

South Dayton Valley Area Drainage Master Plan



CWSD Board Meeting
August 19, 2020 | 6:30pm

What is an Area Drainage Master Plan (ADMP)?

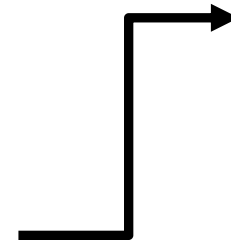
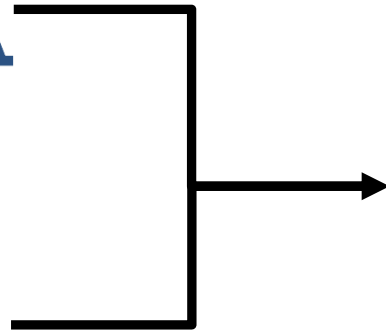
- Planning-level study of flood risk within a watershed
- Goals:
 - Develop a comprehensive understanding of the off-site existing condition flood risk
 - Develop alternative mitigation solutions

Project Funding

- FEMA Cooperative Technical Partner (CTP) grant
- Lyon County



FEMA

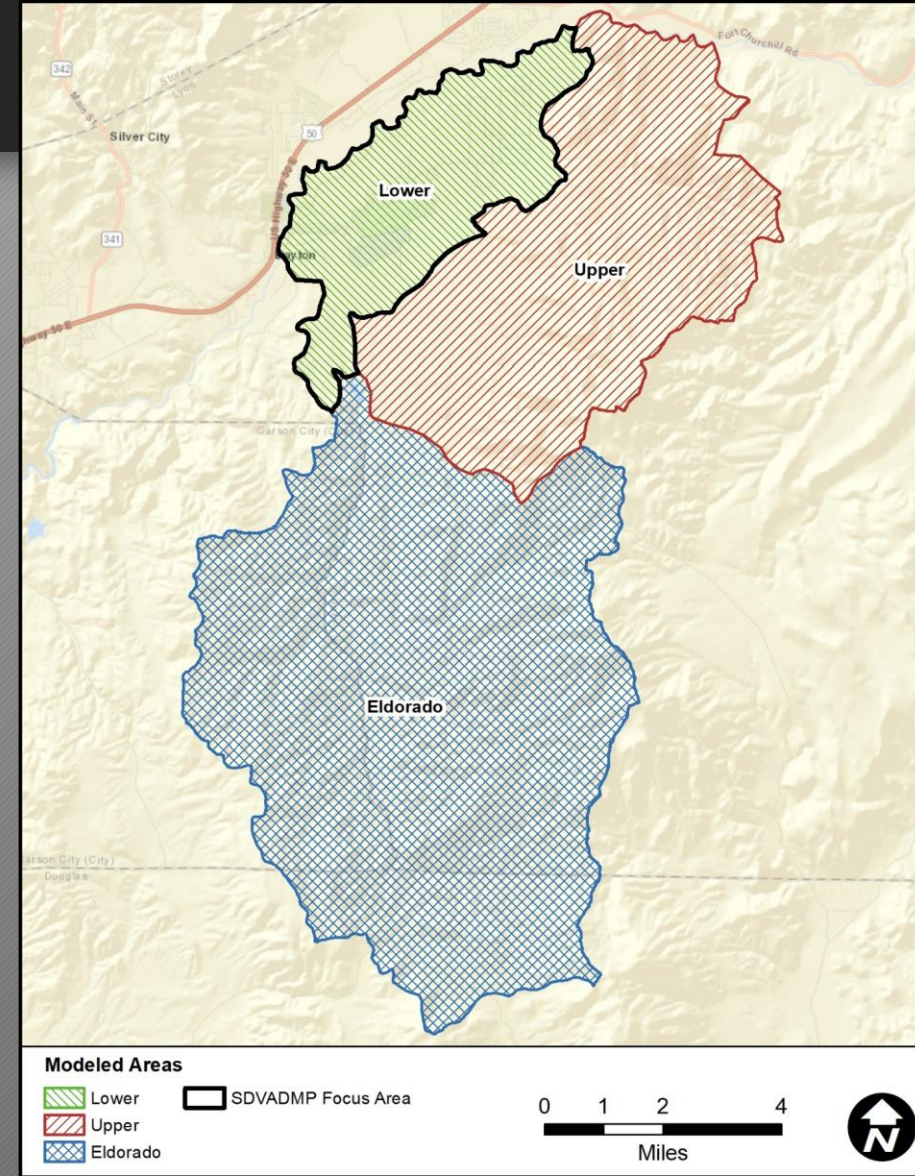


ADMP



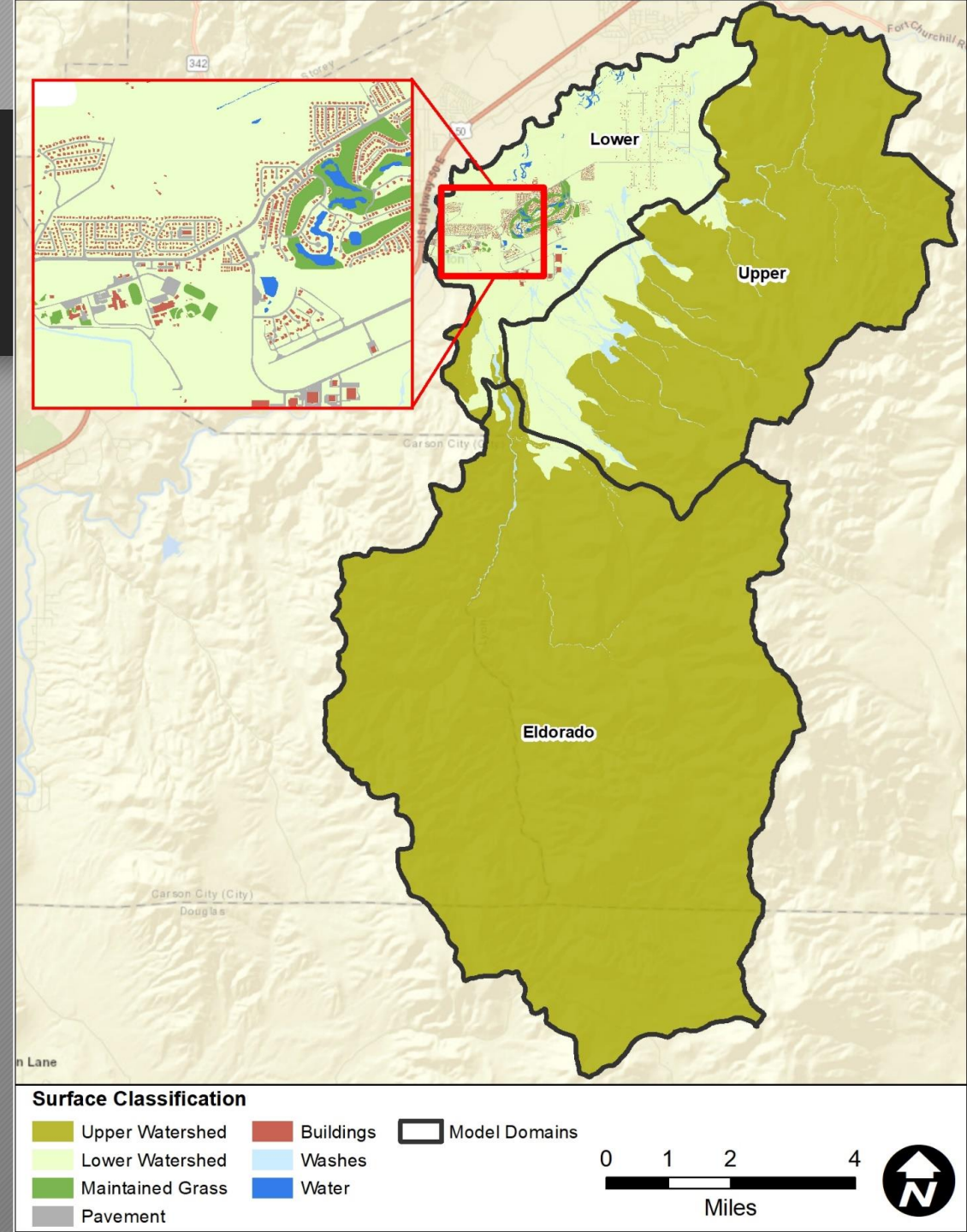
ADMP Major Project Elements

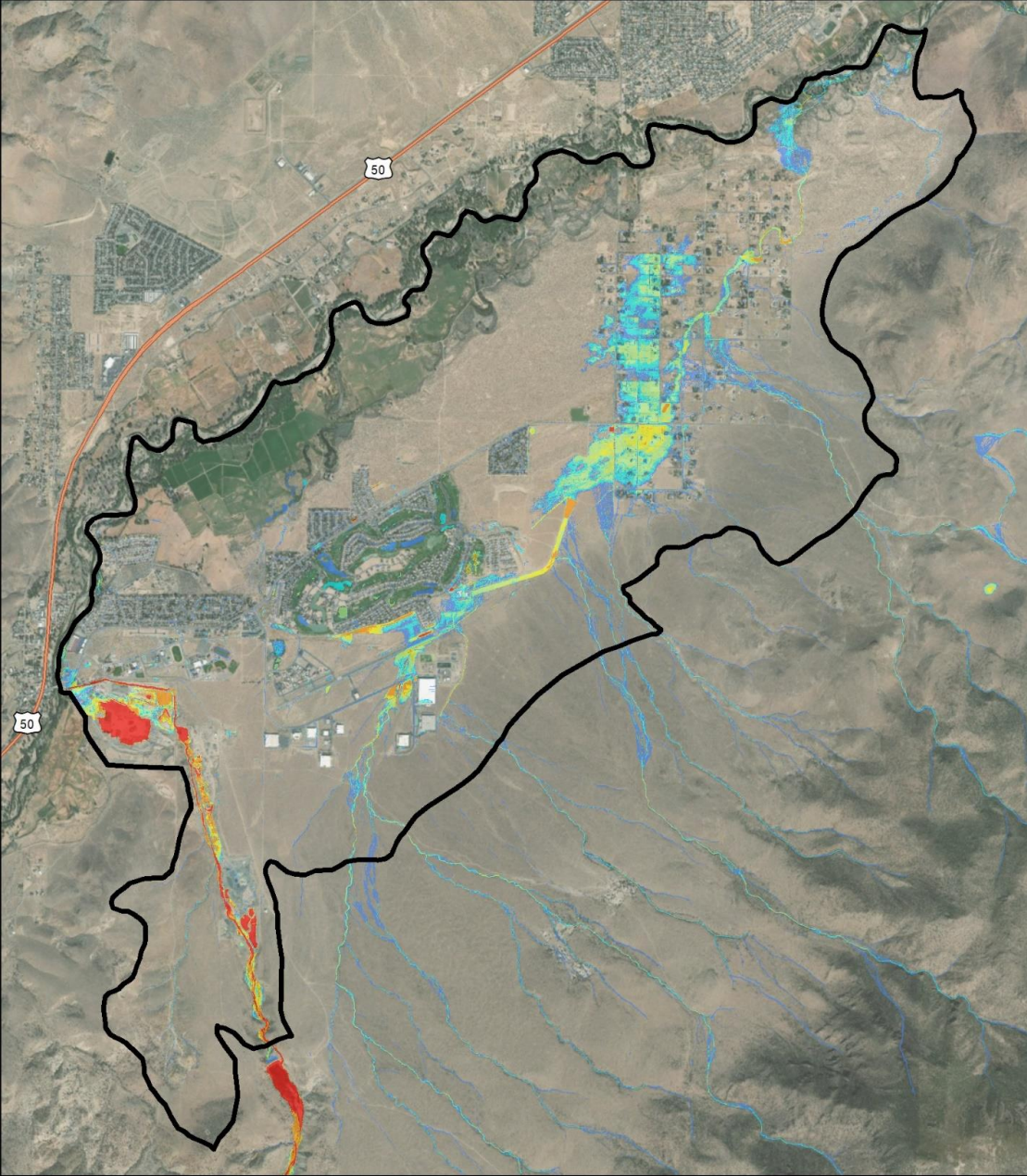
- Data Collection
- Topographic Mapping (USGS LiDAR)
- Watershed Assessment (landforms)
- Flood Risk Assessment
 - Hydrologic Modeling
 - Hydraulic (2D) Modeling
- Flood Risk Classification (people, buildings, roads)
- Sediment Engineering
- Economic Loss Estimates
- Regional Alternative



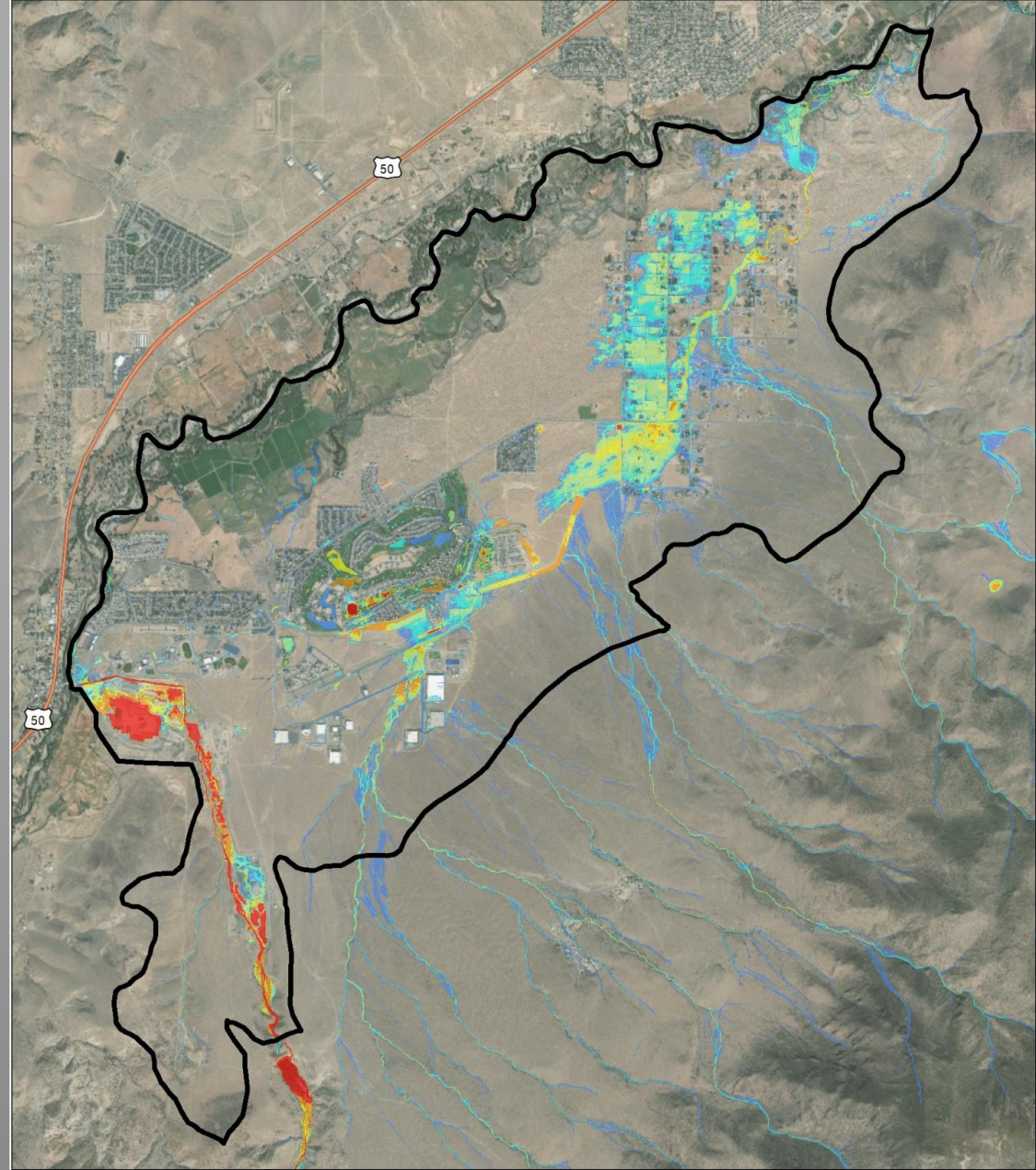
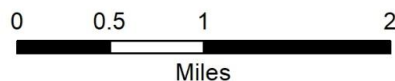
Flood Risk Assessment

- Hydrologic Modeling
 - New NDOT Method for Storm Shape
 - 25-year, 24-hour storm
 - County Design Standards
 - 100-year, 6-hour storm
 - 100-year, 24-hour storm
- Hydraulic Modeling (FLO-2D)
 - Three Separate Models





25-Year, 24-Hour Flow Depth (feet)

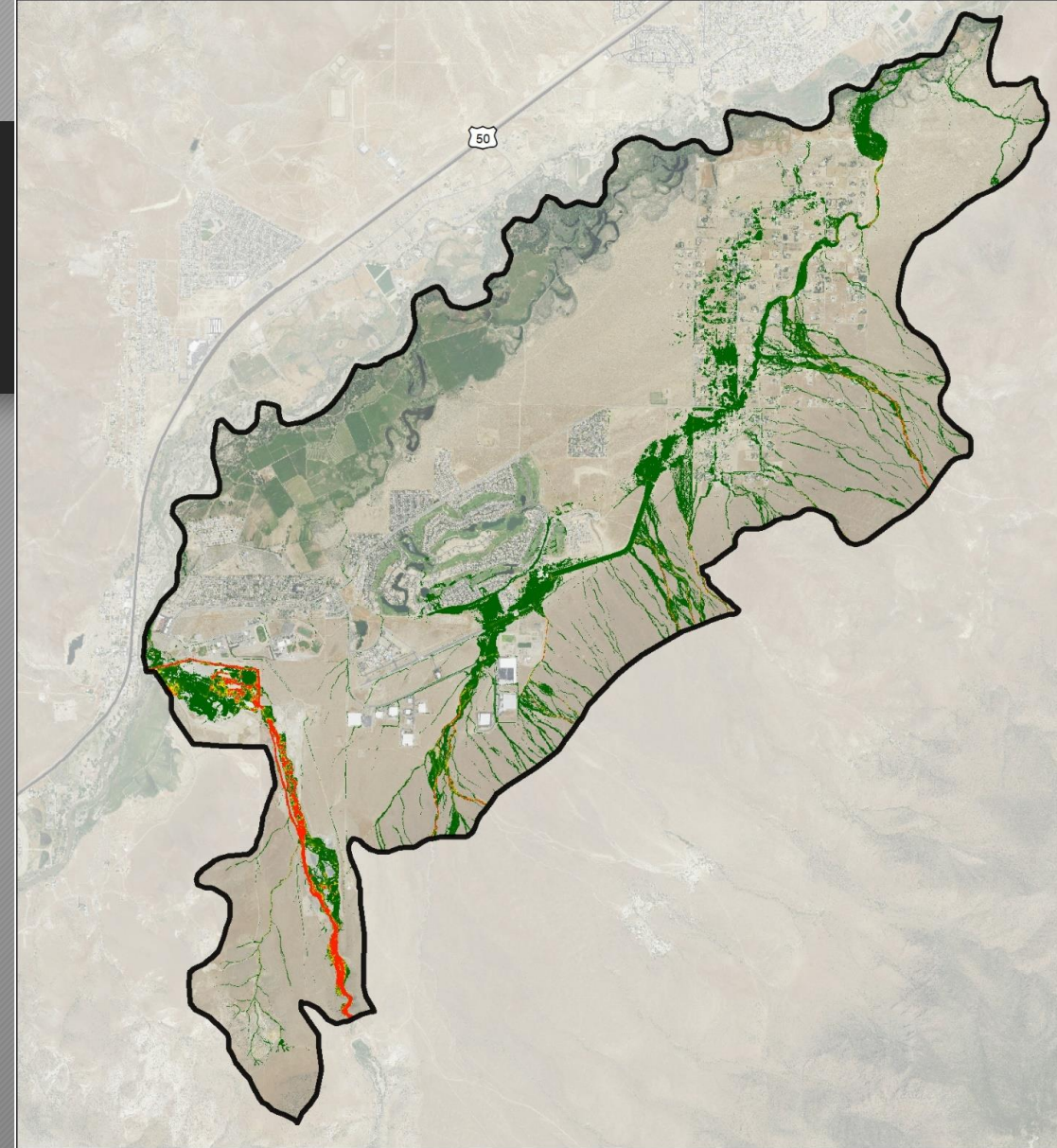


100-Year, 24-Hour Flow Depth (feet)



Flood Risk Assessment

- Sediment Engineering
 - Collected 12 samples
 - Identify watercourses with high sediment transport
 - Quantify sediment yield



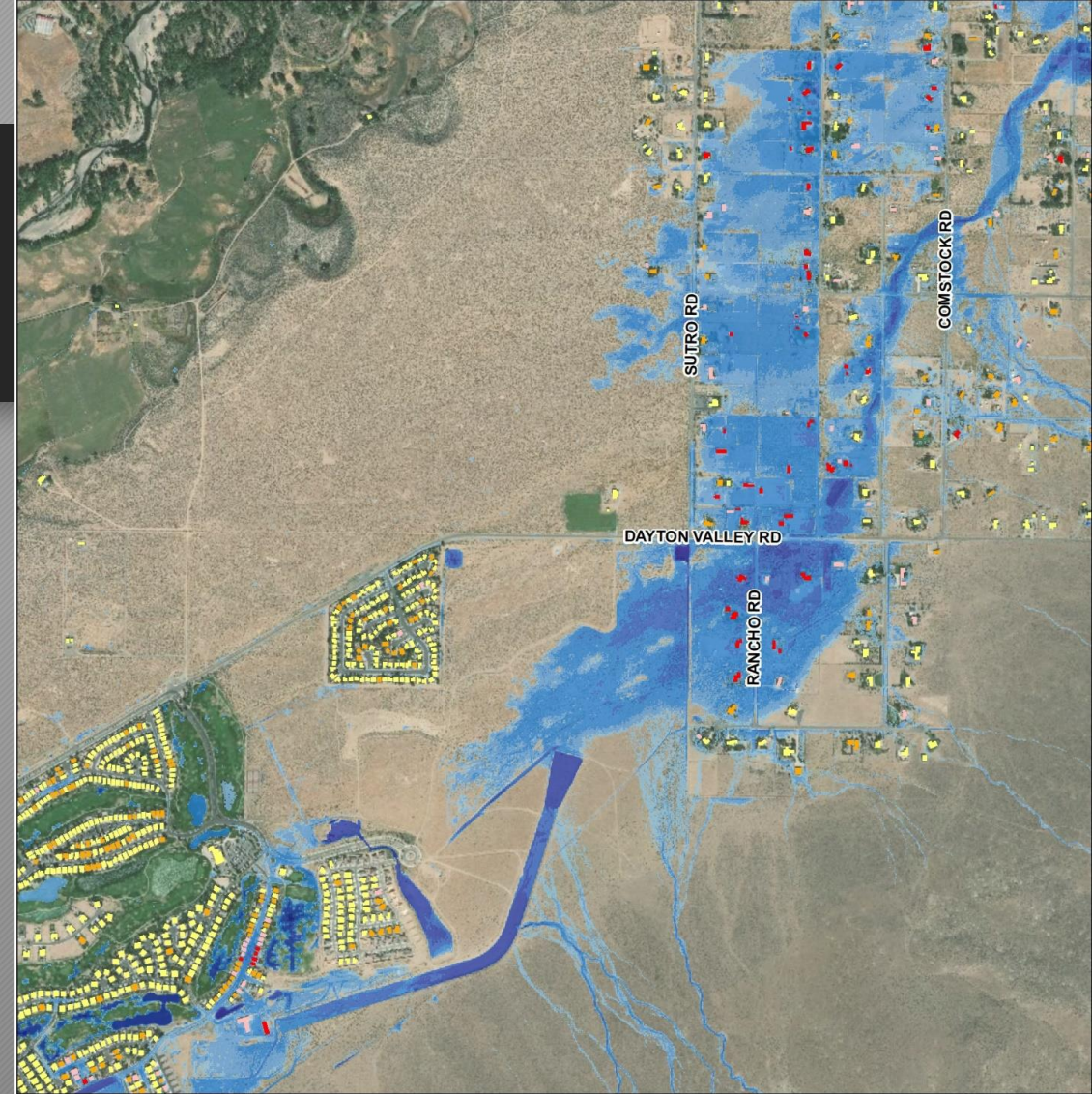
Relative Sediment Transport Capacity (100-year 24-hour)

Yang Sediment Transport  SDVADMP Focus Area



Flood Risk Classification

- Identify specific flood risk areas:
 - Pedestrians
 - Vehicles
 - Buildings



Building Inundation Hazard

- Very Low (Depth < 0.25 feet)
- Low (Depth 0.25 feet to 0.5 feet)
- Moderate (Depth 0.5 feet to 1 foot)
- High (Depth > 1 foot)

100-year 24-hour Max. Depth (ft)

- < 0.25
- 0.25 - 0.5
- 0.5 - 1
- 1 - 2
- 2 - 3
- 3 - 6
- > 6

0 1,000 2,000 4,000
Feet



Flood Risk Classification

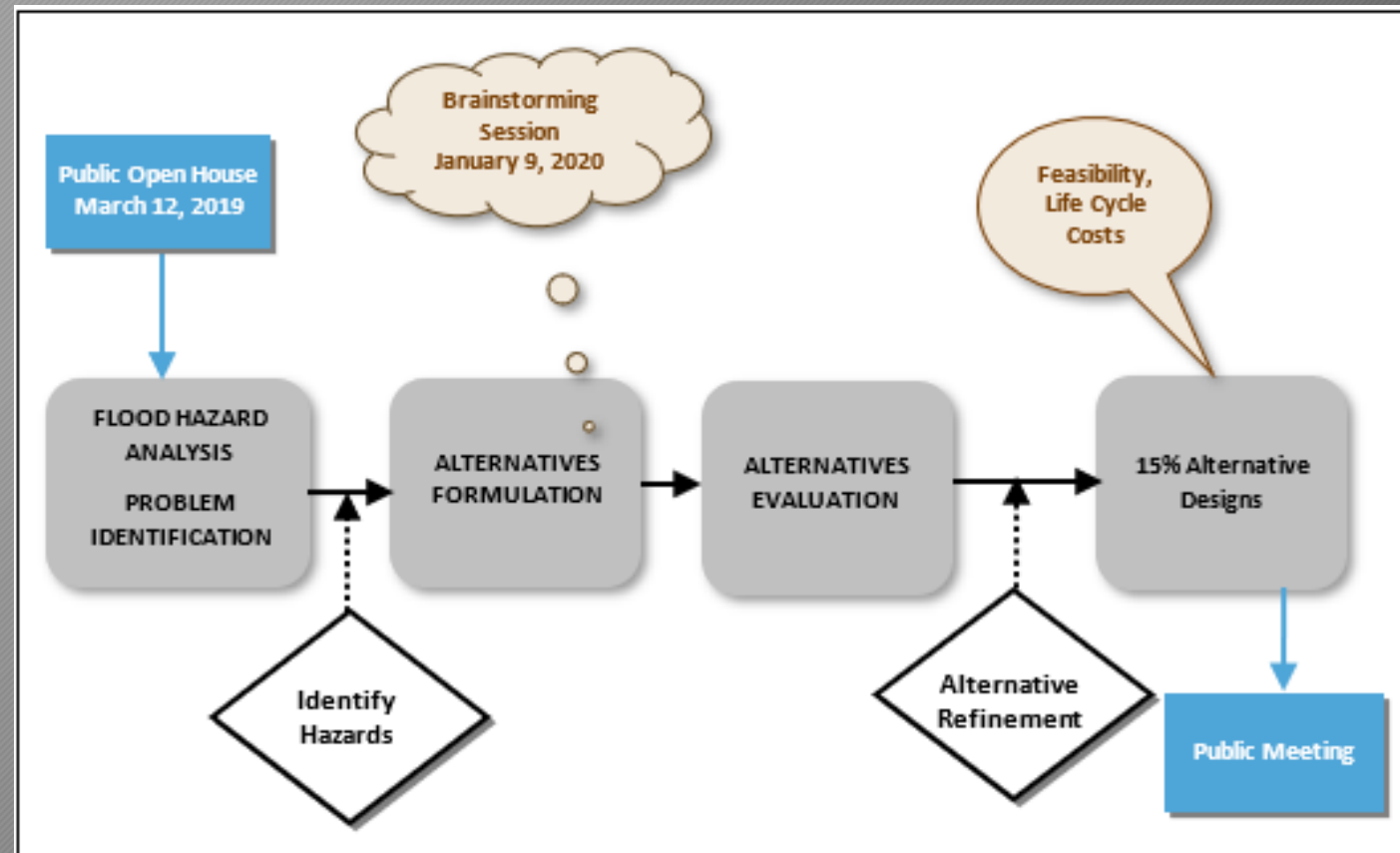
- HAZUS Analysis

- FEMA model used for estimating potential economic losses from natural disasters

Base Conditions					
Recurrence Interval	Direct Building Economic Loss				
	Residential	Commercial	Industrial	Others	Total Property ¹
	\$ millions	\$ millions	\$ millions	\$ millions	\$ millions
25Y24H	2.68	0.21	0.45	0.43	3.77
100Y24H	5.93	0.36	0.69	0.67	7.65
100Y6H	0.78	0.05	0.08	0.06	0.97
1. May not be additive due to rounding in internal HAZUS calculations					

Alternatives - Regional Mitigation Alternatives

- South Dayton Valley unique challenges
 - Minimal drainage infrastructure
 - Highly distributary flow
- Community-wide solutions



Three Mitigation Alternatives

- Detention/Sediment Basins
 - Collector Channels
 - Conveyance Channels
 - Upsized Culverts
 - New Culverts
- Provides a regional solution
 - The Lyon County Comprehensive Master Plan: South Dayton Bypass Road
 - The basins and channel are located primarily on public land
 - Minimize the number of private parcels

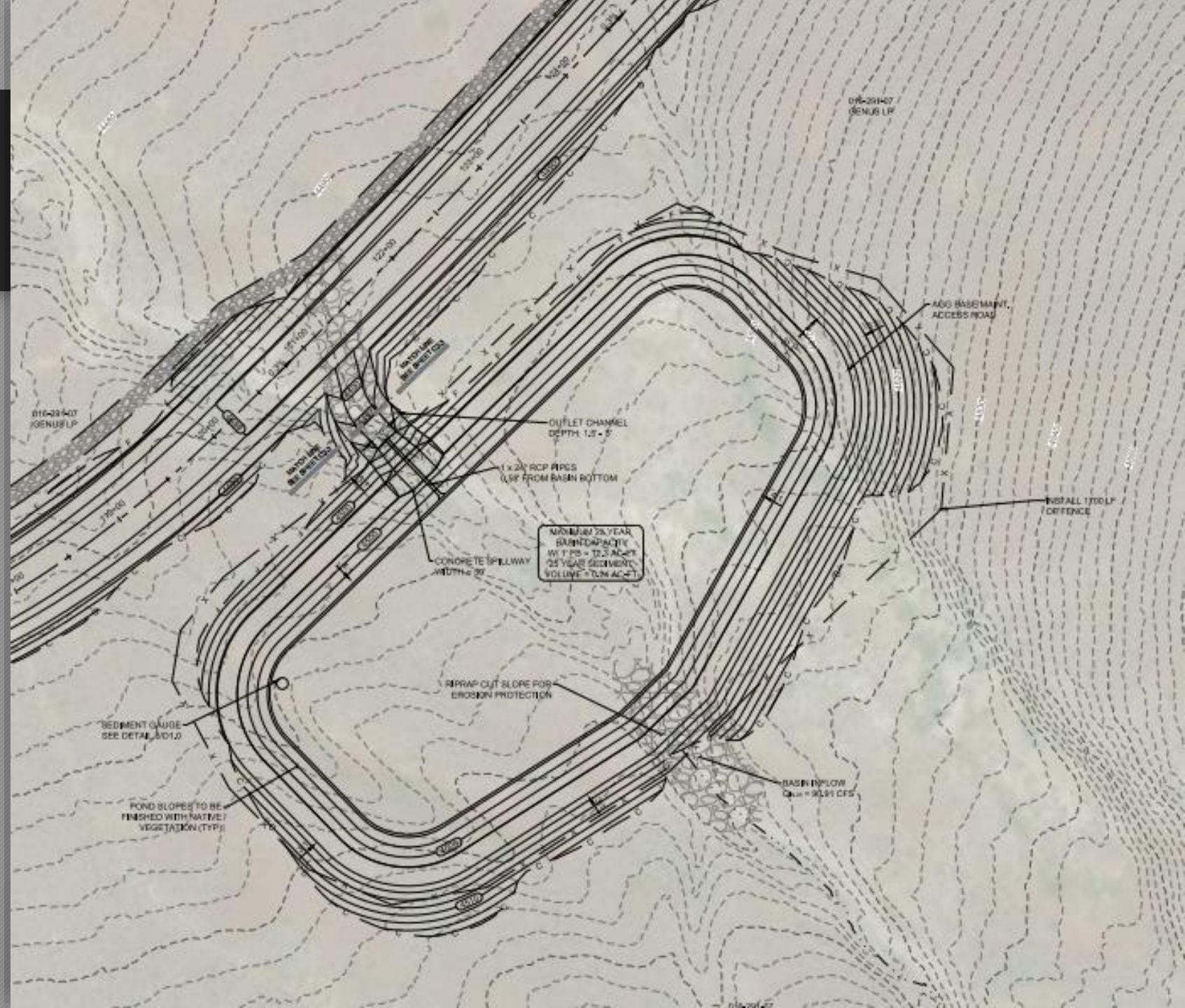


Selected Mitigation System

- Collector/Conveyance Channel
- Sediment/Detention Basin



Sediment / Detention Basin



Building Impacts

Recurrence Interval Storm	Proposed Conditions Building Counts				Existing Conditions Building Count ¹	Buildings Removed (Benefit)
	Building Count Flow Depth	Building Count Flow Depth	Building Count Flow Depth	Total Building Count		
	0.25' < h ≤ 0.5'	0.5'< h ≤ 1'	1' < h			
Proposed Conditions (25-year System)						
25Y24H	314	47	12	373	445	72
100Y24H	351	80	27	458	580	122
100Y6H	432	53	7	492	499	7
Proposed Conditions (100-year System)						
25Y24H	314	47	12	373	445	72
100Y24H	345	62	15	422	580	158
100Y6H	432	53	7	492	499	7

Flood Risk Area Reduction Benefit

Recurrence Interval Storm	Flood Risk Inundation Area	Total Benefit
	Acres	Acres Removed from Flood Risk (depth < 0.25 feet)
Base Conditions		
25Y24H	770	-
100Y24H	1,165	-
Proposed Conditions (25-year System)		
25Y24H	347	423
100Y24H	751	414
Proposed Conditions (100-year System)		
25Y24H	337	433
100Y24H	501	664

Project Phasing

Phase	Structure Elements	25-Year Structure Cost Estimate ²	100-Year Structure Cost Estimate ²
Phase 1	Conveyance Channel (5,200 LF ¹)	\$3,030,000	\$4,500,000
Phase 2	Conveyance Channel (4,500 LF)	\$2,600,000	\$3,800,000
Phase 3	Conveyance Channel (1,100 LF) Basin #6	\$700,000 \$2,400,000	\$970,000 \$2,800,000
Phase 4	Conveyance Channel (7,200 LF)	\$4,200,000	\$6,100,000
Phase 5	Conveyance Channel (2,300 LF) Basin #5 Basin #4	\$1,350,000 \$1,100,000 \$3,100,000	\$2,000,000 \$2,200,000 \$4,400,000
Phase 6	Conveyance Channel (3,700 LF)	\$2,200,000	\$3,200,000
Phase 7	Conveyance Channel (900 LF) Basin #3	\$515,000 \$2,000,000	\$760,000 \$3,200,000
Phase 8	Conveyance Channel (3,300 LF)	\$1,950,000	\$3,000,000
Phase 9	Conveyance Channel (2,500 LF) Basin #2 Basin #1	\$1,500,000 \$2,000,000 \$2,600,000	\$2,200,000 \$2,200,000 \$3,000,000

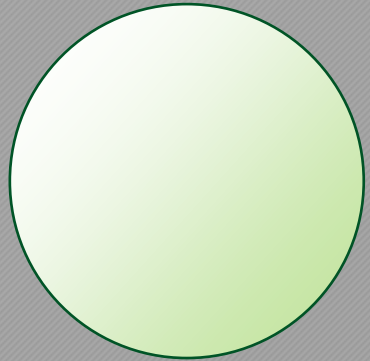
1. LF = linear feet (approximate)
2. Construction costs have been rounded for simplification. See Appendix B for a detailed breakdown of cost estimates.



Potential Mitigation Phasing



ADMP Provides a Range of Solutions



Development
Guidelines

Site-Specific
Solutions
(Ranchos)

Full Regional
Solution

Questions



Prepared by:



Mike Kellogg, PG, CFM, GISP
mike@jefuller.com

Richard Waskowsky, PE
richard@jefuller.com



Ryan Spreeman, PE
rspreeman@lumosinc.com