Project Name: **Lemmon Drive Capacity Improvement Project**

Subject: **Level One Alternatives Analysis Screening Summary for Segment 2**

Date: July 24, 2020 – FINAL

Attention: Dale Keller - RTC

From: Kaci Stansbury – Jacobs

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1. Project Background

The Regional Transportation Commission (RTC) of Washoe County has initiated the Lemmon Drive Capacity Improvement Project identified in the 2040 Regional Transportation Plan (RTP). To increase capacity, Lemmon Drive will be increased from four to six lanes between Sky Vista Parkway/Buck Drive and Military Road, referred to as Segment 1, and from two lanes to four lanes between Fleetwood Drive and Chickadee Drive, referred to as Segment 2. Improvements will accommodate future growth, and include complete street improvements, providing safe, multimodal connectivity through bike lanes, sidewalks, and/or shared use paths, and linkages to public transit stops. Improvements to Segment 2 will also address the fact that a large portion of Segment 2 is located below the 100-year flood plain, which is currently identified at elevation 4924.0, and has experienced flooding since 2017. Recent evaluation with FEMA as part of the Swan Lake Mitigation Studies expects this 100-year flood elevation to rise, but the new elevation has not been finalized. Preliminary results indicate the new elevation may rise approximately 0.6 feet to 4924.6, but final results are pending. Historically, prior to 2003, Lemmon Dr experienced localized flooding in the area of Segment 2 every seven to eight years. In 2003, The Lemmon Drive Rehabilitation Project raised the profile of Lemmon Drive approximately six inches, and until 2017 there were no flooding issues. In 2017, an unusual weather pattern of multiple atmospheric river events saturated the Swan Lake floodplain and water inundated the roadway. Washoe County constructed HESCO barriers and installed pumping facilities along the roadway to clear the water off Lemmon Drive and keep the road open to traffic.

According to the 2040 RTP, Lemmon Drive is classified as a "Medium Access Control Arterial". The posted speed limit is 35 mph from US 395 to 1000-feet north of the Sky Visa Parkway/Buck Drive intersection where it changes to 45 mph. At Bernoulli St, the speed limit reduces back down to 35 mph. When Washoe County constructed the HESCO barriers and installed pumping facilities, it required the speed limit to be reduced to 20 mph north of Patrician Drive. These mitigation efforts have greatly affected traffic safety and mobility along Segment 2 of Lemmon Drive. RTC Bus Route 17 provides connectivity between Downtown Reno and Lemmon Valley via North Virginia Street along Lemmon Drive north to Fleetwood Drive.

The North Valleys Multimodal Transportation Study, completed in February 2017, focused on traffic operation analysis and capacity improvements, safety improvements, pedestrian and bicycle connectivity, and transit service needs. During a public meeting held on February 4, 2016, closing the sidewalk gaps on Lemmon Drive was a second priority identified by the 70 community members in attendance. Their number one priority was the US-395/Lemmon Drive interchange. Improvements at the Red Rock / Silver Lake Intersection and the Parr Boulevard / US-395 Interchange Intersection were tied with closing the sidewalk gaps as a second priory.

Existing and 2040 projected traffic volumes along Lemmon Drive based on the raw, unrefined, RTC adopted model outputs are summarized in Table 1 below. These traffic volumes are lower than those shown for a full build-out development condition in the North Valleys Multimodal Transportation Study model. However, they are from RTC's year 2040 adopted travel demand model and consistent with the approach taken for the traffic analysis Jacobs completed for Lemmon Drive, Segment 1.

Table 1. Lemmon Drive Traffic Volumes from RTC's Adopted Model

Roadway Segment	Year 2020 October Daily Volume from RTC's Adopted Model	Year 2040 October Daily Volume from RTC's Adopted Model
Lemmon Drive just north of Fleetwood Drive	5,200	12,000*
Lemmon Drive just south of Chickadee Drive	4,500	14,000*
Lemmon Drive just north of Chickadee Drive	4,500	7,100*
Future Eagle Canyon Drive Extension	N/A	3,900

* Includes contributing traffic volume from the Eagle Canyon Drive Extension, assumed to be completed in the 2027 through 2040 timeline.

This technical memorandum summarizes the Level 1 Alternative Analysis Screening Process to identify the top three alternative alignments for Segment 2 that address the purpose and need of adding capacity, providing safe multimodal connectivity, and raise the roadway out of the 100-year flood plain.

2. Project Goals

To develop project goals that address the purpose and need of Segment 2, a Technical Advisory Committee (TAC) has been formed with representatives from the RTC, Washoe County, City of Reno, and Jacobs. The TAC has met monthly beginning in February 2020, and together, the TAC has developed eight project goals:

G1. Widen Lemmon Drive from two (2) lanes to four (4) lanes as outlined in the 2040 Regional Transportation Plan (RTP) to accommodate potential future growth.

G2. Provide a safe and reliable regional road during a 100-year flood event by having at least one dry lane in each direction of travel.

G3. Support the Swan Lake mitigation efforts by incorporating floodplain mitigation along Lemmon Drive that significantly reduce or eliminate future maintenance costs for Washoe County and City of Reno. These maintenance costs include HESCO barriers and pumping facilities.

G4. Incorporate safe access for all multi-modal users with the construction of a multi-use path, safer pedestrian crossings, and bike lanes.

G5. Provide opportunities along Lemmon Drive to aid long-term flood response planning.

G6. Upgrade Lemmon Drive to comply with current engineering design criteria (horizontal, vertical, clear zone, etc.) and eliminate any deficiencies in the existing roadway alignment.

G7. Ensure connectivity of future road-network improvements such as the Eagle Canyon Drive Extension and other potential projects in the proposed 2050 RTP by considering logical termini suitable for the region.

G8. Deliver a cost appropriate solution that addresses the goals of the project.

3. Alternatives Screening Process

The alternatives screening process and evaluation criteria for Segment 2 are established early on to ensure that alternatives are assessed objectively by evaluating their ability to meet the identified project goals summarized above.

The alternatives screening process is a two-step process. This first step, known as Level 1 screening, begins with brainstorming ideas with an open-minded approach, identifying all possible alignments and concepts. These alternatives will be qualitatively evaluated against the project goals to determine three alternatives to advance to a 15% design level for further evaluation.

The second step, known as Level 2 screening, will then evaluate the 15% design of the three alternatives against the project goals, TAC input, and professional judgement to determine the preferred alternative to advance to 30% design.

4. Segment 2 Alternatives and Assumptions

The development of Segment 2 alternatives occurred during the TAC workshop held on February 27th, 2020. During the TAC workshop, attendees spilt into four teams to brainstorm alternative alignment ideas, and then each team presented their ideas to the rest of the TAC for discussion. Through this process, twelve alternatives (A1 through A12) were identified, including the No-Build alternative to carry through the Level 1 screening process. Each alternative and the assumptions associated with that alternative are summarized below and are shown in Figures 1-12.

For each alternative except the No Build, it is assumed that Lemmon Drive from Fleetwood Drive to Palace Drive is widened to four lanes with the addition of bicycle lanes in both directions. In addition, it is assumed the profile of Lemmon Drive will be raised to ensure the roadway is above the revised 100-yr flood elevation. Freeboard for wave action will be evaluated as well.

The existing multi-use path along the east side of Lemmon Drive is an 8-ft wide asphalt path and was also flooded during the weather events beginning in 2017. Some areas of the path were still inundated in the fall of 2019. The unique location of this project within the isolated playa basin requires the elevation of the path and the roadway to be set to an agreed upon elevation that consider freeboard for wave action in addition to standing water elevations, rather than a storm event year elevation.

To assist in determining high level construction costs for each alternative, The NDOT Cost Wizard Spreadsheet tool was used. The NDOT Cost Wizard Tool provides consistent calculations with standardized user input. These are included below in Tables 1 through 12.

The assumptions for each of the alternative layouts and the cost wizards are summarized below.

A1. No Build:

- Lemmon Drive remains a 2-lane facility on its existing alignment
- Current maintenance costs for pavement rehabilitation and flood mitigation (including pumping facilities, HESCO barriers, earthen berms, and Tiger Dams) would be ongoing
- The existing geometric deficiencies, including inadequate shoulder width, lack of dedicated bicycle lanes, and a profile elevation below the 100-year floodplain remain. Additionally, in the no-build scenario, the reduced regulatory posted speed limit of 20 mph remains due to flooding mitigation measures in place.
- Lemmon Drive won't have capacity for future connectivity of Eagle Canyon Drive, or other developments
- The existing multi-use path along the east side of Lemmon Drive remains in place along its existing profile, which in August 2019 Google imagery shows a 250 foot length segment is underwater.
- Lemmon Drive currently does not have designated bike lanes, nor is there an adequate shoulder along the existing Lemmon Drive to accommodate bicycles
- Current pumping activities would need to be continued to get water into Swan Lake from east of Lemmon Drive

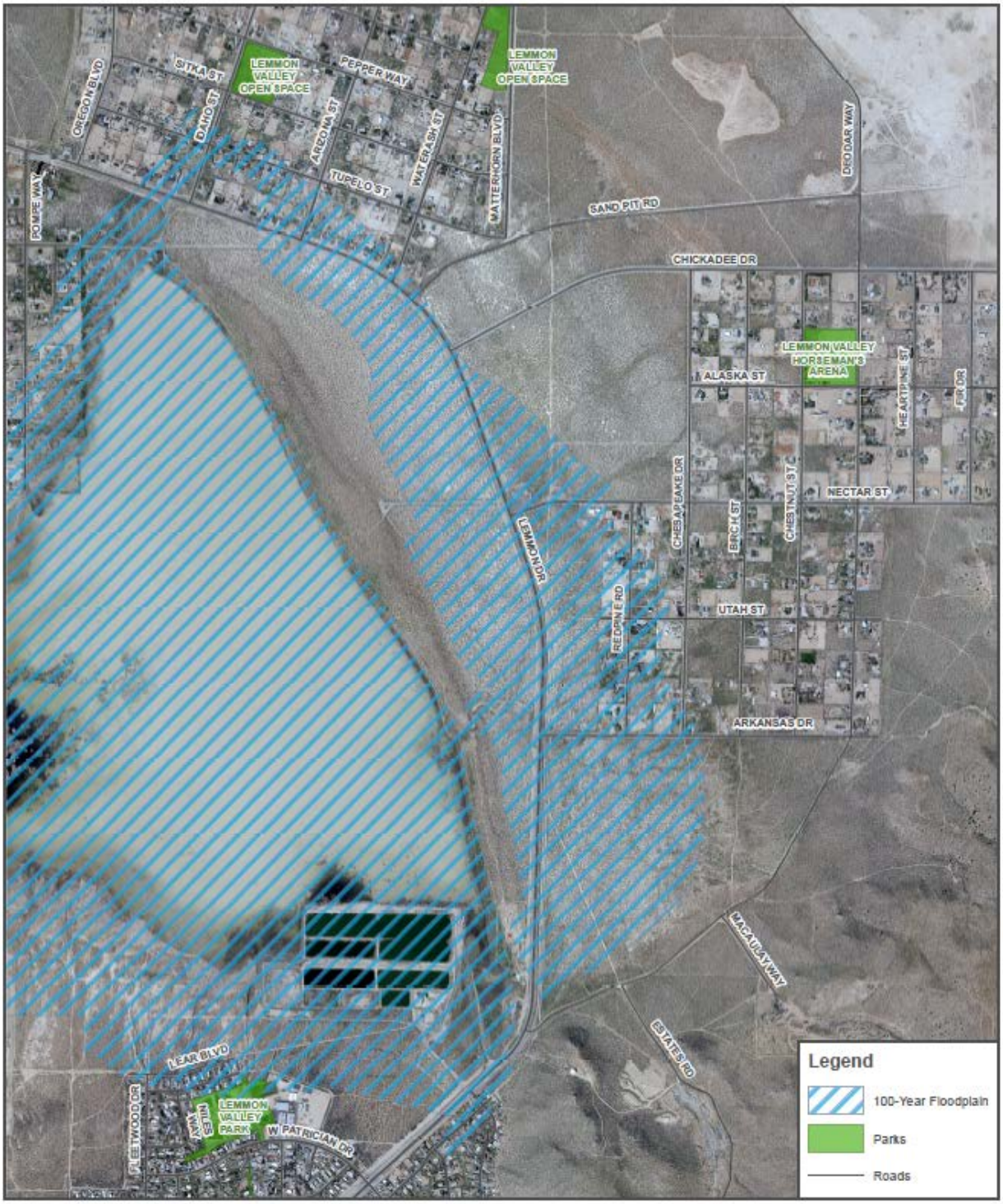


Figure 1. No Build

Lemmon Drive remains a 2-lane facility on its existing alignment

A2. Elevate existing Lemmon Drive above the 100-yr. floodplain:

- Maintain existing horizontal alignment of Lemmon Drive
- Widen from 2 to 4 lanes as an undivided arterial; and raise the vertical profile up to 2.5′ to ensure one lane in either travel direction remains dry to provide residents and emergency vehicle access during a 100-yr. flood event
  (existing profile low point is approximately 4922.4′)
- Will require volumetric mitigation for additional roadway fill placed in the floodplain
- Requires equalization culverts under the roadway to keep the WSE the same on both sides of the roadway
- Includes dedicated bicycle lanes in both directions
- The existing 8′ wide multi-use path east of Lemmon Drive is reconstructed as a 10′ wide path and the profile raised above an agreed upon elevation.
- Adequate shoulder width and a vertical profile that meet current design standards will be provided.
- Raising the profile of Lemmon Drive will require side street profile tie-in adjustments
- Raising the roadway profile elevation does not imply the roadway will act as a berm/levee; but this could be an option depending on the solution determined by the Washoe County Swan Lake Mitigation Studies.
- Raising the profile grade allows reconstruction of the pavement section with less dewatering efforts than trying to reconstruct at the same profile elevation.
- Cost Wizard Assumptions:
  - Lemmon Drive profile raised approximately 2.5′ to be above the new floodplain elevation with agreed upon freeboard so construction was priced as a “new” 4-lane undivided roadway.
  - Multiuse path profile raised so priced as ‘new’ construction
  - Traffic signal installed at Chickadee Drive to accommodate anticipated volumes with the future Eagle Canyon Drive roadway extension
  - Additional Items used Default value of 15% plus volumetric mitigation for roadway fill at a place holder cost of $1,000,000
  - Default Standard Percentage Adders values were used for Erosion Control, Traffic Control, Roadside Safety, Landscaping/Aesthetics, Mobilization, and Construction Engineering & Inspection
  - Construction Cost Escalation to year 2023
  - Engineering Design Escalation to year 2022
  - Hydraulics/Storm Water Costs set at 5% since within a floodplain
  - No acquisition of right of way

Figure 2. Elevate Lemmon Drive

Elevate existing Lemmon Drive above the 100-yr floodplain; Widen from two to four lanes

SUMMARY

ESTIMATED PROBABLE CONSTRUCTION COST

Alt. 2-Widen&Raise Profile Along Ext Alg

PREPARED BY THE NEVADA DEPARTMENT OF TRANSPORTATION

SECTION	ESCALATED TO YEAR	TOTAL
SECTION I - ROADWAY CONSTRUCTION		$11,613,878
SECTION II - BRIDGES		
SECTION III - WALLS		
SECTION IV - TYPICAL INTERCHANGES		
SECTION V - SIGNAL SYSTEMS AT INTERSECTIONS		$212,000
SECTION VI - DEMOLITION		
SECTION VII - ADDITIONAL ITEMS		$2,773,882
SECTION VIII - STANDARD PERCENTAGE ADDERS		$6,329,470
TOTAL PRESENT DAY CONSTRUCTION COST		$20,929,230
TOTAL ESCALATED CONSTRUCTION COST	2023	$23,011,688
TOTAL CONSTRUCTION & ENGINEERING	2022	$24,409,000
SECTION IX - HYDRAULICS/STORM WATER COSTS	2023	$1,341,885
SECTION X - RIGHT OF WAY COSTS	2022	
GRAND TOTAL PROJECT COST		$25,750,885

	CURRENT ESTIMATE	LOW RANGE	HIGH RANGE
TOTAL PRESENT DAY CONSTRUCTION COST	$20,900,000	$19,800,000	$24,000,000
TOTAL PROJECT COST	$25,800,000	$24,300,000	$29,600,000

Estimate prepared by:	K. Stansbury
Date of initial estimate:	May 11, 2020
Date of latest estimate revision:	May 11, 2020
Route name or number:	PWP-WA-2020-xxx
Project Title:	Alt. 2-Widen&Raise Profile Along Ext Alg
Project length (in miles):	2.4
District price database used:	District 2
Predominant County:	Washoe
NDOT project manager:	RTC PM - Dale Keller

A3. Elevate one side of the roadway above the floodplain:

- One option for this alternative is to rehabilitate the existing Lemmon Drive along its existing alignment and convert it to a two-lane northbound or southbound alignment. A new two-lane alignment for the alternative direction is constructed either west or east of the existing Lemmon Drive, depending on the direction travel, above the newly established 100-year floodplain elevation. In this option, if the southbound lanes are constructed at the 100-year floodplain elevation, they could act as a berm/levee as necessary to coordinate with the Washoe County Swan Lake Mitigation Study.
- The other option for this alternative would be to raise the profile of the existing Lemmon Drive alignment above the newly established 100-yr. floodplain elevation and convert it to a two-lane northbound or southbound alignment. A new two-lane alignment for the alternative direction is constructed either west of east of the exiting Lemmon Drive, depending on the direction of travel, near the existing ground elevation. In this option, raising the existing roadway for the southbound direction could allow the roadway closest to Swan Lake to act as a berm/levee as necessary to coordinate with the Washoe County Swan Lake Mitigation Study.
- To accommodate the difference in profiles, the roadway becomes a divided alignment similar to the geometric layout between Military Road and Fleetwood Drive. U-turn opportunities would be located at the locations of the side street intersections.
- In the event of a flood, the higher roadway could be converted to a two-lane two-directional roadway to maintain access along this regional road.
- Includes a bicycle lane in each direction and a 10' wide multi-use path separated from the roadway alignment.
- Compared to Alternative #2, this alternative lessens the amount of new fill placed within the floodplain by only elevating one direction of travel
- Must address the need to get the water into Swan Lake from the east with one direction of travel near the existing ground elevation.
- Reconstruction of the existing Lemmon Drive will include adequate shoulder widths and minor geometric profile adjustments as necessary to ensure 0.5% longitudinal grade.
- Cost Wizard Assumptions:
    - Southbound Lemmon Drive profile raised approximately 2.5' above new floodplain elevation so priced 2-lane undivided road as 'new' roadway construction and 2-lane roadway as roadbed modification with asphalt pavement.
    - Multiuse path profile raised so priced as 'new' construction
    - Traffic signals installed at both northbound and southbound at Chickadee Drive to accommodate volumes of future Eagle Canyon Drive Extension
    - Additional Items used Default value of 15% plus volumetric mitigation for southbound roadway fill at $750,000 and cost to pump water under northbound roadway at $250,000.
    - Default Standard Percentage Adders values were used for Erosion Control, Traffic Control, Roadside Safety, Landscaping/Aesthetics, Mobilization, and Construction Engineering & Inspection.

- Construction Cost Escalation to year 2023
- Engineering Design Escalation to year 2022
- Hydraulics/Storm Water Costs set at 5% since within a floodplain
- No acquisition of right of way

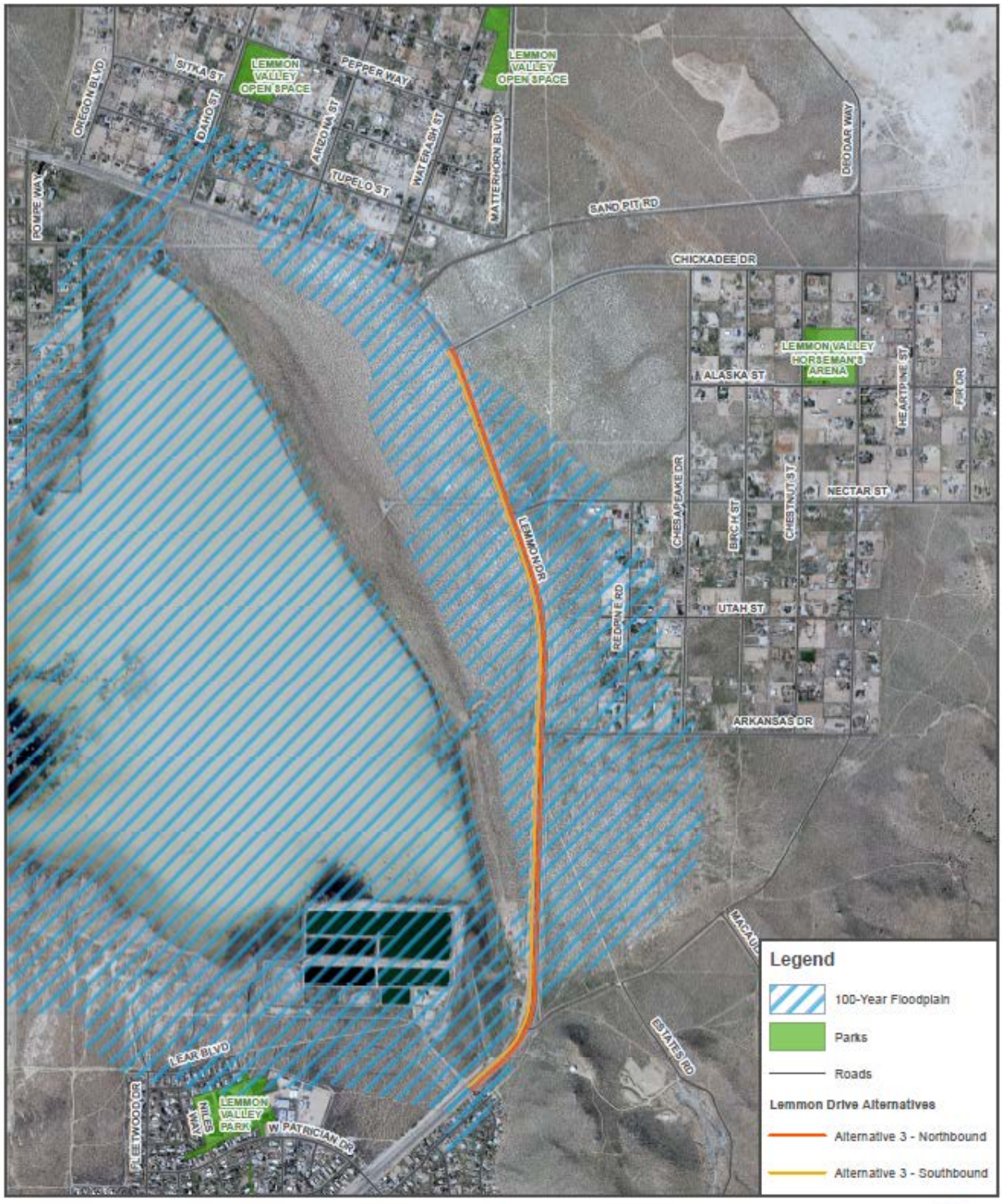


Figure 3. Elevate One Side of Lemmon Drive

Convert existing Lemmon Drive into a two-lane southboundalignment and construct a new northbound alignment east of Lemmon Dr above the floodplain

SUMMARY

ESTIMATED PROBABLE CONSTRUCTION COST

Alt. 3 - Elevate SB / NB along Existing

PREPARED BY THE NEVADA DEPARTMENT OF TRANSPORTATION

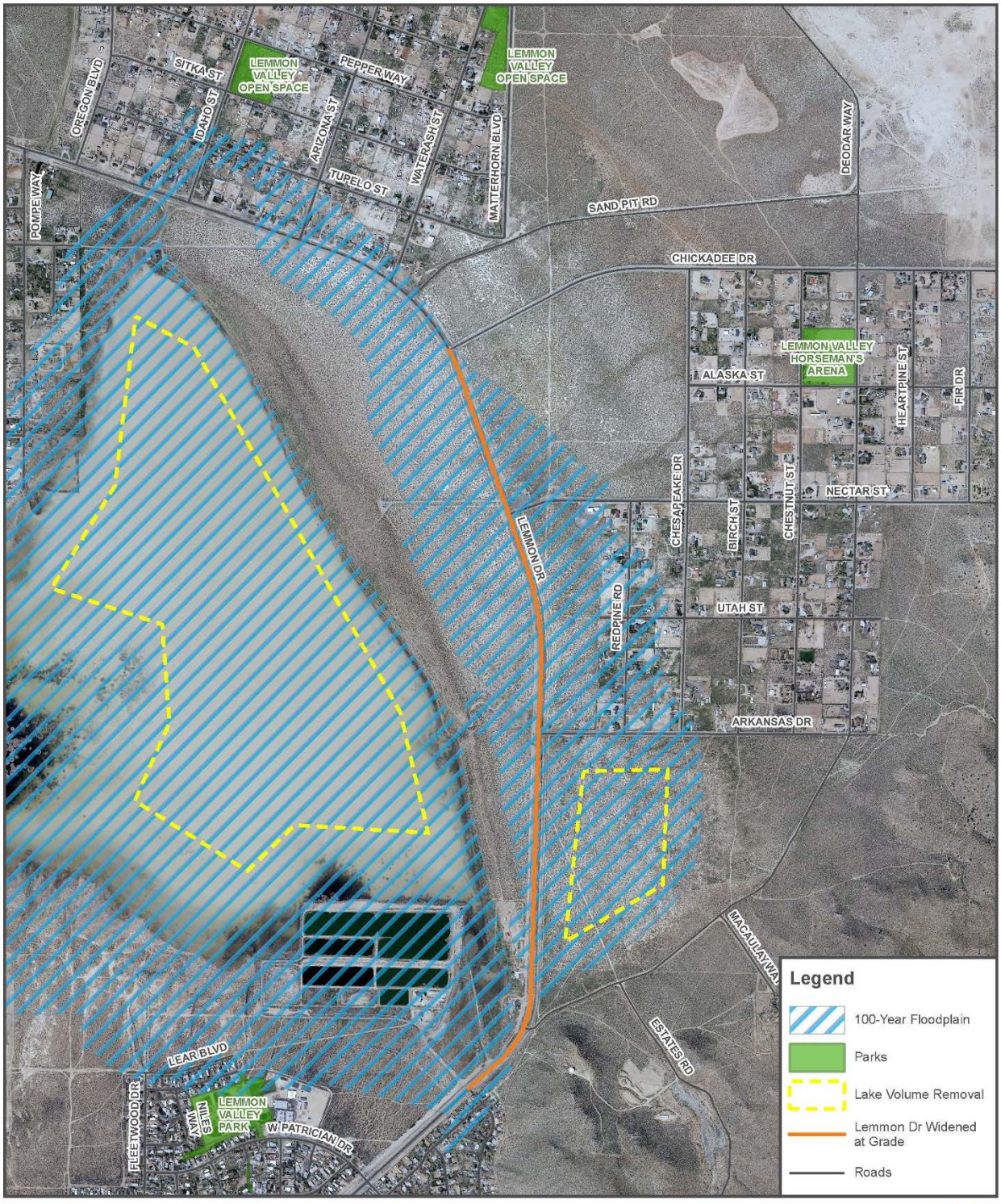
SECTION	ESCALATED TO YEAR	TOTAL
SECTION I - ROADWAY CONSTRUCTION		$9,309,475
SECTION II - BRIDGES		
SECTION III - WALLS		
SECTION IV - TYPICAL INTERCHANGES		
SECTION V - SIGNAL SYSTEMS AT INTERSECTIONS		$318,000
SECTION VI - DEMOLITION		
SECTION VII - ADDITIONAL ITEMS		$2,444,121
SECTION VIII - STANDARD PERCENTAGE ADDERS		$5,233,429
TOTAL PRESENT DAY CONSTRUCTION COST		$17,305,026
TOTAL ESCALATED CONSTRUCTION COST	2023	$19,026,876
TOTAL CONSTRUCTION & ENGINEERING	2022	$20,183,152
SECTION IX - HYDRAULICS/STORM WATER COSTS	2023	$1,109,569
SECTION X - RIGHT OF WAY COSTS	2022	
GRAND TOTAL PROJECT COST		$21,292,721

	CURRENT ESTIMATE	LOW RANGE	HIGH RANGE
TOTAL PRESENT DAY CONSTRUCTION COST	$17,300,000	$16,300,000	$19,900,000
TOTAL PROJECT COST	$21,300,000	$20,100,000	$24,400,000

Estimate prepared by:	K. Stansbury
Date of initial estimate:	May 11, 2020
Date of latest estimate revision:	May 11, 2020
Route name or number:	PWP-WA-2020-xxx
Project Title:	Alt. 3 - Elevate SB / NB along Existing
Project length (in miles):	2.4
District price database used:	District 2
Predominant County:	Washoe
NDOT project manager:	RTC PM - Dale Keller

A4. Lake Volume removal to lower the floodplain below the existing elevation of Lemmon Drive: .

- Excavate enough soil from Swan Lake to lower the flood plain elevation approximately 2.5' allowing the existing profile of Lemmon Drive to be maintained, while widening to four lanes.
- Excavation will also be done east of Lemmon Drive to provide additional retention volume and avoid overtopping of the roadway. Even with this retention volume, there must still be a way to accommodate getting water into Swan Lake from east of Lemmon Drive.
- Includes a dedicated bicycle lane in each direction and a 10' wide multi-use path
- An exorbitant amount of excavation would be required for this to be a viable alternative; a recent Washoe County study showed approximately 2 feet of removal would be required to provide an additional 3200 Acre-feet of lake volume at a cost of $100-$120 million, not including off haul costs.
- Off-haul of excavation is required as it cannot be placed on nearby land earmarked to be developed.
- Ongoing maintenance of sedimentation removal would be required to maintain excavated volume
- A study performed by TMWA shows there is an existing aquifer confining clay layer that any excavation shall not penetrate.
- Reconstruction of the existing Lemmon Drive will widen it to four lanes, include adequate shoulder widths and minor geometric profile adjustments as necessary to ensure 0.5% longitudinal grade. Lemmon Drive will not need to be elevated, as the excavation lowers the 100-year floodplain elevation.
- Cost Wizard Assumptions:
    - Roadway priced as widen 2 lanes to 4 lanes and the existing 2-lane roadway receives roadbed modification with asphalt pavement.
    - Multiuse path profile raised so priced as 'new' construction
    - Traffic signal installed at Chickadee Drive to accommodate future volumes with Eagle Canyon Drive Extension
    - Additional Items used Default value of 15% plus excavation of Swan Lake to provide 3,200 Acre-feet of floodplain storage volume at a cost of $110,000,000.
    - Default Standard Percentage Adders values were used for Erosion Control, Traffic Control, Roadside Safety, Landscaping/Aesthetics, Mobilization, and Construction Engineering & Inspection.
    - Construction Cost Escalation to year 2023
    - Engineering Design Escalation to year 2022
    - Hydraulics/Storm Water Costs set at 5% since within a floodplain
    - No acquisition of right of way



ROADWAY SECTION DRAWING HERE

Figure 4. Lower the Floodplain

Excavate enough soil from Swan Lake tto lower the floodplain elevation by ~2.5 feet; Excavate east of Lemmon Dr to provide additional retention volume

SUMMARY

ESTIMATED PROBABLE CONSTRUCTION COST

Alternative 4 - Excavate Swan Lake

PREPARED BY THE NEVADA DEPARTMENT OF TRANSPORTATION

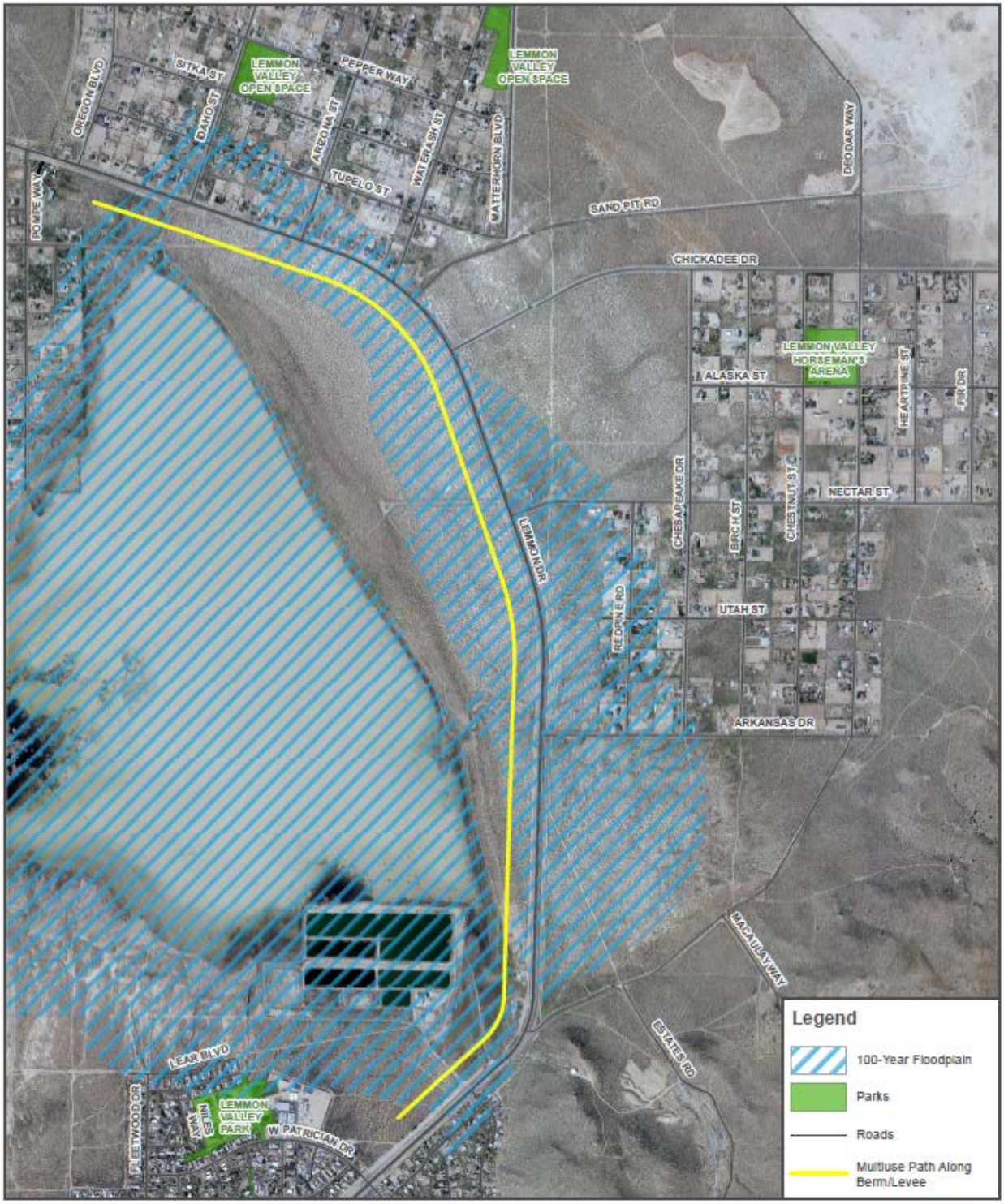
SECTION	ESCALATED TO YEAR	TOTAL
SECTION I - ROADWAY CONSTRUCTION		$8,059,368
SECTION II - BRIDGES		
SECTION III - WALLS		
SECTION IV - TYPICAL INTERCHANGES		
SECTION V - SIGNAL SYSTEMS AT INTERSECTIONS		$212,000
SECTION VI - DEMOLITION		
SECTION VII - ADDITIONAL ITEMS		$111,240,705
SECTION VIII - STANDARD PERCENTAGE ADDERS		$51,812,368
TOTAL PRESENT DAY CONSTRUCTION COST		$171,324,441
TOTAL ESCALATED CONSTRUCTION COST	2023	$188,371,223
TOTAL CONSTRUCTION & ENGINEERING	2022	$199,770,929
SECTION IX - HYDRAULICS/STORM WATER COSTS	2023	$10,982,407
SECTION X - RIGHT OF WAY COSTS	2022	
GRAND TOTAL PROJECT COST		$210,753,336

	CURRENT ESTIMATE	LOW RANGE	HIGH RANGE
TOTAL PRESENT DAY CONSTRUCTION COST	$171,300,000	$157,200,000	$205,500,000
TOTAL PROJECT COST	$210,800,000	$194,700,000	$250,800,000

Estimate prepared by:	K. Stansbury
Date of initial estimate:	May 11, 2020
Date of latest estimate revision:	May 11, 2020
Route name or number:	PWP-WA-2020-xxx
Project Title:	Alternative 4 - Excavate Swan Lake
Project length (in miles):	2.4
District price database used:	District 2
Predominant County:	Washoe
NDOT project manager:	RTC PM - Dale Keller

A5. Elevate Shared-use path to act as a berm/levee:

- Construct a 10' wide multi-use path west of the existing Lemmon Drive alignment to act as a berm/levee. This alternative should only be considered if a berm/levee is the solution determined by the Washoe County Swan Lake Mitigation Study.
- Lemmon Drive is widened to four lanes along its existing alignment and includes the addition of dedicated bikes lanes in both directions.
- Adequate shoulder widths and minor profile adjustments to ensure a minimum 0.5% profile grade are included to comply with current design standards.
- Must address the need to get offsite flows into Swan Lake from east and north of Lemmon Drive.
- Assumes roadway widened to the east and the shared use path berm/levee is constructed west of Lemmon Drive.
- Cost Wizard Assumptions:
    - Roadway priced as widen 2 lanes to 4 lanes and the existing 2-lane roadway receives roadbed modification with asphalt pavement.
    - Multiuse path profile raised so priced as 'new' construction
    - Traffic signal installed at Chickadee Drive to accommodate volumes of future Eagle Canyon Drive Extension
    - Additional Items: used Default value of 15% plus berm/levee design requirements at $1,500,000 plus pumping requirements under Lemmon Drive from east/north at $500,000.
    - Default Standard Percentage Adders values were used for Erosion Control, Traffic Control, Roadside Safety, Landscaping/Aesthetics, Mobilization, and Construction Engineering & Inspection
    - Construction Cost Escalation to year 2023
    - Engineering Design Escalation to year 2022
    - Hydraulics/Storm Water Costs set at 5% since within a floodplain
    - No acquisition of right of way



LEMMON DRIVE PROJECT

N

0 0.125 0.25 Miles

Data Sources: FEMA, Jacobs, and Washoe County

ROADWAY SECTION DRAWING HERE

Figure 5. Elevated Shared-Use Path

Construct a ten foot wide multi-use path west of the existing Lemmon Dr alignment to act as a berm/levee

RTC

Jacobs

Jacobs

SUMMARY

ESTIMATED PROBABLE CONSTRUCTION COST

Alt. 5 - Elevated Path as Berm/Levee

PREPARED BY THE NEVADA DEPARTMENT OF TRANSPORTATION

SECTION	ESCALATED TO YEAR	TOTAL
SECTION I - ROADWAY CONSTRUCTION		$8,059,368
SECTION II - BRIDGES		
SECTION III - WALLS		
SECTION IV - TYPICAL INTERCHANGES		
SECTION V - SIGNAL SYSTEMS AT INTERSECTIONS		$212,000
SECTION VI - DEMOLITION		
SECTION VII - ADDITIONAL ITEMS		$3,240,705
SECTION VIII - STANDARD PERCENTAGE ADDERS		$4,990,858
TOTAL PRESENT DAY CONSTRUCTION COST		$16,502,931
TOTAL ESCALATED CONSTRUCTION COST	2023	$18,144,972
TOTAL CONSTRUCTION & ENGINEERING	2022	$19,247,903
SECTION IX - HYDRAULICS/STORM WATER COSTS	2023	$1,058,153
SECTION X - RIGHT OF WAY COSTS	2022	
GRAND TOTAL PROJECT COST		$20,306,056

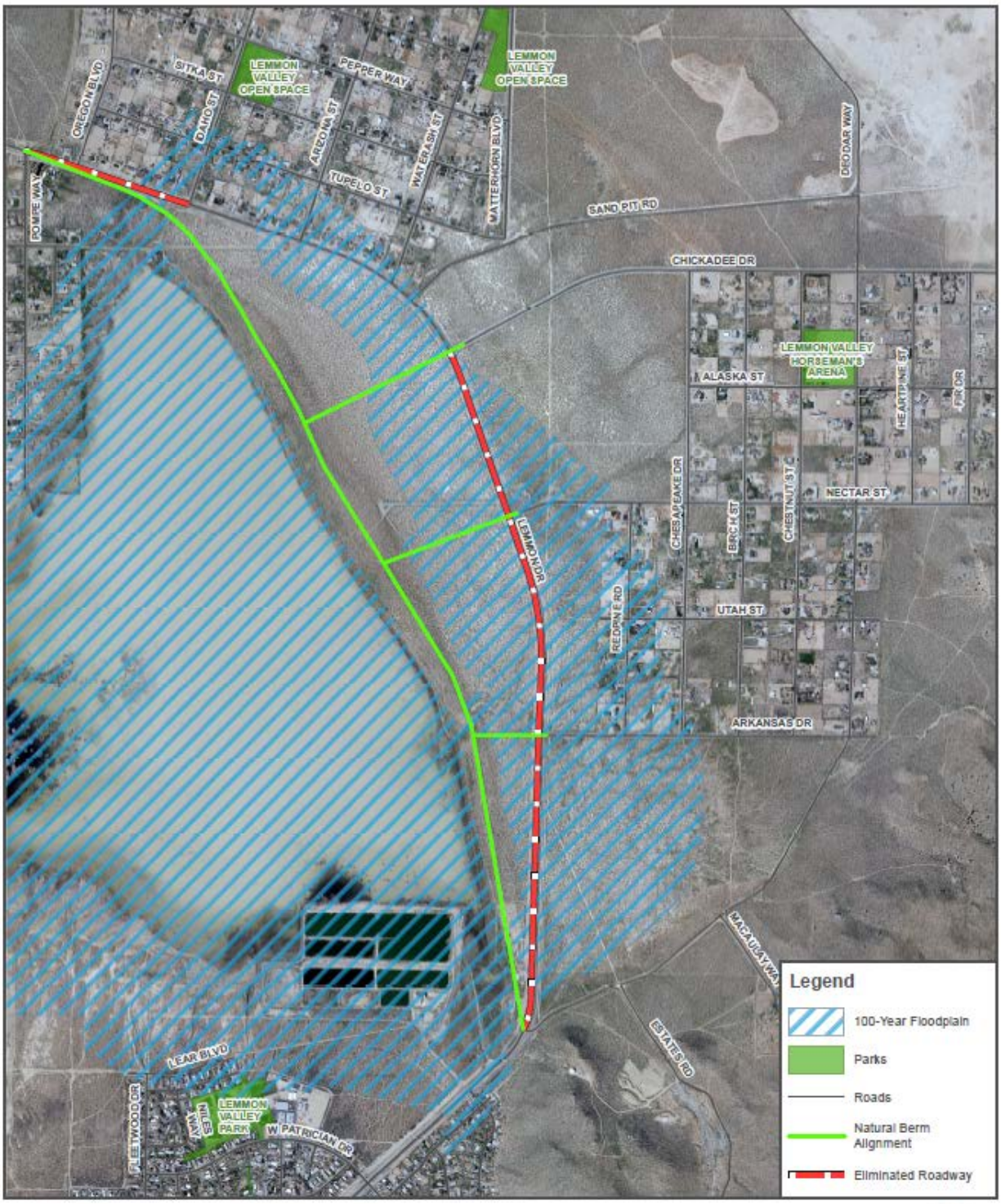
	CURRENT ESTIMATE	LOW RANGE	HIGH RANGE
TOTAL PRESENT DAY CONSTRUCTION COST	$16,500,000	$15,500,000	$19,000,000
TOTAL PROJECT COST	$20,300,000	$19,100,000	$23,400,000

Estimate prepared by:	K. Stansbury
Date of initial estimate:	May 11, 2020
Date of latest estimate revision:	May 11, 2020
Route name or number:	PWP-WA-2020-xxx
Project Title:	Alt. 5 - Elevated Path as Berm/Levee
Project length (in miles):	2.4
District price database used:	District 2
Predominant County:	Washoe
NDOT project manager:	RTC PM - Dale Keller

A6. Natural Berm Realignment:

- Realign Lemmon Drive to the west along the natural berm of Swan Lake; (Google shows a dirt road labeled as Idaho Street along this natural berm).
- The realignment would begin with a continuation of the horizontal curve near Deodar Way to align the roadway with the natural berm.
- At the northern end, the realignment would end with a horizontal curve matching into the existing Lemmon Drive alignment at Pompe Way (to provide adequate distance to match back into the existing profile of Lemmon Drive).
- The existing elevation of this natural berm allows Lemmon Drive to be constructed 'at-grade' and be above the adjusted 100-yr. floodplain elevation
- The new alignment would provide four lanes and be designed to current geometric standards.
- Potentially, Arkansas St., Nectar St., and Chickadee Dr., or some combination thereof, would be extended westward to connect into the realigned Lemmon Drive.
- A drainage structure would need to be provided along the realigned Lemmon Drive near the Arkansas St. extension to perpetuate an existing low spot along the natural berm.
- The existing Lemmon Drive between Pompe Way and Idaho Street would be eliminated, requiring the acquisition of approximately ten properties with frontage to Lemmon Drive.
- Idaho Street is not extended to tie into the realigned Lemmon Drive.
- With the removal of Lemmon Drive between Pompe Way and Idaho Street, additional volumetric storage becomes available and a large equalization structure would be constructed under the natural berm alignment at the northern end of Swan Lake.
- Jean Way would continue to have access to/from the western side of Swan Lake.
- The existing 3,500 feet of Lemmon Drive from Idaho Street south to Chickadee Drive would be maintained to preserve local access for the properties with frontage to Lemmon Drive. This existing segment of roadway provides access to the realigned Lemmon Drive via Chickadee Drive.
- From Chickadee Drive south to Deodar Way the existing roadway would be removed. This eliminates the need to continue to maintain this roadway and eliminates the need for any necessary intersection improvements with the extension of Arkansas St., Nectar St. and Chickadee Drive. In addition, this increases the available volume within the floodplain and may assist in lowering the base floodplain elevation.
- Dedicated bike lanes in both directions are included along the realigned Lemmon Drive.
- A 10' wide multi-use path would either be constructed along the west side of the realigned Lemmon Drive to provide scenic views of Swan Lake and the multitude of birds that migrate through the area, or along its existing alignment but raised to an agreed upon elevation.
- Cost Wizard Assumptions:
    - Lemmon Drive priced as new 4-lane undivided roadway, a length of 3.0 miles, extension of Chickadee Dr., Nectar St., and Arkansas St. roadways are priced as new 2-lane undivided roadways, with a total combined length of 0.85 miles.

- Multiuse path is either realigned or the profile raised, so is priced as 'new' construction
- 4-lane culvert/bridge structure provided to perpetuate the natural break in the berm near the Arkansas St. extension
- 4-lane culvert/bridge structure provide to perpetuate the natural drainage way at the north end of Swan Lake.
- Traffic signal installed at Chickadee Drive to accommodate future volumes from the extension of Eagle Canyon Drive.
- Demolish 1.85 miles of existing Lemmon Drive
- Additional Items: used Default value of 15%.
- Default Standard Percentage Adders values were used for Erosion Control, Traffic Control, Roadside Safety, Landscaping/Aesthetics, Mobilization, and Construction Engineering & Inspection
- Construction Cost Escalation to year 2023
- Engineering Design Escalation to year 2022
- Hydraulics/Storm Water Costs set at 5% since within a floodplain
- Right of Way acquisition is required:
    - Developed Parcels assumed at $500,000 (take and relocation)
        - 080-461-03
        - 080-671-04
    - Washoe County Owned Parcels @ $0 acre (portion or full)
        - 080-461-19
    - BLM owned parcels @ $0/acre (portion or full)
        - 080-671-43
        - 080-722-02
    - Undeveloped parcels owned by North Valleys Investment Group @6,000/acre
        - 080-671-57 – 40 acres
        - 080-671-56 – 20 acres
        - 080-671-55 – 36 acres
        - 080-722-03 – 100 acres



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0 0.125 0.25 Miles

Data Sources: FEMA, Jacobs, and Washoe County

ROADWAY SECTION DRAWING HERE

Figure 6. Natural Berm Alignment

Construct a ten foot wide multi-use path west of the existing Lemmon Dr alignment to act as a berm/levee

SUMMARY

ESTIMATED PROBABLE CONSTRUCTION COST

Alt. 6 - Natural Berm Realignment

PREPARED BY THE NEVADA DEPARTMENT OF TRANSPORTATION

SECTION	ESCALATED TO YEAR	TOTAL
SECTION I - ROADWAY CONSTRUCTION		$16,776,765
SECTION II - BRIDGES		$3,923,198
SECTION III - WALLS		
SECTION IV - TYPICAL INTERCHANGES		
SECTION V - SIGNAL SYSTEMS AT INTERSECTIONS		$212,000
SECTION VI - DEMOLITION		$345,786
SECTION VII - ADDITIONAL ITEMS		$3,188,663
SECTION VIII - STANDARD PERCENTAGE ADDERS		$10,598,314
TOTAL PRESENT DAY CONSTRUCTION COST		$35,044,727
TOTAL ESCALATED CONSTRUCTION COST	2023	$38,531,677
TOTAL CONSTRUCTION & ENGINEERING	2022	$40,867,774
SECTION IX - HYDRAULICS/STORM WATER COSTS	2023	$2,246,706
SECTION X - RIGHT OF WAY COSTS	2022	$2,334,195
GRAND TOTAL PROJECT COST		$45,448,676

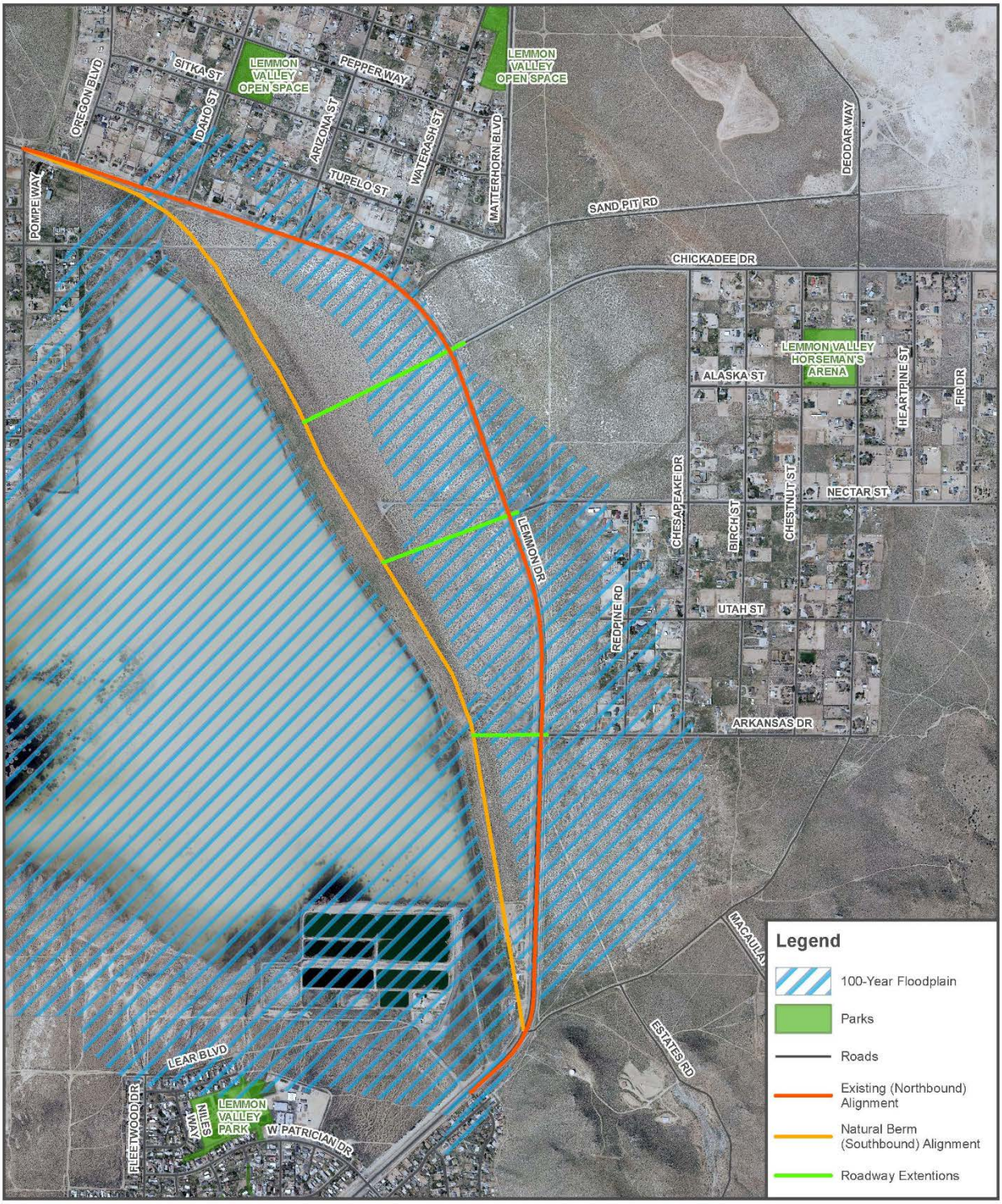
	CURRENT ESTIMATE	LOW RANGE	HIGH RANGE
TOTAL PRESENT DAY CONSTRUCTION COST	$35,000,000	$32,400,000	$39,700,000
TOTAL PROJECT COST	$45,400,000	$42,300,000	$51,700,000

Estimate prepared by:	K. Stansbury
Date of initial estimate:	May 11, 2020
Date of latest estimate revision:	May 11, 2020
Route name or number:	PWP-WA-2020-xxx
Project Title:	Alt. 6 - Natural Berm Realignment
Project length (in miles):	3.0
District price database used:	District 2
Predominant County:	Washoe
NDOT project manager:	RTC PM - Dale Keller

A7. Divided alignment between existing alignment and the natural berm alignment:

- Similar to Alternative 6, however, only construct the two southbound lanes along the natural berm alignment above the 100-year flood elevation, while maintaining the existing Lemmon Drive alignment for the two northbound lanes.
- Arkansas St., Nectar St., and Chickadee Dr. would be extended westward to connect into the realigned Lemmon Drive. This creates additional intersections, as these cross streets would require intersections at both the northbound and the southbound alignments.
- Unlike Alternative 6, the existing Lemmon Drive between Pompe Way and Idaho Street is perpetuated for the northbound direction, and no acquisitions are required.
- During times of elevated lake levels, the natural berm alignment can be converted into a two-lane, two-way roadway to maintain regional access.
- A dedicated bike lane for both directions of travel is included in the roadway typical section.
- A 10' wide multi-use path would either be provided along the west side of the new southbound natural berm alignment to provide scenic views of Swan Lake and the multitude of birds that migrate through the area or raised and widened along the existing path alignment.
- The southbound alignment is designed to current geometric design standards.
- Reconstruction of the existing Lemmon Drive for the northbound lanes will include adequate shoulder widths and minor geometric profile adjustments as necessary to ensure 0.5% longitudinal grade. Northbound Lemmon Drive will not be elevated above the 100-year floodplain elevation.
- Need to accommodate getting the water into Swan Lake from east and north of Lemmon Drive.
- Cost Wizard Assumptions:
    - Lemmon Drive priced as new 2-lane undivided roadway for southbound, 3.0 miles, and, roadbed modification with asphalt pavement for separate northbound, 2.0 miles. Extension of Chickadee Dr., Nectar St., and Arkansas St. roadways priced as new 2-lane undivided roadways, a total combined length of 0.85 miles.
    - Multiuse path either relocated or raised along its existing alignment so priced as 'new' construction.
    - 2-lane culvert/bridge structure provided to perpetuate the natural break in the berm near the Arkansas St. extension for southbound natural berm alignment.
    - 2-lane culvert/bridge structure provide to perpetuate the natural drainage way at the north end of Swan Lake for southbound natural berm alignment.
    - Traffic signals installed at southbound and northbound Lemmon Drive at Chickadee Drive to accommodate future volumes from the extension of Eagle Canyon Drive.
    - Additional Items: used Default value of 15%.
    - Default Standard Percentage Adders values were used for Erosion Control, Traffic Control, Roadside Safety, Landscaping/Aesthetics, Mobilization, and Construction Engineering & Inspection

- Construction Cost Escalation to year 2023
- Engineering Design Escalation to year 2022
- Hydraulics/Storm Water Costs set at 5% since within a floodplain
- Right of Way acquisition is required: (assumed to impact approximately same amount as if doing full 4 lane roadway along natural berm)
    - Developed Parcels assumed at $500,000 (take and relocation)
        - 080-461-03
        - 080-671-04
    - Washoe County Owned Parcels @ $0 acre (portion or full)
        - 080-461-19
    - BLM owned parcels @ $0/acre (portion or full)
        - 080-671-43
        - 080-722-02
    - Undeveloped parcels owned by North Valleys Investment Group @6,000/acre
        - 080-671-57 – 40 acres
        - 080-671-56 – 20 acres
        - 080-671-55 – 36 acres
        - 080-722-03 – 100 acres



LEMMON DRIVE PROJECT

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0 0.125 0.25 Miles

Data Sources: FEMA, Jacobs, and Washoe County

ROADWAY SECTION DRAWING HERE

Figure 7.Exisiting and Divided Berm Alignment

Construct two southbound lanes along the natural berm and maintain the existing Lemmon Dr alignment forthe two northbound lanes

RTC

Jacobs

Jacobs

SUMMARY

ESTIMATED PROBABLE CONSTRUCTION COST

Alt. 7 - SB NaturalBerm / NB Existing

PREPARED BY THE NEVADA DEPARTMENT OF TRANSPORTATION

SECTION	ESCALATED TO YEAR	TOTAL
SECTION I - ROADWAY CONSTRUCTION		$13,189,644
SECTION II - BRIDGES		$2,082,519
SECTION III - WALLS		
SECTION IV - TYPICAL INTERCHANGES		
SECTION V - SIGNAL SYSTEMS AT INTERSECTIONS		$318,000
SECTION VI - DEMOLITION		
SECTION VII - ADDITIONAL ITEMS		$2,338,524
SECTION VIII - STANDARD PERCENTAGE ADDERS		$7,772,669
TOTAL PRESENT DAY CONSTRUCTION COST		$25,701,357
TOTAL ESCALATED CONSTRUCTION COST	2023	$28,258,642
TOTAL CONSTRUCTION & ENGINEERING	2022	$29,973,335
SECTION IX - HYDRAULICS/STORM WATER COSTS	2023	$1,647,784
SECTION X - RIGHT OF WAY COSTS	2022	$2,334,195
GRAND TOTAL PROJECT COST		$33,955,315

	CURRENT ESTIMATE	LOW RANGE	HIGH RANGE
TOTAL PRESENT DAY CONSTRUCTION COST	$25,700,000	$23,900,000	$29,200,000
TOTAL PROJECT COST	$34,000,000	$31,800,000	$38,800,000

Estimate prepared by:	K. Stansbury
Date of initial estimate:	May 11, 2020
Date of latest estimate revision:	May 11, 2020
Route name or number:	PWP-WA-2020-xxx
Project Title:	Alt. 7 - SB NaturalBerm / NB Existing
Project length (in miles):	3.0
District price database used:	District 2
Predominant County:	Washoe
NDOT project manager:	RTC PM - Dale Keller

A8. Deodar Way Realignment:

- Realign Lemmon Drive to the east along the existing Deodar Way corridor.
- Existing Lemmon Drive between Chickadee Drive and Deodar Way is eliminated.
- The realignment would begin near the existing Deodar Way intersection, continuing north along the Deodar Way corridor, terminating as a signalized intersection with Chickadee Dr.
- This alignment can be built 'on-grade' as it would be above the adjusted 100-yr. floodplain elevation
- The new alignment would provide four lanes and be designed to current geometric standards.
- Widening of the existing Deodar Way corridor to accommodate four lanes of traffic and a dedicated bike lane in both directions would have property impacts to approximately 40 parcels.
- The existing 8' wide multi-use path would be reconstructed as a 10' wide path and the profile raised to an agreed upon elevation. This separates path users from the four-lane roadway facility and provides scenic views of Swan Lake.
- This realignment introduces two intersections that current traffic along Lemmon Drive does not navigate through, a signalized intersection where the realigned Lemmon Drive intersects Chickadee Dr. and a possible roundabout for the directional traffic movement where Chickadee Dr. intersects with the existing Lemmon Drive. Realigning Chickadee Drive along a large radius horizonal curve west of Chesapeake Dr. to Tupelo Street may be possible to eliminate the need for a second intersection where Chickadee Dr. would intersect with the existing Lemmon Dr.
- A second option for this alternative, identified as alternative 8a, is to realign Lemmon Drive east of Deodar Way along Fir Drive. Fir Drive would be widened to the east to accommodate the four lanes and dedicated bike lanes, affecting only 8 parcels, rather than the 40 parcels required along the Deodar Way alignment.
- A third option for this alternative is to realign Lemmon Drive farther east to avoid all the developed parcels of this neighborhood. This alternative is identified as 8b. The terrain becomes very hilly just east of Fir Drive so retaining walls may be required. Connectivity to the neighborhood must be perpetuated from the realigned Lemmon Drive.
- The new profile alignment would accommodate existing drainage pathways to Swan Lake.
- Mitigation measures would still need to be employed at Nectar St. and other localized spots along the existing Lemmon Drive alignment to address flooding. The existing Lemmon Drive could be repurposed into a HESCO barrier platform should future water elevations require protection of developed parcels.
- Alt. 8 Cost Wizard Assumptions:
    - Lemmon Drive priced as new 4-lane undivided roadway from Fleetwood Dr. to Chickadee Dr., along Deodar Way, a length of 2.87 miles. Then Chickadee Dr. priced as two new lanes plus two lanes of roadbed modification from the realignment to the existing Lemmon Drive, a length of 0.92 miles.

- Multiuse path constructed new along realignment or raised and widened along the existing alignment.
- Traffic signals installed at realigned Lemmon Drive (Deodar Way) / Chickadee Dr. and at Chickadee Dr. / existing Lemmon Drive (priced as signal but a roundabout seems like a more practical solution).
- Demolish 1.45 miles of existing Lemmon Drive
- Additional Items: used Default value of 15%.
- Default Standard Percentage Adders values were used for Erosion Control, Traffic Control, Roadside Safety, Landscaping/Aesthetics, Mobilization, and Construction Engineering & Inspection
- Construction Cost Escalation to year 2023
- Engineering Design Escalation to year 2022
- Hydraulics/Storm Water Costs set at 5% since within a floodplain
- Right of Way acquisition is required:
  - Developed Parcels assumed at $500,000 (take and relocation)
    - 080-285-09, 080-285-10, 080-285-07, 080-285-06, 080-285-05, 080-286-01, 080-286-02, 080-286-03, 080-286-04, 080-272-09, 080-272-10, 080-272-14, 080-272-13, 080-272-18, 080-272-17, 080-272-05, 080-273-01, 080-273-02, 080-273-03, 080-273-04, 080-263-08, 080-263-07, 080-263-06, 080-263-05, 080-274-01, 080-274-02, 080-274-03, 080-274-04, 080-264-04, 080-264-03, 080-264-07, 080-279-05, 080-279-12, 080-279-11, 080-279-07, 080-279-08
  - Washoe County Owned Parcels @ $0 acre (portion or full)
    - none
  - BLM owned parcels @ $0/acre (portion or full)
    - none
  - Undeveloped parcels owned by North Valleys Investment Group @6,000/acre
    - 080-730-16 – 15 acres
    - 080-730-15 – 5 acres
    - 080-730-14 – 5 acres
    - 080-730-13 – 10 acres
    - 080-730-12 – 10 acres
    - 080-271-02 – 5 acres
    - 080-721-03 – 10 acres
    - 080-721-04 – 10 acres

- Alt. 8a Cost Wizard Assumptions (along Fir Drive):
  - Lemmon Drive priced as new 4-lane undivided roadway from Fleetwood Dr. to Chickadee Dr. along a realignment that uses Deodar Way and Fir Drive, a length of

2.97 miles. Then Chickadee Dr. priced as two new lanes plus two lanes of roadbed modification from the realignment to the existing Lemmon Drive, a length of 1.18 miles.

- Multiuse path constructed new along realignment or widened and raised along existing alignment.
- Traffic signals installed at realigned Lemmon Drive (Fir Dr.) / Chickadee Dr. and at Chickadee Dr. / existing Lemmon Drive (priced as signal but a roundabout seems like a more practical solution).
- Demolish 1.45 miles of existing Lemmon Drive
- Approximate 250 ft long by 50 ft height MSE wall at location of hill
- Additional Items: used Default value of 15%.
- Default Standard Percentage Adders values were used for Erosion Control, Traffic Control, Roadside Safety, Landscaping/Aesthetics, Mobilization, and Construction Engineering & Inspection
- Construction Cost Escalation to year 2023
- Engineering Design Escalation to year 2022
- Hydraulics/Storm Water Costs set at 5% since within a floodplain
- Right of Way acquisition is required (eastern side of Fir Dr.):
  - Developed Parcels assumed at $500,000 (take and relocation)
    - 080-276-01, 080-276-02, 080-276-03, 080-276-05, 080-277-05, 080-277-02, 080-277-03, 080-277-04
  - Washoe County Owned Parcels @ $0 acre (portion or full)
    - none
  - BLM owned parcels @ $0/acre (portion or full)
    - 080-740-02 – 5 acres
  - Undeveloped parcels owned by North Valleys Investment Group @6,000/acre
    - 080-730-16 – 15 acres
    - 080-730-15 – 15 acres
    - 080-730-14 – 5 acres
    - 080-730-13 – 20 acres
    - 080-271-02 – 5 acres
    - 080-721-03 – 10 acres
    - 080-721-04 – 10 acres
  - Undeveloped (with well) parcel owned by Sha-Neva Inc. @$20,000/acre
    - 080-710-13 – 2 acres

- Alt. 8b Cost Wizard Assumptions (east of Fir Drive):
  - Lemmon Drive priced as a new 4-lane undivided roadway from Fleetwood Dr. to Chickadee Dr., along Deodar Way and east of Fir Drive, a length of 3.0 miles. Then Chickadee Dr. priced as two new lanes plus two lanes of roadbed modification from the realignment to the existing Lemmon Drive, a length of 1.25 miles.

- Multiuse path constructed new along realignment or widened and raised along its existing alignment.
- Traffic signals installed at realigned Lemmon Drive (Fir Dr.) / Chickadee Dr. and at Chickadee Dr. / existing Lemmon Drive (this one priced as signal but a roundabout seems like a more practical solution).
- Demolish 1.45 miles of existing Lemmon Drive
- Three MSE walls along hills, approximate 250 ft long by 50 ft height, 800 ft long by 75 ft height, 400 ft long by 20 ft height
- Additional Items: used Default value of 15%.
- Default Standard Percentage Adders values were used for Erosion Control, Traffic Control, Roadside Safety, Landscaping/Aesthetics, Mobilization, and Construction Engineering & Inspection
- Construction Cost Escalation to year 2023
- Engineering Design Escalation to year 2022
- Hydraulics/Storm Water Costs set at 5% since within a floodplain
- Right of Way acquisition is required (eastern side of Fir Dr.):
  - Developed Parcels assumed at $500,000 (take and relocation)
    - none
  - Washoe County Owned Parcels @ $0 acre (portion or full)
    - none
  - BLM owned parcels @ $0/acre (portion or full)
    - 080-740-02 – 5 acres
    - 080-710-14 – 5 acres
  - Undeveloped parcels owned by North Valleys Investment Group @6,000/acre
    - 080-730-16 – 15 acres
    - 080-730-15 – 15 acres
    - 080-730-14 – 5 acres
    - 080-730-13 – 20 acres
    - 080-271-02 – 5 acres
    - 080-721-03 – 10 acres
    - 080-721-04 – 10 acres
  - Undeveloped (with well) parcel owned by Sha-Neva Inc. @$20,000/acre
    - 080-710-13 – 2 acres
  - Undeveloped parcels owned by Hungry Valley Enterprises, LLC @ $6,000/acre
    - 080-710-12 – 2 acres

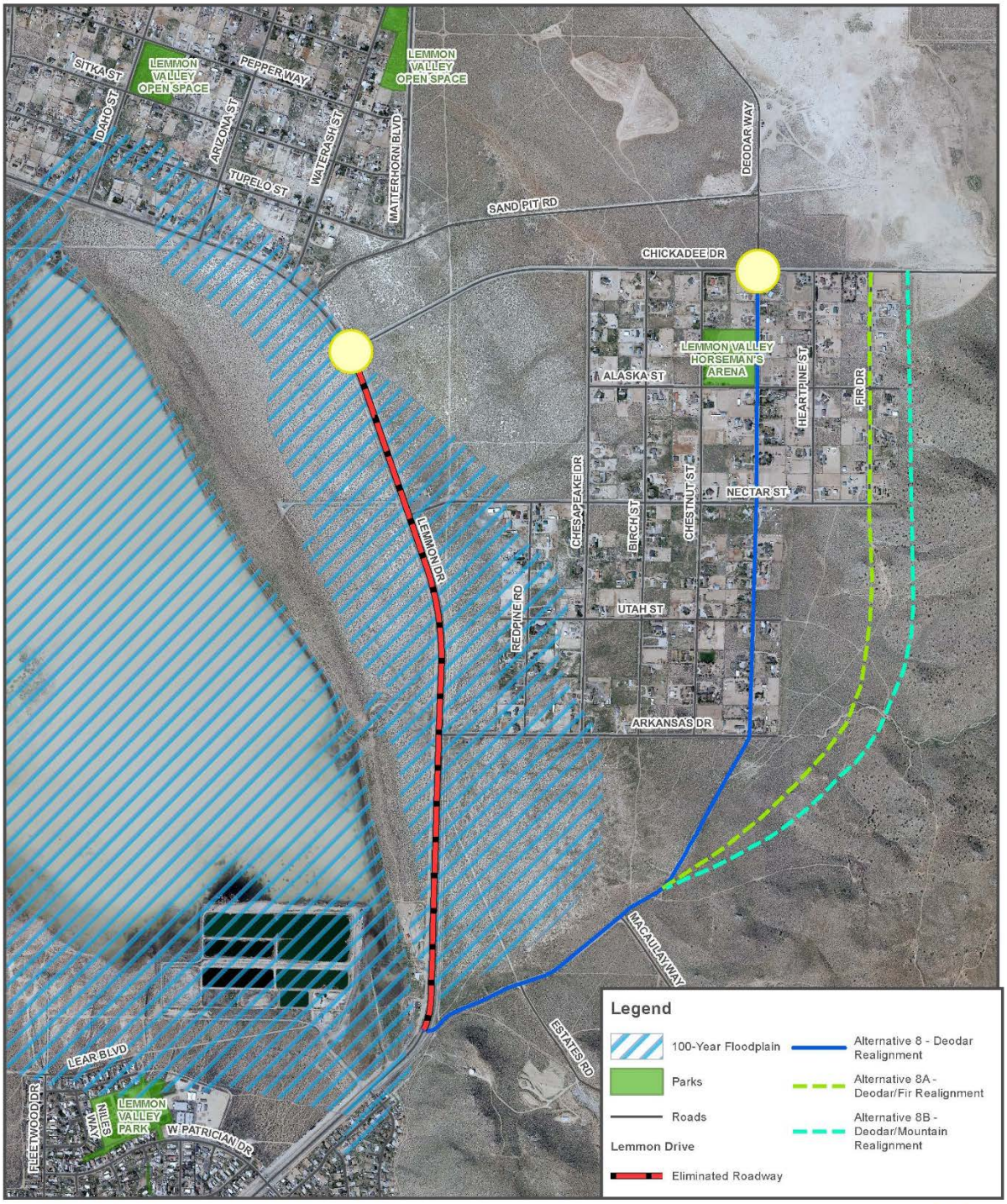


Figure 8. Deodar Alignment

Realign Lemmon Dr to the east along the Deodar Way corridor, and widening Deodar Way to four lanes

SUMMARY

ESTIMATED PROBABLE CONSTRUCTION COST

Alt 8 - Deodar Realignment

PREPARED BY THE NEVADA DEPARTMENT OF TRANSPORTATION

SECTION	ESCALATED TO YEAR	TOTAL
SECTION I - ROADWAY CONSTRUCTION		$16,983,838
SECTION II - BRIDGES		
SECTION III - WALLS		
SECTION IV - TYPICAL INTERCHANGES		
SECTION V - SIGNAL SYSTEMS AT INTERSECTIONS		$371,000
SECTION VI - DEMOLITION		$271,022
SECTION VII - ADDITIONAL ITEMS		$2,643,879
SECTION VIII - STANDARD PERCENTAGE ADDERS		$8,787,591
TOTAL PRESENT DAY CONSTRUCTION COST		$29,057,330
TOTAL ESCALATED CONSTRUCTION COST	2023	$31,948,534
TOTAL CONSTRUCTION & ENGINEERING	2022	$33,886,425
SECTION IX - HYDRAULICS/STORM WATER COSTS	2023	$1,862,906
SECTION X - RIGHT OF WAY COSTS	2022	$19,759,134
GRAND TOTAL PROJECT COST		$55,508,465

	CURRENT ESTIMATE	LOW RANGE	HIGH RANGE
TOTAL PRESENT DAY CONSTRUCTION COST	**$29,100,000**	**$27,500,000**	**$33,200,000**
TOTAL PROJECT COST	**$55,500,000**	**$53,000,000**	**$64,600,000**

Estimate prepared by:	K. Stansbury
Date of initial estimate:	May 11, 2020
Date of latest estimate revision:	May 11, 2020
Route name or number:	PWP-WA-2020-xxx
Project Title:	Alt 8 - Deodar Realignment
Project length (in miles):	2.9
District price database used:	District 2
Predominant County:	Washoe
NDOT project manager:	RTC PM - Dale Keller

SUMMARY

ESTIMATED PROBABLE CONSTRUCTION COST

Alt 8a - Deodar/Fir Realignment

PREPARED BY THE NEVADA DEPARTMENT OF TRANSPORTATION

SECTION	ESCALATED TO YEAR	TOTAL
SECTION I - ROADWAY CONSTRUCTION		$18,342,586
SECTION II - BRIDGES		
SECTION III - WALLS		$711,500
SECTION IV - TYPICAL INTERCHANGES		
SECTION V - SIGNAL SYSTEMS AT INTERSECTIONS		$371,000
SECTION VI - DEMOLITION		$271,022
SECTION VII - ADDITIONAL ITEMS		$2,954,416
SECTION VIII - STANDARD PERCENTAGE ADDERS		$9,819,739
TOTAL PRESENT DAY CONSTRUCTION COST		$32,470,263
TOTAL ESCALATED CONSTRUCTION COST	2023	$35,701,054
TOTAL CONSTRUCTION & ENGINEERING	2022	$37,865,930
SECTION IX - HYDRAULICS/STORM WATER COSTS	2023	$2,081,680
SECTION X - RIGHT OF WAY COSTS	2022	$4,848,604
GRAND TOTAL PROJECT COST		$44,796,214

	CURRENT ESTIMATE	LOW RANGE	HIGH RANGE
TOTAL PRESENT DAY CONSTRUCTION COST	$32,500,000	$30,800,000	$37,100,000
TOTAL PROJECT COST	$44,800,000	$42,600,000	$51,500,000

Estimate prepared by:	K. Stansbury
Date of initial estimate:	May 11, 2020
Date of latest estimate revision:	May 11, 2020
Route name or number:	PWP-WA-2020-xxx
Project Title:	Alt 8a - Deodar/Fir Realignment
Project length (in miles):	3.0
District price database used:	District 2
Predominant County:	Washoe
NDOT project manager:	RTC PM - Dale Keller

SUMMARY

ESTIMATED PROBABLE CONSTRUCTION COST

Alt 8b - Deodar/East of Fir Realignment

PREPARED BY THE NEVADA DEPARTMENT OF TRANSPORTATION

SECTION	ESCALATED TO YEAR	TOTAL
SECTION I - ROADWAY CONSTRUCTION		$18,723,293
SECTION II - BRIDGES		
SECTION III - WALLS		$4,226,310
SECTION IV - TYPICAL INTERCHANGES		
SECTION V - SIGNAL SYSTEMS AT INTERSECTIONS		$371,000
SECTION VI - DEMOLITION		$271,022
SECTION VII - ADDITIONAL ITEMS		$3,538,744
SECTION VIII - STANDARD PERCENTAGE ADDERS		$11,761,896
TOTAL PRESENT DAY CONSTRUCTION COST		$38,892,265
TOTAL ESCALATED CONSTRUCTION COST	2023	$42,762,045
TOTAL CONSTRUCTION & ENGINEERING	2022	$45,354,032
SECTION IX - HYDRAULICS/STORM WATER COSTS	2023	$2,493,338
SECTION X - RIGHT OF WAY COSTS	2022	$570,676
GRAND TOTAL PROJECT COST		$48,418,046

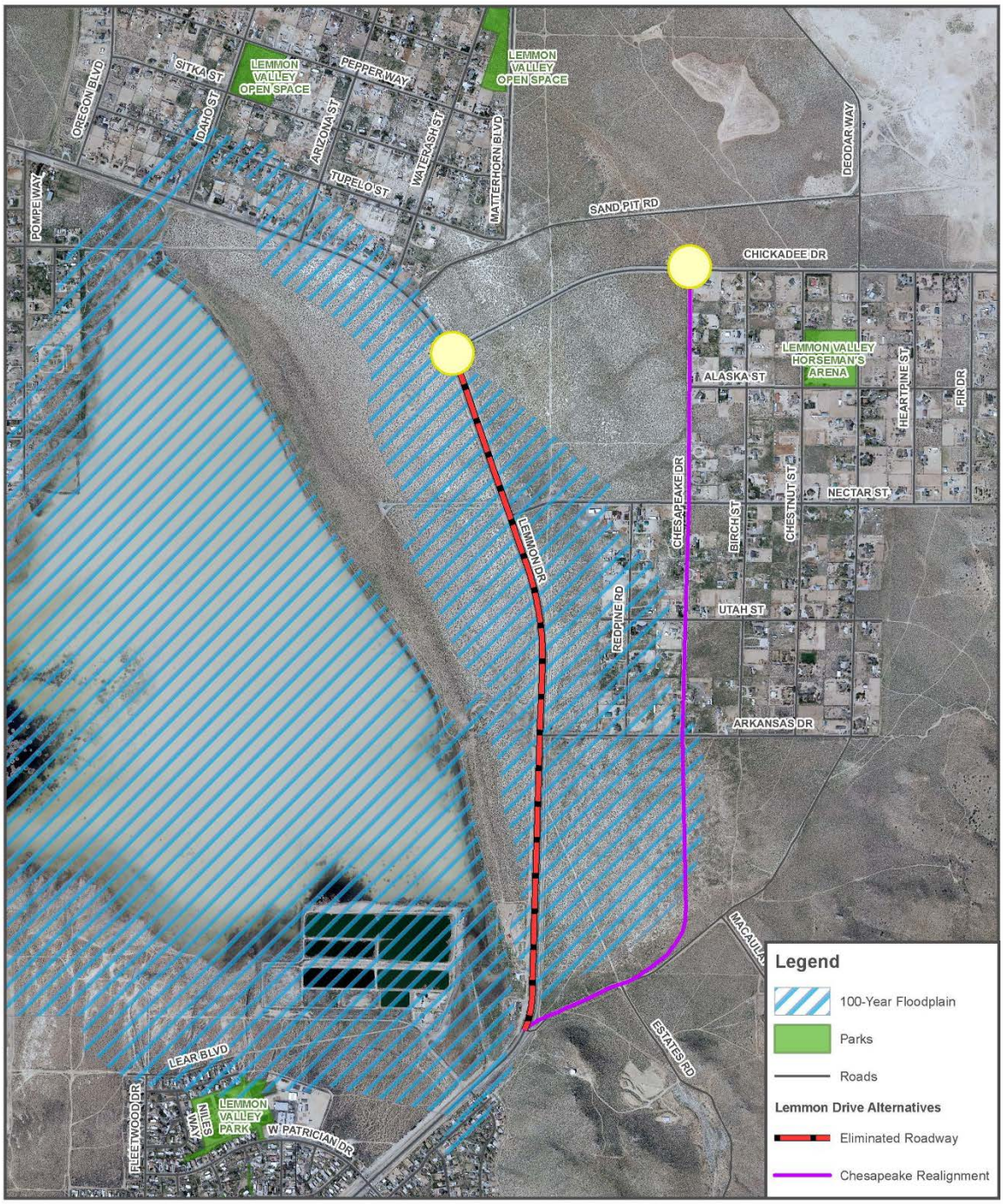
	CURRENT ESTIMATE	LOW RANGE	HIGH RANGE
TOTAL PRESENT DAY CONSTRUCTION COST	$38,900,000	$37,000,000	$44,300,000
TOTAL PROJECT COST	$48,400,000	$46,100,000	$55,200,000

Estimate prepared by:	K. Stansbury
Date of initial estimate:	May 11, 2020
Date of latest estimate revision:	May 11, 2020
Route name or number:	PWP-WA-2020-xxx
Project Title:	Alt 8b - Deodar/East of Fir Realignment
Project length (in miles):	3.0
District price database used:	District 2
Predominant County:	Washoe
NDOT project manager:	RTC PM - Dale Keller

A9. Chesapeake Dr. Realignment:

- Similar to Alternative 8, this alternative realigns Lemmon Drive to the east starting along Deodar Way, but then turns north along the existing Chesapeake Dr., widening to the west to avoid parcels at the north end as it connects to Chickadee Dr.
- Unlike Alternative 8, the realignment along this corridor at existing ground elevations does not completely remove Lemmon Drive out of the 100-yr. floodplain.
- The new alignment would provide four lanes and be designed to current geometric standards.
- Existing Lemmon Drive between Chickadee Drive and Deodar Way is eliminated.
- Widening of the existing Chesapeake Dr. corridor to accommodate four lanes of traffic and a dedicated bike lane in both directions would have property impacts to approximately 20 parcels.
- This realignment introduces two intersections that current traffic along Lemmon Drive does not navigate through, a signalized intersection where the realigned Lemmon Drive intersects Chickadee Dr. and a possible roundabout for the directional traffic movement where Chickadee Dr. intersects with the existing Lemmon Drive. Realigning Chickadee Drive along a large radius horizonal curve west of Chesapeake Dr. to Tupelo Street may be possible to eliminate the need for a second intersection where Chickadee Dr. would intersect with the existing Lemmon Dr.
- The existing 8' wide multi-use path would be reconstructed as a 10' wide path and the profile raised to an agreed upon elevation. This separates path users from the four-lane roadway facility and provides scenic views of Swan Lake.
- The new profile alignment would accommodate existing drainage pathways to Swan Lake.
- Mitigation measures would still need to be employed at Nectar St. and other localized low spots along the existing Lemmon Drive alignment to address flooding. The existing Lemmon Drive could be repurposed into a HESCO barrier platform.
- RTC suggested an alternative to the Chesapeake Dr. (or any of the full realignment options) to realign Lemmon Drive as a 2-lane facility and use a combination of a 'Bravo' alignment for the additional two lanes. This alternative was not analyzed further as it does not provide the increased capacity in the vicinity of Chickadee Dr. where the future Eagle Canyon Drive Extension may connect into.
- Alt. 9 Cost Wizard Assumptions:
    - Lemmon Drive priced as new 4-lane undivided roadway from Fleetwood to Chickadee Dr., along Chesapeake Dr., a length of 2.65 miles. Then Chickadee Dr. priced as a new two-lane road plus two lanes of roadbed modification from the realignment to the existing Lemmon Drive, a length of 0.56 miles.
    - Multiuse path is constructed new along existing alignment as a widened path raised to an agreed upon elevation.
    - Traffic signals installed at realigned Lemmon Drive (Chesapeake Dr.) / Chickadee Dr. and at Chickadee Dr./ existing Lemmon Drive (at this location a roundabout may be appropriate).

- Demolish 1.45 miles of existing Lemmon Drive
- Additional Items: used Default value of 15%.
- Default Standard Percentage Adders values were used for Erosion Control, Traffic Control, Roadside Safety, Landscaping/Aesthetics, Mobilization, and Construction Engineering & Inspection
- Construction Cost Escalation to year 2023
- Engineering Design Escalation to year 2022
- Hydraulics/Storm Water Costs set at 5% since within a floodplain
- Right of Way acquisition is required:
    - Developed Parcels assumed at $500,000 (take and relocation)
        - 080-282-08, 080-282-07, 080-282-06, 080-282-05, 080-283-01, 080-283-02, 080-283-03, 080-288-04, 080-288-03, 080-288-02, 080-288-12, 080-288-11, 080-287-05, 080-287-06, 080-287-12, 080-287-11, 080-287-15, 080-287-14
    - Washoe County Owned Parcels @ $0 acre (portion or full)
        - none
    - BLM owned parcels @ $0/acre (portion or full)
        - none
    - Undeveloped parcels owned by North Valleys Investment Group @ $6,000/acre
        - 080-730-16 – 20 acres
        - 080-730-14 – 20 acres
        - 080-730-12 – 5 acres
        - 080-730-11 – 10 acres
        - 080-723-03 – 1 acre
        - 080-723-01 – 10 acres
        - 080-721-03 – 5 acres
        - 080-721-04 – 10 acres



LEMMON DRIVE PROJECT

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0 0.125 0.25 Miles

Data Sources: FEMA, Jacobs, and Washoe County

ROADWAY SECTION DRAWING HERE

Figure 9. Chesapeake Alignment

Widen to four lanes, and realign east along Deodar Way, turn north along Chesapeake Dr to Nectar St, then curve west to rejoin the exisitng Lemmon Dr alignment

RTC

Jacobs

SUMMARY

ESTIMATED PROBABLE CONSTRUCTION COST

Alt 9 - Chesapeake Realignment

PREPARED BY THE NEVADA DEPARTMENT OF TRANSPORTATION

SECTION	ESCALATED TO YEAR	TOTAL
SECTION I - ROADWAY CONSTRUCTION		$14,707,920
SECTION II - BRIDGES		
SECTION III - WALLS		
SECTION IV - TYPICAL INTERCHANGES		
SECTION V - SIGNAL SYSTEMS AT INTERSECTIONS		$371,000
SECTION VI - DEMOLITION		$271,022
SECTION VII - ADDITIONAL ITEMS		$2,302,491
SECTION VIII - STANDARD PERCENTAGE ADDERS		$7,652,904
TOTAL PRESENT DAY CONSTRUCTION COST		$25,305,337
TOTAL ESCALATED CONSTRUCTION COST	2023	$27,823,218
TOTAL CONSTRUCTION & ENGINEERING	2022	$29,511,574
SECTION IX - HYDRAULICS/STORM WATER COSTS	2023	$1,622,399
SECTION X - RIGHT OF WAY COSTS	2022	$10,175,632
GRAND TOTAL PROJECT COST		$41,309,605

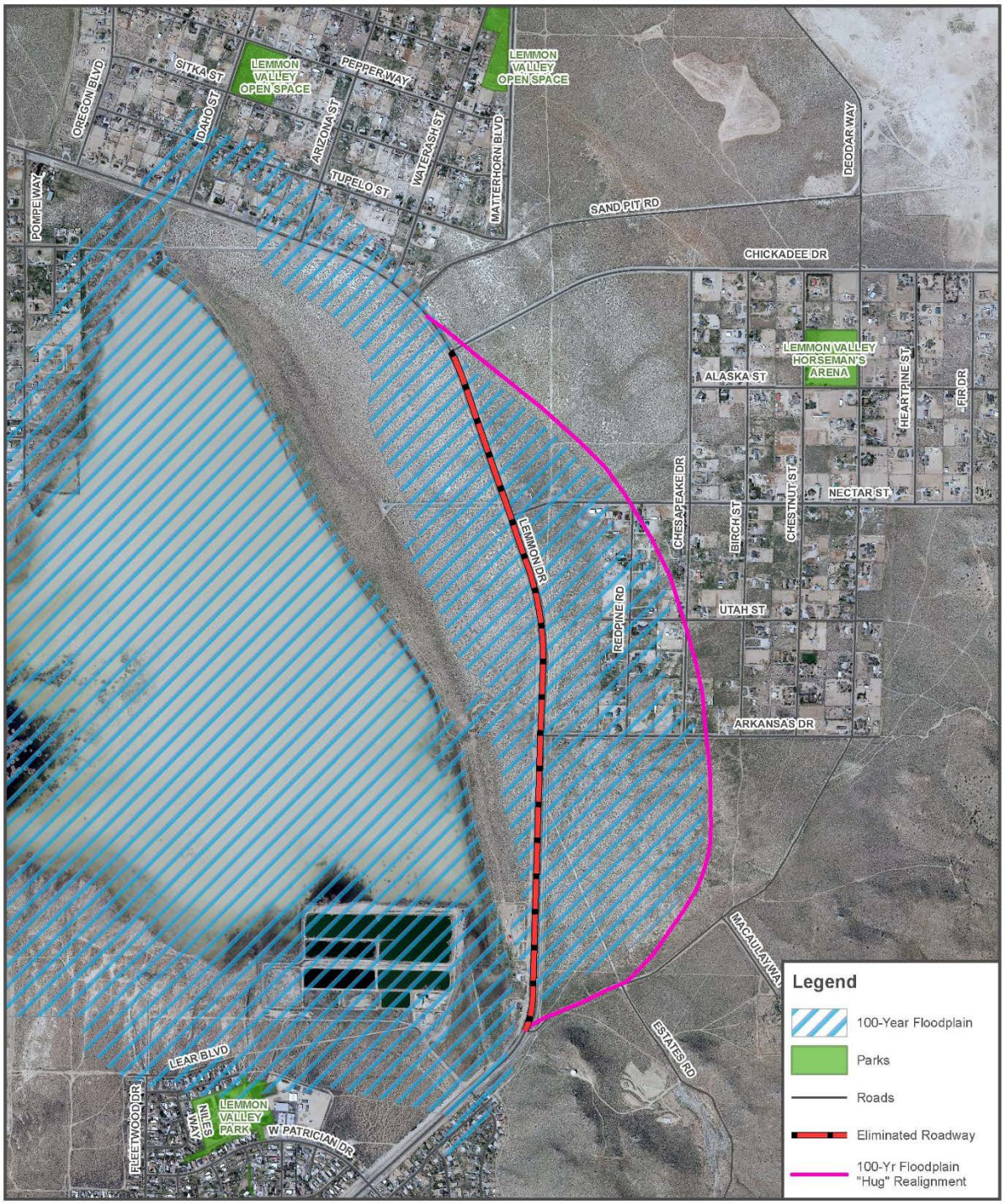
	CURRENT ESTIMATE	LOW RANGE	HIGH RANGE
TOTAL PRESENT DAY CONSTRUCTION COST	$25,300,000	$23,900,000	$28,900,000
TOTAL PROJECT COST	$41,300,000	$39,300,000	$47,800,000

Estimate prepared by:	K. Stansbury
Date of initial estimate:	May 11, 2020
Date of latest estimate revision:	May 11, 2020
Route name or number:	PWP-WA-2020-xxx
Project Title:	Alt 9 - Chesapeake Realignment
Project length (in miles):	2.7
District price database used:	District 2
Predominant County:	Washoe
NDOT project manager:	RTC PM - Dale Keller

A10. Realign Lemmon Drive Eastward to "Hug" the outside of the floodplain: Realign Lemmon Drive to the east to "hug" the edge of the adjusted 100-year floodplain

- Similar to alternatives 8 and 9, Lemmon Drive is realigned to the east beginning at Deodar Way, however, this alternative doesn't follow an existing roadway corridor, but rather makes a large sweeping arc to 'hug' the floodplain limits connecting back into Lemmon Drive near Chesapeake Dr.
- The new alignment would provide four lanes with dedicated bike lanes and be designed to current geometric standards.
- Existing Lemmon Drive between Chickadee Drive and Deodar Way is eliminated.
- This sweeping arc 'hug' alignment would have property impacts to approximately 25 parcels and would also affect interior circulation within the neighborhood. Acquisition of parcels along this alignment may be favorable to some property owners who have experienced recent flooding.
- In addition to acquiring parcels along the alignment, there would be several parcels west of the realigned Lemmon Drive that would require acquisition as access to Lemmon Drive would be severed and they would remain in the floodplain.
- A FEMA grant known as the Hazard Mitigation Grant Program, is a voluntary option for certain homeowners located with the FEMA-designated flood plain to sell their property and relocate outside of the floodplain. Washoe County would then deed the land as open.
- The existing 8' wide multi-use path would be reconstructed as a 10' wide path and the profile raised to an agreed upon elevation. This separates path users from the four-lane roadway facility and provides scenic views of Swan Lake.
- Unlike Alternative 8, this realignment perpetuates Lemmon Drive as the through arterial movement and does not introduce additional intersections.
- The new alignment would accommodate existing drainage pathways to Swan Lake.
- Mitigation measures would still need to be employed at Nectar St. and other localized spots along the existing Lemmon Drive alignment to address flooding. The existing Lemmon Drive could be repurposed into a HESCO barrier platform.
- Alt. 10 Cost Wizard Assumptions:
    - Lemmon Drive priced as new 4-lane undivided roadway from Fleetwood Dr. to Chickadee Dr., along an alignment that 'hugs' the floodplain, a length of 2.75 miles.
    - Multiuse path constructed new along realignment
    - Traffic signal installed at realigned Lemmon Drive / Chickadee Drive.
    - Demolish 1.45 miles of existing Lemmon Drive
    - Additional Items: used Default value of 15%.
    - Default Standard Percentage Adders values were used for Erosion Control, Traffic Control, Roadside Safety, Landscaping/Aesthetics, Mobilization, and Construction Engineering & Inspection
    - Construction Cost Escalation to year 2023
    - Engineering Design Escalation to year 2022
    - Hydraulics/Storm Water Costs set at 5% since within a floodplain

- Right of Way acquisition is required:
  - Developed Parcels assumed at $500,000 (take and relocation)
    - 080-283-01, 080-283-02, 080-283-03, 080-282-08, 080-282-07, 080-282-06, 080-282-05, 080-282-04, 080-282-09, 080-282-10, 080-282-02, 080-282-01, 080-281-15, 080-281-16, 080-281-12, 080-281-11, 080-281-08, 080-281-07, 080-288-04, 080-288-03, 080-288-05, 080-288-06, 080-281-06, 080-281-13, 080-281-14, 080-281-04, 080-281-03, 080-281-02, 080-289-01, 080-289-02
  - Washoe County Owned Parcels @ $0 acre (portion or full)
    - none
  - BLM owned parcels @ $0/acre (portion or full)
    - none
  - Undeveloped parcels owned by North Valleys Investment Group @ $6,000/acre
    - 080-730-16 – 20 acres
    - 080-730-14 – 20 acres
    - 080-730-12 – 5 acres
    - 080-730-11 – 10 acres
    - 080-723-01 – 1 acre
    - 080-721-03 – 40 acres
    - 080-721-02 – 20 acres



ROADWAY SECTION DRAWING HERE

Figure 10. Border the Floodplain

Widen to four lanes, and realign east along Deodar Way, then curve along the border of the 100-year floodplain until reconnecting with the current Lemmon Dr alignment near Chickadee Dr

SUMMARY

ESTIMATED PROBABLE CONSTRUCTION COST

Alt 10 - 'Hug' Realignment

PREPARED BY THE NEVADA DEPARTMENT OF TRANSPORTATION

SECTION	ESCALATED TO YEAR	TOTAL
SECTION I - ROADWAY CONSTRUCTION		$13,307,568
SECTION II - BRIDGES		
SECTION III - WALLS		
SECTION IV - TYPICAL INTERCHANGES		
SECTION V - SIGNAL SYSTEMS AT INTERSECTIONS		$159,000
SECTION VI - DEMOLITION		$271,022
SECTION VII - ADDITIONAL ITEMS		$2,060,639
SECTION VIII - STANDARD PERCENTAGE ADDERS		$6,849,046
TOTAL PRESENT DAY CONSTRUCTION COST		$22,647,274
TOTAL ESCALATED CONSTRUCTION COST	2023	$24,900,678
TOTAL CONSTRUCTION & ENGINEERING	2022	$26,412,253
SECTION IX - HYDRAULICS/STORM WATER COSTS	2023	$1,452,014
SECTION X - RIGHT OF WAY COSTS	2022	$16,837,099
GRAND TOTAL PROJECT COST		$44,701,366

	CURRENT ESTIMATE	LOW RANGE	HIGH RANGE
TOTAL PRESENT DAY CONSTRUCTION COST	**$22,600,000**	**$21,400,000**	**$25,900,000**
TOTAL PROJECT COST	**$44,700,000**	**$42,700,000**	**$52,100,000**

Estimate prepared by:	K. Stansbury
Date of initial estimate:	May 11, 2020
Date of latest estimate revision:	May 11, 2020
Route name or number:	PWP-WA-2020-xxx
Project Title:	Alt 10 - 'Hug' Realignment
Project length (in miles):	2.8
District price database used:	District 2
Predominant County:	Washoe
NDOT project manager:	RTC PM - Dale Keller

A11. Elevate existing Lemmon Drive with "Structures":

- Replace Lemmon Drive with a continuous series of bridges creating a four-lane viaduct that is above the adjusted 100-year floodplain elevation
- Allows for easy equalization of flood waters under viaduct structures
- Includes a dedicated bike lane in both directions along the viaduct
- A 10' multi-use path is included separate from the viaduct or the existing path may be widened, and the profile adjusted.
- The geometry of Lemmon Drive would comply with current engineering design criteria
- To provide connectivity with side streets; entire intersections become structures and side street profiles are required to be adjusted.
- Cost Wizard Assumptions:
    - 1.2 miles of Lemmon Drive raised onto viaduct structures and priced as bridge structure; an additional 1.2 miles raised approximately 2.5' above new floodplain elevation and priced as a "new" 4-lane undivided roadway
    - Multiuse path profile raised so priced as 'new' construction
    - Traffic signal installed at Chickadee Drive to accommodate future volumes of the Eagle Canyon Drive Extension
    - Default Standard Percentage Adders values were used for Erosion Control, Traffic Control, Roadside Safety, Landscaping/Aesthetics, Mobilization, and Construction Engineering & Inspection
    - Construction Cost Escalation to year 2023
    - Engineering Design Escalation to year 2022
    - Hydraulics/Storm Water Costs set at 5% since within a floodplain
    - No acquisition of right of way

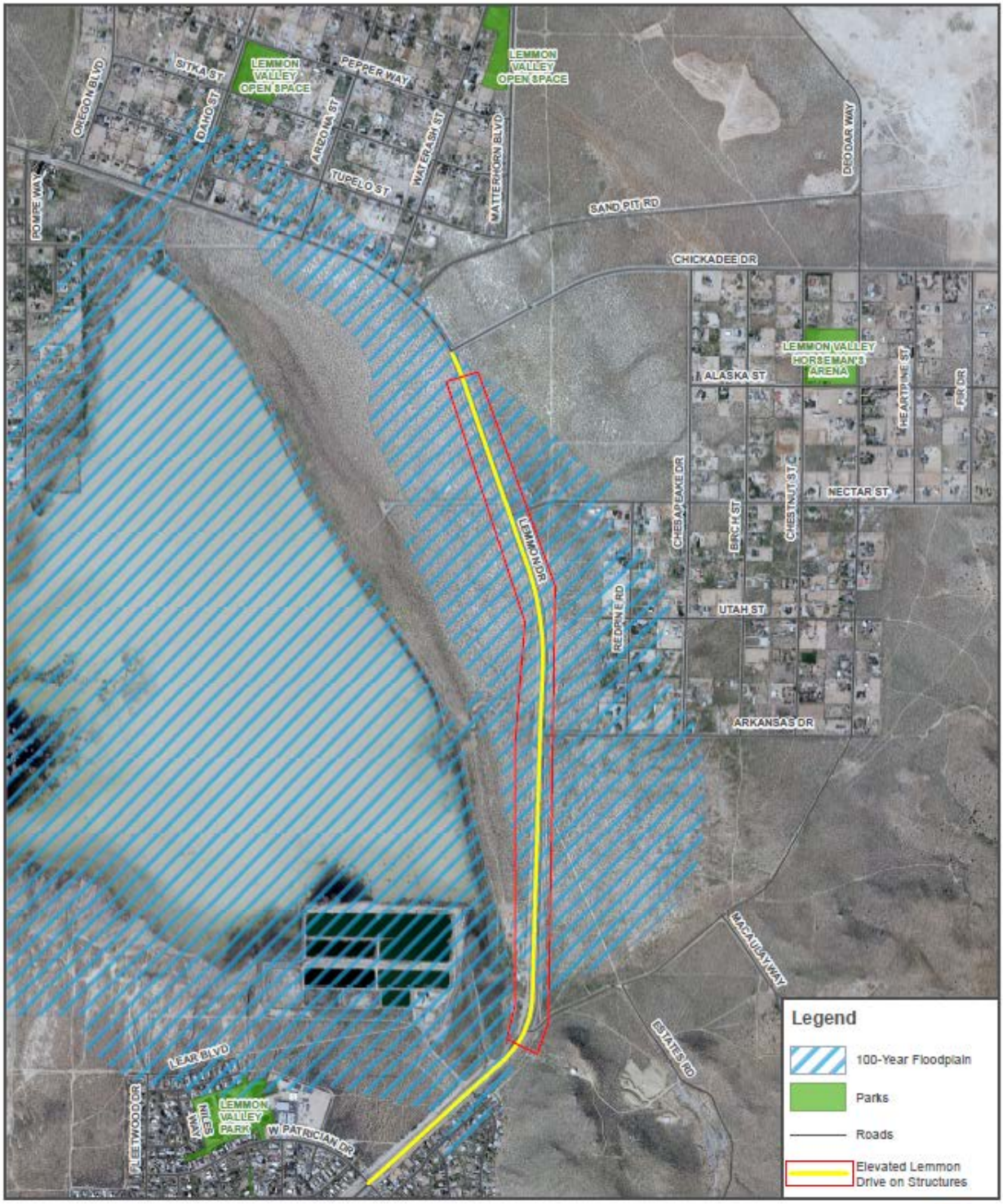


Figure 11. Elevate Lemmon Drive

Replace Lemmon Dr with a continuous series of bridges creating a four-lane viaduct above the 100-yr floodplain. To provide connectivity with side streets, entire intersections become structures.

SUMMARY

ESTIMATED PROBABLE CONSTRUCTION COST

Alt. 11-Elevate Along Structures

PREPARED BY THE NEVADA DEPARTMENT OF TRANSPORTATION

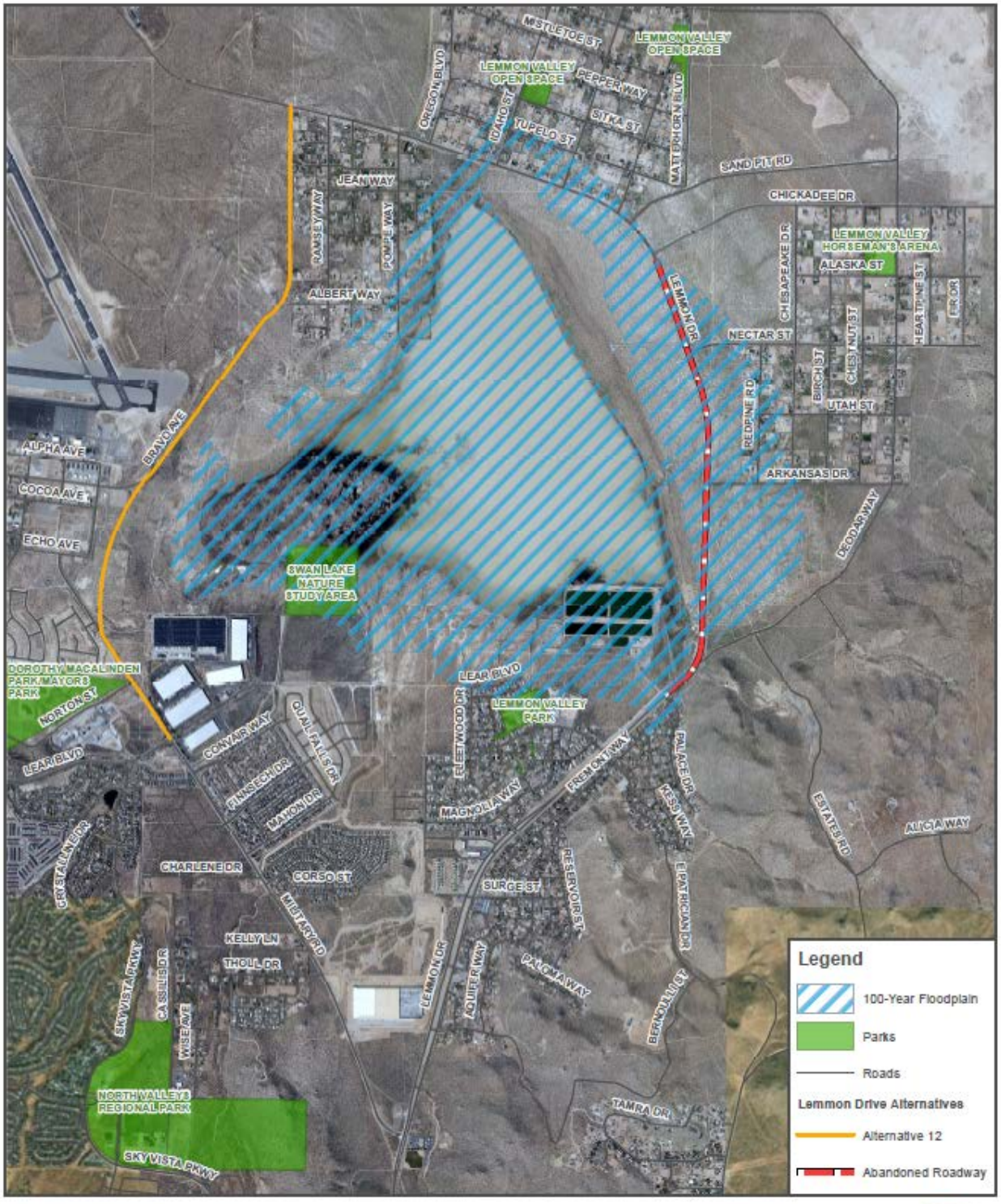
SECTION	ESCALATED TO YEAR	TOTAL
SECTION I - ROADWAY CONSTRUCTION		$6,423,969
SECTION II - BRIDGES		$74,240,206
SECTION III - WALLS		
SECTION IV - TYPICAL INTERCHANGES		
SECTION V - SIGNAL SYSTEMS AT INTERSECTIONS		$212,000
SECTION VI - DEMOLITION		
SECTION VII - ADDITIONAL ITEMS		$12,131,426
SECTION VIII - STANDARD PERCENTAGE ADDERS		$40,321,818
TOTAL PRESENT DAY CONSTRUCTION COST		$133,329,419
TOTAL ESCALATED CONSTRUCTION COST	2023	$146,595,697
TOTAL CONSTRUCTION & ENGINEERING	2022	$155,468,453
SECTION IX - HYDRAULICS/STORM WATER COSTS	2023	$8,546,878
SECTION X - RIGHT OF WAY COSTS	2022	
GRAND TOTAL PROJECT COST		$164,015,331

	CURRENT ESTIMATE	LOW RANGE	HIGH RANGE
TOTAL PRESENT DAY CONSTRUCTION COST	$133,300,000	$111,200,000	$145,100,000
TOTAL PROJECT COST	$164,000,000	$140,400,000	$180,300,000

Estimate prepared by:	K. Stansbury
Date of initial estimate:	May 11, 2020
Date of latest estimate revision:	May 11, 2020
Route name or number:	PWP-WA-2020-xxx
Project Title:	Alt. 11-Elevate Along Structures
Project length (in miles):	2.4
District price database used:	District 2
Predominant County:	Washoe
NDOT project manager:	RTC PM - Dale Keller

A12. Eliminate Lemmon Drive (Back door):

- This alternative assumes Lemmon Drive gets abandoned between Palace Dr. and Chickadee Dr. and a route to the west of Swan Lake must be used to access the northern section of Lemmon Drive.
- The western route would consist of using Military Road, to Lear Blvd, then along a new alignment to connect to the existing Bravo Avenue corridor upgraded to a four-lane facility, and finally northward along a new alignment one block west of Ramsey Way, connecting into the existing Lemmon Drive with a signalized intersection.
- This alternative reduces overall capacity of the transportation network, eliminates circulation, and overburdens an already at capacity Military Road.
- This alternative does not provide for connectivity of the future Eagle Canyon Drive Extension.
- Eliminating the existing Lemmon Dr access would not be favorable to stakeholders
- Cost Wizard Assumptions:
    - No Cost Wizard was completed as this alternative has a fatal flaw of reducing the overall network capacity



LEMMON DRIVE PROJECT

N

0 0.25 0.5 Miles

Data Sources: Esri, FEMA, Jacobs, and Washoe County

ROADWAY SECTION DRAWING HERE

Figure 12. Eliminate Lemmon Drive

Lemmon Dr becomes abandoned between Palace Dr and Chickadee Dr, and the new alignment connects to the existing Bravo Ave corridor, which will be upgraded to a four-lane facility

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5. Segment 2 Level 1 Screening

After brainstorming alignment alternatives during the February 27, 2020 TAC workshop, each team qualitatively evaluated the twelve alternatives against the project goals using a *Consumer Reports* type evaluation of Good (green), Medium (yellow), and Poor (red). Once each team went through the evaluation exercise separately, the rankings were discussed amongst the TAC with each agency providing any insight they had, including identifying potential advantages and disadvantages for each alternative.

The team evaluations were then averaged to determine a single grade for each alternative/goal matrix as shown in Figure 13. A summary of the advantages and disadvantages for each alternative per goal are included in Attachment A. All goals were weighted equally.

The NDOT Cost Wizard spreadsheet tool was used to determine high level construction costs for each alternative. The cost of the alternatives is summarized below, listed lowest to highest.

A1 - No Build	$0
A5 - Elevated Shared Use Path	$ 20.3 million
A3 - Divided w/ SB Raised	$ 21.3 million
A2 – Widen/Raise along existing alignment	$ 25.8 million
A7 – Divided w/ SB along Natural Berm, NB along existing	$ 34.0 million
A9 – Chesapeake Dr. Realignment	$ 41.3 million
A10 – "Hug" Floodplain Realignment	$ 44.7 million
A8a – Deodar Way/Fir Dr. Realignment	$ 44.8 million
A6 – Natural Berm Realignment	$ 45.4 million
A8b – Deodar Way/East of Fir Dr. Realignment	$ 48.4 million
A8 – Deodar Way Realignment	$ 55.5 million
A11 – Elevate Existing Lemmon Dr. w/ Structures	$164.0 million
A4 – Lake volume removal	$210.8 million
A12 – No cost wizard developed/ fatal flaw	Not Priced / Fatal Flaw

5.1 Level 1 Screening Results

The results of the Level 1 screening demonstrate that:

Two of the alternatives, A1-No Build and A12-Eliminate Lemmon Drive, do not provide additional network capacity which is the purpose of the Lemmon Drive Capacity Improvements Project per the RTC's 2040 Regional Transportation Plan (RTP) and therefore are not viable options.

Two of the alternatives, A4-Swan Lake Volume Removal and A11-Elevate Existing Lemmon Drive On Structures, have exorbitant costs and therefore are also not viable options.

Alternative A3- Raising the northbound or southbound direction of a divided alignment reduces roadway fill volumes very minimally compared to raising the entire undivided alignment, alternative A2. The divided alignment would require additional intersections to accommodate turning movements, introducing additional traffic conflict points, and as a result, reducing safety. With only one direction of travel elevated, providing a dry lane in each direction during high storm events would require changes in traffic patterns placing two-way traffic along what typically is two lane, one-way traffic. These reductions in safety, without any benefit in cost savings eliminate this alternative from further evaluation.

Similar to Alternative A3, Alternative A7– Divided alignment with southbound along the natural berm and northbound along the existing Lemmon Drive alignment, requires additional intersections to accommodate turning movements and requires changes in traffic patterns to provide a dry lane for both directions during high storm events. These reductions in safety combined with an increased cost compared to alternative A2, eliminate this alternative from further evaluation.

Alternative A5-Elevated Shared Use Path would provide a barrier to maintain water within Swan Lake to the west of the alignment. However, without raising the roadway profile in addition to widening it to four lanes, Lemmon Drive will still experience flooding due to heavy storm water runoff from the east and north as it flows to the low point of the closed basin of Swan Lake. As a result, this alternative effectively functions as the no-build alternative from a flooding standpoint, but with additional capacity. Without the ability to provide one dry lane for both directions of travel during the 100-year storm, this alternative has a fatal flaw and is eliminated from further evaluation.

Five alternatives, A8, A8a, A8b, A9, and A10, realign Lemmon Drive to the east. Of these eastern realignment alternatives, Alternative A9-Chesapeake Dr. is the cheapest, however, it does not realign Lemmon Drive completely out of the floodplain south of Arkansas Drive. The second cheapest option of the eastern realignments, Alternative A10-Hug Alignment, realigns Lemmon Dr. out of the floodplain boundary, however, cost savings over Alternative A8a-Deodar Way / Fir Dr. Realignment are negligible and don't outweigh the neighbor access impacts and multiple parcel acquisitions required with Alternative A10. Alternative 8, realignment along Deodar Way, and the two sub-alternatives, A8a-Deodar Way/Fir Dr Realignment and A8b Deodar Way/East of Fir Dr. Realignment, provide alignment alternatives that are of out of the adjusted 100-year floodplain elevation without the need to place fill volume within the floodplain. Placing additional fill within the floodplain requires volumetric mitigation excavation and equalization culvert structures to ensure the water surface elevation throughout the surrounding properties is not negatively impacted.

One alternative, A6-Natural Berm Realignment, realigns Lemmon Drive to the west along the natural berm of Swan Lake. Alternative A6 costs approximately the same as the eastern realignment options, however alternative A6 impacts fewer developed parcels than the eastern realignment options.

Figure 13. Lemmon Drive Segment 2 Alternatives - Level 1 Analysis

Alternative	GOAL 1 Widen 2 to 4 lanes	GOAL 2 Reliable in 100-year flood (1-dry lane each way)	GOAL 3 Support Swan Lake recovery efforts (floodplain mitigation)	GOAL 4 Safe Access for multi-modal (Bike Lanes and Multi-Use Path)	GOAL 5 Incorporate Opportunities To Aid Long-Term Flood Response Planning	GOAL 6 Upgrade to current design criteria (eliminate any deficiencies)	GOAL 7 Connectivity w/ future roadways (Eagle Canyon Ext., et al)	GOAL 8 Cost-Appropriate solution	Cost Wizard Estimate	LEVEL 1 SCREENING CONCLUSIONS
A1) No Build	O	O	O	O	O	O	O Connectivity but not enough capacity	No construction cost; but ongoing pavement and flood mitigation maintenance cost	N/A	Eliminate from further evaluation Does not address any goals
A2) Raise Existing Lemmon Drive above 100-yr. floodplain elevation	●	●	Elevated profile allows for equalization culverts ; but places additional fill w/in floodplain	●	● Storage Areas can be incorporated along wider roadway corridor	●	Maintains existing connectivity options	Requires volumetric mitigation to offset additional roadway fill; Right-Of-Way impacts are minimal;	$25.8 million	Advance to Level 2 Screening
A3) Raise one side (Northbound or Southbound) above 100-yr.	●	Requires temporary change in traffic pattern during flood events	less fill than Alt 2 placed w/in floodplain; cannot use equalization culverts	●	Storage Areas can be incorporated along the newer side, but not both	●	O Requires intersections at both northbound and southbound connectivity locations	●	$21.3 million	Eliminate from further evaluation Decreased Safety, No Cost Benefits
A4) Lake volume removal to get Lemmon out of 100-yr.	●	●	●	●		●	Maintains existing connectivity options	O Ongoing volume maintenance; very high excavation cost (not including haul)	$210.8 million	Eliminate from further evaluation Extremely high construction costs
A5) Elevated shared use path	●	O holds water w/in lake but high storm event waters still flood roadway from east and north	● Provides Berm if necessary for Swan Lake Recovery Solutions	multiuse path dry but bike lanes would experience flooding w/ roadway		●	Maintains existing connectivity options		$20.3 million	Eliminate from further evaluation Fatal Flaw - Unable to Provide Dry Lanes During 100-Yr storm
A6) Natural Berm alignment	●	●	●	●	●	●	O Requires additional length to connect to realigned Lemmon Drive	Still need to maintain a portion of Lemmon Drive for local access	$45.4 million	Advance to Level 2 Screening
A7) Divided alignment Southbound along natural berm & northbound along existing	●	Requires temporary change in traffic pattern during flood events	●	●		●	O Requires intersections at both northbound and southbound connectivity locations		$34 million	Eliminate from further evaluation Decreased Safety, No Cost Benefits
A8) Deodar alignment	●	●		●	●	●	O Changes 'through' movement from Lemmon Drive to Chickadee, No stop control along existing Lemmon Dr.	O High ROW impacts; can be lessened with alg shift	A8) $55.5 million A8a) $44.8 million A8b) $48.4 million	Advance to Level 2 Screening with subalternatives 8a and 8b
A9) Chesapeake alignment	●	●		●	●	●	O Changes 'through' movement from Lemmon Drive to Chickadee, No stop control along existing Lemmon Dr.	O Medium ROW impacts, properties to the west of the alignment still within floodplain	A9) $41.3 million	Eliminate from further evaluation. Much greater right of way impacts than Alt 8, and a portion of the alignment is still within the floodplain limit
A10) Align Lemmon Dr. outside 100-yr. (Hug)	●	●	O Does not provide solution for properties that remain to the west in the floodplain	●	●	●	Maintains existing connectivity options	O High ROW impacts	A10) $44.7 million	Eliminate from further evaluation. High right of way impacts, and properties to west are not adequately addressed
A11) Elevate Lemmon Dr. with structures	●	●	●	Bike lanes on structures are not provided an escape route	O	●	O Connectivity on Structures is difficult geometry	O Structures are expensive	$164.0 million	Eliminate from further evaluation Extremely high construction costs
A12) Eliminate Lemmon Dr.	O	O	O Stakeholders affected negatively with reduction in access	O	● A portion of the existing pavement can be repurposed for storage/staging	O	O Eliminated capacity from the regional road network		No Cost Wizard Developed	Eliminate from further evaluation Reduces system network capacity; Does not address any goals;

O Negative Impact / Does Not Address Goal

Medium Impact / Somewhat Addresses Goal / No Change From Existing

● **Positive Impact / Addresses Goal**

6. Conclusions

Based on the results of the Level 1 Screening process, the Alternatives that will be advanced to a 15% design for further screening are:

A2- Raise profile and widen along the existing Lemmon Drive alignment

A8, A8a, A8b – Realigning Lemmon Drive to the east along Deodar Way, Deodar Way/Fir Drive, and Deodar Way/East of Fir Drive

A6 – Realigning Lemmon Drive to the west along the natural berm of Swan Lake.

The 15% design will include determining typical sections, profile adjustment, drainage concepts, impacts to adjoining cross streets, multi-use path alignment, floodplain impacts and mitigation measures, striping configuration, traffic analysis results, major utility conflicts, and coordination with regional Swan Lake improvements. Deliverables for the 15% design will be 1"=100' scale roll plots with plan linework and profile view. A design technical memo for each alternative will also prepared summarizing key design issues and possible mitigations, and a planning level construction cost estimate using developed quantities.

Once the 15% design of the alternatives has been completed, the Level 2 screening process, a qualitative evaluation of the 15% design against the same project goals, will be completed to provide consensus of the preferred alternative to advance to a 30% design.

ATTACHMENT A – ADVANTAGES AND DISADVANTAGES FOR EACH GOAL

Goal #01: Widen Lemmon Drive from two (2) lanes to four (4) lanes as outlined in the Regional Transportation Plan (RTP) to accommodate potential future growth.

Alternative	Potential Advantages	Potential Disadvantages	Preferences (Check One)
#1) "No Build"		Does not add capacity for future Eagle Canyon Drive connection or future development	
#2) Raise Ex. Lemmon above 100-yr	Adds required capacity as an undivided arterial		
#3) Raise one side (N or S) above 100-yr	Adds required capacity as a divided arterial, which matches the 4-lane roadway configuration to the south		
#4) Lake volume removal, take Lemmon out of 100-yr	Adds required capacity as an undivided arterial		

Level 1 Screening: Evaluation with Respect to Defined Goals

Alternative	Potential Advantages	Potential Disadvantages	Preferences (Check One)
#5) Elevated shared use path	Adds required capacity as an undivided arterial		
#6) Natural Berm alignment	Adds required capacity as an undivided arterial		
#7) Split alignment/ existing + berm	Adds required capacity along split alignments		
#8) Deodar alignment	Adds required capacity as an undivided arterial		

#9) Chesapeake alignment	Adds required capacity as an undivided arterial		
#10) Align Lemmon Dr. outside of 100-Yr Flood Plain ("Hug")	Adds required capacity as an undivided arterial		
#11) Elevate Lemmon Dr. with Structures	Adds required capacity	Structural design may necessitate the separation of northbound and southbound directions onto separate structures	
#12) Eliminate Lemmon Dr.		This would reduce capacity. Places more traffic on alternative routes which are already at or near capacity.	

Goal #02: Provide a reliable regional road during 100-year flood event by having one dry lane in each direction.

Alternative	Potential Advantages	Potential Disadvantages	Preferences (Check One)
#1) "No Build"		HESCO Barriers and Pumping Facilities are required to keep the roadway dry.	
#2) Raise Ex. Lemmon above 100-yr	New roadway alignment profile can be set above the updated 100-year flood elevation. Traffic Patterns remain the same to access the 'dry' lanes.		
#3) Raise one side (N or S) above 100-yr	New two-lane roadway alignment profile can be set above the updated 100-year flood elevation.	Traffic patterns are required to change to accommodate two-way traffic on the elevated two-lane roadway. At-grade roadway alignment still gets flooded from water getting into Swan Lake unless adequate pumping or other alternative	
#4) Lake volume removal, take Lemmon out of 100-yr	Traffic Patterns remain the same to access the 'dry' lanes.	Hydraulic Models required to determine amount and location of volume necessary to be removed to ensure roadway would remain dry. Ongoing maintenance to ensure sedimentation does not cause WSE to raise.	

Level 1 Screening: Evaluation with Respect to Defined Goals

Alternative	Potential Advantages	Potential Disadvantages	Preferences (Check One)
#5) Elevated shared use path	Traffic Patterns remain the same to access the 'dry' lanes.	At-grade roadway alignment still gets flooded from water getting into Swan Lake unless adequate pumping or another alternative	
#6) Natural Berm Realignment	Roadway alignment can be at-grade and still provide all travel lanes and bike lanes to remain dry Traffic Patterns remain the same to access the 'dry' lanes.		
#7) Split alignment/ existing + berm		Traffic patterns are required to change to accommodate two-way traffic on the elevated two-lane roadway.	
#8) Deodar alignment	Roadway alignment can be at-grade and still provide all travel lanes and bike lanes to remain dry Traffic Patterns remain the same to access the 'dry' lanes.		

Level 1 Screening: Evaluation with Respect to Defined Goals

#9) Chesapeake alignment	Mostly at-grade alignment and remains dry Traffic Patterns remain the same to access the 'dry' lanes.	A portion of alignment still falls within floodplain and would require elevated profile to remain dry	
#10) Align Lemmon Dr. outside of 100-Yr Flood Plain ("Hug")	At-grade alignment and remains dry Traffic Patterns remain the same to access the 'dry' lanes.		
#11) Elevate Lemmon Dr. with Structures	Ensures dry lanes by providing plenty of area for equalization under the viaduct Traffic Patterns remain the same to access the 'dry' lanes.	Structure widths must be adequate to provide emergency vehicle access Elevated alignment limits emergency vehicle access locations	
#12) Eliminate Lemmon Dr.		This eliminates a regional road needed by emergency vehicles and residents.	

Goal # G3: Support the Swan Lake recovery efforts by incorporating floodplain mitigation along Lemmon Drive and reduce water surface elevation within the closed basin.

Alternative	Potential Advantages	Potential Disadvantages	Impact
A1) "No Build"	Does not add additional fill within the floodplain	Does not incorporate volumetric mitigation to reduce the WSE	
A2) Raise Ex. Lemmon above 100-yr	Raised profile eliminates need for HESCO barriers and provides opportunities to incorporate equalization culverts which eliminates need for pumping	Raising the roadway profile adds additional fill volume within the floodplain that would need mitigated	
A3) Raise one side (N or S) above 100-yr	Places less fill volume within the floodplain than alternative 2	Unable to place equalization culverts under the existing roadway profile so pumping still required	
A4) Lake volume removal, take Lemmon out of 100-yr	Lowers floodplain elevation without placing additional roadway fill	Existing clay layer must not be penetrated Still need pumping to get across the roadway	

Level 1 Screening: Evaluation with Respect to Defined Goals

Alternative	Potential Advantages	Potential Disadvantages	Impact
A5) Elevated shared use path	Places even less fill within the floodplain than alternative 3	Unable to place equalization culverts under the existing roadway profile; still need pumping	
A6) Natural Berm alignment	The roadway alignment would be above the floodplain elevation, eliminating the need for volumetric mitigation for the roadway volume. Elimination of a large portion of the existing roadway provides additional volumetric area to reduce the WSE.		
A7) Split alignment/ existing +natural berm	The southbound half of the roadway would be above the floodplain elevation, eliminating the need for volumetric mitigation	Existing Lemmon Drive remains in place, eliminating the ability to provide volumetric mitigation with removal of the roadway Unable to place equalization culverts under the existing roadway profile so still need pumping	
A8) Deodar alignment	Drainage features incorporated into design to get water under the roadway from the east Elimination of a large portion of the existing roadway provides additional volumetric area to reduce the WSE	.	

A9) Chesapeake alignment	Drainage features incorporated into design to get water under the roadway from the east Elimination of a large portion of the existing roadway provides additional volumetric area to reduce the WSE.		
A10) Align Lemmon Dr. outside of 100-Yr Flood Plain ("Hug")	Drainage features incorporated into design to get water under the roadway from the east Elimination of a large portion of the existing roadway provides additional volumetric area to reduce the WSE.		
A11) Elevate Lemmon Dr. with Structures	Raising the alignment onto structures provides a continuous opening for water to equalize on either side of the alignment Raising the roadway on structures allows the existing roadway to be removed and provides additional volumetric area to reduce the WSE.		
A12) Eliminate Lemmon Dr.		Does not address the problem	

Goal # G4: Incorporate safe access for all multi-modal users with the construction of a multi-use path, safer pedestrian crossings, and bike lanes.

Alternative	Potential Advantages	Potential Disadvantages	Impact
A1) "No Build"		Approximately 250' of the existing multi-use path east of Lemmon Drive is underwater (Google August 2019 imagery) Existing Lemmon Drive does not have bike lanes	
A2) Raise Ex. Lemmon above 100-yr	Existing separated multi-use path is widened from 8' to 10' Bike lanes added in both directions	Path not raised to 100-year flood, only 5-year (or other?) How long does path remain inundated with water at different design storms?	
A3) Raise one side (N or S) above 100-yr	Includes a bike lane along both directions of travel Includes a separated 10' multi-use path (either update existing path or construct new)	Path not raised to 100-year flood, only 5-year (or other?) How long does path remain inundated with water at different design storms?	
A4) Lake volume removal, take Lemmon out of 100-yr	Includes a bike lane along both directions of travel Includes a separated 10' multi-use path (either update existing path or construct new	Path not raised to 100-year flood, only 5-year (or other?) How long does path remain inundated with water at different design storms?	

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Alternative	Potential Advantages	Potential Disadvantages	Impact
A5) Elevated shared use path	Includes a bike lane along both directions of travel Includes a separated 10’ multi-use path	Height and alignment of multi-use path may require safety railing No intermediate locations to enter/exit the multi-use path	
A6) Natural Berm alignment	Includes a bike lane along both directions of travel Includes a separated 10’ multi-use path If Path alignment along natural berm can provide views of Swan Lake	If path alignment is along the natural berm, it increases the distance to residential locations where trips begin/end	
A7) Split alignment/ existing + berm	Includes a bike lane along both directions of travel Includes a separated 10’ multi-use path can either be placed along the natural berm or widen the existing path	If path alignment is along the natural berm, it increases the distance to residential locations where trips begin/end	
A8) Deodar alignment	Includes a bike lane along both directions of travel Includes a separated 10’ multi-use path	Path not raised to 100-year flood, only 5-year (or other?) How long does path remain inundated with water at different design storms?	

A9) Chesapeake alignment	Includes a bike lane along both directions of travel Includes a separated 10’ multi-use path	Path not raised to 100-year flood, only 5-year (or other?) How long does path remain inundated with water at different design storms?	
A10) Align Lemmon Dr. outside of 100-Yr Flood Plain (“Hug”)	Includes a bike lane along both directions of travel Includes a separated 10’ multi-use path	Path not raised to 100-year flood, only 5-year (or other?) How long does path remain inundated with water at different design storms?	
A11) Elevate Lemmon Dr. with Structures	Includes a bike lane along both directions of travel Includes 10’ multi-use path separated from the bridge	No escape route for bikes when on structures. Elevated alignment limits access locations	
A12) Eliminate Lemmon Dr.		Multi-modal improvements would be needed along other existing roadways.	

Goal # G5: Provide opportunities along Lemmon Drive to aid long-term flood response planning.

Alternative	Potential Advantages	Potential Disadvantages	Impact
A1) "No Build"		This would not eliminate the need for HESCO barriers. Pumping is still necessary to get the water from the east and north sides of Lemmon Drive into Swan Lake	
A2) Raise Ex. Lemmon above 100-yr	This would eliminate the need for HESCO barriers. Equalization culverts under the roadway to eliminate need for pumping while getting water from east and north of the roadway into Swan Lake		
A3) Raise one side (N or S) above 100-yr	This would eliminate the need for HESCO barriers.	Pumping is still necessary to get the water from the east and north sides of Lemmon Drive into Swan Lake under the at-grade alignment	
A4) Lake volume removal, take Lemmon out of 100-yr	This would eliminate the need for HESCO barriers.	Pumping is still necessary to get the water from the east and north sides of Lemmon Drive into Swan Lake under the at-grade alignment Ongoing maintenance to ensure sedimentation does not cause WSE to raise.	

Level 1 Screening: Evaluation with Respect to Defined Goals

Alternative	Potential Advantages	Potential Disadvantages	Preferences (Check One)
A5) Elevated shared use path	This would eliminate the need for HESCO barriers. *(Verify this with Washoe County)*	Pumping is still necessary to get the water from the east and north sides of Lemmon Drive into Swan Lake under the at-grade alignment	
A6) Natural Berm alignment	This would eliminate the need for HESCO barrier and pumping facilities	Ongoing pavement Maintenance still required for approximately 3,500 feet of Lemmon Drive at the north end of Swan Lake	
A7) Split alignment/ existing + berm		Pumping is still necessary to get the water from the east and north sides of Lemmon Drive into Swan Lake under the at-grade alignment. HESCO barriers still required along the west side of the existing Lemmon Drive	
A8) Deodar alignment	This would eliminate the need for HESCO barriers and pumping facilities	.	

A9) Chesapeake alignment	This would eliminate the need for HESCO barriers and pumping facilities		
A10) Align Lemmon Dr. outside of 100-Yr Flood Plain ("Hug")	This would eliminate the need for HESCO barriers and pumping facilities		
A11) Elevate Lemmon Dr. with Structures	This would eliminate the need for HESCO barriers and pumping facilities		
A12) Eliminate Lemmon Dr.	This would eliminate the need for HESCO barriers and pumping facilities		

Goal # G6: Upgrade Lemmon Drive to comply with the current engineering design criteria (horizontal, vertical, clear zone, etc.) and eliminate any deficiencies in the existing roadway alignment.

Alternative	Potential Advantages	Potential Disadvantages	Impact
A1) "No Build"		Any existing deficiencies remain in place; including the current 20 mph posted speed limit because of HESCO Barriers and pumping facilities	
A2) Raise Ex. Lemmon above 100-yr	Any vertical deficiencies can be corrected.	Any existing horizontal deficiencies may/may not be able to be corrected.	
A3) Raise one side (N or S) above 100-yr	Roadway becomes a divided alignment New roadway alignment can meet design criteria	Any existing deficiencies may/may not be able to be corrected.	
A4) Lake volume removal, take Lemmon out of 100-yr		Any existing deficiencies may/may not be able to be corrected.	

Level 1 Screening: Evaluation with Respect to Defined Goals

Alternative	Potential Advantages	Potential Disadvantages	Impact
A5) Elevated shared use path		Any existing deficiencies may/may not be able to be corrected. Requirement for HESCO barriers requires reduced speeds to remain in place	
A6) Natural Berm alignment	New alignment can meet current design standards.		
A7) Split alignment/ existing + berm	Roadway becomes a split alignment New roadway alignment can meet design criteria Any vertical deficiencies along existing alignment can be corrected.	Any horizontal deficiencies along existing alignment remain in place. Requirement for HESCO barriers requires reduced speeds to remain in place Additional intersections introduce additional conflict points	
A8) Deodar alignment	New alignment can meet current design standards.	Additional intersections introduce additional conflict points	

A9) Chesapeake alignment	New alignment can meet current design standards.	Additional intersections introduce additional conflict points	
A10) Align Lemmon Dr. outside of 100-Yr Flood Plain ("Hug")	New alignment can meet current design standards. No additional intersections required		
A11) Elevate Lemmon Dr. with Structures	New alignment can meet current design standards.	Would require major change in profile tie-in of side streets. Intersections on structures	
A12) Eliminate Lemmon Dr.		It is unknown if other alignments meet current design standards. Additional intersection introduce additional conflict points	

Goal # G7: Ensure connectivity of future road-network improvements such as the Eagle Canyon Extension and other potential projects in the proposed 2050 RTP by considering logical termini suitable for the region.

Alternative	Potential Advantages	Potential Disadvantages	Impact
A1) "No Build"	Provides connectivity of Eagle Canyon Extension	Lemmon Drive may not meet future capacity needs with forecasted growth in this area.	
A2) Raise Ex. Lemmon above 100-yr	All side street connections remain in their existing location; Accommodates the alternative locations of the Eagle Canyon Extension corridor as well	Profile adjustments will be necessary on side streets to connect to raised profile of Lemmon Drive	
A3) Raise one side (N or S) above 100-yr	All side street connections remain in their existing location; Accommodates the alternative locations of the Eagle Canyon Extension corridor as well	Profile adjustments will be necessary on side streets if northbound alignment profile is raised Adds additional intersections southbound direction separate from northbound direction	
A4) Lake volume removal, take Lemmon out of 100-yr	All side street connections remain in their existing location; Accommodates the alternative locations of the Eagle Canyon Extension corridor as well		

Level 1 Screening: Evaluation with Respect to Defined Goals

Alternative	Potential Advantages	Potential Disadvantages	Impact
A5) Elevated shared use path	All side street connections remain in their existing location; Accommodates the alternative locations of the Eagle Canyon Extension corridor as well		
A6) Natural Berm alignment	Shorter route for potential Stead Airport growth	Chickadee Drive would need to be extended to tie into the realigned Lemmon Dr.	
A7) Split alignment/ existing + berm		Requires existing side streets to be extended to the new alignment to access southbound direction This adds additional intersections (required at both alignments for access in either direction)	
A8) Deodar alignment		Lemmon Drive would intersect with Chickadee Drive, rather than Chickadee intersection with Lemmon Drive. In addition, traffic would be required to navigate a second intersection where Chickadee intersects existing Lemmon Drive	

A9) Chesapeake alignment		Lemmon Drive would intersect with Chickadee Drive, rather than Chickadee intersection with Lemmon Drive. In addition, traffic would be required to navigate a second intersection where Chickadee intersects existing Lemmon Drive	
A10) Align Lemmon Dr. outside of 100-Yr Flood Plain ("Hug")	Lemmon Drive remains the through movement with no additional intersections Accommodates the alternative locations of the Eagle Canyon Extension corridor as well		
A11) Elevate Lemmon Dr. with Structures		Connectivity requires intersections to be on large structures	
A12) Eliminate Lemmon Dr.		This eliminates connectivity with future improvements.	

Goal # G8: Deliver a cost appropriate solution that addresses the goals of the project.

Alternative	Potential Advantages	Potential Disadvantages	Impact
A1) "No Build"	No construction costs	On-going pavement rehabilitation maintenance costs On-going flood mitigation costs including HESCO Barriers, Tiger Dams, and pumping facilities	
A2) Raise Ex. Lemmon above 100-yr	Dewatering efforts during construction reduced by raising the profile	There would be a cost for import, as well as a cost for offsetting volumetric mitigation.	
A3) Raise one side (N or S) above 100-yr	This would require approximately 1/3 of the amount of fill compared to Alternative #2, so there would be less cost than Alternative # 2.	Dewatering necessary to reconstruct existing pavement section	
A4) Lake volume removal, take Lemmon out of 100-yr		This would be very expensive. Washoe County studied excavation of 1' = 1600 AcFt $50-60 million, not including haul costs. High dewatering costs to reconstruct the roadway as a 4-lane facility	

Level 1 Screening: Evaluation with Respect to Defined Goals

Alternative	Potential Advantages	Potential Disadvantages	Impact
A5) Elevated shared use path	Minimal fill required to raise existing roadway elevation	Dewatering necessary to reconstruct existing pavement section Berm/Levee design requirements will add additional costs	
A6) Natural Berm Realignment	Can be constructed at-grade so minimum fill required Eliminates the construction dewatering issues that are along the existing alignment	Box Culvert required under the alignment near the Arkansas St. extension and at the northern end to perpetuate existing drainage	
A7) Split alignment/ existing + berm	New alignment can be constructed at-grade so minimal fill required	Large drainage structures necessary under the alignment near the Arkansas St. extension and at the northern end Construction dewatering issues along existing alignment	
A8) Deodar Realignment	Sub-Alternatives can reduce number of impacted parcels	ROW impacts approximately 40 parcels	

A9) Chesapeake Realignment		ROW impacts approximately 20 parcels	
A10) Align Lemmon Dr. outside of 100-Yr Flood Plain ("Hug")	FEMA's Hazard Mitigation Grant Program could assist in purchasing parcels located within the floodplain	ROW impacts approximately 20 parcels.	
A11) Elevate Lemmon Dr. with Structures		Structures are very expensive.	
A12) Eliminate Lemmon Dr.		The widening of other roadways and the additional new roadways needed to provide a backdoor alignment are still costly