributing resources to the historic property.

3.5.1.4 Properties of Religious or Cultural Significance to Native American Tribes

Native American Tribes with a potential interest in the project area based on location or historical ties to the area were identified as part of the cultural resources assessment; consultation letters to three tribes (Las Vegas Paiute, Moapa Paiute, and Pahrump Paiute) were sent in April 5, 2017 (Appendix H). After no responses were received, each Tribe was contacted by telephone on May 15, 2017. A follow up email was sent to each Tribe on June 5, 2017. To date, no responses have been received. Based on a preliminary review, no properties of religious or cultural significance to Native American tribes are known to occur within the proposed project area.

3.5.2 Impacts

Impacts to archaeological, architectural, and Native American resources from implementation of either the Build Alternatives or Enhanced Bus Alternative are discussed below.

3.5.2.1 Build Alternatives

Archaeological Resources

There is limited to no potential for impacts to archaeological resources in the APE from implementation of the two Build Alternatives. Although one previously identified archaeological site is mapped within the APE, based on documented destruction and prior disturbance, there is limited potential for that site or other intact resources to occur in the APE.

Construction of the Build Alternatives in the existing Maryland Parkway and other project related corridors overlaps previously heavily developed areas including a major transportation corridor flanked by commercial, institutional, residential buildings with underground utilities, and other infrastructure. Initial construction and redevelopment of the roadway as well as grading, utilities, and resurfacing would have disturbed the area, thereby eliminating the potential for intact archaeological resources. Any excavation proposed for installation of subsurface elements of the Build Alternative would occur in areas of previous disturbance from roadway grading. Under the LRT alternative, additional ground disturbance from the installation of footings for catenary poles and construction of a maintenance facility in the former UPRR yard would occur. Staging for construction under both Build Alternatives would occur in the former UPRR yard where prior disturbance from building construction, demolition, and environmental remediation have limited the potential for intact resources to occur.

Architectural Resources

There is limited potential for impacts to architectural resources in the APE from construction of the Build Alternatives. Numerous historic properties, including the Huntridge Theater, a former railroad cottage, hotel, and other contributing or eligible or potentially eligible commercial and residential buildings, occur in the architectural APE. These properties have already been subject to alterations in aspects of integrity (setting and feeling) resulting from surrounding urban development. Features associated with a busy urban roadway, existing transit corridor, and downtown commercial district occur in the APE and include modifications to the existing roadway to accommodate transit vehicles, bus stops, sidewalks, utility poles, signals and signs, and heavy transit traffic for an existing bus route. Demolition and alteration of historic structures and infill of modern buildings have also occurred in the project area. The addition of infrastructure to support a new transit system as part of the Build Alternative will occur within the existing roadway and associated elements (*e.g.*, small structures and utility/catenary poles) will not create any additional visual intrusions to historic architectural resources because they are similar to other vertical features that already occur in the corridor.

Minor right-of-way acquisition is proposed in areas along the corridor to provide right-hand turn lanes. A portion of the parking lot on the north side of Huntridge Theater/Performing Arts Center is proposed for acquisition to provide a right-hand turn lane from Maryland Parkway onto Charleston Boulevard. The acquisition will result in the loss of about seven parking spaces from a parcel northwest of the theater. This parking lot is adjacent to the two parcels comprising the historic property; no features or aspects of integrity that contribute to the NRHP eligibility of the theater would be impacted. The landscape surrounding the theater has already been altered over time with the addition of paving. No new areas of paving are proposed but the use will be altered from parking to roadway. No adverse effects to the Huntridge Theater will occur from this right-of-way acquisition.

Additional minor right-of-way acquisitions, easements for new stations, or the addition/expansion of sidewalks may occur along the corridor. New stations will be located adjacent to the Neon Apartments, Central Telephone Building, and Archie C. Grant Hall; however, no adverse effects will occur to these eligible buildings. Although alterations may occur along the edges of parcel boundaries of historic properties, the addition of pavement for a sidewalk or a station will not alter aspects of integrity that make these properties eligible (or would make these properties eligible when evaluated) for the NRHP because paving already occurs in front of the properties and transit-related features like bus stops occur near or within viewshed of most properties. Features like sidewalks and stations could be expected to occur along a busy urban commuter corridor.

There is a potential for short-term visual and noise impacts to historic properties during construction for the new transit system. Although minor impacts to historic properties may result from implementation of the Build Alternative, they are not expected to result in adverse effects.

FTA will consult with the Nevada SHPO for concurrence on the determination of no adverse effect to historic properties as a result of implementing either Build Alternatives.

Properties of Religious or Cultural Significance to Native American Tribes

No impacts to Native American resources are expected from construction of either of the Build Alternatives because no properties of religious or cultural significance to Native American Tribes are known to occur in the project area.

3.5.2.2 Enhanced Bus Alternative

Archaeological Resources

Similar to the Build Alternatives, there is limited to no potential for impacts to archaeological resources in the APE from implementation of the Enhanced Bus Alternative. Although one previously identified archaeological site is mapped within the APE, based on documented destruction and prior disturbance, there is limited potential for this site or other intact resources to occur in the APE.

Limited construction for the Enhanced Bus Alternative would reuse an existing major transportation corridor flanked by commercial, institutional, and residential buildings with underground utilities and other infrastructure. Initial construction and redevelopment of the roadway as well as grading, utilities, and resurfacing would have disturbed the area, thereby eliminating the potential for intact archaeological resources. Any excavation proposed for installation of subsurface elements of the Enhanced Bus Alternative would occur in areas of previous disturbance from roadway grading. Staging for construction would occur in the former UPRR yard where prior disturbance from building construction, demolition, and environmental remediation have limited the potential for intact resources to occur.

Architectural Resources

Similar to the Build Alternative, there is limited potential for impacts to architectural resources in the APE from construction of the Enhanced Bus Alternative. Numerous historic properties, including the Huntridge Theater, a former railroad cottage, hotel, and other contributing, eligible or potentially eligible commercial and residential buildings, occur within the architectural APE. These properties are already located along a busy bus route and have already been subject to alterations in aspects of integrity (setting and feeling) resulting from surrounding urban development. Features associated with a busy urban roadway, existing bus route, and downtown commercial district occur in the APE and include modifications to the existing roadway to accommodate buses, bus stops, sidewalks, utility poles, signals and signs, and heavy traffic for an existing bus route. Demolition and alteration of historic structures and infill of modern buildings have also occurred in the project area. The addition of infrastructure to support an enhanced bus route as part of the Enhanced Bus Alternative will occur within the existing roadway and associated elements (*e.g.*, additional bus stops) will not create any additional visual intrusions to historic architectural resources because they are similar to other vertical features that already occur in the corridor. The frequency of buses will increase above that of the existing bus route, but no additional noise or vibration impacts are expected from implementing the Enhanced Bus Alternative.

Additional minor right-of-way acquisitions or easements for new bus stops or the addition/expansion of sidewalks may occur along the corridor. Some of this area may border properties that have been determined eligible for the NRHP or are unevaluated for eligibility on the NRHP. Although alterations may occur along the edges of parcel boundaries of historic properties, the addition of pavement for a sidewalk or a new bus stop will not alter aspects of integrity that make these properties eligible (or would make these properties eligible when evaluated) for the NRHP because paving already occurs in front of the properties and features like bus stops already occur near or within viewshed of most properties. Features like sidewalks and bus stops could be expected to occur along a busy urban commuter corridor.

There is a potential for short-term visual and noise impacts to historic properties during construction for the new bus stations, but they will be minor and are not expected to result in adverse effects.

FTA will consult with the Nevada SHPO for concurrence on the determination of no adverse effect to historic properties as a result of implementing the Enhanced Bus Alternative.

Properties of Religious or Cultural Significance to Native American Tribes

No impacts to Native American resources are expected from construction of the Enhanced Bus Alternative because no properties of religious or cultural significance to Native American Tribes are known to occur in the project area, pending consultation with Native American Tribes.

3.5.2.3 No Build Alternative

The No Build Alternative would cause no direct, indirect, or construction impacts to cultural resources in the project area.

3.5.3 Mitigation

Mitigation measures reduce significant impacts/adverse effects on cultural resources. The preferred mitigation is avoidance. Avoidance preserves the integrity of cultural resources and protects their research potential (*i.e.*, their NRHP eligibility) and, also, avoids costs and potential construction delays associated with data recovery. The contractor will use appropriate traffic control measures to protect properties, which typically include orange construction safety fence and concrete barriers. FTA will consult with the Nevada SHPO for concurrence on the determination of no adverse effects to historic properties.

Archaeological Resources

No areas of archaeological potential have been identified in the project area. In the event that archaeological deposits or features are identified or unanticipated buried cultural resources were to be discovered during construction, work will be halted or redirected to other locations in the project area and the Contractor would contact RTC immediately. RTC would contact a qualified archaeologist to make an assessment for the proper treatment of those resources. If human remains are discovered, RTC would notify the County Coroner and FTA for the possibility of tribal consultation. All archaeological deposits and cultural resources would be preserved at the State Historical Museum.

The nearest State Historical museums include the following:

- Nevada State Museum 309 S. Valley View Blvd. Las Vegas, NV
- Nevada State Museum 600 N. Carson Street Carson City, NV 89701
- Nevada Tourism and Cultural Affairs 401 N. Carson Street Carson City, NV 89701

Architectural Resources

Minor, short-term visual and audible effects may occur to historic architectural resources along the project corridor during construction. Mitigation measures are not required because these minor, short-term effects will not alter the characteristics of the historic structures that make them eligible for the NRHP, pending consultation with the Nevada SHPO.

3.6 Water Resources and Water Quality

The Southern Nevada Water Authority was established in 1991 to manage water resources in the Las Vegas Valley. In 2007, SNWA established the Las Vegas Valley Watershed Advisory Committee to enhance overall watershed management efforts and to develop a regional water quality plan for the Las Vegas watershed. The goals of the Las Vegas Valley Watershed Advisory Committee are to protect Lake Mead and downstream users; meet or surpass federal, state, and local standards; preserve and enhance the natural, cultural, historic, and recreational values of the watershed; sustain and coordinate water resources for future generations; manage flood risks; and build community awareness for watershed management (Las Vegas Valley Watershed Advisory Committee, 2012).

In 1972, Congress amended the Federal Water Pollution Control Act, making the addition of pollutants to the waters of the U.S., from any point source unlawful unless the discharge is in compliance with a National Pollution Discharge Elimination System (NPDES) permit. This act and its amendments are known today as the Clean Water Act. Congress has amended the act several times. In the 1987 amendments, Congress directed dischargers of storm water from municipal and industrial/construction point sources to comply with the NPDES permit scheme. The following are important Clean Water Act sections:

- Section 401 requires a project to obtain water quality certification from the State Board for a federal license or permit to conduct any activity that may result in a discharge to waters of the U.S. and that the discharge will comply with other provisions of the act.
- Section 401 requires an applicant for a federal license or permit to conduct any activity that may result in a discharge to waters of the U.S. to obtain certification from the Nevada Division of Environmental Protection (NDEP) that the discharge will comply with other provisions of the act. This is most frequently required in tandem with a Section 404 permit request (see below).
- Section 404 establishes a permit program for the discharge of dredge or fill material into waters of the U.S. This permit program is administered by the U.S. Army Corps of Engineers (USACE).

The goal of the Clean Water Act is "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters."

In Nevada, the NDEP is responsible for implementation and enforcement efforts associated with the Clean Water Act. NDEP is responsible for NPDES permitting activities in addition to setting water quality standards and total maximum daily loads for water bodies. The Clark County Regional Flood Control District is the lead agency for the Las Vegas Valley NPDES Municipal Separate Storm Sewer System permit and coordinates permit compliance among stormwater system operators, such as the cities of Las Vegas, Henderson, North Las Vegas, and Clark County. Potable water sources for Nevada include Lake Mead and groundwater.

The Las Vegas Wash is a tributary to Lake Mead and its flows are comprised of urban runoff, shallow groundwater, highly treated wastewater, and stormwater (Las Vegas Valley Watershed Advisory Committee, 2012). Urban runoff can pose a risk to water quality in Las Vegas Wash, and ultimately to Lake Mead, because of the potential to carry pollutants such as oil, grease, pesticide, and fertilizer from the urban landscape through the stormwater drainage system.

3.6.1 Existing Conditions

The Las Vegas Valley Hydrographic Basin is bordered by the Spring Mountains to the west, Frenchman Mountains to the east, McCullough Range to the south, and the Sheep Range to the north. The valley is mainly drained by the Las Vegas Wash. The Las Vegas Valley receives an average rainfall of approximately 4 inches per year; however, the area often experiences intense rainfall and subsequent flash floods (Las Vegas Valley Watershed Advisory Committee, 2012).

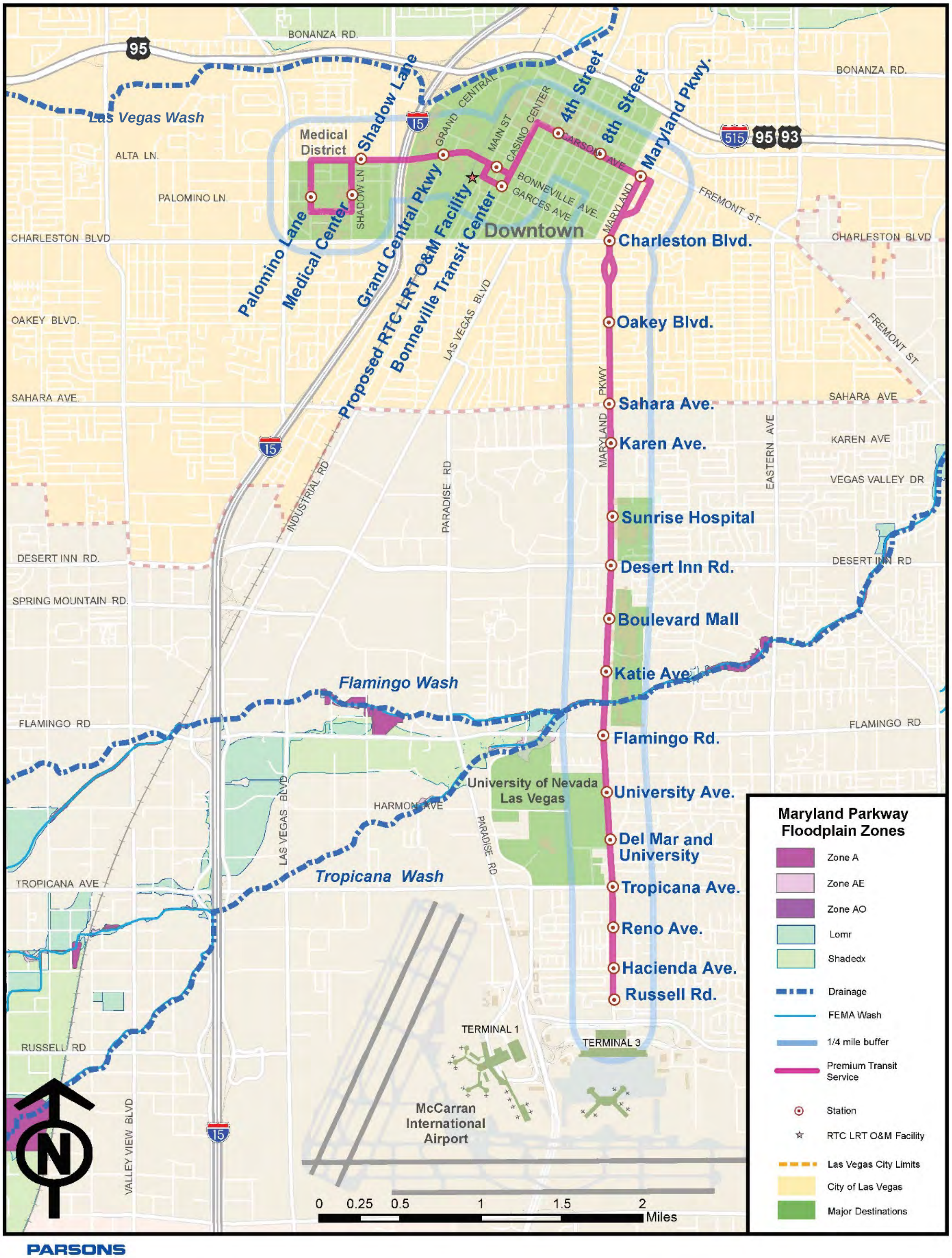
Nevada is predominately a plateau, with the southern portion generally between 2,000 and 3,000 feet in elevation. The average temperature in the southern portion of the state is in the middle 60's Fahrenheit (F), with long and hot summers and short and mild winters with a temperature range from 25 to 60° F. Summer temperatures above 100° F occur rather frequently and the humidity is low. The average number of days with precipitation of 0.01 inch or more in Las Vegas is 23. Thunderstorms in the Las Vegas area are infrequent, with 15 average number of days annually. Dust and sand storms occur occasionally when storms move through.

The average annual maximum temperature at the Las Vegas McCarran Airport is 80.1° F and the minimum temperature is 54.3° F. The average total precipitation is 4.15 inches and the average total snowfall is 0.9 inch. The daily average wind speed is 7.8 mph and the maximum daily average wind speed is 29.1 mph (Western Regional Climate Center, 2016).

Shallow groundwater is historically naturally occurring, but is also fed by excess irrigation. Shallow groundwater is trapped by an impermeable layer of clay soils and typically lies within 50 feet of the Las Vegas Valley land surface. There is a shallow confined aquifer, called the Near-Surface Aquifer, under the project corridor that ranges in depth from 10 to 30 feet below ground surface. A lower aquifer, called the Principal Aquifer, ranges in depth from 50 to 100 feet below ground surface and is the primary source for local water development. (Las Vegas Valley Watershed Advisory Committee, 2012). Water used locally is primarily from the Colorado River and Lake Mead, with limited water development from the aquifer. Per the Southern Nevada Water Authority, only 10 percent of Southern Nevada's municipal water supply comes from Las Vegas groundwater (Southern Nevada Water Authority, 2018). Natural flow of groundwater in the Valley is toward Las Vegas Creek and then southeasterly. Groundwater flow along the proposed corridor flows in an easterly direction. The natural water quality of the regional shallow aquifers is poor. It has been degraded by infiltration of irrigation waters and surface runoff containing fertilizers, organics, and other contaminants.

There are no perennial streams in the project corridor. Flamingo Wash is the only drainage crossing the project corridor, near Maryland Parkway and Flamingo Road, and is generally dry (Figure 3.6-1). Flamingo Wash is in the Colorado River Basin and considered a Category 5 stream. Flamingo Wash flows to the Las Vegas Valley Wash, in the southwest section of Las Vegas, which flows to Lake Mead and the Colorado River. The drainage facility has been concrete lined at Maryland Parkway, so no vegetation is associated with Flamingo Wash near the project area.

Figure 3.6-1 Surface Water Drainages and Floodplains in the Project Corridor



3.6.2 Impacts

3.6.2.1 Build Alternatives

There are no perennial surface waters in the project area. Flamingo Wash is a concrete-lined ephemeral wash. No direct impacts to the stream are anticipated because the LRT tracks or BRT lanes will be placed on top of the existing culverts along Maryland Parkway and would not require extension or replacement of the culverts. Excavation for the proposed project is not expected to exceed 2 to 3 feet, except for the placement of catenary, utility, and sign poles which can go as deep as 20 feet. Due to limited excavation depths, impacts to surface water and groundwater from construction activities are not expected with appropriate best management practices. Any disturbed areas will be fully stabilized with pavement. Therefore, there are no direct or indirect impacts to water resources anticipated from the Build Alternatives.

The LRT cars are electric and BRT will likely use compressed natural gas (CNG) buses; therefore, neither Build Alternative would cause indirect impacts from accidental spills of fuel near Flamingo Wash or in any storm sewer. The maintenance facility will be equipped with appropriate storm water controls, such as oil/water separators. Construction impacts could occur due to sedimentation and run-off into the Flamingo Wash or the existing storm sewer systems during excavation activities. These potential construction impacts would be temporary and minimized or avoided by the use of best management practices, such as silt fences, sediment control logs, and dust control measures.

3.6.2.2 Enhanced Bus Service

Continued bus service will occur with the Enhanced Bus Service, however, the vehicles would likely reflect the RTC transition to CNG-fueled buses. Construction of the new stations would require appropriate best management practices to avoid potential water quality impacts. No new maintenance facility is planned with this alternative.

3.6.2.3 No Build Alternative

The No Build Alternative would cause no direct, indirect, or construction impacts to water resources or water quality.

3.6.3 Mitigation

Best management practices would be utilized by the contractors to prevent sediment from entering the storm sewers or Flamingo Wash during construction activities. Permits are required by the local agencies to ensure compliance with water quality standards. A Stormwater Pollution Prevention Plan will be prepared prior to construction to avoid or mitigate potential water quality impacts.

If groundwater is encountered during construction, it may require a Groundwater Discharge Permit to properly dispose of groundwater onsite after it has been water quality tested or disposed offsite at an approved disposal facility.

3.7 FLOODPLAINS AND HYDROLOGIC ASSESSMENT

EO 11988 (Floodplain Management) directs all federal agencies to refrain from conducting, supporting, or allowing actions in floodplains unless it is the only practicable alternative. Requirements for compliance are outlined in 23 (CFR 650) Subpart A.

The Clark County Regional Flood Control District was created in 1985 to develop a comprehensive master plan to solve flooding problems, regulate land use in floodplains, fund and coordinate flood control facilities, and develop a maintenance program for master plan flood control facilities.

3.7.1 Existing Conditions

Floodplain data was obtained from the Federal Emergency Management Agency and viewed in Google Earth. UMTA Circular 5620.1, Guidelines for Preparing EAs, states that if the proposed project is within a 100-year floodplain, then a detailed analysis must be completed. The potential for flooding within an area designated as a 100-year flood plain is a 1 percent annual chance.

The only 100-year floodplain within the project corridor is the Flamingo Wash at Maryland Parkway (Figure 3.6-1). The Las Vegas Wash floodplain is located north of the project study area. If flooding events occur in the Flamingo Wash floodplain, the road would be flooded and traffic would be stopped, including any transit vehicles until it is clear to cross, per direction from authorities.

3.7.2 Impacts

3.7.2.1 Build Alternatives

No direct, indirect, or construction impacts will occur to floodplains for the Build Alternatives. LRT tracks or BRT lanes will be placed across the existing Flamingo Wash box culvert at Maryland Parkway. No modifications to the culverts are expected.

3.7.2.2 Enhanced Bus Alternative

Since operation of the Enhanced Bus Alternative would occur with the existing roadway and there is minimal construction at stops, no direct, indirect, or construction impacts will occur to floodplains for the Enhanced Bus Alternative.

3.7.2.3 No Build Alternative

Since there is no construction impacts and operations of the existing bus service will continue on existing roadways, no impacts will occur to floodplains for the No Build Alternative.

3.7.3 Mitigation

No mitigation is needed for floodplains within the project corridor.

3.8 SOILS AND GEOLOGY

This section discusses geology, soils and seismic concerns as they relate to public safety and project design. The Las Vegas Valley is located in southern Nevada in the Basin and Range Physiographic Province. The Las Vegas Valley is bounded by the Desert, Sheep, and Las Vegas Ranges to the north, the Spring Mountains to the west, the River Mountains and McCullough Range to the south, and the Frenchman and Sunrise Mountains to the east. Between the mountains, lies the Las Vegas Valley that consists of a gently sloping alluvial fan piedmont.

Geology in the Las Vegas Valley includes sedimentary formations in the surrounding mountain ranges consisting of limestone, sandstone, shale, dolomite, gypsum, and quartzite. These formations date from the Cambrian to the early Devonian periods of the early Paleozoic era. Volcanic activity was confined to the southern and eastern boundaries of Las Vegas Valley (Soil Conservation Service [SCS], 1985).

3.8.1 Existing Conditions

Soils were mapped by the Natural Resources Conservation Service in 1985 for Clark County (SCS, 1985). Expansive soils exist within the project corridor and are characterized as McCarran Soil Series, which consist of very deep, well drained soils on alluvial basin floor remnants. These soils were formed in mixed alluvium derived from limestone, sandstone, and gypsiferous sediment and they are commonly called sandy loam, or loam, soils. In the Flamingo Wash floodplain, soils are characterized as Alluvium of Active Washes.

Soils present in the project corridor are identified as having low to moderate shrink-swell characteristics due to the presence of silty clay and sandy clay. Soils located under concrete slabs tend to increase soil moisture content, thus causing the soils to swell. Soils and groundwater within the project corridor are generally associated with high sulfate content and, therefore, high corrosion potential.

The project corridor is categorized as Zone 2B by the Uniform Building Code and seismic risk in the area is minimal. There are no mapped tectonic faults crossing the project corridor. In Clark County, there have been no major earthquakes on record. Liquefaction potential is also low within the corridor. Although shallow groundwater is present, native soils are generally uniformly graded with plastic fines.

3.8.2 Impacts

3.8.2.1 Build Alternatives

If expansive soils occur within the construction area for either the LRT or BRT Build Alternatives, appropriate design practices would provide for potential over-excavation of the soil and replacement with suitable materials to limit shrink-swell potential under the track and stations. Disturbance of soil during construction could result in minimal and isolated instances of windblown dust and erosion into storm sewers and washes. Appropriate mitigation measures would be taken to avoid or minimize dust and erosion concerns.

The risk of seismically-induced strong ground shaking is relatively low. Therefore, direct, indirect, and construction impacts resulting from earthquakes and soil liquefaction would not occur.

3.8.2.2 Enhanced Bus Alternative

There are no construction activities associated with this alternative that would impact soil or geology.

3.8.2.3 No Build Alternative

The project would not be constructed; therefore, no impacts to soils and geology would occur.

3.8.3 Mitigation

The presence of expansive soils within the project corridor will be considered during preliminary engineering. Each foundation site will be evaluated for expansive soils and settlement potential during preliminary engineering when general foundation loads are calculated. Expansive soils, if present, will be mitigated with appropriate selection of material, site grading, drainage, and irrigation control.

Collapsible and corrosive soils will be over excavated to remove unsuitable soils replaced with suitable soils, and site grading to direct surface water flows away from foundations and stations.

3.9 HAZARDOUS MATERIALS

EO 12088, Federal Compliance with Pollution Control Standards, mandates that necessary actions be taken to prevent and control environmental pollution when federal activities or federal facilities are involved. EO 12088 references the following regulations:

- Resource Conservation and Recovery Act (RCRA);
- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA);
- Superfund Amendments and Reauthorization Act (SARA);
- Toxic Substance Control Act; and
- Federal Occupational Safety and Health Act.

Worker and public health and safety are key issues when addressing hazardous materials that may affect human health and the environment. Proper management and disposal of hazardous material is vital if it is found, disturbed, or generated during project construction.

3.9.1 Existing Conditions

A review of information was conducted regarding potential environmental contamination within or near the project corridor using a number of historical information resources including regulatory database reports, aerial photography review, historical maps, and visual inspection of the corridor to determine, to the extent possible, if contaminated properties could cause adverse impacts to the proposed alignment. The review was conducted using the American Society of Testing Materials (ASTM) Standard Practice for Environmental Site Assessments (ESAs): Phase I ESA E1527-05. A *Maryland Parkway Initial Site*

Assessment Report was prepared by Parsons (2017c) to identify potential issues within the study area from hazardous materials (Appendix I).

CERLCA, also known as Superfund, is a federal law that governs contaminated sites, including the cleanup and removal of hazardous waste at abandoned dumpsites. A Superfund “trust fund” was developed by collecting taxes on chemical and petroleum industries for cleaning up abandoned hazardous waste sites. However, CERCLA requires that any land owner, even new owners that did not cause the contamination, are responsible and liable for the cleanup costs. The National Priorities List (NPL) identifies the country’s most contaminated sites. In 2014, the Superfund Program implemented a new information system, the Superfund Enterprise Management System, which lists all active and deleted NPL and non-NPL sites. There are no active, proposed, or deleted NPL sites in the Las Vegas area (U. S. Environmental Protection Agency [USEPA], 2016a). There are no active Superfund sites within 1 mile of the project alignment.

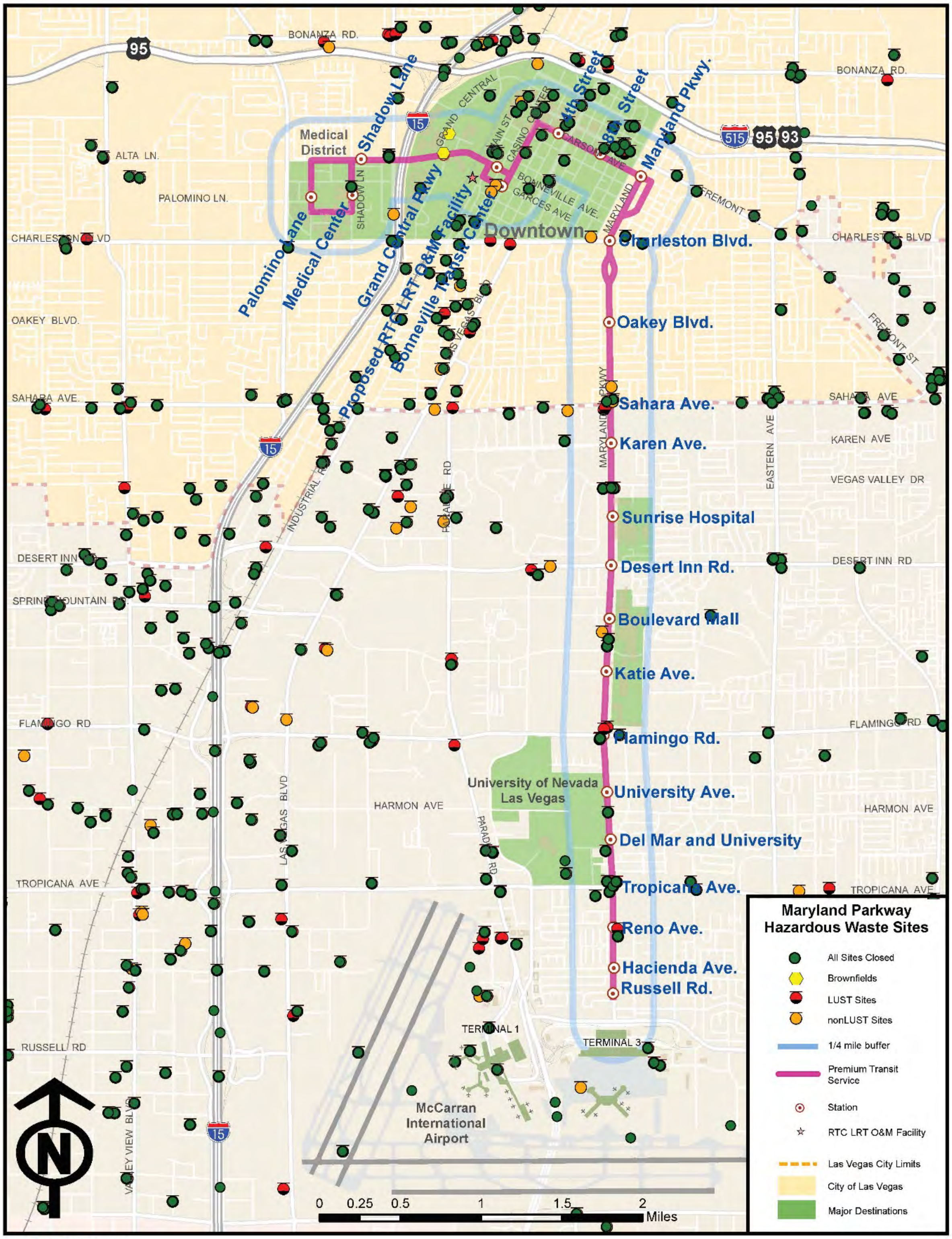
The USEPA developed the Brownfield Redevelopment Initiative in 1995 to provide a variety of incentives toward redevelopment of Superfund sites. In 2002, the CERCLA law was amended by the Brownfields Law to provide funds to access and clean up brownfields, clarified CERCLA liability protections, and provided funds to enhance state and tribal response programs. As defined by USEPA, a brownfield is a property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant (USEPA, 2016b). Most Brownfield sites tend to have low levels of contamination. The NDEP regulates the Nevada Brownfield Program that has a loan fund intended to help property owners or developers cover the costs associated with the cleanup of environmentally-contaminated sites.

The RCRA is also a federal law that focuses on hazardous and solid waste management to ensure that operating facilities do not become Superfund sites. RCRA regulates the treatment and disposal of hazardous waste and addresses the environmental damage by requiring responsible parties to pay for pollution remediation. There are no active or removed RCRA sites within 1 mile of the project alignment.

Historical records and aerials were reviewed to determine if previous land uses may have resulted in contamination that has not been documented by regulatory agencies. The likelihood that historical contaminated releases have gone undetected in the highly developed Las Vegas metropolitan area and study area specifically is low.

NDEP maintains a list of leaking underground storage tanks (LUST) and non-LUST contaminated sites in Clark County. NDEP tracks information regarding contamination, monitoring, and site remediation activities. Per the NDEP, there are 66 documented releases within the 0.25-mile buffer study area (Figure 3.9-1). Of those documented releases, 53 have been closed by NDEP and 13 remain open. Table 3.9-1 lists the 13 active sites along the project corridor.

Figure 3.9-1 Hazardous Waste Sites Within the Project Corridor



PARSONS

Table 3.9-1 Documented Hazardous Waste Releases in the Maryland Parkway Corridor that Remain on the Nevada Division of Environmental Protection Active List

Address	Business
5110 S. Maryland Parkway	7-Eleven
4090 S. Maryland Parkway	Chevron
3661 S. Maryland Parkway	Maryland Square Shopping Center
1195 E. Sahara Avenue	Terrible Herbst
2301 S. Maryland Parkway	Parkway Cleaners
953 E. Sahara Avenue	Commercial Center (former Tiffany Cleaners)
2212 S. Maryland Parkway	Royal Crest Cleaners
1015 E. Charleston Boulevard	Cantrell Cleaners
917 E. Fremont Street	Doc's Automotive (former)
1 S. Main Street	Plaza Hotel and Casino
707 S. First Street	Las Vegas Laundry & Dry Cleaner
721-723 S. First Street	Former Dry Cleaner (Abandoned)
201 Claim Avenue	Union Pacific Railroad

A hazardous material site was eliminated from further consideration if it was listed as being closed in the databases by the agency responsible for oversight. Sites that were reported to have a release were also eliminated from further consideration if they were judged to have a low probability of adverse impacts on the project corridor. This judgement was made based on the distance from the alignment or lack of a likely contamination pathway.

3.9.2 Impacts

Impacts from hazardous materials would be significant if it causes potential health hazards, has a known soil or groundwater plume contamination on acquired property, or has a high probability of undiscovered soil or groundwater that could be released to the environment during construction activities.

3.9.2.1 Build Alternatives

Documented releases that remain open have occurred at 2 locations where additional right-of-way acquisition could occur for both Build Alternatives for future station locations, sidewalk enhancements, or turn lanes. The addresses of these documented releases are shown below.

4090 S. Maryland Parkway – LUST under remediation as of May 2016

1195 E. Sahara Avenue – LUST under remediation as of May 2016

A majority of the open sites are under remedial actions, so the potential for residual contamination could create an impact. Limited soil sampling be completed prior to acquisition of those open properties to confirm the presence of contaminant wastes.

Construction within the newly acquired properties would be limited to shallow grading for the new stations, sidewalks, utilities, and driveways. Station canopy caissons will extend down less than 20 feet below ground surface, so exposure to contaminated soils and groundwater at deeper depths is not likely.

No buildings or structures will be demolished as part of this project, so the potential for asbestos or lead -based paint contamination is not a concern.

It should be noted that UPRR operated a railroad for 80 years in downtown Las Vegas at the intersection of W. Bonneville Road and S. Grand Central Parkway. Between 1992 and 1998, UPRR was ordered by NDEP to remove petroleum contaminated soils above the water table and replace with clean soil. This was required because significant contamination was found during a site characterization study in 1987, including petroleum products (diesel and bunker carbon fuels), volatile and semi-volatile organic compounds, and lead. A final closure report prepared in 1997 indicated that the requirements of the remedial action plan had been achieved. UPRR sold the property to the Lehman Brothers in December 2000 as part of a land swap. RTC purchased a portion of the property for the potential location of a rail maintenance facility. During future construction activities at the maintenance facility location, plans will be developed by the contractor and RTC in case undiscovered contamination is discovered in the soil and/or groundwater.

3.9.2.2 Enhanced Bus Alternative

No stations would require right-of-way acquisition, so there are no direct or indirect impacts for hazardous materials.

3.9.2.3 No Build Alternative

The No Build Alternative would have no impact on hazardous materials.

3.9.3 Mitigation

A formal Phase I ESA was not completed for this EA because final property acquisitions for future stations and right-of-way have not been finalized and Phase I reports are only valid for one year. If it is determined that property acquisition is needed, a formal Phase I ESA and Phase II ESA (will be conducted for those properties.

In several locations, various forms of gasoline, diesel, or solvent-related contaminants may be present and may require special treatment. Where any new right-of-way would be required for the stations or other maintenance facilities in documented release areas, specific Phase II sampling (soil and or groundwater) will be performed at those sites to determine specific contamination levels. The Phase II report would determine if a Phase III study would be needed on specific properties. Where Phase III studies would be required, further studies, potential remediation, closure techniques, and responsible parties would be evaluated prior to a determination regarding potential property acquisition. There is a potential to encounter undocumented contaminated soil and groundwater during construction activities. Contingency measures will be developed by the construction contractor that outline site worker protection and management requirements if contaminated soil or groundwater is encountered. If contaminated groundwater is encountered during subsurface construction activities, the groundwater may be treated on-site to acceptable local and state criteria and discharged into a sanitary sewer or storm sewer system. This requires special groundwater discharge permits from the state. If on-site treatment of groundwater is not feasible, due to the type and level of contamination identified, the contaminated groundwater will be disposed of in a permitted facility approved by RTC and the state.

Mitigation of any contaminated material will be required to conform to the applicable local, state, and federal regulations. RTC will direct the contractor to load, transport, and unload contaminated material at an RTC-designated facility (*e.g.*, Class III landfill, a recycling center, or an unclassified waste management unit). The contractor will provide qualified and trained personnel and personal protective equipment to perform operations that require disturbance of hazardous materials. RTC will provide information regarding RCRA compliance and other state waste disposal requirements that apply to this project in the final construction documents.

3.10 Air Quality

The Federal Clean Air Act, as amended, is the primary federal law that governs air quality, while the Nevada Clean Air Act is its companion state law. These laws, and related regulations by the USEPA, the State of Nevada, and the Clark County Department of Air Quality and Environmental Management, set standards for the concentration of pollutants in the air. At the federal level, these standards are called National Ambient Air Quality Standards (NAAQS). NAAQS and state ambient air quality standards have been established for six transportation-related criteria pollutants that have been linked to potential health concerns: carbon monoxide; nitrogen dioxide; ozone; particulate matter, which is broken down into particles of 10 micrometers or smaller (PM_{10}) and particles of 2.5 micrometers and smaller ($PM_{2.5}$); sulfur dioxide; and lead.

The NAAQS and state standards are set at levels that protect public health with a margin of safety and are subject to periodic review and revision (refer to Table 3.10-1 for current standard levels). Areas not meeting ambient air quality standards are designated as non-attainment for the specific pollutant that is a violation of the standard. Non-attainment areas are further classified based on the magnitude of the air quality problem.

The Clean Air Act identifies two types of NAAQS. ***Primary standards*** provide public health protection, including protecting the health of "sensitive" populations such as asthmatics, children, and the elderly. ***Secondary standards*** provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings.

Clark County Department of Air Quality and Environmental Management is required to develop long-term planning documents such as a State Implementation Plan to demonstrate how the NAAQS will be attained, maintained, and enforced. After an area reaches attainment, a Redesignation/Maintenance Plan is developed to demonstrate maintenance for at least the next 10-year period. These Maintenance Plans

Table 3.10-1 National and Nevada Ambient Air Quality Standards

Pollutant	Averaging Time	Nevada and National Ambient Air Quality Standards[1]	
		Primary[2]	Secondary[2]
Ozone	8-hour[3]	0.070 ppm	0.070 ppm
Carbon monoxide	8-hour[4] 1-hour[4]	9 ppm 35 ppm	-- --
Nitrogen dioxide	Annual mean 1-hour[6]	53 ppb 100 ppb	53 ppb --
Sulfur dioxide	1-hour[6] 3-hour[4]	75 ppb --	-- 0.5 ppm
Lead	Rolling 3-month average[7]	0.15 $\mu g/m^3$	0.15 $\mu g/m^3$
PM_{10}	24-hour[8]	150 $\mu g/m^3$	150 $\mu g/m^3$
$PM_{2.5}$	Annual mean[5] 24-hour[6]	12 $\mu g/m^3$ 35 $\mu g/m^3$	15 $\mu g/m^3$ 35 $\mu g/m^3$

Sources: USEPA, 2016c.

[1] Nevada adopted the NAAQS as the state ambient air quality standards.
[2] ppm = parts per million; ppb = parts per billion; $\mu g/m^3$ = micrograms per cubic meter; -- = not applicable
[3] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor over each year must not exceed 0.070 ppm (effective October 26, 2015).
[4] Not to be exceeded more than once per calendar year.
[5] Annual arithmetic mean, averaged over 3 years.
[6] 98th percentile of 1-hour daily maximum concentrations, averaged over 3 years.
[7] Not to be exceeded.
[8] Not to be exceeded more than once per year on average over 3 years.

also become part of the State Implementation Plan. Clark County Department of Air Quality and Environmental Management also develops Transportation Conformity Plans , in collaboration with RTC, the Metropolitan Planning Organization for Clark County, to address transportation conformity issues in Southern Nevada. If an area's proposed projects will lead to travel demand that exceeds the NAAQS, then the projects cannot be federally-funded.

Parsons (2018a) prepared an *Air Quality Technical Memorandum* that describes air quality conditions, impacts, and mitigation.

3.10.1 Existing Conditions

As of April 2015, Clark County was classified in attainment for $PM_{2.5}$, sulfur dioxide, lead, nitrogen dioxide, and ozone. The Las Vegas Valley is a maintenance area for PM_{10} and carbon monoxide. A Maintenance Plan and Redesignation Request for PM_{10} was submitted to USEPA in August 2012 and USEPA approved Clark County Department of Air Quality and Environmental Management's request and designation for Clark County as a PM_{10} attainment area on October 6, 2014.

FTA must find that a transit project located in a nonattainment or maintenance area meets the project-level conformity requirements of a currently conforming Metropolitan Transportation Plan and Transportation Improvement Program (TIP). Each Metropolitan Planning Organization must prepare a

Metropolitan Transportation Plan in accordance with 49 USC 5303(i). The plan must identify how the metropolitan area will manage and operate a multi-modal transportation system. Under this requirement, RTC must quantitatively assess the air quality impacts of its plans and programs. In particular, RTC needs to demonstrate that changes in the transportation system will not cause the areas to exceed motor vehicle emissions milestones set by the USEPA and the local air quality agency.

The RTC adopted the *Regional Transportation Plan of Southern Nevada 2017-2040* (RTC, 2017), which is the region's Metropolitan Transportation Plan and meets the air quality conformity determination requirement of the federal government. In 2014, RTC adopted the 2015-2019 TIP (RTC, 2016a) containing the highway, transit, bike, and pedestrian projects in Southern Nevada, which updated the Air Quality Conformity Analysis of the 2013-2015 Regional Transportation Plan. The projects identified in the 2017-2040 Regional Transportation Plan and the 2015-2019 TIP will not contribute to any violation of the air quality standards.

Certain transit projects located in the PM_{10} maintenance area would require a qualitative PM hot-spot analysis during the NEPA process. However, these projects generally include major new or expanded transit centers or stations where a large number of diesel-powered transit vehicles will congregate. Projects typically not of concern for PM hot-spot analysis are stations and transit centers serviced by non-diesel-powered transit vehicles (LRT, BRT, additional bus service).

Carbon monoxide, PM_{10}, and $PM_{2.5}$ hot-spot analyses are not required to consider construction-related activities which cause temporary increases in emissions. Each site which is affected by construction-related activities shall be considered separately, using established "Guideline" methods. Temporary increases are defined as those which occur only during the construction phase and last five years or less at any individual site (40 CFR 93.123).

The concentration of a pollutant in the atmosphere depends on the amount of pollutant released, the nature of the source, and the ability of the atmosphere to transport and disperse the pollutant. The main components of transport and dispersion are wind, atmospheric stability or turbulence, topography, and the existence of inversion layers. Climatic and meteorological conditions will influence the quality of air in Las Vegas.

The project is located in the Las Vegas Valley. Temperatures range from daily maximum of 56° F in January to an average daily maximum of 104° F in July. Average daily minimums range from 33° F in January to 75° F in July. During the winter, on calm sunny days, afternoon temperatures fall rapidly as the sun goes down. A shallow inversion layer forms and traps pollutants close to the ground. During evening hours, airflow drains the Las Vegas Valley of the trapped pollutants. Prevailing winds are southwesterly with monthly average wind speeds in the range of 7 to 11 mph. Wind speeds in excess of 40 mph are infrequent. During the day, as the air mass is heated, wind direction is generally upslope and westerly. At night, the wind direction reverses and cool air is drawn down from the higher elevations to the lower valley (FTA and RTC, 2002).

3.10.2 Impacts

3.10.2.1 Build Alternatives

The Build Alternatives were included in the 2015-2019 TIP (Project #2792 on Table 1, Page T1-46) for premium transit service; therefore, it meets the project-level air quality conformity analysis required by FTA. No PM_{10} hot spot analysis was completed for this NEPA analysis, because the LRT cars will be electric powered and replace existing CNG and diesel-fueled buses. Reduction in emissions would occur along the corridor where vehicles are replaced with transit riders and traffic congestion is reduced, which could result in positive air quality improvements. The BRT option would replace any remaining diesel-fueled buses with CNG-fueled vehicles and would have similar positive results for air quality (see Air Quality Technical Memorandum, Parsons, 2018a).

During the 3-year construction period, short-term degradation of air quality may occur due to the release of particulate emissions (airborne dust) generated by excavation, grading, hauling, and other construction-related activities. Site preparation and rail construction typically involves clearing, cut-and-fill activities, grading, installing rails and catenary system, and paving roadway and sidewalk surfaces. Sources of fugitive dust would include disturbed soils at the construction site. Unless properly controlled, vehicles leaving the site could deposit mud on local streets, which could be an added source of airborne dust after it dries. PM_{10} emissions would vary from day to day, depending on the nature and magnitude of construction activity and local weather conditions. PM_{10} emissions would depend on soil moisture, silt content of soil, wind speed, and the amount of equipment operating. Larger dust particles would settle near the source, while fine particles would be dispersed over greater distances from the construction site.

In addition to dust-related PM_{10} emissions, heavy-duty trucks, and construction equipment powered by gasoline and diesel engines would generate carbon monoxide, sulfur dioxide, nitrogen oxides, volatile organic compounds, and some soot particulate (PM_{10} and $PM_{2.5}$) in exhaust emissions. Because construction activities will increase traffic congestion in the area, carbon monoxide and other emissions from traffic would increase slightly while those vehicles are delayed. These emissions would be temporary and limited to the immediate area surrounding the construction site. Construction activities are expected to occur over a 2.5-year period, less than the 5-year federal requirement to be considered temporary impacts.

3.10.2.2 Enhanced Bus Alternative

The Enhanced Bus Alternative was included in the 2015-2019 TIP (Project #2792 on Table 1, Page T1-46) for enhanced transit service; therefore, it meets the project-level air quality conformity analysis required by FTA. No PM_{10} hot spot analysis was completed for this NEPA analysis because the new buses will be alternative fuel powered and replace any existing diesel-fueled buses. There would be no increase in diesel-fueled vehicles in the project corridor.

Construction impacts would be similar to the Build Alternatives, except soil disturbance will be confined to only the 24 new station locations along the route. Therefore, temporary construction activities would be minimal.

3.10.2.3 No Build Alternative

Air quality conditions will continue under the No Build alternative and may worsen as traffic congestion increases in the corridor.

3.10.3 Mitigation

Most of the construction impacts to air quality are short-term in duration and, therefore, will not result in long-term adverse conditions. Implementation of the following measures, some of which may also be required for other purposes such as storm water pollution control, will reduce any air quality impacts resulting from construction activities:

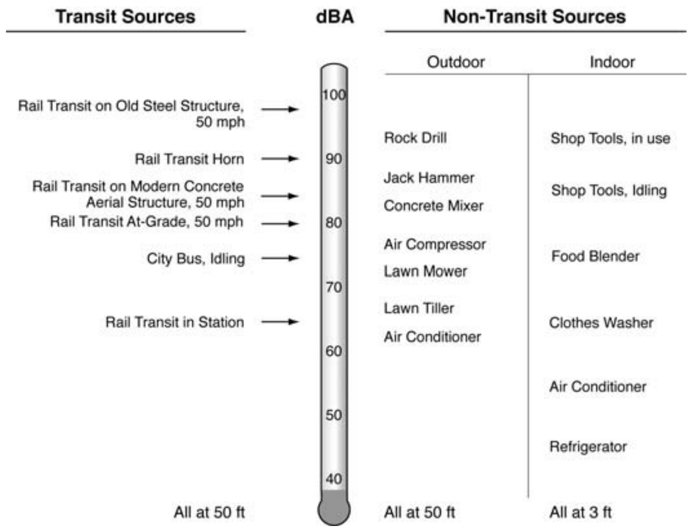
- Minimize land disturbance.
- Water or dust palliative will be applied to the site and equipment as often as necessary to control fugitive dust emissions.
- Construction equipment and vehicles will be properly tuned and maintained.
- A dust control plan will be developed documenting sprinkling, temporary paving, speed limits, and timely revegetation of disturbed slopes, as needed.
- Equipment and materials storage sites will be located as far away from residential and park uses, as practicable.
- Gravel pads will be used at project access points to minimize dust and mud deposits on roads affected by construction traffic. All transported loads of soils and wet materials will be covered before transport.
- Dust and mud that are deposited on paved, public roads due to construction activity and traffic will be promptly and regularly removed to decrease particulate matter.
- To the extent feasible, construction traffic will be scheduled and routed to reduce congestion and related air quality impacts caused by idling vehicles along local roads during peak travel times.

3.11 Noise and Vibration

This section includes an introduction to basic noise and vibration concepts, including noise and vibration characteristics, the prediction methodologies and modeling assumptions used for the project, the ambient noise monitoring program, and the evaluation of potential impacts along the Maryland Parkway project corridor.

Noise levels are measured in units called decibels (dB). Since the human ear does not respond equally to all frequencies, measured sound levels are adjusted or weighted to correspond to the frequency response of human hearing and the human perception of loudness. The weighted sound level is expressed in single number units called A-weighted decibels (dBA) and is measured with a calibrated noise meter. Figure 3.11-1 identifies typical sound levels from common transit and non-transit noise sources.

Figure 3.11-1 Typical A-Weighted Sound Levels



Traffic and other noises found in communities tend to fluctuate moment to moment, depending on whether a noisy truck passes by, an airplane flies over, a train horn sounds, or children shout as they play in a nearby schoolyard. In order to measure this noise accurately, the common practice is to calculate an average noise produced by different activities over a period of time to obtain a single number. This single number is called the equivalent continuous noise level, (L_{eq}). Another noise measure, the day-night noise level (L_{dn}), takes into account the increased sensitivity of people to noise during sleeping hours. The L_{dn} is a 24-hour L_{eq}, but with a 10-dB penalty assessed to noise events occurring at night (10:00 pm to 7:00 am). Both L_{eq} and L_{dn} are used by the FTA in evaluating transit noise impacts. For transit operations, L_{eq} and L_{dn} are appropriate because these levels are sensitive to the frequency and duration of noise events.

The criteria in the *Transit Noise and Vibration Impact Assessment* (FTA, 2006) guidance were used to assess existing ambient noise levels and vibration impacts, as well as future noise and vibration impacts from LRT and BRT operations. The criteria are founded on well-documented research on community reaction to noise and are based on change in noise exposure using a sliding scale. The amount that transit projects are allowed to change the overall noise environment is reduced with increasing levels of existing noise.

The FTA Noise Impact Criteria applicable to three categories of land use are summarized in Table 3.11-1. L_{dn} is used to characterize noise exposure for residential areas, hotels, and hospitals (Category 2). The maximum 1-hour L_{eq} during the period that the facility is in use is used for other noise-sensitive land uses such as schools, libraries, churches, and parks (Category 3). The noise impact criteria for human annoyance for a proposed transit project are based on comparison of the existing outdoor noise levels and the future outdoor noise levels that occur along the corridor. There are two interpretations of noise impacts:

Table 3.11-1 Land Use Categories and Metrics for Transit Noise Impact Criteria

Land Use Category	Noise Metric, dBA	Description of Land Use Category
1	Outdoor $L_{eq}(h)$*	Tracts of land where quiet is an essential element in their intended purpose. This category includes lands set aside for serenity and quiet, and such land uses as outdoor amphitheaters and concert pavilions, as well as National Historic Landmarks with significant outdoor use.
2	Outdoor L_{dn}	Residences and buildings where people normally sleep. This category includes homes, hospitals, and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.
3	Outdoor $L_{eq}(h)$*	Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, and churches where it is important to avoid interference with such activities as speech, meditation, and concentration on reading material. Buildings with interior spaces where quiet is important, such as medical offices, conference rooms, recording studios, and concert halls fall into this category. Places for meditation or study associated with cemeteries, monuments, and museums. Certain historical sites, parks, and recreational facilities are also included.

Note:
* L_{eq} for the noisiest hour of transit-related activity during hours of noise sensitivity.
Source: FTA, 2006

- Severe Impact: Project noise is considered to cause Severe Impact since a significant percentage of people would be highly annoyed by the new noise. This curve flattens out at 75 dB for Category 1 and 2 land use, a level associated with an unacceptable living environment.

- Moderate Impact: The change in the cumulative noise level is noticeable to most people, but it may not be sufficient to cause strong, adverse reactions from the community. In this transitional area, other project-specific factors must be considered to determine the magnitude of the impact and the need for mitigation, such as the existing level, predicted level of increase over existing noise levels, and the types and numbers of noise-sensitive land uses affected.

For residential land use, the noise criteria are to be applied outside the building locations at noise-sensitive areas with frequent human use, including outdoor patios, decks, pools, and play areas. If none are present, the criteria should be applied near building doors and windows. For parks and other significant outdoor use, the criteria are to be applied at the property lines; however, for locations where land use activities are solely indoors, noise impact may be less significant if the outdoor-to-indoor reduction is greater than for typical buildings (approximately 25 dB with windows closed). Thus, if it can be demonstrated that there will only be indoor activities, mitigation may not be needed.

The evaluation of vibration impacts can be divided into two categories: (1) human annoyance and (2) building damage. Generally, human annoyance criteria are used to assess potential impacts associated with operational vibration, whereas building damage criteria are used to estimate vibration impacts due to construction activities.

Typically, highway traffic does not generate ground-borne vibration levels that raise environmental concerns. With train systems, especially freight rail, and much less so, LRT, ground-borne vibration is created by the interaction of the wheels rolling on the steel rails. Although vibration is sometimes noticeable outdoors, it is almost exclusively an indoor problem. While it is conceivable for ground-borne vibration from transit trains to cause building damage, the vibration from trains is almost never of sufficient amplitude to cause even minor cosmetic damage to buildings. The primary concern is that the vibration from ground-borne noise can be intrusive and annoying to building occupants.

The ground-borne vibration impact criteria describe human response to vibration and potential interference as relates to the operation of vibration sensitive equipment. The criteria for acceptable ground-borne vibration are expressed in terms of route mean square velocity levels in velocity in decibels vibration (VdB) and based on the maximum noise levels (L_{max}) for a single event. Table 3.11-2 presents the criteria for various land use categories, as well as the frequency of events.

Sensitive receptors within the project boundary include residences, hotels, and hospitals. These fall under Category 2, places where people normally sleep, and Category 3, schools, churches, and parks with primarily daytime use. Since the number of proposed operations is 128 trains or buses per weekday, the FTA classifies the proposed service under “Frequent Events.” As shown in Table 3.11-2, the maximum vibration level cannot exceed 72 VdB for Category 2 land uses and 75 VdB for Category 3 land uses.

Table 3.11-2 Ground-Borne Vibration Impact Criteria for Human Annoyance

Land Use Category	Ground-Borne Vibration Impact Levels, VdB*		
	Frequent Events[1]	Occasional Events[2]	Infrequent Events[3]
Category 1: Buildings where vibration would interfere with interior operations.	65 VdB[4]	65 VdB[4]	65 VdB[4]
Category 2: Residences and buildings where people normally sleep.	72 VdB	75 VdB	80 VdB
Category 3: Institutional land uses with primarily daytime use.	75 VdB	78 VdB	83 VdB

Notes:

1. “Frequent Events” is defined as more than 70 vibration events of the same source per day. Most rapid transit projects fall into this category.
2. “Occasional Events” is defined as between 30 and 70 vibration events of the same source per day. Most commuter trunk lines have this many operations.
3. “Infrequent Events” is defined as more than 30 vibration events of the same kind per day. This category includes most commuter rail branch lines.
4. This criterion limit is based on levels that are acceptable for most moderately sensitive equipment, such as optical microscopes. Vibration-sensitive manufacturing or research will require detailed evaluation to define the acceptable vibration levels. Ensuring lower vibration levels in a building often requires special design of the HVAC systems and stiffened floors.

* Root-mean-square velocity in decibels (VdB) re: 1 micro-inch per second.

Source: FTA, 2006.

Construction activities can also result in varying degrees of ground vibration, depending on the equipment and method employed. The vibration associated with typical LRT/BRT construction is not likely to damage building structures, but it could cause cosmetic building damage.

Vibrations generated by surface transportation and construction activities are mainly in the form of surface or Raleigh waves. Studies have shown that the vertical component of transportation generated vibrations is the strongest, and that peak particle velocity correlates best with building damage and complaints. Table 3.11-3 summarizes the construction vibration limits shown in FTA guidelines for structures located near the right-of-way of a transit project.

Table 3.11-3 Construction Vibration Damage Criteria

Building Category	Peak Particle Velocity, in/sec	Approximate Lv*, VdB
I. Reinforced-concrete, steel, or timber (no plaster)	0.50	102
II. Engineered concrete and masonry (no plaster)	0.30	98
III. Non-engineered timber and masonry buildings	0.20	94
IV. Buildings extremely susceptible to vibration damage	0.12	90

Note:
* Root-mean-square velocity in decibels (VdB) re: 1 micro-inch per second.
Source: FTA, 2006.

Construction impacts to sensitive neighborhoods, although temporary in nature, can significantly affect residents and/or compromise building structures. This is recognized by most municipal governments who establish and enforce limits for construction noise and vibration disturbance.

3.11.1 Existing Conditions

The existing noise along the proposed project corridor is largely dominated by local traffic on surface roads. Noise measurements were taken at 13 locations along the proposed project corridor. Locations were chosen based on types of sensitive receptors within each of the three project segments; Maryland Parkway, Downtown, and Medical District. Table 3.11-4 presents the locations and descriptions of the representative noise-measurement sites and the measurement results. These locations are shown in figures included in an appendix of the *Noise and Vibration Technical Report* (Parsons, 2016b) (Appendix J).

No significant vibration sources exist along the Maryland Parkway corridor. Typical bus or truck pass-by on the local roadways would be the only perceptible vibration source along most of the alignment. Table 3.11-5 summarizes the existing vibration measurements that were collected as part of the EA. The measured vibration velocity levels are typical of an urban area where the primary and predominant vibration sources are from vehicular traffic traveling on local surface roadways.

Table 3.11-4 Summary of Noise Measurement Locations and Results

Meas. Site[1]	Address	Land Use[2]	FTA Category	Date mm/dd/yy	Start Time[3]	Duration hh:mm	Measured Leq dBA	Ref[4]	Ldn / (Leq[5]) dBA
ST1	1184 King Richard Ave Las Vegas, NV 89119	SFR	2	06/24/16	09:00	01:00	70	LT2	75
LT1	Tropicana Village Apartments 4995 Maryland Pkwy #169 Las Vegas, NV 89119	MFR	2	06/23/16 - 06/24/16	12:00	24:00	--	--	71 / (69)
LT2	Sunrise Hospital 3186 S Maryland Pkwy Las Vegas, NV 89109	MED	3	06/21/16 - 06/22/16	12:00	24:00	--	--	72 / (70)
LT3	Christ Church Episcopal 2000 S Maryland Pkwy Las Vegas, NV 89104	REL	3	06/22/16 - 06/23/16	12:00	24:00	--	--	70 / (68)
LT4	1501 S Maryland Pkwy Las Vegas, NV 89104	COM	2	06/23/16 - 06/24/16	17:00	24:00	--	--	67 / (65)
LT5	Clark Maryland Apartments 524 S Maryland Pkwy Las Vegas, NV 89101	MFR	2	06/23/16 - 06/24/16	15:00	24:00	--	--	66 / (64)
LT6	First Good Shepherd 301 S Maryland Pkwy Las Vegas, NV 89101	SCH	3	06/20/16 - 06/21/16	16:00	24:00	--	--	64 / (63)
ST2	Valley Hospital Medical Center 620 Shadow Ln Las Vegas, NV 89106	MED	3	06/24/16	13:40	01:00	66	LT7	67
LT7	Helix Apartments 1700 Alta Drive #2009 Las Vegas, NV 89106	MFR	2	06/21/16 - 06/22/16	17:00	24:00	--	--	67

Table 3.11-4 Summary of Noise Measurement Locations and Results (continued)

Meas. Site[1]	Address	Land Use[2]	FTA Category	Date mm/dd/yy	Start Time[3]	Duration hh:mm	Measured L_{eq} dBA	Ref[4]	L_{dn} / (L_{eq}[5]) dBA
LT8 [W]	432 Beaumont St. Las Vegas, NV 89106	SFR	2	06/20/16 - 06/21/16	18:00	24:00	--	--	62
LT9	2030 Pinto Ln. Las Vegas, NV 89106	SFR	2	06/20/16 - 06/21/16	17:00	24:00	--	--	62 / (62)
LT10 [W]	1109 Westwood Dr. Las Vegas, NV 89102	SFR	2	06/23/16 - 06/24/16	15:00	24:00	--	--	61
ST3	650 S Main St. Las Vegas, NV 89101	COM	3	06/24/16	07:00	01:00	64	LT13	62

Notes:

1. LT = long-term noise measurement site, ST = short-term noise measurement site.
2. Land Use: SFR - single-family residence; MFR - multi-family residence; COM - commercial; REL - religious institution; SCH - school; MED - medical facility.
3. Start time for long-term measurements corresponds to first full hour of recorded data.
4. Long-term measurement result used to estimate L_{dn} and/or peak hour L_{eq} for the short-term measurement site.
5. Peak hour L_{eq} is provided for nearby Category 3 receptors.

W Measurement was located behind a property wall.

Table 3.11-5 Summary of Existing Vibration Measurements

Meas. Site[1]	Address	Land Use[2]	FTA Category	Date mm/dd/yy	Start Time	Duration hh:mm	Highest Measured Peak Particle Velocity (PPV) in/sec	RMS Vibration Velocity [3] VdB
V1	First Good Shepherd 301 S Maryland Pkwy Las Vegas, NV 89101	SCH	3	06/21/16 - 06/22/16	16:10	24:00	0.01	68
V2	Helix Apartments 1700 Alta Drive #2009 Las Vegas, NV 89106	MFR	2	06/22/16 - 06/23/16	10:09	24:00	0.01	68
V3	432 Beaumont St Las Vegas, NV 89106	SFR	2	06/22/16 - 06/23/16	09:35	24:00	0.018	73

Notes:

1. Vx = Vibration measurement site.
2. Land Use: SFR - single-family residence; MFR - multi-family residence; COM - commercial; REL - religious institution; SCH - school; MED - medical facility.
3. RMS velocity converted from measured PPV using reference of 1 micro inch per second.

3.11.2 Impacts

3.11.2.1 Build Alternatives

There are no noise impacts anticipated on noise sensitive receivers for various land uses in proximity of the alignments for the two Build Alternatives. In fact, noise from an LRT vehicle for the LRT Build Alternative would be less than the existing noise measurement along the busy and heavily-traveled Maryland Parkway corridor (Table 3.11-6). For the BRT Build Alternative, noise levels from the addition of BRT buses would also be less than existing noise measurement due to the use of CNG-fueled vehicles instead of the existing diesel-powered buses (Table 3.11-7). Due to its relatively low speed of travel of both LRT and BRT vehicles (between 25 and 30 mph), the operation of either of the two Build Alternatives are not anticipated to create vibration impacts to nearby building structures located along the Maryland Parkway project alignment.

The FTA's Generalized Ground Surface Vibration Curves were used for this assessment. These generalized curves, presented in Figure 3-1, are based on measurements of ground-borne vibration at representative North American transit systems.

In assessing transit operation vibration impact, Figure 3.11-2 is used to determine the average unadjusted vibration level to be expected at a specified distance for the appropriate transit vehicle type. Adjustment factors are then applied to compensate for detailed factors affecting the predicted average vibration level at the sensitive receptor. The final calculated vibration level determines if vibration impact is anticipated when interpreted against the FTA's vibration impact threshold for human annoyance, which is previously provided in Table 3.11-2.

The FTA guidelines state that actual levels of ground-borne vibration will sometime differ substantially from the projections and some care must be taken when interpreting the projections. Therefore, interpretation of results obtained following the described procedure should adhere to the following guidelines:

- "No Impact" – Project vibration is below the impact threshold. Vibration impact is unlikely to occur in this case.
- "Impact" with 0 to 5 dB greater than the impact threshold – In this range, there is still a significant chance that actual ground-borne vibration levels will be below the impact threshold.
- "Impact" with 5 dB or more greater than the impact threshold – Vibration impact is probable and Detailed Analysis will be needed during final design to help determine appropriate vibration control measures.

Table 3.11-6 Predicted Project Noise Levels for LRT Build Alternative

Site No.	Land Use	FTA Land Use Category[1]	LRT Vehicle Speed, mph	Existing Noise Level, L_{dn}/L_{eq}, (dBA)[2]	Project Noise Level, L_{dn}/L_{eq}, (dBA)[2]	FTA Noise Impact Criteria, Moderate/Severe, L_{dn}/L_{eq}, (dBA)[2]	Impact
Maryland Parkway Segment							
R1	SFR	2	30	71	51	65 / 70	None
R2	MFR	2	30	71	52	65 / 70	None
R3	SFR	2	30	71	47	65 / 70	None
R4/ST1	SFR	2	30	71	53	65 / 70	None
R5	SFR	2	30	71	48	65 / 70	None
R6	MFR	2	30	71	47	65 / 70	None
R7	MFR	2	30	71	52	65 / 70	None
R8	MFR	2	30	71	55	65 / 70	None
R9/LT1	MFR	2	30	71	51	65 / 70	None
R10	UNLV SCHOOL	3	30	70	38	69 / 74	None
R11	UNLV SCHOOL	3	30	70	43	69 / 74	None
R12	UNLV SCHOOL	3	30	70	46	69 / 74	None
R13	DESERT PARKWAY HOSPITAL	2	30	72	40	65 / 71	None
R14	FOOTHILL PEDIATRICS	3	30	70	50	69 / 74	None
R15	EXTENDED STAY	2	30	72	49	65 / 71	None
R16/LT2	SUNRISE HOSPITAL	2	30	72	48	65 / 71	None
R17	SFR	2	30	72	43	65 / 71	None
R18/LT3	CHURCH	3	30	68	50	68 / 73	None
R19	SFR	2	30	70	54	64 / 69	None

Table 3.11-6 Predicted Project Noise Levels for LRT Build Alternative (continued)

Site No.	Land Use	FTA Land Use Category[1]	LRT Vehicle Speed, mph	Existing Noise Level, L_{dn}/L_{eq}, (dBA)[2]	Project Noise Level, L_{dn}/L_{eq}, (dBA)[2]	FTA Noise Impact Criteria, Moderate/Severe, L_{dn}/L_{eq}, (dBA)[2]	Impact
R20	CHURCH	3	30	68	48	68 / 73	None
R21	SCHOOL	3	30	68	46	68 / 73	None
R22	SFR	2	30	67	50	62 / 67	None
R23/LT4	SFR	2	30	67	54	62 / 67	None
R24	SFR	2	30	67	53	62 / 67	None
R25	PARK	3	30	65	43	66 / 71	None
R26/LT5	MFR	2	30	66	53	61 / 67	None
R27	MFR	2	30	66	55	61 / 67	None
R28	MFR	2	30	64	55	60 / 66	None
R29	CHURCH	3	30	63	49	65 / 70	None
R30	MFR	2	30	64	50	60 / 66	None
R31/LT6	MFR	2	30	64	51	60 / 66	None
Downtown Area							
R32	MFR	2	25	64	53	60 / 66	None
R33	MFR	2	25	64	46	60 / 66	None
R34	SFR	2	25	64	51	60 / 66	None
R36	CHURCH	3	25	63	40	65 / 70	None
R37	RESTAURANT	3	25	63	47	65 / 70	None
R38	MFR	2	25	64	52	60 / 66	None
R39	SFR	2	25	64	52	60 / 66	None

Table 3.11-6 Predicted Project Noise Levels for LRT Build Alternative (continued)

Site No.	Land Use	FTA Land Use Category[1]	LRT Vehicle Speed, mph	Existing Noise Level, L_{dn}/L_{eq}, (dBA)[2]	Project Noise Level, L_{dn}/L_{eq}, (dBA)[2]	FTA Noise Impact Criteria, Moderate/Severe, L_{dn}/L_{eq}, (dBA)[2]	Impact
R40	CHURCH	3	25	64	43	65 / 71	None
R41	HOTEL	2	25	62	44	59 / 64	None
R42/ST2	ICEHOUSE	3	25	64	47	65 / 71	None
R43	CLEVELAND CLINIC	3	25	64	44	65 / 71	None
Medical District							
R44/LT7	MFR	2	25	67	49	62 / 67	None
R45	PRE-SCHOOL	3	25	68	49	68 / 73	None
R46/LT8	SFR	2	25	62	47	59 / 64	None
R47	SFR	2	25	62	44	59 / 64	None
R48	OFFICE	3	25	62	48	64 / 69	None
R49	SFR	2	25	62	44	59 / 64	None
R50/ST3	VALLEY HOSPITAL	2	25	67	52	62 / 67	None
R51/LT9	SFR	3	25	62	52	59 / 64	None
R52	UNLV SCHOOL OF MEDICINE	3	25	62	42	64 / 69	None
R53/LT10	SFR	2	25	61	42	58 / 64	None
R54	MFR	2	25	62	46	59 / 64	None

Notes:

1- FTA land use Category 2 – residential, hotel, and hospital; Category 3 - institutional or commercial.

2 - L_{dn} would be used for Category 2 land uses and peak hour L_{eq} for Category 3 land uses.

Table 3.11-7 Predicted Project Noise Levels for BRT Build and Enhanced Bus Alternatives

Site No.	Land Use	FTA Land Use Category[1]	Bus Speed, mph	Existing Noise Level, L_{dn}/L_{eq}, (dBA)[2]	Project Noise Level, L_{dn}/L_{eq}, (dBA)[2]	FTA Noise Impact Criteria, Moderate/Severe, L_{dn}/L_{eq}, (dBA)[2]	Impact
Maryland Parkway Segment							
R1	SFR	2	30	71	54	65 / 70	None
R2	MFR	2	30	71	54	65 / 70	None
R3	SFR	2	30	71	51	65 / 70	None
R4/ST1	SFR	2	30	71	55	65 / 70	None
R5	SFR	2	30	71	52	65 / 70	None
R6	MFR	2	30	71	51	65 / 70	None
R7	MFR	2	30	71	54	65 / 70	None
R8	MFR	2	30	71	55	65 / 70	None
R9/LT1	MFR	2	30	71	54	65 / 70	None
R10	UNLV SCHOOL	3	30	70	43	69 / 74	None
R11	UNLV SCHOOL	3	30	70	47	69 / 74	None
R12	UNLV SCHOOL	3	30	70	49	69 / 74	None
R13	DESERT PARKWAY HOSPITAL	2	30	72	45	65 / 71	None
R14	FOOTHILL PEDIATRICS	3	30	70	51	69 / 74	None
R15	EXTENDED STAY	2	30	72	52	65 / 71	None
R16/LT2	SUNRISE HOSPITAL	2	30	72	52	65 / 71	None
R17	SFR	2	30	72	47	65 / 71	None
R18/LT3	CHURCH	3	30	68	52	68 / 73	None
R19	SFR	2	30	70	55	64 / 69	None

Table 3.11-7 Predicted Project Noise Levels for BRT Build and Enhanced Bus Alternatives (continued)

Site No.	Land Use	FTA Land Use Category[1]	Bus Speed, mph	Existing Noise Level, L_{dn}/L_{eq}, (dBA)[2]	Project Noise Level, L_{dn}/L_{eq}, (dBA)[2]	FTA Noise Impact Criteria, Moderate/Severe, L_{dn}/L_{eq}, (dBA)[2]	Impact
R20	CHURCH	3	30	68	51	68 / 73	None
R21	SCHOOL	3	30	68	49	68 / 73	None
R22	SFR	2	30	67	53	62 / 67	None
R23/LT4	SFR	2	30	67	55	62 / 67	None
R24	SFR	2	30	67	54	62 / 67	None
R25	PARK	3	30	65	49	66 / 71	None
R26/LT5	MFR	2	30	66	55	61 / 67	None
R27	MFR	2	30	66	56	61 / 67	None
R28	MFR	2	30	64	57	60 / 66	None
R29	CHURCH	3	30	63	54	65 / 70	None
R30	MFR	2	30	64	55	60 / 66	None
R31/LT6	MFR	2	30	64	56	60 / 66	None
Downtown Area							
R32	MFR	2	25	64	56	60 / 66	None
R33	MFR	2	25	64	51	60 / 66	None
R34	SFR	2	25	64	54	60 / 66	None
R36	CHURCH	3	25	63	44	65 / 70	None
R37	RESTAURANT	3	25	63	51	65 / 70	None
R38	MFR	2	25	64	56	60 / 66	None

Table 3.11-7 Predicted Project Noise Levels for BRT Build and Enhanced Bus Alternatives (continued)

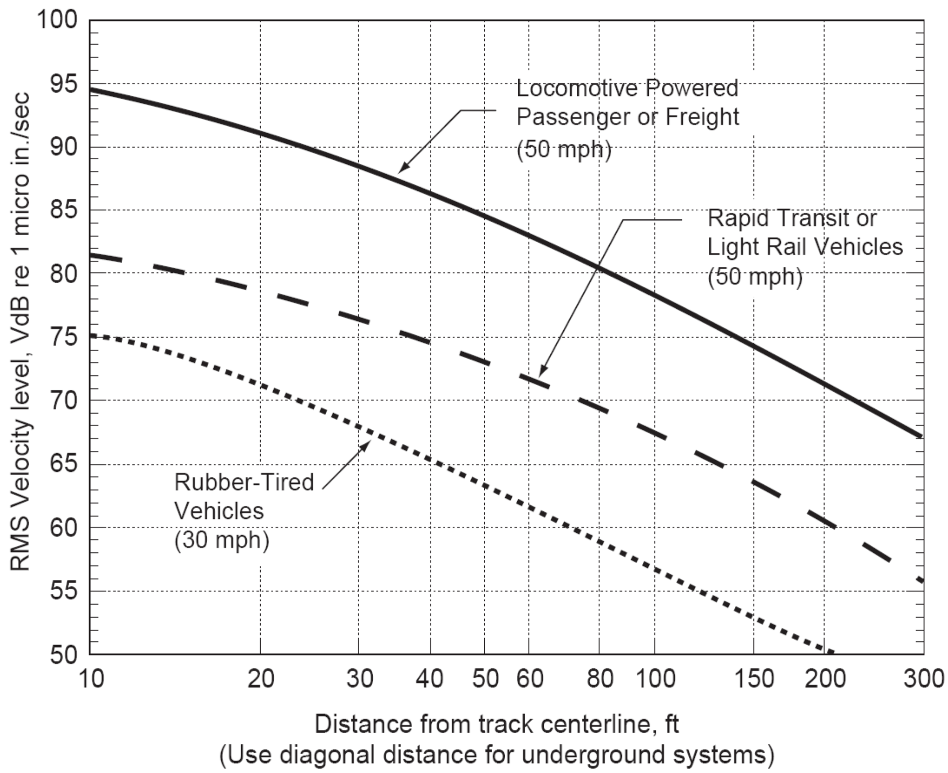
Site No.	Land Use	FTA Land Use Category[1]	Bus Speed, mph	Existing Noise Level, L_{dn}/L_{eq}, (dBA)[2]	Project Noise Level, L_{dn}/L_{eq}, (dBA)[2]	FTA Noise Impact Criteria, Moderate/Severe, L_{dn}/L_{eq}, (dBA)[2]	Impact
R39	SFR	2	25	64	55	60 / 66	None
R40	CHURCH	3	25	64	48	65 / 71	None
R41	HOTEL	2	25	62	49	59 / 64	None
R42/ST2	ICEHOUSE	3	25	64	52	65 / 71	None
R43	CLEVELAND CLINIC	3	25	64	47	65 / 71	None
Medical District							
R44/LT7	MFR	2	25	67	52	62 / 67	None
R45	PRE-SCHOOL	3	25	68	51	68 / 73	None
R46/LT8	SFR	2	25	62	52	59 / 64	None
R47	SFR	2	25	62	49	59 / 64	None
R48	OFFICE	3	25	62	53	64 / 69	None
R49	SFR	2	25	62	49	59 / 64	None
R50/ST3	VALLEY HOSPITAL	2	25	62	49	59 / 64	None
R51/LT9	SFR	3	25	62	56	59 / 64	None
R52	UNLV SCHOOL OF MEDICINE	3	25	62	47	64 / 69	None
R53/LT10	SFR	2	25	61	47	58 / 64	None
R54	MFR	2	25	62	51	59 / 64	None

Notes:

1- FTA land use Category 2 – residential, hotel, and hospital; Category 3 - institutional or commercial.

2 - L_{dn} would be used for Category 2 land uses and peak hour L_{eq} for Category 3 land uses.

Figure 3.11-2 Generalized Ground Surface Vibration Curves



Source: FTA, 2006

Due to its relatively low speed of travel of between 25 and 30 mph, the operation of either Build Alternatives (LRT or BRT) is not anticipated to create vibration impact at nearby building structures located along the Maryland Parkway Corridor. Under the LRT Build Alternative, a residential building structure would need to be within 30 feet or less of the track centerline to approach or exceed the vibration impact threshold. Many of the residential buildings in the Huntridge Neighborhood in Segment 1 are approximately 20-30 feet away from the proposed LRT tracks. There is one residential building in Segment 5 at the southwest corner of Maryland Parkway and E. Hacienda Ave that is 25 feet away from the track. The remaining residences and other buildings are greater than 30 feet away from the proposed tracks. At 25 feet distance from the proposed track, the vibration increases by approximately 1 VdB. For buildings 20 to 25 feet away from the track, vibration thresholds increase by approximately 3 VdB. The vibrations threshold would have to be exceeded by 5 VdB or greater to have significant impact requiring additional detailed analysis. Therefore, the residential buildings that are 20-25 feet away would have insignificant impacts. In addition, based on the proposed operational speed and distances to receptor locations along the project corridor, it is estimated that the vibration generated by the LRT operations would range between 51 and 69 VdB. This would be below the impact thresholds of 72 VdB and 75 VdB for Categories 2 and 3 land uses, respectively.

Significant vibration impact from rubber tire-fitted vehicles is extremely rare, because rubber tire-fitted vehicles are not as massive as railway vehicles. In addition, they are typically well-isolated by the vehicle suspension design and rubber tires act as a highly effective barrier to vibration transmission from the vibration-generating carriage and the main propagation medium for vibration excitation, the ground.

Construction noise and vibration from both Build Alternatives would create short-term impacts to receptors located along the corridor, near station locations, and along designated construction access routes. It is possible that some construction could occur at night to minimize disruption to traffic. The primary source of construction noise and vibration is expected to be diesel-powered trucks and earthmoving equipment. It is expected that ground-borne vibration, if any, from construction activities would cause only intermittent localized disturbance along the project corridor. Although processes such as earth moving with bulldozers or the use of vibratory compaction rollers can create annoying vibration, there should be only isolated cases where it is necessary to use this type of equipment in close proximity to residential buildings.

3.11.2.2 Enhanced Bus Alternative

There are no noise impacts on sensitive receptor locations for various land uses in proximity of the Enhanced Bus Alternative alignment because continued bus service would occur with the increase of the number of buses not contributing any additional noise impacts. Potential vibration impacts for building damage from the addition of rubber tire-fitted buses along the corridor can be reasonably dismissed under general conditions.

3.11.2.3 No Build Alternative

The No Build Alternative would not result in any direct, indirect, or construction-related noise or vibration.

3.11.3 Mitigation

Since there are no impacts from operations anticipated for either of the Build Alternatives, no mitigation measures are required.

Several measures can be taken to reduce noise and vibration intrusion without placing unreasonable constraints on the construction process or substantially increasing costs. These measures include noise and vibration monitoring to ensure contractors take all reasonable steps to minimize impacts when operating near sensitive areas and buildings; noise testing and inspections of equipment to ensure that all equipment on the site is in good condition and effectively muffled; and an active community liaison program. The community liaison program should keep residents, businesses, and other stakeholders informed about construction plans so they can plan around noise or vibration impacts; it should also provide a conduit for residents to express any concerns or complaints.

The following is a listing of procedures that have been shown to minimize noise and vibration disturbances at sensitive areas during construction:

- Use newer equipment with improved noise muffling and ensure that all equipment items have the manufacturers' recommended noise abatement measures, such as mufflers, engine covers, and engine vibration isolators intact and operational. All construction equipment should be inspected at periodic intervals to ensure proper maintenance and presence of noise control devices (*e.g.,* mufflers and shrouding).

- Perform all construction in a manner to minimize noise and vibration. Use construction methods or equipment that will provide the lowest level of noise and ground vibration impact near residences or other sensitive buildings and consider alternative methods that are also suitable for the soil condition. The contractor should be required to select construction processes and techniques that create the lowest noise and vibration levels.

- Perform noise and vibration monitoring to demonstrate compliance with the noise and vibration limits. Independent monitoring should be performed to check compliance in particularly sensitive areas. Require contractors to modify and/or reschedule their construction activities if monitoring determines that maximum limits are exceeded at residential land uses. If construction occurs next to buildings, vibration monitoring may be needed to ensure no damage to the structures.

- Conduct truck loading, unloading, and hauling operations so that noise and vibration are kept to a minimum by carefully selecting routes to avoid going through residential neighborhoods to the greatest possible extent.

- When possible, limit the use of construction equipment that creates high vibration levels, such as vibratory rollers, operating within 140 feet of residential structures.

- Design ingress and egress to and from the staging area to be on streets designated as collectors or higher street designations (preferred), and through routes for trucks (to the extent feasible) to minimize the potential for back-up alarm disturbances.

- Turn off idling equipment.

- Use temporary noise barriers, as practicable, to protect sensitive receptors against excessive noise from construction activities. Consider mitigation measures, such as partial enclosures, around continuously operating equipment or temporary barriers along construction boundaries.

- Minimize construction activities within residential areas during evening, nighttime, weekend, and holiday periods. Restrict the hours of vibration-intensive equipment usage such as vibratory rollers so that impacts to residents are minimal (*e.g.,* weekdays during daytime hours only, when as many residents as possible are away from home).

- Provide an active community liaison program.

3.12 Safety and Security

This section identifies, evaluates, and characterizes existing and future safety and security issues as it relates to passengers, pedestrians, motorists, and the public. The FTA's goal is to achieve the highest practical level of safety and security for all modes of transit. FAST-ACT grants FTA the authority to establish and enforce a new comprehensive framework to oversee the safety of public transportation throughout the U.S. The Federal Transit Act (49 U.S.C Section 5330) requires the FTA to create state-managed oversight programs for rail transit safety.

RTC prepared a *Southern Nevada Transportation Safety Plan* in 2015 (Kimley-Horn, 2015) to set goals to achieve zero fatalities and minimize serious crashes. The safety plan evaluated the different crash characteristics from 2008-2012 in Southern Nevada and rated bus crashes as extremely low. In addition, engineering strategies that were recommended in the safety plan included constructing pedestrian refuge islands and raised medians and improving left and right turn lanes at intersections.

During the development of the *Maryland Parkway Implementation Strategy Plan* (Southern Nevada Strong, 2014), open houses were held to address key themes, one being safety and security concerns along the corridor. Participants highlighted the need for improvements to pedestrian safety through features such as pedestrian walkways, crosswalks, better signaling, too many curb cuts, and covered transit stations. Participants also suggested that better parking management and design should be used along the corridor. Personal safety was also a concern, including homeless people in the area, and the extent of crime, trash, graffiti, and drug use along the corridor. Participants suggested security patrols and improved lighting would help to improve safety.

The *Maryland Parkway Implementation Strategy Plan* also indicated NDOT has a desire to improve intersection designs, especially where Charleston Boulevard, Sahara Avenue, and Tropicana Avenue cross Maryland Parkway, to improve operations and safety for all modes of travel (Southern Nevada Strong, 2014).

3.12.1 Existing Conditions

RTC operates bus transit throughout the Las Vegas metropolitan area and has established departments to address specific safety and security issues. RTC is currently using BRT vehicles throughout its system and have specified guidelines for their operations, safety, and security.

RTC currently monitors activities at its fixed facilities and on its fleet with surveillance cameras, emergency call boxes, and fully lit station stops and parking facilities. These features are designed to offer security and a personal sense of safety for passengers. In addition, RTC has trained security personnel that patrol the facilities and buses. The Las Vegas Metropolitan Police Department and other local law enforcement agencies provide additional police support when requested.

To measure change in safety, FTA uses the change in vehicle miles traveled (VMT) to estimate changes in disabling injuries and fatalities for automobiles and transit (Table 3.12-1). FTA does not attempt to capture the changes in pedestrian or bicyclist accidents or injuries resulting from changes in vehicle miles traveled because of the difficulty in accounting for such changes using readily available national data (FTA, 2016).

Table 3.12-1 Change in Safety Factor

Mode	2014 Fatalities (per million VMT)	2014 Injuries (per million VMT)
Automobile	0.013	0.195
Bus – Diesel	0.004	1.824
Bus – Electric	0.004	1.458
Heavy Rail	0.007	0.155
LRT and Streetcar	0.009	1.696
Commuter Rail – Diesel	0.012	1.746
Commuter Rail – Electric	0.012	1.746

3.12.2 Impacts

3.12.2.1 Build Alternatives

RTC will operate all LRT or BRT vehicles according to industry guidelines. These guidelines specify such provisions as rear-view mirrors, audible warning devices, and grab handles for standing passengers; they also regulate speed, lighting, and braking.

The Build Alternatives provide pedestrian amenities for convenience and safety, including crosswalks, sidewalks, and mid-block crossings with pedestrian hybrid beacons, traffic signals or other related devices to alert motorists to the presence of pedestrians and facilitate safe crossings. The conceptual designs for the proposed stations took safety and security into consideration and incorporate crime prevention through environmental design principles. For example, the open nature of the stations would prevent hiding places, but still provide shade for riders. The 24 proposed station locations would be equipped with surveillance cameras to monitor activity as well as public address system and passenger information displays to transmit safety and security messages to patrons. In addition, the design of the station would improve ADA access to, from, and within the stations, including providing level boarding onto the LRT/BRT vehicles.

Curbside-running dedicated transit lanes will allow vehicular right-turns at minor cross street intersections and access driveways to help maintain flexibility and capacity in traffic. The project also includes separate right-turn lanes at major cross street intersections along northbound and southbound Maryland Parkway to ensure transit vehicles are not delayed by the volume of right-turning vehicles or queues from crossing pedestrians, making it safer for pedestrians in crosswalks.

Safety could be impacted in work zones as lanes are shut down during construction, pedestrians and vehicles are traveling through construction areas, and equipment and workers are moving in confined work areas. Mitigation measures would be implemented throughout the construction phases to reduce potential safety issues to pedestrians, traffic, and workers due to construction activities.

3.12.2.2 Enhanced Bus Alternative

Under the Enhanced Bus Alternative, proposed enhancements to the bus service would occur along the proposed route. The Enhanced Bus alternative would be a limited stop service with the same 24 stations as those included in the Build Alternatives with average spacing of 0.35-mile and the same span of service, but the buses would operate in the existing mixed flow traffic curb lanes, like the existing Route 109 buses.

Safety could be impacted in work zones as lanes are shut down during construction of the new stations; otherwise, construction areas would be contained to small areas along the alignment. Mitigation measures would be implemented to reduce potential safety issues to pedestrians, traffic, and workers due to construction activities.

3.12.2.3 No Build Alternative

The No Build Alternative would maintain the current level of bus service in the project corridor and would have no direct or indirect impacts to public safety and security. No construction would occur with the No Build Alternative, so potential for accidents would not increase. However, as traffic congestion increases along the project corridor, the probability of vehicle and/or pedestrian accidents could increase.

3.12.3 Mitigation

Mitigation measures include improved passenger safety in and near LRT or BRT transit stations. Provide security cameras at stations and on transit vehicles for monitoring, provide adequate lighting and increase security personnel patrols during peak and off-peak times to make riders feel more secure. Provide pedestrian and bicyclist access improvements around stations and along streets to enhance pedestrian and bicycle safety. A traffic management plan will be prepared by the contractor prior to construction activities that will be reviewed and approved by RTC, the City of Las Vegas, and Clark County. Provide traffic control personnel and measures to maintain safety for construction workers and the traveling public.

3.13 Wetlands and Jurisdictional Wetlands

The U.S. Army Corps of Engineers (USACE), acting under Section 404 of the Clean Water Act and Section 10 of the River and Harbors Act of 1899, regulates certain activities occurring in waters of the U.S. and navigable waters of the U.S. Waters of the U.S. include other parts of the surface water tributary system down to the smallest of streams (*e.g.*, tributary that only contains water after a rain event), lakes, ponds, or other water bodies on those streams, and adjacent wetlands (*e.g*., sloughs, swamps, and some seasonally flooded areas) if they meet certain criteria.

3.13.1 Existing Conditions

A wetland and waters of the U.S field survey was completed by a qualified Parsons' biologist on May 10, 2016, along the project corridor. There is one designated waters of the U.S. in the project corridor, which is the Flamingo Wash that crosses Maryland Parkway north of Flamingo Road. The drainage facility is concrete lined, maintained, and does not contain any wetlands. No other waters of the U.S. or wetlands occur in the project study area.

3.13.2 Impacts

3.13.2.1 Build Alternatives

No impacts are anticipated from the Build Alternatives because no wetlands occur within the project area.

3.13.2.2 Enhanced Bus Alternative

No impacts are anticipated from the Enhanced Bus alternative because no wetlands occur within the project area.

3.13.2.3 No Build Alternative

No impacts are anticipated from the No Build alternative; no wetlands occur within the project area.

3.13.3 Mitigation

Prior to construction, a wetland survey will be performed to ensure no wetlands have formed. Best management practices would be utilized by the contractors to prevent sediment from entering the storm sewers or Flamingo Wash during construction activities. A Stormwater Pollution Prevention Plan would be prepared prior to construction to avoid or mitigate potential water quality impacts.

3.14 Biological Resources

Biological resources include wildlife; vegetation; and threatened, endangered, and sensitive species. The U.S. Fish and Wildlife Service (USFWS) is responsible for the administration of the Endangered Species Act of 1973, as amended. Section 7 of the Endangered Species Act outlines procedures for interagency cooperation to conserve federally-listed species and designated critical habitats. Section 7(a)(2) requires federal agencies to consult with the USFWS to ensure they are not undertaking, funding, permitting, or authorizing actions likely to jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat.

3.14.1 Existing Conditions

A search of the USFWS Threatened and Endangered Species database (USFWS, 2017) and Nevada Natural Heritage Program (Nevada Department of Conservation and Natural Resources, 2017) identified a list of sensitive species that occurs in Clark County (Table 3.14-1). None of the species or their habitats occur within the project study area based on surveys of the corridor by a qualified Parsons' biologist.

The Migratory Bird Treaty Act (16 U.S.C. § 703) provides for protection of all native migratory game and non-game birds, including all common songbirds, waterfowl, shorebirds, hawks, owls, eagles, ravens, crows, native doves and pigeons, swifts, martins, swallows and others, including their body parts (feathers and plumes), nests, and eggs. The take of a protected species is defined as "to pursue, hunt, shoot, wound, kill, trap, capture, collect, or any attempt to carry out these activities." A take does not include habitat destruction or alteration, as long as there is not a direct taking of birds, nests, eggs, or parts thereof.

EO 13112 directs federal agencies whose activities may affect the status of invasive species to control populations of such species in a cost-effective and environmentally sound manner, monitor invasive species populations, and provide for restoration of native species and habitat conditions in ecosystems that have been invaded.

Parsons (2018b) prepared a *Biological Resources Technical Memorandum* that describes biological survey methodology and results.

3.14.2 Impacts

3.14.2.1 Build Alternatives

The urban nature of the project corridor provides little natural habitat for wildlife and plants. Native and non-native landscaping plants are scattered along the corridor. There are no biological resources that would be impacted in the highly-urbanized study area. There are no surface water or riparian areas present in the project corridor to support aquatic species. No noxious weeds were observed along the project corridor during the site surveys. Therefore, no impacts to threatened, endangered, or sensitive species from the Build Alternatives are anticipated.

There could be potential impacts to migratory birds during construction activities if trees or shrubs are removed along the project corridor that contain active bird nests.

3.14.2.2 Enhanced Bus Alternative

There are no biological resources that would be impacted in the highly-urbanized study area. There are no surface water or riparian areas present in the project corridor to support aquatic species. No noxious weeds were observed along the project corridor during the site surveys. Therefore, no impacts to threatened, endangered, and sensitive species from the Enhanced Bus Alternative are anticipated.

There could be potential impacts to migratory birds during construction activities if trees or shrubs are removed along the project corridor that contain active bird nests.

3.14.2.3 No Build Alternative

No impacts to any biological resources would occur with the No Build Alternative.

Table 3.14-1 Threatened, Endangered, and Sensitive Species in Clark County

Scientific Name	Common Name	USESA Status	Nevada Status
Insects			
Plebejus shasta charlestonensis	Mt. Charleston blue	LE	
Plants			
Arctomecon californica	Las Vegas bearpoppy		CE
Astragalus geyeri var. triquetrus	Threecorner milkvetch		CE
Cryptantha insolita	Las Vegas catseye		CE
Cylindropuntia multigeniculata	Blue Diamond cholla		CE, CY
Eriogonum corymbosum var. nilesii	Las Vegas buckwheat	C	
Eriogonum viscidulum	Sticky buckwheat		CE
Ferocactus cylindraceus var. *lecontei*	Mojave barrel cactus		CY
Amphibians			
Lithobates once	Relict leopard frog	C	P
Lithobates pipiens	Northern leopard frog		P
Birds			
Coccyzus americanus	Yellow-billed Cuckoo	LT	
Empidonax traillii extimus	Southwestern Willow Flycatcher	LE	E
Falco peregrinus	Peregrine Falcon		E
Lanius ludovicianus	Loggerhead Shrike		S
Oreoscoptes montanus	Sage Thrasher		S
Rallus longirostris yumanensis	Yuma Clapper Rail	LE	E
Spizella breweri	Brewer's Sparrow		S
Fishes			
Cyprinodon diabolis	Devils Hole pupfish	LE	E
Empetrichthys latos	Pahrump poolfish	LE	E
Gila elegans	Bonytail chub	LE	E
Gila seminude	Virgin River chub	LE	E
Moapa coriacea	Moapa dace	LE	E
Oncorhynchus clarkii henshawi	Lahontan cutthroat trout	LT	
Plagopterus argentissimus	Woundfin	LE	E
Rhinichthys osculus moapae	Moapa speckled dace		S
Xyrauchen texanus	Razorback sucker	LE	E
Mammals			
Antrozous pallidus	Pallid bat		P
Corynorhinus townsendii	Townsend's big-eared bat		S
Macrotus californicus	California leaf-nosed bat		S
Euderma maculatum	Spotted bat		T
Idionycteris phyllotis	Allen's big-eared bat		P
Lasiurus blossevillii	Western red bat		S
Lontra canadensis sonora	Southwestern otter		FM

Table 3.14-1 Threatened, Endangered, and Sensitive Species in Clark County (continued)

Scientific Name	Common Name	USESA Status	Nevada Status
Myotis thysanodes	Fringed myotis		P
Neotamias palmeri	Palmer's chipmunk		S
Neotamias umbrinus nevadensis	Hidden Forest Uinta chipmunk		S
Tadarida brasiliensis	Mexican free-tailed bat		P
Vulpes macrotis	Kit fox		FM
Reptile			
Gopherus agassizii	Mojave Ddesert tortoise	LT	T
Heloderma suspectum cinctum	Banded Gila monster		P

Sources: U.S. Fish and Wildlife Service Threatened and Endangered Species database (USFWS, 2017) and Nevada Natural Heritage Program (Nevada Department of Conservation and Natural Resources, 2017)

U.S. Endangered Species Act (USESA) Designation:
- LE - Listed Endangered
- LT - Listed Threatened
- PE - Proposed Endangered
- PT - Proposed Threatened
- C - Candidate for listing as Threatened or Endangered

State of Nevada Protection and Designations:
- CE - Critically Endangered Plant
- CY - Protected as a cactus, yucca, or Christmas tree
- P - Protected
- E - Endangered
- S - Sensitive
- FM - Fur-bearing Mammal

3.14.3 Mitigation

Before construction begins, active migratory bird nest surveys should be completed by a qualified biologist to determine if active nests (*e.g.,* eggs, young) are located in trees and shrubs that will be removed or trimmed as part of the project. If construction activities are scheduled during prime nesting periods, the vegetation should be removed ahead of construction during non-nesting periods.

A noxious weed management plan will be prepared and implemented by the contractor to prevent noxious weeds from entering the project corridor. Earthmoving and hauling equipment will be washed at the contractor's storage facility prior to arriving onsite to prevent the introduction of noxious weed seeds. Disturbed areas will be landscaped or reseeded with a certified weed-free mix.

Best management practices would be utilized by the contractors to prevent sediment from entering the storm sewers or Flamingo Wash during construction activities. A Stormwater Pollution Prevention Plan would be prepared prior to construction to avoid or mitigate potential water quality impacts.

3.15 Section 4(f)

The Department of Transportation Act of 1966, 49 U.S.C. 303 and/or regulations in 23 CFR 774, includes a special provision, Section 4(f), which stipulates that Federal agencies cannot approve the use of land from publicly-owned parks, recreational areas, wildlife and waterfowl refuges, and public or private historical sites unless the following conditions apply:

- There is no feasible and prudent avoidance alternative to the use of land; and the action includes all possible planning to minimize harm to the property resulting from such use; or
- The FTA determines that the use of the property will have a *de minimis* impact (too minor to merit consideration).

Any transportation program that affects Section 4(f) land must include a Section 4(f) assessment. Under 23 CFR Part 774.17, the FTA must determine that the "use" of the Section 4(f) property from the proposed project. Section 4(f) defines "use" as permanent, constructive use, or temporary occupancy. A permanent use occurs when property is permanently incorporated into a proposed transportation facility. Permanent use may occur as a result of a partial or full acquisition or a permanent easement allowing access onto a property for transportation-related purposes. A constructive use occurs when there is no permanent incorporation of land from the resource, but the projects proximity results in impacts that substantially impair the protected activities, features, or attributes that quality the property for protection under Section 4(f) regulations. Temporary use of a Section 4(f) property may not trigger the application of Section 4(f) if it meets five criteria:

- Duration is temporary, the occupancy is shorter than the time needed for construction of the project and there is no change in property ownership;

- Scope of work is minor, both the nature and magnitude of the changes to the property are minimal;
- There are no anticipated permanent adverse physical impacts on or permanent interference with the protected activities, features, or attributes of the property;
- The property is restored to the same or better condition that existed prior to the project; and
- There is a documented agreement from the appropriate officials having jurisdiction.

3.15.1 Existing Conditions

Parsons (2018d) prepared a *Section 4(f) Technical Memorandum* that identified Section 4(f) properties in the project study area and evaluated potential impacts. Section 4(f) properties identified within the study area included three public parks and 51 historic properties. Historic sites were identified through a cultural resource survey (Section 3.5). Section 4(f) only applies to historic or cultural resource sites that are eligible for the National Register of Historic Places.

3.15.2.1 Build Alternatives

A summary of the potential permanent (direct) and temporary impacts to Section 4(f) properties from the project is provided below.

Huntridge Theater. The Huntridge Theater, listed on the NRHP, is located at the intersection of Maryland Parkway and Charleston Boulevard. A portion of the parking lot on the north side of Huntridge Theater/Performing Arts Center is proposed for acquisition under both Build Alternatives to provide a right-hand turn lane from Maryland Parkway onto Charleston Boulevard. The acquisition will result in the loss of about seven parking spaces from a parcel northwest of the theater. This parking lot is adjacent to the two parcels comprising the historic property; no features or aspects of integrity that contribute to the NRHP eligibility of the theater would be impacted. No new areas of paving are proposed, but the use will be altered from parking to roadway. No adverse effects of the Huntridge Theater will occur from this right-of-way acquisition. Based on future projections of increases in vehicle traffic, the LRT and BRT Build Alternatives, including new right-turn lanes at the major intersections, would benefit the corridor by improving traffic flow and provide a faster, safer transportation option for workers and patrons of the many employment centers, businesses, and residences along the corridor.

A right turn lane from Maryland Parkway to Charleston Boulevard is required for the project to minimize delays to the LRT or BRT for right-turning vehicles, especially when there are pedestrians in the cross-walk. There are also safety concerns to pedestrians, bicyclists, vehicle drivers, and transit drivers from right-turning vehicles, making the new right turn lanes a necessity. There is no feasible and prudent avoidance alternatives to the change of use of a small portion on the parking lot to roadway. Temporary use of the existing sidewalk and a portion of the parking lot during construction would occur during construction activities, but the impacts would be less than the total project schedule. Therefore, *de minimus* impacts (too minor to merit consideration) will occur to the historic building.

Archie C. Grant Hall. Archie C. Grant Hall, recommended as eligible for the NRHP, is located on the UNLV campus. Consultation with UNLV identified the preferred location of the proposed transit station near Archie C. Grant Hall, which would service the northern end of the campus. Minor right-of-way acquisition for the new station and sidewalk will occur at this location for both Build Alternatives, which would result in a permanent use adjacent to the historic building. The proposed station adjacent to Archie C. Grant Hall will result in the acquisition of about 3 parking spaces and relocation of the entrance into the parking lot. The addition of a station and new pavement for a sidewalk will not alter aspects of integrity that make this property eligible for listing on the NRHP because paving already occurs in front of the property and transit-related features like bus stops occur near or within viewshed of the property. Features like sidewalks and stations would be expected to occur along a busy urban commuter corridor. Temporary use of the existing sidewalk and parking lot during construction would occur during construction activities, but the impacts would be less than the total project schedule. Coordination and approval from UNLV for construction activities would be required. There is a potential for short-term visual and noise impacts to the historic building during construction for the new transit system, but the impacts would be minor. Therefore, *de minimis* impacts will occur to the UNLV historic building.

Neon Apartments. The Neon Apartments, recommended as eligible for the NRHP, are located at 501 Desert Lane in the Las Vegas Medical District. Minor right-of-way acquisitions for this eligible historical property would occur to extend the sidewalk and add a bike lane along the north side of the apartments. No direct impacts from permanent use will occur to the building and improved pedestrian and bicycle access will occur that could benefit the property. The addition of new pavement for a sidewalk and bike lane will not alter aspects of integrity that make this property eligible for the NRHP because paving already occurs in front of the property and transit-related features like bus stops occur within viewshed of the property. Features like sidewalks would be expected to occur along a busy urban commuter corridor. Temporary use of the existing sidewalk and areas adjacent to the building would occur during construction, but the impacts would be less than the total project schedule. There is a potential for short-term visual and noise impacts to the historic building during construction for the new transit system, but the impacts would be minor. Therefore, *de minimis* impacts will occur to the building and property.

3.15.2.2 Enhanced Bus Alternative

No public parks or historic sites adjacent to the corridor will be impacted as part of the Enhanced Bus Alternative. Little to no temporary construction impacts to Section 4(f) properties are anticipated for this alternative.

3.15.2.3 No Build Alternative

No public parks or historic sites adjacent to the corridor will be impacted as part of the No Build Alternative.

3.15.2 Mitigation

Mitigation measures will be used adjacent to parks and historic sites to avoid and minimize harm to those resources. Temporary construction barriers, which typically includes orange construction fence or concrete barriers, will be used to exclude construction vehicles and workers from accidentally disturbing the adjacent parks and historical buildings. The contractor will monitor and minimize temporary vibration impacts from heavy construction equipment adjacent to historical buildings. The land being used for temporary construction will be fully returned to existing conditions.

3.16 CLIMATE CHANGE

Climate changes pose challenges to the Southwest, which is the hottest and driest region in the U.S. and is expected to get hotter and significantly drier. Projected regional temperature increases, combined with the way cities amplify heat, will pose increased threats and costs to public health in southwestern cities (U.S. Global Research Program [USGCRP], 2014). Climate change science continues to expand and refine our understanding of the impacts of anthropogenic greenhouse gas (GHG) emissions.

NEPA recognizes "the profound impact of man's activity on the interrelations of all components of the natural environment" (42 U.S.C. 4331(a)). It was enacted to "promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man" (42 U.S.C. 4321). Studies have projected the effects of increasing GHGs on many resources normally discussed in the NEPA process, including water availability, ocean acidity, sea-level rise, ecosystem functions, energy production, agriculture and food security, air quality, and human health (USGCRP, 2014).

A GHG is a gas in an atmosphere that absorbs and emits radiation within the thermal infrared range. The primary GHGs in Earth's atmosphere are carbon dioxide, methane, nitrous oxide, and ozone. The dominant GHG is atmospheric carbon dioxide, which is presently responsible for approximately 63 percent of the anthropogenic climate change flux. Human activities since the beginning of the Industrial Revolution (taken as the year 1750) have produced a 40 percent increase in the atmospheric concentration of carbon dioxide , from 280 parts per million (ppm) in 1750 to 404 ppm in December 2016 (Raupach *et. al*., 2007; Dlugokencky and Tans, 2017). The carbon dioxide emissions produced by human activities mainly come from combustion of fossil fuels, principally coal, oil, and natural gas. The seven sources of carbon dioxide from fossil fuel combustion (with percentage contributions for 2000–2004) are shown in Table 3.16-1.

3.16.1 Existing Conditions

The Southern Nevada Regional Planning Coalition's (SNRPC) mission is to coordinate regional planning among all public jurisdictions. SNRPC plays a key role in developing a consistent protocol for reporting GHG emissions to establish independent reduction strategies and targets by each jurisdiction and agency.

The Regional Greenhouse Gas Emissions Inventory will be updated on a biennial basis, based on the availability of data from Nevada Energy, Southwest Gas, NDOT, RTC, Southern Nevada Health District, and NDEP. This report provides a GHG emission inventory for 2014 and the contributions from Residential and Commercial Energy, Transportation, Natural Gas, and Waste. Carbon Dioxide Equivalent (E-CO_2) (reported in tons) is a metric used to compare the emissions from various GHGs based upon their global warming potential.

Table 3.16-1 Sources of Carbon Dioxide from Fossil Fuel Combustion

Fossil Fuel Combustion Sources	Contribution
Liquid fuels (*e.g.*, gasoline, fuel oil)	36%
Solid fuels (*e.g.*, coal)	35%
Gaseous fuels (*e.g.,* natural gas)	20%
Cement production	3%
Flaring gas (from wells and industrial uses)	< 1%
Non-fuel hydrocarbon oxidation	< 1%
Fuel from "International bunkers" used for shipping and air transport (not included in national inventories)	4%

Source: Raupach *et. al.,* 2007.

Emissions by sector shown in Table 3.16-2 shows the total E-CO_2 results compared to baseline conditions. It can be observed that E-CO_2 emissions have increased since 2005 until 2011, then slightly decreasing for 2012, with an increase for 2013 and 2014. It is also observed that, in 2014, the emissions in the industrial waste and residential sectors have decreased when compared to those in 2005. The commercial sector had less emissions in 2014 than the previous year. The transportation sector shows an increasing trend compared to the baseline. The decrease in 2010 was attributed to reduced tourist activity caused by the recession (Stephen and Hoyuela-Alcaraz, 2014).

Table 3.16-2 Emissions by Sector (E-CO_2 (tons))

	2005		2010		2011		2012		2013		2014	
Residential	6,938,768	24.75%	6,995,131	23.49%	7,425,547	24.80%	7,190,445	24.09%	7,035,370	23.56%	6,967,395	22.78%
Commercial	6,877,364	24.53%	7,655,530	25.71%	7,757,493	25.91%	7,602,870	25.48%	7,130,904	23.88%	7,767,980	25.40%
Industrial	4,056,220	14.47%	4,624,681	15.53%	4,370,135	14.60%	4,768,052	15.98%	4,588,662	15.36%	3,918,830	12.81%
Transportation	8,870,378	31.64%	9,338,344	31.36%	9,489,662	31.69%	9,572,334	32.07%	10,008,003	33.51%	11,002,925	35.97%
Waste	1,296,808	4.62%	1,160,933	3.90%	898,379	3.00%	709,951	2.38%	1,103,345	3.69%	930,983	3.04%
Total	28,039,538		29,774,619		29,941,216		29,843,652		29,866,284		30,588,113	

Source: Stephen and Hoyuela-Alcaraz, 2014.

Over the past few years, there have been efforts by the SNRPC to mitigate excessive emissions throughout the valley. Strategies included providing more renewable energy sources, energy efficiency rebates, alternative fuel vehicles, and increased public transit facilities. For example, the City of Las Vegas planned to be powered by 100 percent renewable energy by January 2017. Through an expanded partnership with Nevada Energy, the City of Las Vegas will undertake a mix of energy-efficiency programs, a large-scale solar project near Boulder City, and a purchasing agreement of hydropower from Hoover Dam to reach its goal (Green Chips, 2016). In December 2016, the City of Las Vegas announced it has achieved this goal. Public transportation can reduce GHG emissions by providing a low emissions alternative to driving, facilitating compact development, and minimizing the carbon footprint of its operations. Public transit ridership shows a gradual increase in ridership over the last five years.

3.16.2 Impacts

The analysis of climate change impacts should focus on those aspects of the human environment that are impacted by both the Build Alternatives and climate change. Climate change can make a resource, ecosystem, human community, or structure more susceptible to many types of impacts and lessen its resilience to other environmental impacts apart from climate change. Certain groups, including children, the elderly, and the poor, are more vulnerable to climate-related health effects and may face barriers to engaging on issues that disproportionately affect them. This increase in vulnerability can exacerbate the effects of the proposed action. Therefore, a NEPA review should consider an action in the context of the future state of the environment.

3.16.2.1 Build Alternatives

Transportation-related emissions have been steadily increasing for the past 10 years in the Southern Nevada Region (Stephen and Hoyuela-Alcaraz, 2014), that can be attributed to population and tourist increases. The LRT Build Alternative would use electric rail vehicles that emit no propulsion system pollution at their point of operation. LRT would be responsible for fuel cycle emissions from Las Vegas' renewable energy sources. The term "fuel cycle emissions" refers to a complete accounting of emissions and energy use from primary feedstock extraction though final energy use (Puchalsky, 2005). The attractiveness of LRT for riders can potentially induce many new riders to consider using it, thus removing motor vehicles trips from the roads. Improving pedestrian and bicycle facilities and access along the corridor could also reduce the number of vehicles in the corridor.

A 2008 study published by the Urban Land Institute and partially funded by USEPA, concluded that compact development can reduce vehicle miles traveled by 20 to 40 percent compared to conventional development. Based on the amount of development that will take place and the percentage of that development that could reasonably be expected to be compact infill, the study estimated that compact development could reduce CO_2 emissions by 7 to 10 percent in 2050. The LRT Build Alternative would bring compact development to the Maryland Parkway corridor and encourage higher ridership on high capacity transit systems.

For the BRT Build Alternative, new CNG buses will be utilized along the corridor. However, CNG vehicles are still a carbon dioxide source for GHG emissions and; therefore, would not be as clean as the LRT vehicles (Puchalsky, 2005). These new and improved buses may require a new bus maintenance facility, which a location has not been identified and is outside the scope of this analysis. Travel to and from the corridor from a new bus maintenance facility could create additional emissions. Providing better buses could attract new riders and reduce the number of motor vehicles trips from the roads. Improving pedestrian and bicycle facilities and access along the corridor could also reduce the number of vehicles on the road.

Construction emissions for the LRT Build Alternative would be slightly higher than the BRT Build Alternative because more earthwork and heavy construction (*e.g.*, rail, electrical lines) will occur as part of the alternative. However, these construction emissions would be short-term and minimal with appropriate air quality mitigation measures discussed in Section 3.10.3.

3.16.2.2 Enhanced Bus Alternative

The Enhanced Bus Alternative would continue the use of RTC buses along the Maryland Parkway corridor and increase the frequency of the number of buses. If the existing older buses have combustion diesel engines, the increase number of buses could increase the GHG emissions along the corridor until eventually the existing buses are converted to CNG as RTC updates its fleet. It is anticipated that GHG emissions would continue to rise along the Maryland Parkway project alignment because of increased traffic congestion and idling vehicles on the road and less increase in transit patronage or pedestrian/bicycle trips. Minimal construction emissions would occur with this alternative.

3.16.2.3 No Build Alternative

The No Build Alternative would continue the use of RTC buses along the Maryland Parkway corridor and eventually the existing buses will be converted to CNG as RTC updates its fleet. It is anticipated that GHG emissions would continue to rise along the Maryland Parkway corridor because of increased traffic congestion and idling vehicles on the road and less increase in transit patronage or pedestrian/bicycle trips.

3.16.3 Mitigation

Reasonable mitigation measures to reduce or mitigate GHG emissions and climate change effects can include enhanced energy efficiency, lower greenhouse-emitting technology, and increase carbon sequestration, such as planting additional trees in road medians and along the project corridor. Other mitigation strategies include increasing public transit facilities, improving pedestrian and bicycle routes to encourage alternate forms of transportation, and providing attractive and affordable public transportation to reduce the number of vehicles on the streets.

3.17 Cumulative Impacts

NEPA evaluation requires that cumulative impacts be assessed and disclosed in EAs. Cumulative impacts occur when impacts from multiple past (completed), present (currently on-going), and reasonably foreseeable future (planned) projects combine to create greater cumulative impacts (40 CFR 1508.7). If no direct and/or indirect effect to a specific resource is expected, there is no need to consider cumulative effects to that resource. Cumulative impacts take into account all disturbances since cumulative impacts result in the compounding of the effects of all actions over time.

The issues and/or resources of concern addressed in this section are based on the direct and indirect effects discussed earlier in this document. The geographic APE for this cumulative effects analysis not only takes into consideration the Maryland Parkway High Capacity Transit project, but also the 0.25-mile radius from the proposed alignment. The timeframe of the cumulative effects analysis assumed a maximum of 15 years, which is based on local plans and available demographic information, that typically project 10 years in the future. Additional information can be found in the Cumulative Effects Technical Memorandum (Parsons, 2016c).

3.17.1 Projects

Cumulative land use changes have an overarching influence on the other resources within this analysis. As a result, land use was evaluated for potential cumulative effects based on other past, present, and foreseeable future development and transportation projects. The intent was not to provide an exhaustive list of every project, but to provide a reasonable characterization of the corridor and projects that have affected or may affect the key resources under evaluation. Past projects (within the past 3 years) along the Maryland Parkway corridor include:

- The Boulevard Mall's new local owner invested $20 million on improvements and enhancements and added 3,000 jobs. In addition, the top floors of the former Dillard's department store and of the JC Penney's department store were both converted to a call center, which adds to the daily inflow-outflow of traffic and employs nearly 2,000. The mall is also home to SeaQuest Interactive Aquarium and John's Incredible Pizza, entertainment destinations for both locals and visitors alike. Both Build Alternatives will serve the mall and call center. Adding right turn lanes around the mall improves traffic flow for turning vehicles. No parking space removal is anticipated from the addition of a new station at the mall and call center. Access to the mall will be maintained during construction activities.

- The Venue Las Vegas, located at 750 Fremont Street, opened in 2015 as a special events facility. It is located one block north of the Maryland Parkway Downtown segment on 8th Street. Both Build Alternatives and the Enhanced Bus Alternative will serve this development. No construction impacts are anticipated from the Alternatives.

- Steinberg Diagnostic Medical Imaging, located at 800 Shadow Lane, adjacent to the Maryland Parkway Medical District segment, opened in 2015 and is part of the planned Las Vegas Medical District expansion. Both Build Alternatives and the Enhanced Bus Alternative will serve this development. No construction impacts are anticipated from the Alternatives. Access to the business will be maintained during construction activities.

- Redflint Innovation Center, located at 300 S. Fourth Street, opened in late 2016 in the Bank of American building one block south of the Maryland Parkway Downtown corridor. It is run by the University of Phoenix, offering training for students for available local jobs and working with local companies and non-profits to find solutions for technology needs. Both Build Alternatives and the Enhanced Bus Alternative will serve this development. No construction impacts are anticipated from the Alternatives.

- Federal Justice Tower, located at 501 S. Las Vegas Boulevard, opened in August 2016 and houses executive offices of multiple components of U.S. Immigration and Customs Enforcement, the U.S. Attorney's Office of the District of Nevada, the Federal Protective Services, and the Department of Labor's Office of Inspector General. The building is located about 3 blocks south of the Maryland Parkway Downtown segment. Both Build Alternatives and the Enhanced Bus Alternative will serve this development. No construction impacts are anticipated from the Alternatives.

- Courthouse Complex, located at the southeast corner of Clark Avenue and Fourth Street, was completed at the end of 2016 and is home to the Nevada Appellate Court. It is located about 3 blocks south of the Maryland Parkway Downtown corridor. Both Build Alternatives and the Enhanced Bus Alternative will serve this development. No construction impacts are anticipated from the Alternatives.

- The Thomas & Mack Center at UNLV was renovated in 2016 and upgrades were made to the restrooms, concession stands, and mechanical, electrical, and plumbing systems, as well as the Si Redd Room and other events spaces. The 150 events at the center bring in 850,000 visitors annually. Both Build Alternatives and the Enhanced Bus Alternative will serve this development. No construction impacts are anticipated from the Alternatives.

- UNLV School of Medicine - Work has begun to convert previously unused space at UNLV's Shadow Lane Campus — located in the heart of the Las Vegas Medical District — into the interim teaching facility for the new medical school, which welcomes its first class of students in fall 2017. To date, UNLV has secured $50 million in funding to build the permanent facility within the same campus across the street from two existing hospitals: University Medical Center and Valley Hospital Medical Center. Both Build Alternatives and the Enhanced Bus Alternative will serve this development. No construction impacts are anticipated from the Alternatives.

Current projects along the Maryland Parkway corridor include:

- Fremont 9 is located at the corner of Fremont and Ninth Street, one block north of the Maryland Parkway Downtown segment. Consists of 15,000 square feet of retail space and 231 market rate multifamily residential units to be completed mid-2017. Both Build Alternatives and the Enhanced

Bus Alternative will serve this development. No construction impacts are anticipated from the Alternatives.

- University Gateway – A two-story parking garage, which includes a new 10,000-square-foot space for UNLV police and in phase two, a retail-professional space. Both Build Alternatives will serve this proposed development. The parking structure was completed at the end of 2016 with the office and retail space to follow in 2017. Both Build Alternatives and the Enhanced Bus Alternative will serve this development. No construction impacts are anticipated from the Alternatives.

- Hospitality Hall, the new home for the William F. Harrah College of Hotel Administration, is being constructed in the heart of the UNLV campus on North Field. The building will contain interactive classrooms, a student-run cafe, an executive learning kitchen, and a learning center for the PGA golf management program. The new facility also will benefit the Lee Business School, which currently shares Frank and Estella Beam Hall with the Hotel College; opening will be in fall 2017. Both Build Alternatives and the Enhanced Bus Alternative will serve this development. No construction impacts are anticipated from the Alternatives.

- U District – A new student complex developed in partnership with UNLV to house up to 760 students on Maryland Parkway at Cottage Grove. Construction started in 2016 with the new building under Phase I anticipated to open in spring 2018. Existing apartment units part of the same historic development still occupy the western portion of the overall site and have been renovated to house upwards of 200 students. Future redevelopment phases will occur over the next 10 years. Both Build Alternatives and the Enhanced Bus Alternative will serve this development. No construction impacts are anticipated from the Alternatives.

Projects planned along the Maryland Parkway corridor in the foreseeable future include:

- The UNLV School of Medicine will open the first UNLV Medicine multi-specialty clinic in 2019. Both Build Alternatives will serve this proposed development. No construction impacts are anticipated.

- UNLV is working with the Clark County Public Works Department to re-align Cottage Grove and Avenue with Rochelle Avenue to create a 4-way signalized intersection adjacent to its Maryland Parkway campus near the U District student complex. This could facilitate better movement of vehicles, as well as provide a signalized crossing for pedestrians. In addition, UNLV is coordinating with the Clark County Public Works Department to replace the existing hybrid pedestrian beacon crossing on Maryland Parkway at Del Mar Street with full signalized crossing for pedestrians.

- The City of Las Vegas identified several new developments in the downtown area including 1,000 residential units to be built along Fremont Street between 9th and 15th Streets. Both Build Alternatives and the Enhanced Bus Alternative will serve this development.

- The Southern Nevada Strong team, in collaboration with the USEPA, recently worked with a consultant team to identify sites that are currently underutilized and could spur development along Maryland Parkway. The team will continue these meetings with community leaders, jurisdictional staff and area stakeholders to further promote redevelopment that supports the goals of the Southern Nevada Strong Regional Plan.

- Las Vegas Medical District, located between I-15 and Rancho Drive near Charleston Boulevard. Business and government leaders have begun working on a plan to expand the Las Vegas Medical District from its current 200 acres to at least 680 acres. While currently offering the largest concentration of health-care services in the Las Vegas Valley, an expanded district would allow for additional health-care opportunities, including the possibility of a medical mart. Available areas for expansion include Charleston Boulevard west to Valley View Boulevard, along Martin L. King Boulevard and in Symphony Park. Both Build Alternatives will serve these proposed developments.

- Clark County Regional Flood Control District has identified future projects in the Maryland Parkway study area from fiscal year 2017 through fiscal year 2026 (Clark County Regional Flood Control District, 2016).

- Central – Sahara Avenue – Las Vegas Boulevard to Maryland Parkway. This project consists of a 14-foot by 14-foot reinforced concrete box culvert in Sahara Avenue from Las Vegas Boulevard to Maryland Parkway. Design is programmed in fiscal year 2022/23. Construction funding is programmed in fiscal year 2025/26. Construction coordination would be required in this area if either of the Build Alternatives' construction occurred at the same time.

- Central – Flamingo Wash – Maryland Parkway System – This project consists of an 8-foot by 6-foot reinforced concrete box culvert in Maryland Parkway from Stewart Avenue to Charleston Boulevard. Design is programmed in fiscal year 2016/17 and construction funding is programmed in fiscal year 2019/20. Construction should be completed prior to the construction of the Build Alternatives.

- Tropicana/Flamingo – Flamingo Wash Maryland – This project consists of 90-inch reinforced concrete pipe in Maryland Parkway from the Flamingo Wash to University Road. Design is programmed in fiscal year 2022/23 and construction funding is programmed in fiscal year 2024/25. Construction coordination would be required in this area if either of the Build Alternatives' construction occurred at the same time.

No upcoming transportation projects were identified by Clark County or the City of Las Vegas. While it is not possible to accurately quantify the changes in land use, right-of-way acquisition, or relocations that other projects might require, the projects which have potential to cause these types of changes were identified to the extent possible, to provide context for the effects of the project on a larger scale. In addition, the alternatives are considered in the context of historic trends and overall expected land use changes in the County.

3.17.2 Resources

This section describes the potential cumulative effects associated with the Build Alternatives and their consequences. The No Build Alternative would not contribute to any potentially negative cumulative effects within the study area and it also would not provide any positive cumulative effects.

3.17.2.1 Land Use

The combined effects of potential induced growth due to the Build Alternatives, as discussed in Section 3.1, and other past, present, and future actions as listed above, would create a cumulative land use effect within the study area. The cumulative effect would further focus development along the transit route and is likely to encourage higher density and mixed-use development along the route. The cumulative effect may also accelerate the pace of development within the APE and along the route.

Anticipated land use change along the Maryland Parkway project alignment is supported by the regulatory planning documents, including the *Clark County Comprehensive Master Plan* (Clark County Department of Comprehensive Planning, 2014), the *Southern Nevada Strong Regional Plan* (Southern Nevada Strong, 2015), and the *Vision 2045 Downtown Las Vegas Master Plan* (City of Las Vegas, 2016). These planning documents aim to promote a compact, mixed-use development pattern in the area of and along the project corridor. LRT and BRT are integral in planning documents to connect major employment centers and destinations and would have positive effects in the area of and along the project corridor. Any negative effects from land use or zoning changes would be managed through the local agency's existing planning and permitting authority.

3.17.2.2 Socioeconomics

Cumulative socioeconomic effects will likely be a result of the past, present, and future actions that occur in the project corridor along with the direct and indirect economic effects associated with the Build Alternatives. Construction and operation of either the LRT or BRT systems creates direct and indirect jobs, which cumulatively contribute to the employment base in the project study area. The Enhanced Bus Alternative would also have a positive impact on the low income and minority communities, but not to the extent of the Build Alternatives. Economic benefits would also be expected from development and redevelopment potentially by the project along the alignment. RTC would fund, operate, and maintain the service, procuring capital, operating, and maintenance funds from both federal and local sources.

3.17.2.3 Environmental Justice

Either of the Build Alternatives along with existing transit services in the corridor would have a positive cumulative effect on environmental justice populations in the study area. The LRT and BRT technologies are both expected to increase mobility and quality of life for those who depend on transit, including the elderly and disabled. The Build Alternatives would increase access to employment, recreation, and goods and services within the study area. The Enhanced Bus Alternative would also have a positive impact on the Environmental Justice community, but not to the extent of the Build Alternatives.

3.17.2.4 Visual Resources

LRT infrastructure, including the electric system and stations would alter existing views as discussed in Section 3.4 Minimal cumulative negative effects are expected as Maryland Parkway is a heavily used transportation corridor in a dense urban setting dominated by buildings, sidewalks, light poles, and bus shelters. Development will continue to occur along the proposed alignment; however, the rate of development and change to the visual resources may be accelerated with the Build Alternatives. Adding vegetation to road medians and along pedestrian facilities throughout would benefit adjacent residents and businesses and the traveling public. The Enhanced Bus Alternative would not have a negative impact on visual resources because of the existing bus service that is currently running in the Maryland Parkway corridor.

3.17.2.5 Cultural Resources

Construction of either of the Build Alternatives along the proposed project alignment, in addition to past, present, and future projects, overlap previously heavily developed areas. Cumulative effects would result from the loss or degradation of important historic and cultural resources. Initial construction and redevelopment of the roadways and buildings, as well as grading, utilities, and resurfacing would have disturbed the area, thereby eliminating the potential for intact archaeological resources within the urban environment. Numerous historic properties in the study area have been torn down for new buildings or parking lots in the past, while numerous vacant historic structures are vacant and in deteriorating condition. However, there are no direct impacts to historic properties from the two Build Alternatives or Enhanced Bus Alternative; therefore, no additional cumulative impacts would occur to historical properties from the project. Future development in the corridor is outlined in local planning documents. The City of Las Vegas is currently coordinating with the Nevada SHPO to identify and document historic resources as part of their land use planning process.

3.17.2.6 Water Resources/Water Quality/Floodplains

Cumulative effect of transportation projects and other development in an urban setting often results in alteration of topography, changes in water flows and water quality, and increases in sediment and contaminant runoff into streams and drainages. The Build and Enhanced Bus Alternatives will occur on existing paved streets that have been highly disturbed and, with appropriate mitigation measures through best management practices identified in Section 3.6.3 in place, would not have a cumulative effect on the study area.

3.17.2.7 Soils and Geology

Cumulative effect of transportation projects and other development in an urban setting often results in alteration of topography. The Build and Enhanced Bus Alternatives will occur on existing paved streets that have been highly disturbed. Disturbed soil from the construction of either Build Alternative and past, current, and future projects could affect air quality in the study area, which would cause a cumulative effect. However, regulatory guidelines and permits would require the use of appropriate mitigation measure on all projects in the region to minimize cumulative effect on the study area.

3.17.2.8 Hazardous Materials

Hazardous materials are generally not expected to be found within the project corridor. Additional development could cumulatively increase the potential for hazardous materials to be released into the environment. However, this effect would be minimized because existing local, state, and federal laws would manage the disturbance, removal, and disposal of hazardous materials. Future projects could disturb additional lands within the study area and locate unknown hazardous materials, which would require some level of clean-up and improve the environment in the study area. However, the presence of hazardous materials could cause delays in development projects because hazardous waste would need to be remediated.

3.17.2.9 Air Quality

Air quality in the study area today is good compared to years past. Projects in the past, current, and foreseeable future could have negative contributions to air quality in the study area; however, regulatory guidelines and permits would require the use of appropriate mitigation measures on all projects in the region to minimize cumulative air quality effects on the study area. Therefore, the Build and Enhanced Bus Alternatives would not contribute to cumulative effects. In fact, the use of LRT or BRT systems would improve air quality by removing motor vehicles off the roads.

3.17.2.10 Noise and Vibration

Direct and construction impacts from noise are anticipated, but no substantial cumulative effect is expected in an existing urban setting with existing noise from daily activities. Mitigation will help reduce any cumulative effects. Noise generated from an LRT vehicle would be less than the existing noise measurement along the busy and heavily-traveled Maryland Parkway corridor. For the BRT Build Alternative, noise levels from the addition of CNG-fueled BRT buses would also likely be less than existing noise measurements from diesel-fueled buses currently operating along the corridor. There would be no increase in noise from the Enhanced Bus Alternative.

Due to its relatively low speed of travel of both LRT and BRT vehicles (between 25 and 30 mph) the operation of the two Build Alternatives is not anticipated to create vibration impacts to nearby building structures located along the Maryland Parkway corridor. Even with potential for future projects to be occurring at the same time the Build Alternatives are being constructed, noise and vibration effects would be minimal.

3.17.2.11 Safety and Security

The Build Alternatives provide pedestrian amenities for convenience and safety, including crosswalks, sidewalks, and mid-block crossings with pedestrian hybrid beacons, traffic signals, or other related devices to alert motorists to the presence of pedestrians and facilitate safe crossings. This would also improve access to other future projects, which would have a beneficial cumulative effect.

3.17.2.12 Wetlands/Jurisdictional Waters

No wetlands occur in the study area, so no cumulative effects are anticipated from past, present, or future projects. The one jurisdictional waters of the U.S. in the study area has been highly manipulated and contain a concrete-lined channel. Appropriate mitigation through best management practices identified in Section 3.13.3 would avoid or minimizes impacts to this resource.

3.17.2.13 Biological Resources

No biological resources were identified in the study area, so no cumulative impacts are anticipated.

3.17.2.14 Section 4(f)

No parks will be directly or temporarily impacted as part of the Build or Enhanced Bus Alternatives. Three historic properties would have permanent impacts; however the addition of stations and new pavement for sidewalks adjacent to the historic buildings will not alter aspects of integrity that make this property eligible for listing on the NRHP because paving already occurs in front of the property and transit-related features like bus stops occur near or within viewshed of the property. Features like sidewalks and stations would be expected to occur along a busy urban commuter corridor. Indirect impacts to the areas surrounding the parks and historical site from the LRT Build Alternative could include future growth-induced effects related to changes in surrounding land use patterns, population densities and growth rate, and economic development. Transit-oriented development around the new station locations in the future could have a cumulative impact to the Section 4(f) properties, but any direct impacts to these resources should be avoided or minimized to the extent possible.

3.17.2.15 Traffic

The Build and Enhanced Bus Alternatives would provide increased transit service to the project study area. This would cumulatively benefit transit services within the project study area by creating a frequent and convenient connection to the bus services and reduce future growth in auto trips. At this time, no other traffic projects are planned in the Maryland Parkway corridor by the City of Las Vegas or Clark County during the time of construction for either of the Build Alternatives or Enhanced Bus Alternative, so no temporary cumulative effects can be identified. Coordination between RTC and the local jurisdictions would occur ahead of construction activities to avoid exacerbation of traffic congestion from multiple construction project in the same area.

3.17.3 Mitigation

Mitigation measures for cumulative impacts were discussed in the previous sections for each resource, as needed. With the use of mitigation measures for the Build and Enhanced Bus Alternatives, cumulative impacts would be avoided or minimal.

4.0 Traffic Impacts and Mitigation

RTC, in cooperation with Clark County and the City of Las Vegas, proposes to construct premium transit service improvements from the Las Vegas Medical District to Bonneville Transit Center, through downtown Las Vegas, and along Maryland Parkway between downtown and north of Russell Road. Refer to the *Traffic Analyses for the Maryland Parkway* (Parsons, 2016d) in Appendix K for a detailed summary of existing and projected future traffic conditions and impacts.

4.1 Existing Conditions

The leading mode of travel in the City of Las Vegas is the single-occupant vehicle. Approximately 68 percent of all person trips are made by private vehicle, with 17 percent by walking or bicycling, 9 percent by public transit, and 6 percent by other modes, such as taxi, limousine, or private shuttle (Westat, 2015). There is need for faster, more reliable transit service along Maryland Parkway, not only to meet current and projected needs, but also to make other modes, such as walking, bicycling, and riding transit, more viable and attractive as alternatives to the automobile.

RTC served more than 64 million boardings in 2016 on 39 bus routes serving the metropolitan area. Maryland Parkway is currently served by local bus Route 109 with 24 hours per day, seven days per week service; 15-minute headways during the majority of the service span; and stops spaced an average of 0.25-mile apart. The Route 109 buses operate in mixed flow traffic along roadway segments that vary from 2-lane to 6-lane streets and are subject to the peak hour congestion that occurs at several of the major intersections where average daily traffic reaches levels of 35,000 to 40,000 vehicles.

Maryland Parkway has high transit ridership, as Route 109 connects to the top 5 busiest routes in the system and provides mobility options for a diverse population, including many transit dependents and Environmental Justice groups. The number of transit-dependent households in the area of the corridor is high; approximately 25.5 percent of all households have no car available, which is over 3 times the rate for the metropolitan area overall (7.5 percent). In addition, nearly 46 percent of households are low income, nearly double the overall rate for the metropolitan area (25 percent).

The EA traffic evaluation area was an 8.7-mile corridor that extends from McCarran International Airport to the Las Vegas Medical District, west of downtown, with a 0.25-mile buffer on each side of the alignment. The project corridor is divided into three segments with the core corridor being the 5-mile segment of Maryland Parkway generally between Russell Road and Charleston Boulevard. The downtown Las Vegas portion is aligned on the Maryland Parkway/13th Street couplet to Carson Avenue, on Carson Avenue to Casino Center Boulevard, and on Casino Center Boulevard to the Bonneville Transit Center. The Medical District portion is aligned along Bonneville Avenue – Alta Drive to Tonopah Drive, and then counterclockwise on Tonopah Drive–Wellness Way–Shadow Lane returning to Alta Drive. Additional details for each segment are provided below.

4.1.1 Maryland Parkway Segment

The Maryland Parkway segment from Russell Road to Charleston Boulevard is 5 miles long. Multiple connection alternatives to McCarran International Airport were considered and discussed with the Clark County Department of Aviation. The 5-mile core corridor segment of Maryland Parkway is a section-line arterial having three through travel lanes, in each direction, between Charleston Boulevard and Tropicana Avenue and two through travel lanes, in each direction, between Tropicana Avenue and Russell Road, with limited flaring for additional turns lanes at major intersections. Much of the corridor has a flush two-way left-turn lane median. Sidewalks are attached to the roadway curb line and are generally 5 to 6 feet in width. The posted speed limit on Maryland Parkway is 30 mph between Charleston Boulevard and Tropicana Avenue, and 35 mph between Tropicana Avenue and Russell Road. Additional characteristics of this segment of Maryland Parkway core corridor are listed below.

- Maryland Parkway forms five major intersections with section-line, east-west arterial cross streets of Charleston Boulevard, Sahara Avenue, Desert Inn Road, Flamingo Road, and Tropicana Avenue.
- There are 16 signalized intersections located between Charleston Boulevard and Russell Road, yielding an average spacing of approximately 1,500 feet (a little more than a 0.25-mile).
- Pedestrian crossings incorporating a refuge island and overhead warning flashers exist at Reno Avenue (south of Tropicana Avenue), at two locations fronting the UNLV campus, and at a location near the Boulevard Mall. The UNLV crossings are located just south of Del Mar Street and just south of University Avenue. The crossing near the Boulevard Mall is located just north of Dumont Boulevard.

Level of service is a quality measure describing operational conditions within a traffic stream, generally in terms of such service measures as speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience (Transportation Research Board, 2010). The level of service of signalized intersections is based on control delay, with thresholds for level of service determination ranked from A to F, with A representing the best operating conditions and F the worst (Table 4.1-1).

Table 4.1-1 Level of Service Criteria for Signalized Intersections

LOS	Control Delay (s/veh)
A	≤10
B	>10-20
C	>20-35
D	>35-55
E	>55-80
F	>80

Source: Transportation Research Board, 2010
LOS = level of service
s/veh = seconds per vehicle

Existing peak-hour levels of service and volume-to-capacity ratios have been calculated for major cross-street intersections in the core corridor. The major intersections limit corridor capacity, and consist of Maryland Parkway intersections with Charleston Boulevard, Sahara Avenue, Desert Inn Road, Flamingo Road, and Tropicana Avenue. All of the intersections are currently operating on 140-second cycles, with the exception of Flamingo Road and Tropicana Avenue, which operate on 160-second cycles during the PM peak hour. Results of existing level of service analyses, including volume-to-capacity ratios, are summarized in Table 4.1-2.

Table 4.1-2 Existing Intersection Level of Service Analyses – Core Corridor

Intersection	AM Peak			PM Peak		
	v/c	Delay (s/veh)	LOS	v/c	Delay (s/veh)	LOS
Charleston Blvd/ Maryland Pkwy	0.55	32.7	C	0.71	38.5	D
Sahara Ave/ Maryland Pkwy	0.74	36.4	D	0.77	41.3	D
Desert Inn Rd/ Maryland Pkwy	0.71	39.7	D	0.79	45.1	D
Flamingo Rd/ Maryland Pkwy	0.59	38.0	D	0.84	51.4	D
Tropicana Ave/ Maryland Pkwy	0.93	48.7	D	0.78	43.6	D

Note: v/c = volume-to-capacity ratios; s/veh = seconds per vehicle; LOS = level of service

Existing peak-hour level of service for the five major cross-street intersections in the core corridor are operating at levels of service D or better. All parallel corridor intersections are estimated to be operating at levels of service D or better.

Capacity and level of service analyses of projected demands at major intersections of the core corridor are summarized in Table 4.1-3. Analyses have been conducted for the No Build, Four-Lane LRT/BRT (side- and center-running) and 6-Lane LRT/BRT scenarios. The Maryland Parkway capacity and level of service analyses indicate the following:

- Under the No Build Alternative the major intersections of Charleston Boulevard, Sahara Avenue, Desert Inn Road, Flamingo Road, and Tropicana Avenue are projected to operate at 2040 pm peak hour volume-to-capacity ratios of 0.93 to 0.98 and levels of service of D or E. The projected 2040 am peak hour volume-to-capacity ratios range from 0.67 to 1.07. The overcapacity condition (volume-to-capacity ratio = 1.07) is projected at Tropicana Avenue.

Table 4.1-3 Future Year Level of Service Analyses – Core Corridor

Intersection	Alternative	AM Peak						PM Peak					
		2022 Opening Day			2040			2022 Opening Day			2040		
		v/c	Delay (s/veh)	LOS	v/c	Delay (s/veh)	LOS	v/c	Delay (s/veh)	LOS	v/c	Delay (s/veh)	LOS
Charleston Blvd/ Maryland Pkwy	No Build	0.56	37.1	D	0.67	39.8	D	0.77	40.8	D	0.93	50.4	D
	4-Ln Alt's	0.71	37.3	D	0.84	42.2	D	0.79	41.3	D	0.94	51.1	D
	6-Ln Center	0.55	37.1	D	0.64	38.9	D	0.76	40.3	D	0.90	47.3	D
Sahara Ave/ Maryland Pkwy	No Build	0.79	38.4	D	0.92	45.5	D	0.83	43.8	D	0.97	54.6	D
	4-Ln Alt's	0.84	40.1	D	0.96	49.1	D	0.87	46.0	D	1.00	60.5	E
	6-Ln Center	0.79	38.5	D	0.89	43.3	D	0.83	44.6	D	0.94	52.7	D
Desert Inn Rd/ Maryland Pkwy	No Build	0.76	41.7	D	0.86	46.9	D	0.85	48.9	D	0.98	62.0	E
	4-Ln Alt's	0.76	40.1	D	0.87	44.7	D	0.86	48.9	D	0.99	63.9	E
	6-Ln Center	0.75	41.6	D	0.84	45.4	D	0.83	48.5	D	0.95	58.7	E
Flamingo Rd/ Maryland Pkwy	No Build	0.61	39.4	D	0.68	41.2	D	0.88	53.1	D	0.97	63.0	E
	4-Ln Alt's	0.67	40.6	D	0.75	42.5	D	0.89	54.4	D	0.98	65.9	E
	6-Ln Center	0.61	39.5	D	0.66	41.0	D	0.86	48.0	D	0.95	59.6	E
Tropicana Ave/ Maryland Pkwy	No Build	0.95	53.4	D	1.07	67.7	E	0.84	47.3	D	0.95	55.4	E
	4-Ln Alt's	0.86	45.5	D	0.96	56.2	E	0.66	42.9	D	0.74	47.9	D
	6-Ln Center	0.97	55.9	E	1.07	68.3	E	0.82	42.9	D	0.95	54.7	D

Note: v/c = volume-to-capacity ratios; s/veh = seconds per vehicle; LOS = level of service

- Under the Four-Lane Build alternatives (with proposed turn lane improvements) the major intersections of Charleston Boulevard, Sahara Avenue, Desert Inn Road, Flamingo Road, and Tropicana Avenue are projected to operate at 2040 pm peak hour volume-to-capacity ratios of 0.74 to 1.00 and levels of service of D or E. The projected 2040 am peak hour volume-to-capacity ratios range from 0.75 to 0.96.
- The Four-Lane alternatives reflect the following turn lane improvements:
  - Exclusive westbound right-turn lane on Tropicana Avenue at Maryland Parkway.
  - Exclusive eastbound right-turn lane on Desert Inn Road at Maryland Parkway.
  - An exclusive south-to-westbound right-turn phase at Tropicana Avenue.
- The Six-Lane Center-Running Alternative, which has slightly lower general purpose demands than the No Build, is projected to operate at 2040 pm peak hour volume-to-capacity ratios of 0.90 to 0.95 at major intersections. The projected 2040 am peak hour volume-to-capacity ratios range from 0.64 to 1.07.

Existing peak-hour levels of service's and volume-to-capacity ratios have been calculated for major intersections on parallel corridors. All of the intersections along the parallel corridors are currently operating with 140-second traffic signal cycles, with the exception of Flamingo Road and Tropicana Avenue, which operate on 160-second cycles in the pm peak hour. Results of existing levels of service analyses for parallel corridors are summarized in Table 4.1-4. All intersections are estimated to be operating at level of service D or better. The highest peak hour volume-to-capacity ratios are at Swenson Street/Tropicana Avenue (am peak) and Swenson Street/Flamingo Road (pm peak). Also, Eastern Avenue intersections with Desert Inn Road, Flamingo Road and Tropicana Avenue are estimated to be operating at volume-to-capacity ratios of 0.81 to 0.85 in the pm peak hour.

Table 4.1-4 Existing Intersection Level of Service Analyses – Parallel Corridors

Intersection	AM Peak			PM Peak		
	v/c	Delay (s/veh)	LOS	v/c	Delay (s/veh)	LOS
Eastern Ave/ Sahara Ave	0.70	34.7	C	0.71	38.5	D
Eastern Ave/ Karen Ave	0.34	10.8	B	0.47	13.5	B
Eastern Ave/ Vegas Valley Dr	0.36	16.7	B	0.45	10.7	B
Eastern Ave/ Desert Inn Rd	0.70	38.7	D	0.85	45.8	D
Eastern Ave/ Flamingo Rd	0.68	38.5	D	0.81	41.3	D
Eastern Ave/ Tropicana Ave	0.64	37.6	D	0.84	45.6	D
Swenson St/ Desert Inn Rd	0.59	25.3	C	0.76	34.7	C
Swenson St/ Twain Ave	0.39	36.6	D	0.63	43.2	D
Swenson St/ Flamingo Rd	0.88	47.9	D	0.98	54.2	D
Swenson St/ Tropicana Ave	0.99	42.9	D	0.72	27.7	C
Flamingo Rd/ Spencer St	0.45	22.7	C	0.65	26.7	C

Note: v/c = volume-to-capacity ratios; s/veh = seconds per vehicle; LOS = level of service

Capacity and level of service analyses of projected demands at major intersections of parallel corridors are summarized in Table 4.1-5. Parallel corridor analyses indicate the following:

Table 4.1-5. Future Year Level of Service Analyses – Parallel Corridors

Intersection	Alternative	AM Peak						PM Peak					
		2022 Opening Day			2040			2022 Opening Day			2040		
		v/c	Delay (s/veh)	LOS	v/c	Delay (s/veh)	LOS	v/c	Delay (s/veh)	LOS	v/c	Delay (s/veh)	LOS
Eastern Ave/ Sahara Ave	No Build	0.76	36.4	D	0.89	42.1	D	0.76	40.0	D	0.90	46.2	D
	4-Ln Alt's	0.76	36.4	D	0.88	41.3	D	0.80	40.5	D	0.92	46.7	D
Eastern Ave/ Karen Ave	No Build	0.41	13.7	B	0.57	19.2	B	0.56	17.4	B	0.79	28.0	C
	4-Ln Alt's	0.40	13.4	B	0.55	18.8	B	0.56	17.0	B	0.77	26.6	C
Eastern Ave/ Vegas Valley Dr	No Build	0.41	19.4	B	0.55	19.2	B	0.51	11.2	B	0.67	12.7	B
	4-Ln Alt's	0.40	19.2	B	0.52	18.8	B	0.50	11.1	B	0.65	12.4	B
Eastern Ave/ Desert Inn Rd	No Build	0.77	41.4	D	0.94	52.1	D	0.94	52.2	D	1.16	89.2	F
	4-Ln Alt's	0.77	40.3	D	0.92	48.6	D	0.81	44.7	D	0.97	58.1	E
Eastern Ave/ Flamingo Rd	No Build	0.75	39.9	D	0.89	45.7	D	0.89	44.8	D	1.06	62.5	E
	4-Ln Alt's	0.74	39.2	D	0.88	44.1	D	0.82	42.3	D	0.95	51.5	D
Eastern Ave/ Tropicana Ave	No Build	0.69	39.1	D	0.82	43.2	D	0.91	50.3	D	1.10	75.5	E
	4-Ln Alt's	0.69	38.0	D	0.80	41.0	D	0.83	44.6	D	0.97	55.5	E
Swenson St/ Desert Inn Rd	No Build	0.64	33.9	C	0.78	38.9	D	0.83	44.9	D	1.03	67.9	E
	4-Ln Alt's	0.62	32.3	C	0.75	36.8	D	0.79	40.5	D	0.99	59.2	E
Swenson St/ Twain Ave	No Build	0.44	37.4	D	0.55	40.0	D	0.70	45.7	D	0.89	56.6	E
	4-Ln Alt's	0.43	37.3	D	0.54	39.8	D	0.70	45.5	D	0.87	54.7	D
Swenson St/ Flamingo Rd	No Build	0.84	50.4	D	0.95	58.5	E	0.94	54.0	D	1.06	69.1	E
	4-Ln Alt's	0.74	40.8	D	0.83	44.0	D	0.86	47.0	D	0.97	53.1	D
Swenson St/ Tropicana Ave	No Build	1.02	48.7	D	1.10	57.7	E	0.74	34.2	C	0.79	36.0	D
	4-Ln Alt's	1.02	48.4	D	1.09	56.7	E	0.74	34.1	C	0.79	35.9	D
Flamingo Rd/ Spencer St	No Build	0.47	23.5	C	0.52	26.5	C	0.68	28.8	C	0.75	34.6	C
	4-Ln Alt's	0.47	23.3	C	0.52	25.6	C	0.65	25.5	C	0.75	33.7	C

Note: v/c = volume-to-capacity ratios; s/veh = seconds per vehicle; LOS = level of service

- Under the No Build Alternative overcapacity conditions (volume-to-capacity ratio great than 1.0) are projected at the following intersections in the 2040 pm peak hour:
  - Eastern Avenue/Desert Inn Road
  - Eastern Avenue/Flamingo Road
  - Eastern Avenue/Tropicana Avenue
  - Swenson Street/Desert Inn Road
  - Swenson Street/Flamingo Road
- Overcapacity conditions under the No Build Alternative are also projected in the 2040 am peak hour at the Swenson Street/Tropicana Avenue intersection.

- Under the Four-Lane Build alternatives (with proposed turn lane improvements) major section line arterial intersections on parallel corridors are projected to operate at 2040 pm peak hour volume-to-capacity ratios of 0.92 to 0.99 and levels of service of D or E.
- Overcapacity conditions under the Four-Lane Build alternatives are also projected in the 2040 am peak hour at the Swenson Street/Tropicana Avenue intersection.
- The Four-Lane alternatives reflect the following turn lane improvements:
  - Exclusive northbound and eastbound right-turn lanes at Eastern Avenue/Desert Inn Road.
  - Exclusive northbound right-turn lane at Eastern Avenue/Flamingo Road.
  - Exclusive northbound and eastbound right-turn lanes at Eastern Avenue/Tropicana Avenue.
  - Exclusive northbound right-turn lane at Swenson Street/Desert Inn Road.
- Grade-separated improvements are likely needed to provide adequate general purpose capacity at the Swenson Street/Tropicana Avenue intersection.

Pedestrian and Bicycle LOS

Existing sidewalks along Maryland Parkway are generally 5 to 6 feet in width and attached to the curb line of the roadway. The attached sidewalks are characterized by numerous obstructions which include utility poles, street light poles, and street signs. The obstructions create numerous clear-width deficiencies for compliance with Public Right-of-Way Accessibility Guidelines, which establish standards for pedestrian access routes, signals, and parking facilities. Additionally, there are numerous street and driveway intersections that do not incorporate Public Right-of-Way Accessibility Guideline-compliant pedestrian access routes.

The pedestrian level of service score quantifies the quality of service provided from a pedestrian perspective (Table 4.1-6), which is driven by environmental and perceived safety factors (Transportation Research Board, 2010). From a pedestrian flow capacity standpoint, a three-foot effective width can provide level of service A capacity (>60 square feet per pedestrian).

Table 4.1-6 Level of Service Score Criteria for Pedestrians

LOS	LOS Score
A	≤2.00
B	>2.00 - 2.75
C	>2.75 - 3.50
D	>3.50 - 4.25
E	>4.25 - 5.00
F	>5.00

Source: Transportation Research Board, 2010
Note: Pedestrian level of service score criteria are for >60 square feet per pedestrian
LOS = level of service

Directional link-based pedestrian level of service scores have been calculated for the pm peak hour of the core corridor of Maryland Parkway in accordance with *Highway Capacity Manual* (Transportation Research Board, 2010) methodology. Factors consist of separation from traffic, motorized vehicle volumes, and motorized vehicle speeds. Existing pm peak hour pedestrian level of service scores by segment of the core corridor are summarized in Table 4.1-7. Scores fall into the level of service C range. The existing 30mph speed limit of Maryland Parkway is helpful to the pedestrian level of service score achieved. A 45mph speed limit, which is typical to many suburban arterials in the Las Vegas Valley, would raise the scores to or near the level of service D range.

Table 4.1-7 Existing Pedestrian Level of Service Scores – Core Corridor

Segment Boundary	Southbound												Northbound											
	W_v	W_1	W_{buf}	W_{aA}	f_{sw}	F_w	v_m	N_{th}	F_v	S_R	F_s	I_P	W_v	W_1	W_{buf}	W_{aA}	f_{sw}	F_w	v_m	N_{th}	F_v	S_R	F_s	I_P
Charleston																								
	16	0	2	9	3.3	-4.74	1025	3	0.78	30	0.36	**2.44**	12	0	2	7	3.9	-4.57	875	3	0.66	30	0.36	**2.50**
Franklin																								
	18	0	2	5	4.5	-4.60	1000	3	0.76	30	0.36	**2.56**	20	0	2	5	4.5	-4.66	1250	3	0.95	30	0.36	**2.70**
Oakey																								
	16	0	2	5	4.5	-4.54	1125	3	0.85	30	0.36	**2.72**	18	0	2	5	4.5	-4.60	1150	3	0.87	30	0.36	**2.68**
St Louis																								
	14	0	2	5	4.5	-4.48	1100	3	0.83	30	0.36	**2.76**	14	0	2	5	4.5	-4.48	1300	3	0.99	30	0.36	**2.91**
Sahara																								
	14	0	2	6	4.2	-4.56	1250	3	0.95	30	0.36	**2.79**	12	0	2	5	4.5	-4.42	1375	3	1.04	30	0.36	**3.03**
Karen																								
	16	0	2	6	4.2	-4.62	1550	3	1.18	30	0.36	**2.96**	13	0	2	6	4.2	-4.53	1675	3	1.27	30	0.36	**3.14**
Vegas Valley																								
	16	0	2	6	4.2	-4.62	1400	3	1.06	30	0.36	**2.85**	15	0	2	6	4.2	-4.59	1700	3	1.29	30	0.36	**3.10**
Sunrise																								
	16	0	2	6	4.2	-4.62	1550	3	1.18	30	0.36	**2.96**	15	0	2	6	4.2	-4.59	1625	3	1.23	30	0.36	**3.04**
Desert Inn																								
	14	0	2	6	4.2	-4.56	1300	3	0.99	30	0.36	**2.83**	14	0	2	6	4.2	-4.56	1500	3	1.14	30	0.36	**2.98**
Sierra Vista																								
	15	0	2	6	4.2	-4.59	1450	3	1.10	30	0.36	**2.91**	15	0	2	6	4.2	-4.59	1600	3	1.21	30	0.36	**3.03**
Twain																								
	13	0	2	6	4.2	-4.53	1500	3	1.14	30	0.36	**3.01**	15	0	2	6	4.2	-4.59	1575	3	1.19	30	0.36	**3.01**
Katie																								
	14	0	2	6	4.2	-4.56	1450	3	1.10	30	0.36	**2.94**	12	0	2	6	4.2	-4.50	1500	3	1.14	30	0.36	**3.04**
Flamingo																								
	14	0	2	6	4.2	-4.56	1300	3	0.99	30	0.36	**2.83**	14	0	2	6	4.2	-4.56	1500	3	1.14	30	0.36	**2.98**
Harmon																								
	14	0	2	6	4.2	-4.56	1450	3	1.10	30	0.36	**2.94**	14	0	2	6	4.2	-4.56	1325	3	1.00	30	0.36	**2.85**
University Rd																								
	14	0	2	6	4.2	-4.56	1425	3	1.08	30	0.36	**2.92**	12	0	2	6	4.2	-4.50	1300	3	0.99	30	0.36	**2.89**
Tropicana																								
	12	0	2	5	4.5	-4.42	1000	2	1.14	30	0.36	**3.13**	12	0	2	6	4.2	-4.50	1200	3	0.91	30	0.36	**2.81**
Hacienda																								
	24	0	2	5	4.5	-4.77	1100	2	1.25	30	0.36	**2.89**	25	0	2	6	4.2	-4.86	725	2	0.82	30	0.36	**2.38**
Russell																								
	Average Ped. LOS Score, Southbound =											**2.85**	Average Ped. LOS Score, Northbound =											**2.89**
	Pedestrian LOS =											**C**	Pedestrian LOS =											**C**

Note: v/c = volume-to-capacity ratios; s/veh = seconds per vehicle; LOS = level of service

It should be recognized that, given the volume of motorized vehicle demand on Maryland Parkway and the absence of a parking lane to physically separate the sidewalk from traffic, there is a limit to the pedestrian level of service score that can be achieved. This limitation is typical for suburban arterials which typically do not have parking lanes and have higher speeds and vehicular volumes than more urban street segments.

Maryland Parkway does not currently incorporate delineated bike lanes, and curb travel lanes are generally 11 to 14 feet in width. Cyclists must also deal with relatively high motor vehicle traffic volumes and frequent driveways, which introduce conflicts associated with turning traffic. The relatively poor quality of service currently provided to cyclists in the core corridor of Maryland Parkway is reflected in level of service scores that consistently fall into the level of service E range. The level of service scores for bicycle facilities measure the effectiveness of events, including meeting an oncoming bicyclist or overtaking a bicyclist traveling in the same direction.

Level of service score factors consist of separation from traffic, motorized vehicle volumes, motorized vehicle speeds, access densities, and pavement conditions. A good pavement condition has been assumed to reflect the level of service score that could be achieved with the existing cross section, and to facilitate comparisons to improvement alternatives that include new pavement. Bicycle level of service score thresholds are the same as the pedestrian thresholds (see Table 4.1-7). Existing bicycle level of service scores by segment of the core corridor are summarized in Table 4.1-8. Scores consistently fall into the level of service E range.

4.1.2 Downtown and Medical District Segments

The downtown Las Vegas portion is aligned on the Maryland Parkway/13th Street couplet to Carson Avenue, on Carson Avenue to Casino Center Boulevard, and on Casino Center Boulevard to the Bonneville Transit Center. NDOT has permanent count stations at eight locations on the Maryland Parkway alignment in the Downtown and Medical District segments. Historic traffic demands at those locations have also increased to varying degrees over the last 4 years. All intersections are estimated to be operating at levels of service C or better, with the exception of the Bonneville Avenue/Grand Central Parkway intersection where longer traffic signal cycle lengths lead to level of service D.

Existing peak-hour levels of service’s and volume-to-capacity ratios have been calculated for major downtown and Medical District intersections. Signal cycle lengths vary on these segments. Existing peak hour traffic signal cycle lengths are 60 seconds at Carson Street/Maryland Parkway and Carson Street/13th Street, 160 seconds at Carson Street/Las Vegas Boulevard, 80 seconds at Carson Street/Casino Center Boulevard and Casino Center Boulevard/Bonneville Avenue, 120 seconds at Bonneville Avenue/Grand Central Parkway, and 140 seconds (am) and 160 seconds (pm) at Alta-Bonneville/Martin L. King Boulevard.

Table 4.1-8 Existing Bicycle Level of Service Scores – Core Corridor

Segment Boundary	Southbound																			
	W_e	$F_{w,link}$	v_{ma}	N_{th}	$F_{v,link}$	S_{Ra}	P_{HVa}	F_S	P_c	F_p	$I_{b,link}$	$N_{ap,s}$	L_{seg} (ft)	v_{appr}	W_{cd}	$F_{w,int}$	$F_{v,int}$	$I_{b,int}$	$I_{b,seg}$	LOS_{seg}
Charleston	16	-1.28	1025	3	2.25	30	2	0.98	4	0.44	**3.16**	9	1010	810	90	-2.0534	0.4455	2.5245	**5.14**	**F**
Franklin	18	-1.62	1000	3	2.24	30	2	0.98	4	0.44	**2.81**	3	1070	1025	30	-3.4002	0.56375	1.29595	**3.86**	**D**
Oakey	16	-1.28	1125	3	2.30	30	2	0.98	4	0.44	**3.21**	3	1140	1050	40	-2.8184	0.5775	1.8915	**3.92**	**D**
St Louis	14	-0.98	1100	3	2.29	30	2	0.98	4	0.44	**3.50**	9	1120	1050	70	-1.9306	0.5775	2.7793	**5.07**	**F**
Sahara	14	-0.98	1250	3	2.36	30	2	0.98	4	0.44	**3.56**	7	1030	1060	120	-1.1656	0.583	3.5498	**5.06**	**F**
Karen	16	-1.28	1550	3	2.46	30	2	0.98	4	0.44	**3.37**	4	1150	1500	70	-2.3594	0.825	2.598	**4.18**	**D**
Vegas Valley	16	-1.28	1400	3	2.41	30	2	0.98	4	0.44	**3.32**	9	970	1450	80	-2.2064	0.7975	2.7235	**5.26**	**F**
Sunrise	16	-1.28	1550	3	2.46	30	2	0.98	4	0.44	**3.37**	4	1080	1430	30	-2.9714	0.7865	1.9475	**4.15**	**D**
Desert Inn	14	-0.98	1300	3	2.38	30	2	0.98	4	0.44	**3.58**	11	920	1390	90	-1.6246	0.7645	3.2723	**5.92**	**F**
Sierra Vista	15	-1.13	1450	3	2.43	30	2	0.98	4	0.44	**3.49**	11	1520	1390	50	-2.451	0.7645	2.4459	**4.87**	**E**
Twain	13	-0.85	1500	3	2.45	30	2	0.98	4	0.44	**3.79**	2	590	1440	70	-1.7162	0.792	3.2082	**4.35**	**E**
Katie	14	-0.98	1450	3	2.43	30	2	0.98	4	0.44	**3.64**	12	1930	1480	70	-1.9306	0.814	3.0158	**4.81**	**E**
Flamingo	14	-0.98	1300	3	2.38	30	2	0.98	4	0.44	**3.58**	8	2350	1430	110	-1.3186	0.7865	3.6003	**4.45**	**E**
Harmon	14	-0.98	1450	3	2.43	30	2	0.98	4	0.44	**3.64**	0	1100	1550	70	-1.9306	0.8525	3.0543	**3.67**	**D**
University Rd	14	-0.98	1425	3	2.42	30	2	0.98	4	0.44	**3.63**	8	1030	1400	40	-2.3896	0.77	2.5128	**5.00**	**F**
Tropicana	12	-0.72	1000	2	2.45	30	2	0.98	4	0.44	**3.91**	5	2550	1250	90	-1.1958	1.03125	3.96785	**4.42**	**E**
Hacienda	24	-2.88	1100	2	2.50	30	2	0.98	4	0.44	**1.80**	3	1610	1030	70	-4.0746	0.84975	0.90755	**3.51**	**D**
																		Average Bicycle LOS, Southbound =	**4.53**	**E**
Segment Boundary	Northbound																			
	W_e	$F_{w,link}$	v_{ma}	N_{th}	$F_{v,link}$	S_{Ra}	P_{HVa}	F_S	P_c	F_p	$I_{b,link}$	$N_{ap,s}$	L_{seg} (ft)	v_{appr}	W_{cd}	$F_{w,int}$	$F_{v,int}$	$I_{b,int}$	$I_{b,seg}$	LOS_{seg}
Charleston	12	-0.72	875	3	2.17	30	2	0.98	4	0.44	**3.64**	7	1430	1240	90	-1.1958	0.682	3.6186	**4.75**	**E**
Franklin	20	-2.00	1250	3	2.36	30	2	0.98	4	0.44	**2.54**	8	1010	1250	30	-3.829	0.6875	0.9909	**4.75**	**E**
Oakey	18	-1.62	1150	3	2.31	30	2	0.98	4	0.44	**2.88**	3	1040	1210	40	-3.2472	0.6655	1.5507	**3.90**	**D**
St Louis	14	-0.98	1300	3	2.38	30	2	0.98	4	0.44	**3.58**	2	1120	1380	70	-1.9306	0.759	2.9608	**3.97**	**D**
Sahara	12	-0.72	1375	3	2.40	30	2	0.98	4	0.44	**3.87**	9	960	1585	120	-0.7368	0.87175	4.26735	**5.99**	**F**
Karen	13	-0.85	1675	3	2.50	30	2	0.98	4	0.44	**3.84**	3	1070	1740	70	-1.7162	0.957	3.3732	**4.30**	**E**
Vegas Valley	15	-1.13	1700	3	2.51	30	2	0.98	4	0.44	**3.57**	12	1110	1700	80	-1.992	0.935	3.0754	**5.66**	**F**
Sunrise	15	-1.13	1625	3	2.49	30	2	0.98	4	0.44	**3.55**	5	930	1580	60	-2.298	0.869	2.7034	**4.58**	**E**
Desert Inn	14	-0.98	1500	3	2.45	30	2	0.98	4	0.44	**3.65**	2	1140	1480	90	-1.6246	0.814	3.3218	**4.06**	**D**
Sierra Vista	15	-1.13	1600	3	2.48	30	2	0.98	4	0.44	**3.54**	2	790	1600	30	-2.757	0.88	2.2554	**3.99**	**D**
Twain	15	-1.13	1575	3	2.47	30	2	0.98	4	0.44	**3.53**	3	1460	1450	70	-2.145	0.7975	2.7849	**3.97**	**D**
Katie	12	-0.72	1500	3	2.45	30	2	0.98	4	0.44	**3.91**	2	570	1450	70	-1.5018	0.7975	3.4281	**4.46**	**E**
Flamingo	14	-0.98	1500	3	2.45	30	2	0.98	4	0.44	**3.65**	8	1380	1390	110	-1.3186	0.7645	3.5783	**4.90**	**E**
Harmon	14	-0.98	1325	3	2.39	30	2	0.98	4	0.44	**3.59**	16	2350	1320	70	-1.9306	0.726	2.9278	**4.89**	**E**
University Rd	12	-0.72	1300	3	2.38	30	2	0.98	4	0.44	**3.84**	9	1090	1320	0	-2.5728	0.726	2.2856	**5.10**	**F**
Tropicana	12	-0.72	1200	3	2.33	30	2	0.98	4	0.44	**3.80**	8	1250	790	90	-1.1958	0.4345	3.3711	**4.96**	**E**
Hacienda	25	-3.13	725	2	2.28	30	2	0.98	4	0.44	**1.35**	15	2550	690	70	-4.289	0.56925	0.41265	**4.17**	**D**
																		Average bicycle LOS, Northbound =	**4.60**	**E**

Note: v/c = volume-to-capacity ratios; s/veh = seconds per vehicle; LOS = level of service

Results of existing levels of service analyses for the downtown and Medical District are summarized in Table 4.1-9. All intersections are estimated to be operating at level of service C or better with the exception of the Bonneville Avenue/Grand Central Parkway and Alta-Bonneville/Martin L. King Boulevard intersections where longer cycle lengths are operated. The most saturated intersection is Alta-Bonneville/Martin L. King Boulevard in the pm peak (volume-to-capacity ratio = 0.80).

The Medical District portion is aligned along Bonneville Avenue – Alta Drive to Tonopah Drive, and then counterclockwise on Tonopah Drive–Wellness Way–Shadow Lane returning to Alta Drive. All intersections are estimated to be operating at level of service C or better, with the exception of the Alta-Bonneville/Martin L. King Boulevard intersection where longer cycle lengths lead to level of service D.

Table 4.1-9 Existing Intersection Level of Service Analyses – Downtown and Medical District

Intersection	AM Peak			PM Peak		
	v/c	Delay (s/veh)	LOS	v/c	Delay (s/veh)	LOS
Alta-Bonneville/ Martin L. King	0.51	35.6	D	0.80	36.2	D
Bonneville Ave/ Grand Central Pkwy	0.41	36.5	D	0.45	38.8	D
Bonneville Ave/ Main Street	0.31	28.5	C	0.42	27.9	C
Bonneville Ave/ Casino Center Dr	0.23	27.4	C	0.20	16.8	B
Carson St/ Casino Center Dr	0.37	17.0	B	0.27	19.1	B
Carson St/ Las Vegas Blvd	0.43	18.6	B	0.42	21.8	C
Carson St/ Maryland Pkwy	0.27	8.8	A	0.21	8.8	A
Carson St/ 13th Street	0.10	6.8	A	0.32	7.0	A

Note: v/c = volume-to-capacity ratios; s/veh = seconds per vehicle; LOS = level of service

Capacity and level of service analyses of projected demands at major intersections on the Downtown and Medical District segments are summarized in Table 4.1-10. Queue jump phases at the Carson Street/13th Street and Carson Street/Casino Center Boulevard have been assumed to utilize ten seconds of the traffic signal cycle length, effectively increasing signal cycle lost time for GP traffic by that amount. The analyses indicate the following:

- Under projected 2040 demands and the Build Alternative the Carson Street/Casino Center Boulevard intersection is projected to operate at a volume-to-capacity ratio of 0.93 (and level of service C) in the am peak hour and 0.84 (and level of service D) in the pm peak hour. Elimination of the north side parking lane on Carson Avenue to accommodate an exclusive westbound right-turn lane would lower the projected volume-to-capacity ratios to 0.84 (and level of service C) in the am peak hour and 0.69 (and level of service C) in the pm peak hour.
- Under projected 2040 demands and the Build Alternative the Carson Street/Las Vegas Boulevard intersection is projected to operate at a volume-to-capacity ratio of 0.78 (and level of service D) in the pm peak hour. This analysis reflects a substantial increase in Carson Street traffic and the elimination of east-west left-turn lanes in order to accommodate sidewalk widening. Inclusion of east-west left-turn lanes would lower the volume-to-capacity ratio to 0.60 (and level of service C).

Table 4.1-10 Future Year Level of Service Analyses – Downtown and Medical District

Intersection	Condition	AM Peak 2022 Opening Day v/c	AM Peak 2022 Opening Day Delay (s/veh)	AM Peak 2022 Opening Day LOS	AM Peak 2040 v/c	AM Peak 2040 Delay (s/veh)	AM Peak 2040 LOS	PM Peak 2022 Opening Day v/c	PM Peak 2022 Opening Day Delay (s/veh)	PM Peak 2022 Opening Day LOS	PM Peak 2040 v/c	PM Peak 2040 Delay (s/veh)	PM Peak 2040 LOS
Alta-Bonneville/ Martin L. King	No Build	0.29	36.0	D	0.33	38.2	D	0.59	43.0	D	0.68	40.4	D
	Build	0.28	36.0	D	0.32	38.2	D	0.61	47.4	D	0.68	47.3	D
Bonneville Ave/ Grand Central Pkwy	No Build	0.41	45.9	D	0.54	48.1	D	0.49	47.5	D	0.64	50.3	D
	Build	0.43	48.0	D	0.55	50.3	D	0.52	51.8	D	0.66	53.8	D
Bonneville Ave/ Main Street	No Build	0.34	28.7	C	0.39	29.1	C	0.46	29.7	C	0.55	33.2	C
	Build	0.32	32.7	C	0.37	32.8	C	0.46	33.0	C	0.56	36.9	D
Bonneville Ave/ Casino Center Dr	No Build	0.27	20.5	C	0.35	22.1	C	0.22	17.2	B	0.28	18.4	B
	Build	0.27	20.5	C	0.34	22.2	C	0.22	17.2	B	0.27	18.2	B
Carson St/ Casino Center Dr	No Build	0.48	18.4	B	0.81	26.1	C	0.35	28.1	C	0.57	32.0	C
	Build	0.56	19.7	B	0.93	27.7	C	0.51	30.2	C	0.84	38.0	D
Carson St/ Las Vegas Blvd	No Build	0.46	20.2	C	0.56	24.3	C	0.46	25.7	C	0.57	32.3	C
	Build	0.50	18.9	B	0.63	26.4	C	0.57	31.3	C	0.78	44.4	D
Carson St/ Maryland Pkwy	No Build	0.31	9.2	A	0.40	10.6	B	0.25	10.6	B	0.35	13.9	B
	Build	0.41	11.2	B	0.52	13.7	B	0.31	10.1	B	0.42	13.5	B
Carson St/ 13th Street	No Build	0.11	7.1	A	0.14	7.6	A	0.36	7.5	A	0.45	8.7	A
	Build	0.17	12.6	B	0.21	13.3	B	0.53	18.1	B	0.65	26.2	C

Note: v/c = volume-to-capacity ratios; s/veh = seconds per vehicle; LOS = level of service

4.2 IMPACTS

Significant impacts to traffic would include a reduction in level of service, a disruption of pedestrian and bicycle traffic, and a loss of access to businesses and residences. The Build Alternatives, Enhanced Bus Alternative, and No Build Alternative are discussed below.

4.2.1 Build Alternatives

Both the LRT and BRT Build Alternatives are to be located in a dedicated, curbside-running configuration in the curb lane that allows vehicles to make right turn movements (Figures 4.2-1 to 4.2-3). Analyses indicate that both of the Build Alternatives can be accommodated without significant adverse impacts to general purpose automobile traffic levels of service. Transit improvements can be made in a manner that improves pedestrian and bicycle levels of service and reduce crash potential through access management and traffic control treatments.

Figure 4.2-1. Elevation View of Side-running LRT along Maryland Parkway with Bike Lane

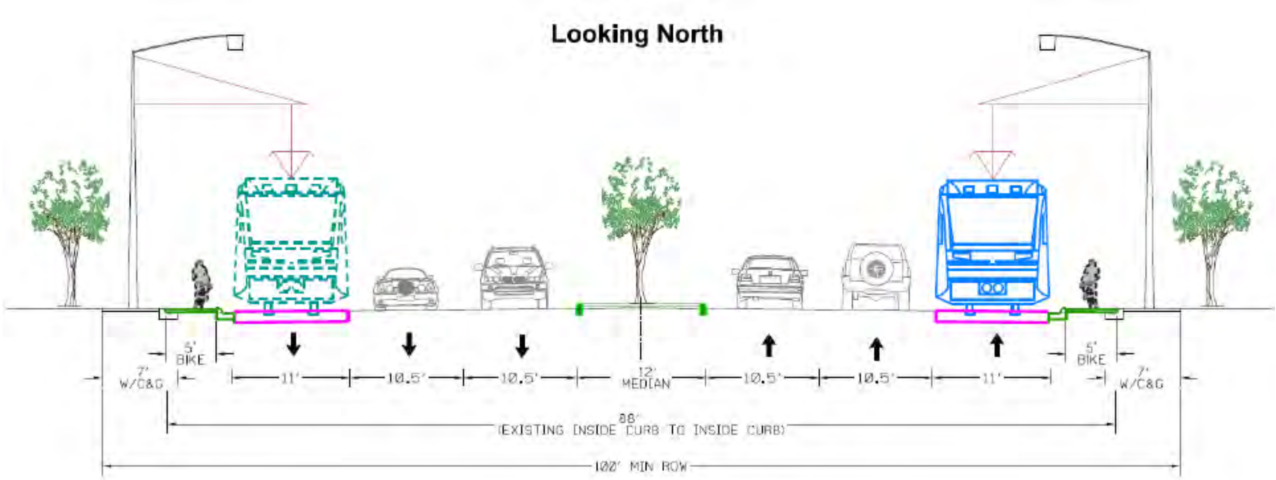


Figure 4.2-2 Typical View of Side-running LRT along Maryland Parkway with Bike Lane

Based on results of the traffic analyses, the recommended alternative for the core corridor of Maryland Parkway (Russell Road to Charleston Boulevard) is the four general purpose lanes plus dedicated curbside-running transit lanes.

To the extent funding allows, the Project improvements along the noted segment of Maryland Parkway should include an elevated cycle track for bicyclists (Figures 4.2-3 and 4.2-4), sidewalk amenity zone to buffer an unobstructed Public Right-of-Way Accessibility Guidelines-compliant sidewalk, and access management improvements consisting of driveway consolidation and a landscaped raised median to provide beautification and left-turn access consolidation.

Figure 4.2-3 Curbside-running Configuration with Right Turn Lane and Bike Lane

Figure 4.2-4 Bike Lane Ramp for Driveways

On most of the Downtown and Medical District segments, the transit vehicles are to operate in exclusive curb side lanes that would also be used by right-turning vehicles. An existing BRT center-running transitway is to be utilized on Casino Center Boulevard. The transit route improvements require new traffic signals and queue-jump phases at seven locations consisting of 13th Street/Carson Avenue (north-to-west queue-jump), Casino Center Boulevard/Carson Avenue (west-to-south and north-to-east queue-jumps), Bonneville Avenue/Main Street (west-to-south queue-jump), Tonopah Drive/Alta Drive (west-to-south queue-jump), Tonopah Drive/Wellness Way (new traffic signal with south-to-east queue-jump), and Wellness Way/Shadow Lane (new traffic signal with east-to-north queue-jump). The proposed route looping through the Medical District facilitates an interface with a potential future fixed guideway transit route on Charleston Boulevard identified by the City of Las Vegas in previous studies (CH2M, 2016).

The rail vehicle maintenance and storage facility improvements will be located on a nearly 6.1-acre RTC-owned site adjacent to the UPRR mainline tracks, just west of the Bonneville Transit Center in a primarily industrial area. No impacts to traffic management are anticipated in this location.

Neither of the Build Alternatives would cause significant direct impacts to the traffic operations along Maryland Parkway and the connecting corridors because they generally maintain the same number of traffic lanes that exist today, add new right-turn lanes at the major intersections, and improves pedestrian and bicycle connections along the corridor. Overall, levels of service are projected to be the same or better than they are today for motorists, as well as pedestrians, bicyclists, and transit patrons. Projected forecasts reflect growth for Maryland Parkway ranging from 23 to 35 percent for the No Build Alternative and 22 to 32 percent for either Build Alternative (see Appendix K, Traffic Analysis). Both Build Alternatives would benefit the corridor by providing separated bicycle and pedestrian facilities and improving person throughput via faster, safer transportation options for access to the many employment centers, businesses, and residences along and proximate to the project corridor.

There are no indirect impacts from either of the Build Alternatives to traffic in the corridor. Construction impacts to traffic would occur for a short period of time, currently estimated to be 3 years; but mitigation measures would be used to minimize disruptions to the traveling public and adjacent businesses and residences.

4.2.2 Enhanced Bus Alternative

The Enhanced Bus Alternative would attempt to maximize service without any major capital improvements. The Enhanced Bus alternative would be a limited stop service with the same 24 stations as those included in the Build Alternatives with average spacing of 0.35-mile and the same span of service, but the buses would operate in the existing curbside mixed flow traffic lanes, like the existing Route 109 buses do today.

Headways would be improved during the weekday peak periods (3 hours in the morning and 3 hours in the afternoon) to every 12 minutes. This would increase the level of bus service by 50 percent over the existing condition, from 4 buses to 6 buses per hour in each direction during peak periods. In addition, the 24 bus stops in the corridor would be enhanced with shelters, benches, and information displays, as appropriate, but with minimal capital expenditure.

No significant direct or indirect impacts for the Enhanced Bus Alternative would occur because existing bus service would be improved 50 percent over the existing conditions and the new stops improved with passenger amenities, lighting, and security concerns. Temporary construction impacts would occur with the construction of 24 new stops; however, construction windows would be short and disruptions to traffic would be minimal.

4.2.3 No Build Alternative

The No Build Alternative maintains existing cross sections of Maryland Parkway with six general purpose through travel lanes between Charleston Boulevard and Tropicana Avenue and Route 109 local bus service in mixed flow traffic lanes.

4.3 Mitigation

Permanent mitigation measures for pedestrian and bicycle improvements for access to new stations may include wider sidewalks, ADA-compliant boarding areas at each station, and connecting ADA-accessible pathways within a 0.25-mile radius of all stations. Project elements may include repair or replacement of sidewalk, curb ramps, removal or relocation of sidewalk obstructions, and enhancements of pedestrian crossings with striping, signage, hybrid pedestrian beacons, or traffic signals to improve access to the stations and along the corridor. Bicycle access improvements may include standard or separated bicycle lanes or other facilities such as raised bike tracks where feasible and bicycle parking racks or lockers at identified stations.

A traffic management plan will be prepared by the contractor prior to construction activities that will be reviewed and approved by RTC, the City of Las Vegas, and Clark County. The plan will identify the necessary measures and best management practices to minimize disruption to vehicle and bus traffic, pedestrians, and access to businesses and residences. Maintenance of traffic measures and best management practices during construction to minimize impacts will be applied throughout the corridor, particularly at the following key activity center locations:

- Bike and Pedestrian Crossings
- UNLV Maryland Parkway campus
- UNLV Shadow Lane campus
- Valley Hospital Medical Center

- UMC
- Lou Ruvo Center for Brain Health | Cleveland Clinic
- Bonneville Transit Center
- Smith Center for the Performing Art Center
- Discovery Children's Museum
- Sunrise Hospital
- Boulevard Mall
- McCarran International Airport

Best construction management practices would be in place to ensure the safety of construction workers, local employees, and residents during construction of either Build Alternative. Specific temporary best management practices could include:

- Constructing the transitway on only one side of the street at a time would allow ample traffic-carrying capacity in the remaining travel lanes to maintain acceptable level of service.
- Apprising public works, police, fire, and other emergency response agencies of construction activities, detours, and road blockages throughout the construction process.
- Providing for emergency access on roadways that would be temporarily affected during the construction period.
- Alerting the public and local businesses about detours, lane blockages, and truck entrances. These locations would be well signed.
- Providing flaggers to route traffic around detours and managing construction equipment and vehicles into and out of traffic lanes.
- Developing pedestrian and bicycle detours around work areas and maintaining pedestrian and bicycle traffic on one side of street.
- Timing and sequencing of construction activities to avoid, as much as possible, the primary business hours at certain locations.
- Utilizing bollards and barriers to protect structural elements, buildings, and existing landscaping from construction vehicle damage.

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5.0 AGENCY COORDINATION AND PUBLIC INVOLVEMENT

Maryland Parkway is one of the Las Vegas Valley's most established and well-used corridors. Over the years, this roadway has seen many changes along its route and boasts an eclectic blend of socio-economically diversified residents, educational and health facilities, and businesses. Along the Maryland Parkway corridor route, the stakeholder list expands from large facilities such as the airport, UNLV campus, and several hospitals and malls; to small businesses and shopping centers; to minority and elderly residents; to the downtown business community. This creates an opportunity during the environmental process to create a distinctive outreach program that will capture each stakeholder's unique perspective and integrate it into the ultimate recommendations for Maryland Parkway corridor.

For this study, the outreach team:

- Actively reached out to Maryland Parkway-based facilities, businesses, residents, affected stakeholders, and the traveling public affected by the study to provide them with the most up-to-date, accurate information;
- Worked collaboratively with corridor stakeholders, residents and businesses to proactively involve those who wish to participate in the study; and
- Requested input from the public—including business owners and operators, residents, commuters, government representatives, visitors and other corridor users—to help develop solutions that will best meet the needs of those who use this project area.

To solicit input from the corridor's stakeholders on needed improvements in the corridor as part of the Maryland Parkway EA, a Public Involvement Plan was created in 2015 to guide the environmental team through an effective outreach program. The goals of this outreach program included:

- To successfully accomplish the RTC's outreach requirements and expectations for the study;
- To successfully accomplish all NEPA and Title VI federal outreach standards for the study;
- To provide accurate and timely information regarding the study and potential impacts and benefits to affected stakeholders, residents, and businesses;
- To provide abundant avenues through which stakeholders can actively obtain information, provide feedback, ask questions or voice concerns during the study;
- To successfully mitigate and/or resolve any questions or concerns from the public during the study; and
- To keep representatives of local governing bodies and stakeholder agencies informed of the study and its progress.

5.1 PUBLIC OUTREACH PROGRAM STRATEGY

To accomplish the federal and RTC goals of the public outreach program for the Maryland Parkway EA, and to meet the Fuel Revenue Indexing public education standards as determined by the RTC, the following strategies were utilized. Additional details on these public outreach strategies and outcomes can be found in Appendix A.

Project Branding & Messaging

To keep with the branding and message that was created by the RTC for the Maryland Parkway study, all project materials, collaterals and communication tools conveyed those pre-approved brands and messaging. This ensured consistency of design and message for easier project identification. In addition, all materials will display the RTC's Fuel Revenue Indexing logo and taglines, so that Southern Nevada Residents may see their fuel revenue dollars at work.

Project Website

A project-specific web page housed on the RTC agency site was developed and will be maintained in conjunction with RTC communications staff for the duration of the project. The website is located at:

http://www.rtcsnv.com/planning-engineering/rtc-projects/maryland-parkway/

The website includes information on the study, including study area, goals and objectives, fact sheet, and other current and relevant information. The website has been advertised on project materials, public announcements, and at public venues. A copy of the fact sheet is located in Appendix A.

Community Stakeholder Notification

Initially, RTC and outreach staff notified stakeholders directly affected by the Maryland Parkway Corridor study area by direct mailers. These mailers (in both English and Spanish) were mailed to prominent stakeholders, businesses, and property owners adjacent to the study area. The mailers detailed the study, its goals and objectives, an invitation to learn more and participate, and the project lead's contact information.

Also, in accordance with RTC specifications, the outreach team notified property owners, residents, and businesses to any upcoming outreach activities, such as meeting and outreach activities. Advertisements were placed in local newspapers, notices were given out over local radio stations, and notices and posters were also displayed prominently in public locations, including bus stops, throughout the corridor prior to any impending meetings or outreach activities.

Community Partnerships

The previous Alternatives Analysis phase of the study was successful in creating partnerships with area coalitions and community groups such as the Maryland Parkway Community Coalition, and those continuing relationships have been vital to success in the current study.

Community Outreach Meetings

As needed throughout the study, some stakeholders will require one-on-one and smaller group meetings to discuss the study and its impacts. The project team will work with the RTC to determine which stakeholders will require such meetings to maximize benefits to the overall study.

Community Stakeholder Meetings

Community stakeholder meetings were held during the study to provide updated information to stakeholders, and inform them of potential benefits and impacts, and seek input into the environmental recommendations. The first public meetings were held early in the study process to inform stakeholders of the study phases, goals, and objectives, alternatives considered, and initial recommendations to be analyzed through the EA process. The second meetings will present the draft EA and request formal comment for a 30-day period. The venues will be accessible by transit, and will be identified via mailers, advertisements, and notices placed in public locations along the corridor (including bus stops).

5.2 Public Involvement Summary

A summary of public outreach to date is provided below. Additional public meetings will be held when the draft EA is issued and this report will be updated with those results.

5.2.1 Previous Public Involvement for the Maryland Parkway Corridor

The original Alternatives Analysis process included extensive public involvement and stakeholder engagement throughout that 18-month process, completed in December 2014. There was strong support for a fixed guideway, high capacity LRT or BRT service in the corridor. Subsequent public meetings were held in September/October 2015 to support the Locally Preferred Alternative refinement process; approximately 50 people attended those meetings, including a mix of residents, business owners, and other stakeholders.

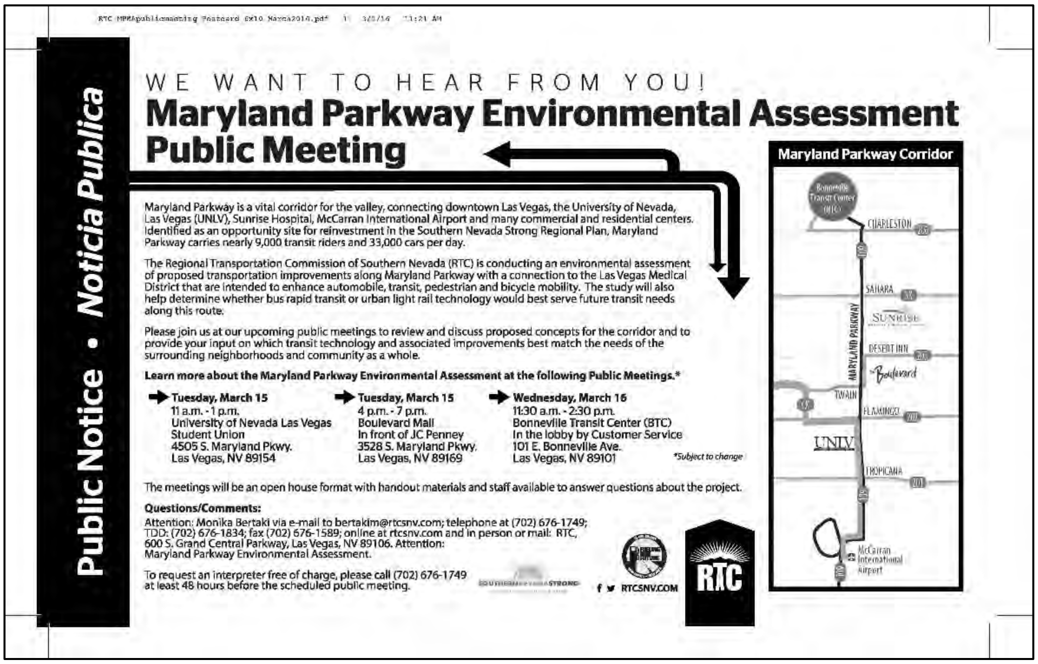
5.2.2 Public Scoping Meetings

RTC held a meeting for 25 local business leaders on March 9, 2016, to inform them of the Maryland Parkway EA ahead of the public meetings that would be held the following week. Many of these business leaders had been involved in the Alternatives Analysis and the one change to the project was the selection of the location of the train tracks to the outside lanes instead of the center lanes recommended by the Alternatives Analysis.

Three public information/scoping meetings were held on March 15 and 16, 2016, to inform interested individuals, groups, and agencies about the proposed project and to receive comments and suggestions from them during the meetings. The first informational meeting was located at the UNLV Student Union, located at 4505 S. Maryland Parkway, on March 15th from 11am to 1pm. The second meeting was held at the Boulevard Mall in front of the JC Penney store, located at 3528 S. Maryland Parkway, on March 15th from 4pm to 7pm. The third meeting was held at the Bonneville Transit Center, located at 101 E.

Bonneville Avenue, on March 16th from 11:30am to 2:30pm. Approximately 85 people attended the informational meetings, including a mix of residents, business owners, and other stakeholders.

A postcard notice (see below) of the public meetings was mailed out by RTC to businesses and residents within a 0.25-mile of the Maryland Parkway Corridor alignment.



Public Notice • Noticia Publica

WE WANT TO HEAR FROM YOU!

Maryland Parkway Environmental Assessment Public Meeting

Maryland Parkway is a vital corridor for the valley, connecting downtown Las Vegas, the University of Nevada, Las Vegas (UNLV), Sunrise Hospital, McCarran International Airport and many commercial and residential centers. Identified as an opportunity site for reinvestment in the Southern Nevada Strong Regional Plan, Maryland Parkway carries nearly 9,000 transit riders and 33,000 cars per day.

The Regional Transportation Commission of Southern Nevada (RTC) is conducting an environmental assessment of proposed transportation improvements along Maryland Parkway with a connection to the Las Vegas Medical District that are intended to enhance automobile, transit, pedestrian and bicycle mobility. The study will also help determine whether bus rapid transit or urban light rail technology would best serve future transit needs along this route.

Please join us at our upcoming public meetings to review and discuss proposed concepts for the corridor and to provide your input on which transit technology and associated improvements best match the needs of the surrounding neighborhoods and community as a whole.

Learn more about the Maryland Parkway Environmental Assessment at the following Public Meetings.*

Tuesday, March 15
11 a.m. - 1 p.m.
University of Nevada Las Vegas
Student Union
4505 S. Maryland Pkwy.
Las Vegas, NV 89154

Tuesday, March 15
4 p.m. - 7 p.m.
Boulevard Mall
In front of JC Penney
3528 S. Maryland Pkwy.
Las Vegas, NV 89169

Wednesday, March 16
11:30 a.m. - 2:30 p.m.
Bonneville Transit Center (BTC)
In the lobby by Customer Service
101 E. Bonneville Ave.
Las Vegas, NV 89101

*Subject to change

The meetings will be an open house format with handout materials and staff available to answer questions about the project.

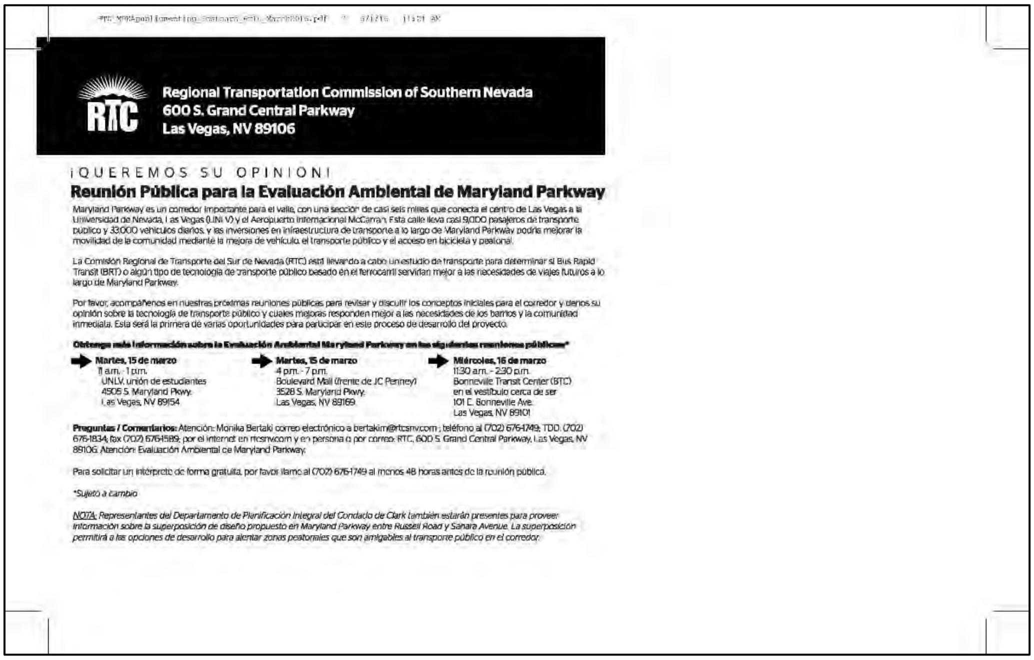
Questions/Comments:
Attention: Monika Bertaki via e-mail to bertakim@rtcsnv.com; telephone at (702) 676-1749; TDD: (702) 676-1834; fax (702) 676-1589; online at rtcsnv.com and in person or mail: RTC, 600 S. Grand Central Parkway, Las Vegas, NV 89106. Attention: Maryland Parkway Environmental Assessment.

To request an interpreter free of charge, please call (702) 676-1749 at least 48 hours before the scheduled public meeting.

RTCSNV.COM

RTC

Front of Postcard (in English)



RTC

Regional Transportation Commission of Southern Nevada
600 S. Grand Central Parkway
Las Vegas, NV 89106

¡QUEREMOS SU OPINION!

Reunión Pública para la Evaluación Ambiental de Maryland Parkway

Maryland Parkway es un corredor importante para el valle, con una sección de casi seis millas que conecta el centro de Las Vegas a la Universidad de Nevada, Las Vegas (UNLV) y el Aeropuerto Internacional McCarran. Esta calle lleva casi 9,000 pasajeros de transporte público y 33,000 vehículos diarios, y las inversiones en infraestructura de transporte a lo largo de Maryland Parkway podría mejorar la movilidad de la comunidad mediante la mejora de vehículo, el transporte público y el acceso en bicicleta y peatonal.

La Comisión Regional de Transporte del Sur de Nevada (RTC) está llevando a cabo un estudio de transporte para determinar si Bus Rapid Transit (BRT) o algún tipo de tecnología de transporte público basado en el ferrocarril servirían mejor a las necesidades de viajes futuros a lo largo de Maryland Parkway.

Por favor, acompáñenos en nuestras próximas reuniones públicas para revisar y discutir los conceptos iniciales para el corredor y denos su opinión sobre la tecnología de transporte público y cuales mejoras responden mejor a las necesidades de los barrios y la comunidad inmediata. Esta será la primera de varias oportunidades para participar en este proceso de desarrollo del proyecto.

Obtenga más información sobre la Evaluación Ambiental Maryland Parkway en las siguientes reuniones públicas*

Martes, 15 de marzo
11 a.m. - 1 p.m.
UNLV, unión de estudiantes
4505 S. Maryland Pkwy.
Las Vegas, NV 89154

Martes, 15 de marzo
4 p.m. - 7 p.m.
Boulevard Mall (frente de JC Penney)
3528 S. Maryland Pkwy.
Las Vegas, NV 89169

Miércoles, 16 de marzo
11:30 a.m. - 2:30 p.m.
Bonneville Transit Center (BTC)
en el vestíbulo cerca de ser
101 E. Bonneville Ave.
Las Vegas, NV 89101

Preguntas / Comentarios: Atención: Monika Bertaki correo electrónico a bertakim@rtcsnv.com ; teléfono al (702) 676-1749; TDD: (702) 676-1834; fax (702) 676-1589; por el internet en rtcsnv.com y en persona o por correo: RTC, 600 S. Grand Central Parkway, Las Vegas, NV 89106. Atención: Evaluación Ambiental de Maryland Parkway.

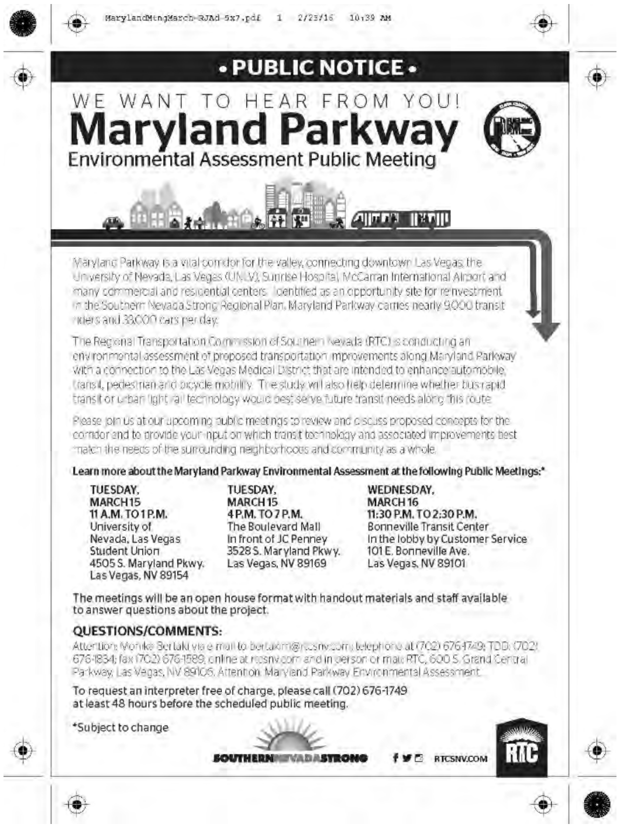
Para solicitar un intérprete de forma gratuita, por favor llame al (702) 676-1749 al menos 48 horas antes de la reunión pública.

Sujeto a cambio

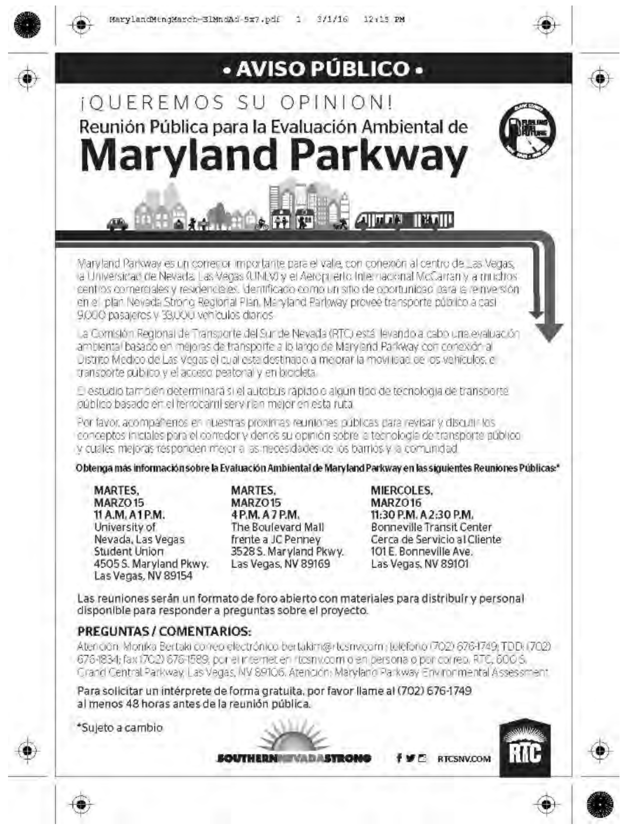
NOTA: Representantes del Departamento de Planificación Integral del Condado de Clark también estarán presentes para proveer información sobre la superposición de diseño propuesto en Maryland Parkway entre Russell Road y Sahara Avenue. La superposición permitirá a las opciones de desarrollo para alentar zonas peatonales que son amigables al transporte público en el corredor.

Back of Postcard (in Spanish)

Ads for the meeting notices were placed in three newspapers, the Review Journal, El Mundo, and Chinese News.



Ad in Review Journal (February 25, 2016)

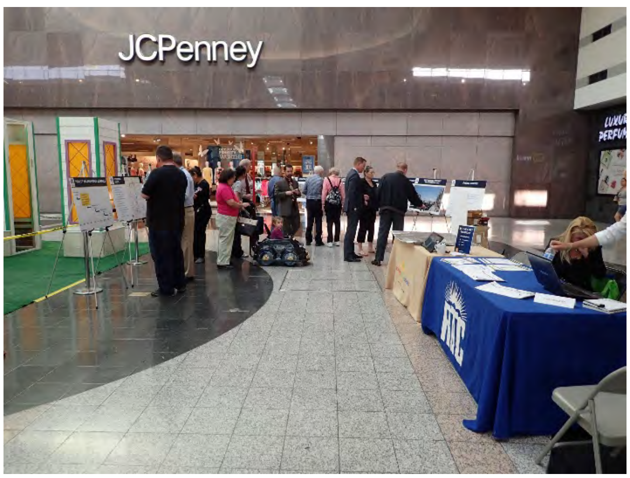


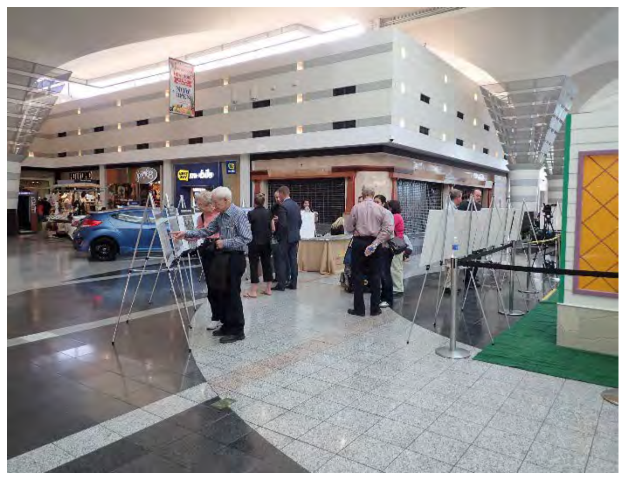
Ad in El Mundo (March 1, 2016)

Ad in Chinese Daily News (March 4, 2016)

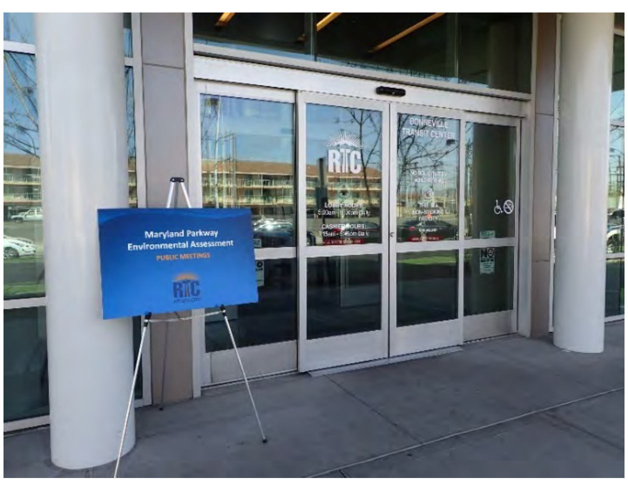
Photographs of the three public meetings are provided below.

Public Meeting at the UNLV Student Union – March 15th





Public Meeting at The Boulevard Mall – March 15th



Public Meeting at the Bonneville Transit Center – March 16th

A court reporter was present to transcribe comments or suggestions from attendees who preferred to make a verbal statement and comments cards were also available to allow attendees to write down their comments. The attendees could leave the comment cards at the event or take them home and mail them in at their leisure. All comments and suggestions become part of the administrative record. Written and verbal responses are included in Appendix A. A summary of the comments received are provided below.

Some attendees believe the project would positively:

- Help resolve the issue that when pedestrians cross a street they block traffic.
- Enhance the neighborhood.
- Reduce traffic congestion.
- Increase safety for all users.
- Provide faster, more efficient mode options.
- Support sustainability and improve air quality.
- Support student travel options.
- Provide connections to key locations and get a lot of use.

> "I support urban light rail on Maryland Parkway. It would enhance the neighborhood and with more people using it, it would result in less automobile traffic. It would also be in the interest of public safety."
> –*Resident along Maryland Parkway, comment card statement*

Some have concerns with:

- How construction would impact businesses.
- Project costs.
- Current systems (such as the current bus or monorail could be enhanced or extended instead).
- The center-running configuration will operate better.
- Light-rail technology and how it may be obsolete compared to emerging technologies.
- An at-grade system; some believe the system should include overpasses or be placed underground.
- The number of stations being proposed. Some believe there should be less to increase efficiency and some believe there should be more to decrease walking distance.
- Property acquisitions.
- Increased ticket costs.
- Preservation of neighborhoods and history.

> "I have been at this location for a few years and I am positive that Maryland Parkway needs an urban rail like in Tucson. This will benefit so many people. Also, it will be faster and prevent air pollution."
> –*Resident along Maryland Parkway, comment card statement*

> A 59-year-old downtown resident checked out the commission's presentation at the Bonneville Transit Center. A daily bus rider, he said he would definitely make use of the Maryland Parkway LRT system. "It's faster for a commute (and) you don't have to worry about the taxis," he said. "It beats traffic."

"We are very happy that we are close to UNLV. We are happy that a lot of people are very energized about this project," said restaurant owner on Maryland Parkway, which has been open for 29 years.

"There are a lot of small business that are not going to be able to survive because when they do the construction—which takes anywhere from six months to probably a year— a lot of these small businesses are not going to have access," he said.

The restaurant owner hopes that there will be incentives from the local government for small businesses to withstand the construction time because customers tend to avoid high construction areas since they become so congested with traffic.

"I don't think [the light rail] is a bad idea; I just think the better way to do it would be a way to help the businesses to survive," he said. "Personally, I am very grateful for our business leaders in our area and our elected officials thinking about this area, because it's overdue."

UNLV student who attended the open house to learn more about the project that he has heard so much about from the media. "I think it will be a good idea because it will make the traffic less packed in the morning," the student said. "It would be easier for students on campus to travel. We wouldn't have to waste gas and drive. We could just take the rail. I wish it would be done sooner though since we're graduating pretty soon."

News outlets covered the public scoping meetings, including local newspapers and television stations. RTC representatives did interviews with numerous television stations and news reporters during the meetings describing the project alternatives. Additional television and newspaper interviews continued with RTC representatives throughout the EA process to keep the public updated on the project's progress.

September 20, 2017, Las Vegas Sun, *"Vision of refreshed Maryland Parkway includes four districts, mass transit"*

March 3, 2016, Las Vegas Review-Journal, *"Maryland Parkway light rail preview shows trains on outside of roadway"*

March 14, 2016, Las Vegas Sun, *"Bus or light rail? RTC seeks input on Maryland parkway transit improvements"*

March 17, 2016, Las Vegas Sun, *"Making tracks: Light-rail proposal for Maryland Parkway is moving forward"*

April 4, 2016, The Rebel Yell, *"Light rail to line Maryland Parkway, but not without concerns"*

June 9, 2017, Las Vegas Review-Journal, *"RTC gets OK to seek funding for light-rail line along Maryland Parkway"*

5.2.3 Stakeholder Group Meetings

Throughout this EA process, RTC has held numerous meetings with a Technical Working Group and a Community Stakeholder Group representing all local agencies and jurisdictions, businesses, real estate developers, neighborhood associations, property owners, members of the Maryland Parkway Coalition, and other key stakeholders such as UNLV and the Clark Department of Aviation, to solicit input to help inform the Locally Preferred Alternative refinement process. Both groups have indicated strong support for the proposed project.

The Community Stakeholder Group and Technical Working Group started meeting in August 2015 to refine the Locally Preferred Alternative. The Community Stakeholder Group met again in March 2016 and August 2016, while the Technical Working Group has November 2015 and February 2017 to continue to provide input and comments on the proposed project.

The Maryland Parkway Coalition is an informal advocacy group that started in 2013 consisting of many stakeholders like the City of Las Vegas, Clark County, RTC, UNLV, Sunrise Hospital, the Boulevard Mall, local businesses, property owners, and many organizations and individuals who share a desire for improvement to the corridor. Documentation from the Maryland Parkway Coalition meetings can be found in Appendix B.

In 2016 and 2017, RTC held smaller one-on-one meetings with stakeholder groups in the corridor, including the City of Las Vegas, Clark County, hospital and medical facilities, religious organizations, neighborhood and homeowner associations, small business and minority advocacy groups, and pedestrian and bicycle advocacy groups.

5.2.4 Agency Coordination

Federal, state, and local public agencies were contacted, as well as state government officials to inform them of the upcoming Maryland Parkway Corridor project. An Intent-to-Study letter and the list of agencies and individuals it was sent to can be found in Appendix A. The letter was sent out on February 25, 2016 and notified the recipients of RTC's and FTA's intention to study potential transportation improvements to the Maryland Parkway corridor, invited comments until April 15, 2016, and informed the dates of three public meetings about the proposed project. One response from the U.S. Coast Guard (Appendix A) was received back from the listed agencies that were sent the Intent-to-Study letter, indicating that the project does not have U.S. Coast Guard jurisdiction because there are no bridges.

FTA notified the Nevada SHPO about the project and provided them a letter describing the project and listing the potential historical properties in the project area. Both the FTA letter and Nevada SHPO response letter are located in Appendix H. Per comments received from the SHPO, revisions to the APE were made and resubmitted to the Nevada SHPO for concurrence. The Nevada SHPO concurred with the revised APE boundary on December 11, 2017 (Appendix H). In addition, the local Native American tribes were contacted (Appendix H), but no responses were received. The Nevada SHPO concurred with our survey methodology and eligibility determinations on August 21, 2018.

Any additional agency coordination may occur once the draft EA is available for public review. FTA will coordinate with the Nevada SHPO on the Finding of Effect determination during the public review period.

5.2.5 EA Public Review Process

The EA will be released in early 2019 for a 30-day public review comment period. RTC will publish a notice of availability in local newspapers and on the RTC's website, as well as mail out a bilingual postcard to all adjacent businesses, landowners, and homeowners in the study area, noting: (1) where the public can access the document; (2) the 30-day review period; (3) where comments should be sent; and (4) public meeting details. Copies of the document will be made available online and in a variety of public locations (e.g., public libraries, at RTC offices, or other local governmental offices) along the corridor. Written comments on the EA can be submitted to RTC by various methods, including email and mail, and will be included in the final decision document. Additional public meetings will be held within the 30-day Draft EA review period along the corridor, similar to the initial scoping meetings. Copies of the EA will also be available at the public meetings. Written and verbal comments will be collected at the public meetings and included in the final decision document. A formal notice of availability (i.e., a notice published in the Federal Register) is not required and not normally used for EAs.

6.0 REFERENCES

Acker, E. 1979. Site Survey Record, Archaeological Research Center, Museum of Natural History for Nevada Site No. 26CK1767. On file at the Nevada State Historic Preservation Office. March.

Atkins. 2014. *Maryland Parkway Alternatives Analysis*. December.

BUNNYFiSH Studio. 2016. *Maryland Parkway Public Art Strategic Design Plan*. Prepared for Clark County Public Art Program. August 31, 2016. http://www.clarkcountynv.gov/parks/Documents/visual-arts/mppap-strategicdesignplan.pdf

CH2M. 2016. *City of Las Vegas Mobility Master Plan*. Draft Final. May. http://mobilitymasterplan.vegas/wp-content/uploads/2015/01/CLVM_Master-Plan_Book_Final_2016-05-16.pdf

City of Las Vegas. 2016. *Vision 2045 Downtown Las Vegas Master Plan*. https://www.lasvegasnevada.gov/cs/groups/public/documents/document/chjk/mdex/~edisp/prd011906.pdf

Clark County Department of Comprehensive Planning. 2015. *Clark County Comprehensive Master Plan*. November 23, 2015. http://www.clarkcountynv.gov/comprehensive-planning/advanced-planning/Documents/1.6%20PRINT%20COMP%20PLAN%20WITH%20ATTACHMENTS%20FOR%20POSTING%2023%20NOV%202015.pdf

Clark County Regional Flood Control District. 2016. Ten-Year Construction Program: Fiscal Year 2017 through Fiscal Year 2026. Adopted June 9, 2016. http://gustfront.ccrfcd.org/pdf_arch1/Administrative/Ten%20Year%20Program/Ten%20Year%202017-2026.pdf

Clark County. 2017. Clark County Maryland Parkway Design Overlay District.

Clark County. 2018. *Community Resources Management Program Guide: 2018*. http://www.clarkcountynv.gov/social-service/crm/Documents/2018_CRM_Program_Guide.pdf

Dlugokencky, E. and P. Tans. 2017. Global Greenhouse Gas Reference Network. National Oceanic and Atmospheric Administration (NOAA), Earth System Research Laboratory. Accessed March 6, 2017. https://www.esrl.noaa.gov/gmd/ccgg/trends/global.html

ECONorthwest. 2015. Draft Maryland Parkway Corridor, Phase I Summary Report. Prepared for Parsons and RTC. October 2015

Federal Highway Administration (FFWA). 2015. Guidelines for the *Visual Impact Assessment of Highway Projects*. January. https://www.environment.fhwa.dot.gov/env_topics/other_topics/VIA_Guidelines_for_Highway_Projects.pdf

Federal Transit Administration (FTA) and the Regional Transportation Commission of Southern Nevada (RTC). 2002. *Las Vegas Resort Corridor Draft Environmental Impact Statement*. February 15, 2002.

FTA. 2006. *Transit Noise and Vibration Impact Assessment*. May. https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/FTA_Noise_and_Vibration_Manual.pdf

FTA. 2012. Environmental Justice Policy Guidance for Federal Transit Administration Recipients. Circular FTA C 4703.1. August 15, 2012. https://www.transit.dot.gov/regulations-and-guidance/fta-circulars/environmental-justice-policy-guidance-federal-transit

FTA. 2016. *National Transit Database Policy Manual.*

G.C Wallace, Inc. 2009. *Maryland Parkway Bus Rapid Transit Feasibility Study*. Prepared for Regional Transportation Commission. March.

Green Chips. 2016. Southern Nevada State of Sustainability Report 2016. http://www.clarkcountynv.gov/comprehensive-planning/eco-county/Documents/Southern%20Nevada%20State%20of%20Sustainability%20Report%202016.pdf

Harmon, M.R. 1999. Nevada Register of Historic Places (NVRHP) Registration Form "Huntridge Theater." Prepared by Nevada SHPO, Historic Preservation Specialist.

Hook, W., S. Lotshaw, and A. Weinstock. 2013. The Institute for Transportation and Development Policy.

Jacobs Engineering Group, Inc. 2015. *Clark County Parking Study Final Report*. Prepared for Clark County, Nevada and Regional Transportation Commission. June. http://www.rtcsnv.com/wp-content/uploads/2012/06/UPWP1710-CC-Parking-Study_-Report-_Final.pdf

Kimley-Horn. 2015. *RTC Southern Nevada Transportation Safety Plan*. August. http://www.rtcsnv.com/wp-content/uploads/2012/06/2015-08-24-SN-TSP_FINAL.pdf

Knight and Leavitt Associates, Inc. (K&LA). 1992. Archaeological Test Excavation at Site 26CK1493 Las Vegas, Nevada. Prepared for Parsons Brinckerhoff Quade & Douglas, Inc. Tempe, Arizona.

Kuranda, Kathryn M., Frank Wright, and Dorothy Wright. 1987. National Register of Historic Places Registration Form "Thematic Nomination of Properties Associated with the San Pedro, Los Angeles, and Salt Lake Railroad, Las Vegas, Nevada." Prepared by Frank Wright and Dorothy Wright, Nevada State Museum and Historical Society. Revised and edited by Kathryn M. Kuranda, Nevada Division of Historic Preservation and Archeology.

Las Vegas Valley Water District. 2016. *2016 Water Quality Report*. https://www.lvvwd.com/assets/pdf/wqreport.pdf

Las Vegas Valley Watershed Advisory Committee (Las Vegas Valley Watershed Advisory Committee). 2012. *Regional Water Quality Plan*. https://www.snwa.com/assets/pdf/lvvwac-regional-water-plan.pdf

Lenz, Richard. 1993. National Register of Historic Places Registration Form "Huntridge Theater."

MIG, Inc. 2017. *Maryland Parkway: Land Use and Economic Development Evaluation*. October 30, 2017.

Mooney, Courtney. 2002. National Register of Historic Places Registration Form "John S. Park Historic District." Prepared by 20th Century Preservation.

Moruzzi, Peter and Sarah Fogelquist. 2012. National Register of Historic Places Registration Form "El Cortez Casino and Hotel."

Nelson/Nygaard. 2016. Maryland Parkway Operations and Maintenance Cost Estimate. Prepared for Southern Nevada RTC. November 2, 2016.

Nevada Department of Conservation and Natural Resources. 2016. Nevada Natural Heritage Program. http://heritage.nv.gov/

Nevada Division of Environmental Protection (NDEP). 2016. Nevada Brownfields - Union Park. http://ndep.nv.gov/bca/brownfield_union-park.htm

Nevada Department of Transportation (NDOT). 2013. *Road Safety Audit Report for Maryland Parkway (Bonanza to Russell).*

Parsons. 2002. *Las Vegas Valley Transit System Development Plan*. http://www.rtcsnv.com/wp-content/uploads/2012/06/LVVTSDP.pdf

Parsons. 2016a. Capital Cost Methodology and Estimates for Maryland Parkway Technical Memorandum. Prepared for RTC. October 31.

Parsons. 2016b. *Maryland Parkway High Capacity Transit Project Noise and Vibration Technical Report*. Prepared for RTC. July.

Parsons. 2016c. *Maryland Parkway High Capacity Transit Project Cumulative Effects Technical Memorandum*. Prepared for RTC and FTA. December.

Parsons. 2016d. *Traffic Analysis for Maryland Parkway Environmental Assessment*. August.

Parsons. 2017a. *Maryland Parkway Corridor Complete Streets Analysis and Considerations Technical Report*. Draft. Prepared for RTC. November.

Parsons 2017b. *Maryland Parkway Bike Facility Options Evaluation Technical Report*. Final. Prepared for RTC. June.

Parsons. 2017c. *Maryland Parkway High Capacity Transit Project Initial Site Assessment*. Prepared for RTC. October.

Parsons. 2018a. *Maryland Parkway High Capacity Transit Project Air Quality Technical Memorandum*. Prepared for RTC and FTA. April.

Parsons. 2018b. *Maryland Parkway High Capacity Transit Project Biological Resources Technical Memorandum*. Prepared for RTC and FTA. April.

Parsons. 2018c. *Maryland Parkway High Capacity Transit Project Cultural Resources Survey*. Prepared for RTC and FTA. July.

Parsons. 2018d. *Maryland Parkway High Capacity Transit Project Section 4(f) Technical Memorandum*. Prepared for RTC and FTA. April.

Parsons. 2018e. *Maryland Parkway High Capacity Transit Project Visual Impact Assessment*. Prepared for RTC and FTA. July.

Puchalsky, C. M. 2005. Comparison of Emissions from Light Rail Transit and Bus Rapid Transit. *Transportation Research record: Journal of the Transportation Research Board*, No. 1927, Transportation Research Board of the National Academies, Washington, D.C. pp. 31-37.

Raupach, M.R.; G. Marland, P. Ciais, C. Le Quere, J.G. Canadell, G. Klepper, and C.B. Field. 2007. Global and regional drivers of accelerating CO2 emissions. Proceedings of the National Academy of Sciences. June 12, 2007. Vol. 104:24. www.pnas.org/cgi/content/full/0700609104/DCI

Rayle, G.J. and H. Ruter. 2017. *National Register of Historic Places Eligibility Assessment of the World War II Era Huntridge Neighborhood, Las Vegas, Clark County, Nevada*. Prepared for the City of Las Vegas Department of Planning. Prepared by North Wind Resource Consulting, LLC. Report No. 30192a.

RBF Consulting Urban Design Studio. 2008. *SOSA Design Standards and Guidelines*. Prepared for Clark County Redevelopment Agency. Las Vegas. Adopted November 19, 2008. http://www.clarkcountynv.gov/comprehensive-planning/zoning/Documents/3048_950.pdf

Regional Transportation Commission of Southern Nevada (RTC). 2002. *Las Vegas Valley Transit System Development Plan*. August 2002.

RTC. 2016a. *Transportation Improvement Program Fiscal Years 2015-2019, Narrative/Analysis and Project Summaries*. http://www.rtcsnv.com/wp-content/uploads/2014/02/RTCSNV_TIPFY2015-2019_2016-12-22.pdf; http://www.rtcsnv.com/wp-content/uploads/2014/02/Table-1-thru-Amend16-19-1.pdf

RTC. 2016b. Transportation Investment Business Plan (TIBP). http://www.rtcsnv.com/govegas/index.php

RTC. 2017. *Regional Transportation Plan of Southern Nevada 2017-2040*. Adopted February 9, 2017. https://www.rtcsnv.com/planning-engineering/transportation-planning/2017-2040-regional-transportation-plan/

SmithGroup JJR. 2015. UNLV 2015 Limited Campus *Master Plan Update*. December 3-4. http://www.smithgroupjjr.com/projects/unlv-campus-master-plans-and-update#.WgATiWfrupo

Smith Group, LCC. 2015. Las Vegas Medical District Facilities Master Plan Technical Report December. https://lasvegasmedicaldistrict.com/wp-content/uploads/2016/01/LVMD-Tech-Report-Dec-2015.pdf

Soil Conservation Services. 1985. *Clark County, Nevada Soils Report*.

Southern Nevada Regional Housing Authority (SNRHA). 2018. *SNRHA Annual Plan: FY 2019*. Approved by the SNRHA Board of Commissioners June 21, 2018. https://www.snvrha.org/pdf/SNRHA-FY2019-Annual-Plan.pdf

Southern Nevada Strong. 2014. *Maryland Parkway Implementation Strategy Plan*. December. http://www.rtcsnv.com/wp-content/uploads/2012/10/1_SNS_MDPkwyImplementationStrategyReport_121614.pdf

Southern Nevada Strong. 2015. *Southern Nevada Strong Regional Plan*. January. southernnevadastrong.org

Southern Nevada Water Authority. 2018. Groundwater. https://www.snwa.com/where-southern-nevada-gets-its-water/groundwater/index.html

Stephen, H. and E. Hoyuela-Alcaraz. 2014. *Clark County Regional Emissions Inventory: Greenhouse Gas Emissions for 2014*. Southern Nevada Regional Planning Coalition.

Thomas, George E. 2006. Las Vegas Main Street Historic District National Register of Historic Places Nomination Submission.

Thomson, J. 2001. The Cottages: A Property Survey.

Transportation Research Board. 2010. *Highway Capacity Manual*. National Academy of Sciences. Washington DC.

United States Census Bureau. 2010 U.S. Census Data. http://www.census.gov/geo/maps-data/

United States Environmental Protection Agency (USEPA). 2016a. NPL List. https://www.epa.gov/superfund/superfund-national-priorities-list-npl

USEPA. 2016b. Brownfield Overview and Definition. https://www.epa.gov/brownfields/brownfield-overview-and-definition

USEPA. 2016c. NAAQS Table. https://www.epa.gov/criteria-air-pollutants/naaqs-table

U.S. Fish and Wildlife Service (USFWS). 2017. Threatened and Endangered Species Database.

U.S. Global Change Research Program (USGCRP). 2014. Regional Highlights from the Third National Climate Assessment: Climate Change Impacts in the United States: Southwest, 2014. http://www.globalchange.gov/sites/globalchange/files/Regional_SW_V2.pdf

University of Nevada at Las Vegas (UNLV) Campus News. 2012. UNLV Master Plan Approved.

UNLV Center for Business and Economic Research. 2017. *Population Forecasts: Long-Term Projections for Clark County, Nevada 2017-2050*. http://cber.unlv.edu/reports/2017-CBER-Population-Forecasts.pdf

Westat. 2015. *2014 Southern Nevada Household Travel Survey Final Report*. Prepared for RTC. August. http://www.rtcsnv.com/wp-content/uploads/2012/06/2014_SNV_HTS_Final_Report.pdf

Western Regional Climate Center. 2016. Historical Climate Information. http://www.wrcc.dri.edu/CLIMATEDATA.html

7.0 LIST OF PREPARERS

People who were responsible for the preparation of this EA include:

Preparers

Candice Hughes, FTA Region 9

Alexander Smith, FTA Region 9

Eric Eidlin, FTA Region 9

David Swallow, RTC Senior Director of Engineering and Technology

Bill Tsiforas, Jacobs Engineering, Program Manager

Amber Brenzikofer, Parsons, Environmental NEPA Manager

Phil Hoffmann, Parsons, Project Manager

Susan Bupp, RPA, Parsons, Senior Archaeologist

Rachael Magnum, RPA, Parsons, Archaeologist

Jill Vesci, Parsons, Architectural Historian

Thanh Luc, Parsons, Noise and Vibration

Bob Scales, Parsons, Engineering Lead

J.P. Woyton, Parsons, Engineering Support and Public Outreach Coordinator

Victoria Rieck, Parsons, Environmental Planner

Eric Coumou, Parsons, GIS Specialist

Melanie Delion, Parsons, GIS Specialist

Nicole Hofert, MIG, Land Use and Socioeconomics

Terry Moore, ECONorthwest, Economic Development

John Tobin, GCW Engineering, Traffic

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