Douglas County, Nevada

STORMWATER MASTER PLAN

2024

NEVADA EST. 1861
DOUGLAS COUNTY
GREAT PEOPLE GREAT PLACES

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Acronyms and Abbreviations

ADMP	Area Drainage Master Plan
BMP	Best Management Practice
BMP RAM	Best Management Practice Rapid Assessment Methodology
CIP	Capital Improvement Program
CRS	Community Rating System
CVCD	Carson Valley Conservation District
CWA	Clean Water Act
CWSD	Carson River Watershed Subconservancy District
EPA	Environmental Protection Agency
ERU	Equivalent Residential Unit
FEMA	Federal Emergency Management Agency
FSP	Fine Sediment Particles
GID	General Improvement District
ILA	Interlocal Agreement
LID	Low Impact Development
MS4	Municipal Separate Storm Sewer System
NDEP	Nevada Division of Environmental Protection
NDSL	Nevada Division of State Lands
NDOT	Nevada Department of Transportation
NFIP	National Flood Insurance Program
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resource Conservation Service
Road RAM	Road Rapid Assessment Methodology
SLRP	Sediment Load Reduction Plan
SMP	Stormwater Master Plan
SNPLMA	Southern Nevada Public Lands Management Act
TCID	Tahoe Carson Irrigation District
TMDL	Total Maximum Daily Load
TRPA	Tahoe Regional Planning Agency
WIFIA	Water Infrastructure Finance and Innovation Act
WQIP	Water Quality Improvement Project

Executive Summary

Introduction

Douglas County provides services to the community that ensure public health, safety and welfare of its constituents, and environmental protection. A Stormwater Management Program was created in 2014 to respond more fully to flood hazards, manage day-to-day and emergency operations of public drainage infrastructure, define responsibilities in response to natural hazards, and respond to increasing federal water quality mandates. However, program activities have largely been reactive due to recurring flooding events, a limited budget, equipment and staffing capabilities. Over these past 10 years, the County initiated flood risk and drainage improvement evaluation studies in numerous areas that experienced repetitive flooding, resulting in flood mitigation projects or drainage improvement alternatives in impacted areas. These projects and alternatives have been compiled and prioritized herein to function as a county-wide implementation plan, or Stormwater Master Plan (SMP). This is a proactive approach to implement an effective and sustainable program to manage and control stormwater in Douglas County.

This County-wide Stormwater Master Plan was developed to assist the County in meeting goals and policies to maintain safe and effective infrastructure to protect life and property, meet regulatory water quality mandates, and identify projects and programs necessary to improve, operate, and maintain facilities within Douglas County. By identifying stormwater program deficiencies and flood or drainage hazards within the County, action can be directed towards completing much needed infrastructure improvements. An effective and sustainable Stormwater Management Program must be able to manage hazardous situations during flooding events, as well as manage day-to-day stormwater operations in the County. This SMP provides a prioritized list of stormwater quality improvement and flood mitigation projects, identifies additional areas to be studied for flood risk, and offers approaches to secure a sustainable source of funding for operations and capital projects.

This Executive Summary briefly summarizes the results of the SMP prepared by AtkinsRéalis for Douglas County, Nevada. The recommendations outlined herein have been developed in cooperation with the Douglas County Stormwater Program, Public Works, Community Development, and County Finance departments. The focus of the SMP was to compile and rank the identified projects and programs necessary to improve, operate, and maintain the County's stormwater drainage and stormwater quality infrastructure. This SMP includes:

- A review of existing local, state, and federal programs and responsibilities, and available funding of projects and programs,
- A review of existing watershed studies and proposed flood control or water quality improvement alternatives; identification of potential new projects resulting from new hazards,
- Recommendations to prioritize projects for implementation to protect residents from the impacts of severe flooding, and
- An evaluation of potential funding sources to meet recommendations.

For a more detailed discussion of the information presented in this Executive Summary, please refer to the individual chapters of this SMP.

Douglas County Jurisdictional or Private Boundaries

Located in northwestern Nevada, Douglas County is comprised primarily of small towns, General Improvement Districts (GIDs), and farms and ranches. Lake Tahoe is situated on the west side of the County; the Towns of Minden, Gardnerville and Genoa are central to the Carson Valley; and communities including Topaz Ranch Estates and other rural residential areas around Topaz Lake are located in the southwestern portion of the County. GIDs are unique entities within the County where community services are privately managed and maintained, providing services such as road and stormwater maintenance, domestic water, and/or sewer services to the residents they serve.

Douglas County was settled based on agricultural activities that are still strong today. As a result, the entire Carson Valley is linked by a historic irrigation infrastructure network where water is removed from the Carson and Walker Rivers, and diverted into distribution systems. There are four main systems within the County:

the West Fork of the Carson River, the East Fork of the Carson River, and the Allerman Ditch Company. Topaz Lake is used for irrigation storage of flow from the winter months to prolong the water available for irrigation and recreation within Lyon County in the summer months.

Stormwater runoff quality and quantity from the land surface to receiving water bodies such as Lake Tahoe and the Carson River is regulated by Federal and State programs. While Douglas County is the permittee for these flood and water quality programs, the intersecting nature of stormwater infrastructure between all these parties (GIDs, Towns, irrigation districts) requires coordination and cooperation to effectively protect the residents, ensure irrigation operations function as intended, assist in responding to flooding hazards and emergencies, and maintain compliance with the mandated programs.

Regulatory Program Overview

The County's existing stormwater program capabilities, policies, and plans were reviewed to understand the extent of current responsibilities and activities. The 1972 Clean Water Act (CWA) consists of water quality and flood hazard protections and requires a certain level of effort by the permittees to plan and respond to these regulatory provisions, including sufficient planning and maintenance staff, equipment, and facilities. Each of these programs requires staff spend time to perform numerous inspections, monitoring, maintenance and generating reports to satisfy the requirements. These activities must be performed, documented, and reported throughout the year to prevent violations of the Clean Water Act, Federal Emergency Management Agency, and other state agencies for which non-compliance is punishable by fines or other legal actions.

Flood hazards are also an ever-present concern in the County for which significant financial and staffing resources are expended each year to provide safe access routes during the flooding event, clean up after the floods, or to mitigate their impacts through structural control measures. These risks may be reduced, and in some cases fully mitigated by implementing the recommendations outlined in this SMP.

Capital Improvement Project (CIP) Identification

Years of repeated flooding events and damage to existing infrastructure within specific communities has raised the County's awareness that mitigation efforts must be implemented. The County has partnered with Carson Watershed Subconservancy District (CWSD) to secure funds for studies to identify the flood hazards and recommend solutions to mitigate hazards in the impacted communities. Project alternatives recommended for implementation produced in the numerous studies have been compiled, and a method of prioritization was established to identify a path forward for the County to begin implementation of these projects to protect private property and public infrastructure from these recurring hazards. Allowing the continued delay of project implementation is a risk to the safety and welfare of the County and its residents. Continued deferral of project implementation will become more expensive in the future due to inflation. Without tangible actions, residents will continue to be impacted by flooding events, and the County may be subject to additional litigation by residents who continue to receive damage to personal property.

Recommendations

The recommendations of this SMP include the following:

- Implement a Stormwater Capital Improvement Program to prepare for future stormwater needs,
- Foster cooperation and coordination with public and private entities to share resources,
- Evaluate development and construction standards and ordinances to ensure future projects are safe and the County continues to meet federal funding guidelines,
- Review administrative aspects of regulatory programs for value-added benefits, such as current administration of the Community Rating System (CRS) program, and implement new activities to further protect the community from flood risk, and
- Select and implement a preferred funding mechanism to ensure the stormwater program is an effective part of County operations.

Stormwater Capital Improvement Program (CIP)

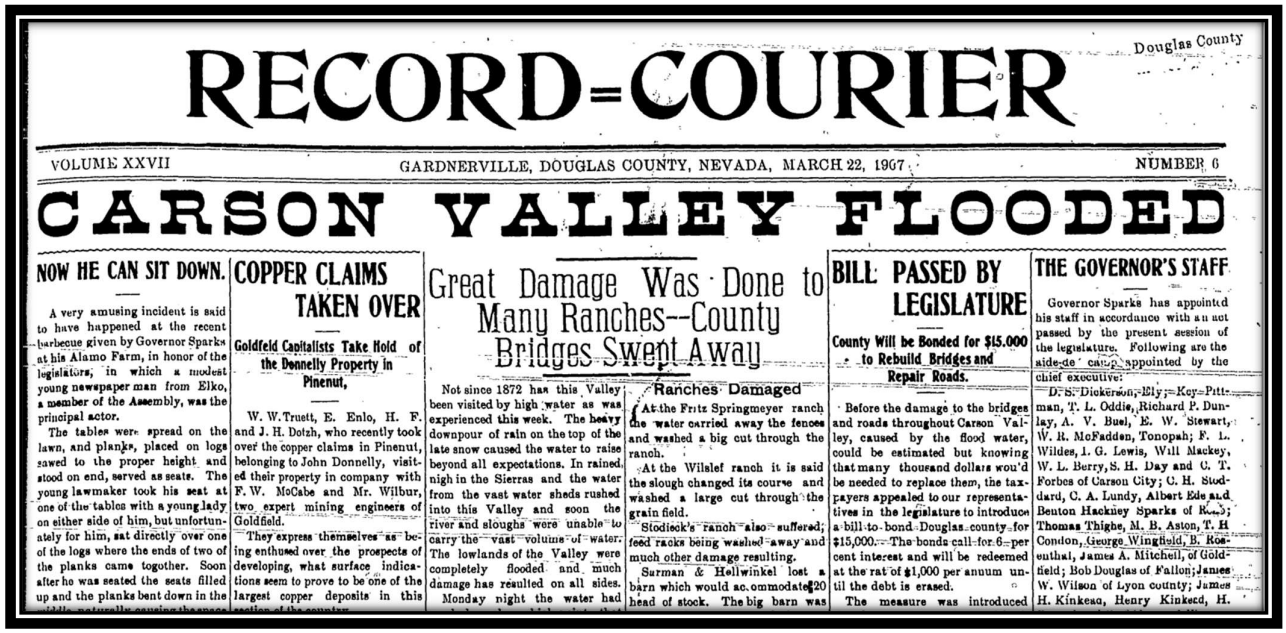
The Stormwater CIP comprises the list of proposed mitigation solutions that were highest scoring and most beneficial to the County and include both flood control and water quality improvement projects. Proposed flood control projects are the outcome of flood risk or drainage master plans conducted on watersheds that have experienced repetitive flooding. Water quality projects were included from the Sediment Load Reduction Plan (SLRP) prepared for Lake Tahoe. To determine which projects should be included in the plan, the County and AtkinsRéalis staff developed a set of rating criteria to score and rank the potential projects that were developed as a result of the numerous flood risk study or drainage master plans. Scoring criteria are included in Table 1. For detailed scoring analysis and project ranking, see Chapter 5 of this SMP.

All of the identified potential projects presented in the individual flood risk studies and SLRP throughout the County were included in the Stormwater CIP and are summarized in Table 2.

Table 1 – Scoring Criteria

Criteria	Basis of Scoring
Frequency of Issue	The more frequently the event occurs, the higher the score/priority
Level of Impact	The more severe the impacts, the higher the priority
Number of Parcels affected	The more parcels impacted, the higher the priority.
Maintenance Intensity; Post-storm maintenance effort	Areas that are prone to higher maintenance and clean-up after storms, the higher the priority
Floodplain	Projects in higher return frequency floodplain are higher priority.
Easements	Parcels, easements or right-of-way that are owned by the County are a higher priority
Implementation	Projects that will provide the most benefits to the community by meeting goals such as longevity, feasibility, and stakeholder partnerships are a higher priority.
Cost	Lower cost projects were given higher priority.
Regulatory Requirements	Projects that must be implemented to meet regulatory requirements are a high priority.
Public Agency Coordination/Permitting	Project implementation requiring coordination and approvals from multiple agencies are reduced priority in that these cannot be implemented immediately or have multiple factors out of the County's control

Figure 1 - 1907 Flood.



RECORD=COURIER

Douglas County

VOLUME XXVII — GARDNERVILLE, DOUGLAS COUNTY, NEVADA, MARCH 22, 1907 — NUMBER 6

CARSON VALLEY FLOODED

NOW HE CAN SIT DOWN.

A very amusing incident is said to have happened at the recent barbecue given by Governor Sparks at his Alamo Farm, in honor of the legislators, in which a modest young newspaper man from Elko, a member of the Assembly, was the principal actor.

The tables were spread on the lawn, and planks, placed on logs sawed to the proper height and stood on end, served as seats. The young lawmaker took his seat at one of the tables with a young lady on either side of him, but unfortunately for him, sat directly over one of the logs where the ends of two of the planks came together. Soon after he was seated the seats filled up and the planks bent down in the middle, naturally causing the ends

COPPER CLAIMS TAKEN OVER

Goldfeld Capitalists Take Hold of the Donnelly Property in Pinenut,

W. W. Truett, E. Enlo, H. F. and J. H. Dotzh, who recently took over the copper claims in Pinenut, belonging to John Donnelly, visited their property in company with F. W. McCabe and Mr. Wilbur, two expert mining engineers of Goldfield.

They express themselves as being enthused over the prospects of developing, what surface indications seem to prove to be one of the largest copper deposits in this section of the country.

Great Damage Was Done to Many Ranches--County Bridges Swept Away

Not since 1872 has this Valley been visited by high water as was experienced this week. The heavy downpour of rain on the top of the late snow caused the water to raise beyond all expectations. In rained nigh in the Sierras and the water from the vast water sheds rushed into this Valley and soon the river and sloughs were unable to carry the vast volume of water. The lowlands of the Valley were completely flooded and much damage has resulted on all sides.

Monday night the water had

Ranches Damaged

At the Fritz Springmeyer ranch the water carried away the fences and washed a big cut through the ranch.

At the Wilslef ranch it is said the slough changed its course and washed a large cut through the grain field.

Stodieck's ranch also suffered; feed racks being washed away and much other damage resulting.

Sarman & Hellwinkel lost a barn which would accommodate 20 head of stock. The big barn was

BILL PASSED BY LEGISLATURE

County Will be Bonded for $15,000 to Rebuild Bridges and Repair Roads.

Before the damage to the bridges and roads throughout Carson Valley, caused by the flood water, could be estimated but knowing that many thousand dollars wou'd be needed to replace them, the taxpayers appealed to our representatives in the legislature to introduce a bill to bond Douglas county for $15,000. The bonds call for 6 per cent interest and will be redeemed at the rat of $1,000 per annum until the debt is erased.

The measure was introduced

THE GOVERNOR'S STAFF

Governor Sparks has appointed his staff in accordance with an act passed by the present session of the legislature. Following are the side-de-camps appointed by the chief executive:

D. S. Dickerson, Ely; Key-Pittman, T. L. Oddie, Richard P. Dunlay, A. V. Buel, E. W. Stewart, W. R. McFadden, Tonopah; F. L. Wildes, I. G. Lewis, Will Mackey, W. L. Berry, S. H. Day and C. T. Forbes of Carson City; C. H. Stoddard, C. A. Lundy, Albert Eds and Benton Hackney Sparks of Reno; Thomas Thighe, M. B. Aston, T. H. Condon, George Wingfield, B. Rosenthal, James A. Mitchell, of Goldfield; Bob Douglas of Fallon; James W. Wilson of Lyon county; James H. Kinkead, Henry Kinkead, H.

Table 2 – Stormwater CIP Projects, Rank, and Costs

Rank	Project Name	Estimated Cost
1	101 - Rain/Flow gauges	$ 6,000
2	7002 - Waterloo Lane Box Culvert at Cottonwood Slough	$ 500,000
3	4001 - Fish Springs - Mel/Myers Basins	$ 7,667,000
4	4006 - Fish Springs - Redhawk Basin	$ 7,665,000
5	3004 - Johnson Lane - Pine Nut North (25 yr) (Completed)	$ 1,075,275
6	6001 - Topaz Lake Drainage Improvements	$ 236,515
7	2002 - Buckeye Road 36" pipe/Box culvert (Upper Allerman)	$ 500,000
8	5001 - Smelter Creek - Phase 1 Sediment Basin upstream	$ 5,045,000
9	3001 - Johnson Lane - Hot Springs Buckbrush (100 yr)	$ 10,442,000
10	4002 - Fish Springs - Pine Nut Creek Dam	$ 24,307,000
11	5003 - Smelter Creek - Unnamed Tributary, Alternative 1 (25-yr Storm Drain)	$ 12,616,000
12	4003 - Fish Springs - Bently Basins	$ 12,007,000
13	5004 - Smelter Creek - Unnamed Tributary, Alternative 2 (25-yr Basin)	$ 2,777,000
14	5002 - Smelter Creek - Phases 1-8 (25-yr)	$ 675,000
15	7001 - East Valley Dip Section (Pine Nut Road)	$ 1,800,000
16	2003 - Crossing at Buckeye Road and Martin Slough	$ 1,800,000
17	4004 - Fish Springs - Janelle Basin	$ 11,709,000
18	3006 - Johnson Lane Wash Dam	$ 6,000,000
19	4005 - Fish Springs - Denmar Basin	$ 14,022,000
20	3005 - Pamela Place	$ 500,000
21	3002 - Johnson Lane - Pine Nut South (25 yr).	$ 1,467,000
22	2004 - Buckeye Detention Basin DCSID Site	$ 3,000,000
23	4007 - Fish Springs - Syphus Basin East (upstream) of Allerman Canal	$ 13,109,000
24	3003 - Johnson Lane - Unnamed Wash A (25 yr)	$ 311,667
25	1001 - Alpine View Estates - Bavarian Drive and Zurich Court	$ 810,000
26	1003 - Alpine View Estates - Cul-de-sac on Bernese Court	$ 250,000
27	1002 - Alpine View Estates - between Bavarian Drive and Jacks Valley Rd	$ 810,000
	TOTAL	$141,107,000

Note: See Table X for individual project benefits.

Implementation of all potential projects identified in the SMP would require a $141 million Stormwater CIP. To proceed with any level of implementation is contingent on a funding source other than the General Fund for the success of the Stormwater Program. Funding scenarios for further evaluation by the County are outlined in Appendix A of this SMP.

Foster cooperation and coordination with private entities or stakeholders

In the Carson Valley, irrigation ditches intersect the public stormwater conveyance infrastructure and inadvertently convey flood flows. Irrigation water users and the County must agree on shared or cooperative maintenance practices to prevent conflicts as a result of sediment accumulation, overflows or blockages. A user's ability to secure, maintain, and improve its own independent drainage infrastructure – despite commingled storm or irrigation water – must be free of conflict to ensure all drainage systems work effectively under both irrigation and stormwater occurrences. The interdependence of historic, private, and public infrastructure necessitates active coordination and cooperation to ensure all parties' benefits are secured. As part of this Stormwater Master Plan, the County met with members of the agricultural community on two occasions to solicit feedback and input on how to address hot spots and resolve conflicts.

At Lake Tahoe, many water quality improvement projects (WQIPs) that reduce sediment input loads to Lake Tahoe have been implemented on General Improvement District (GID) properties. However, it is the County that is the named permit holder under the Federal and State mandated programs, rather than individual GIDs. The construction and maintenance of these improvements requires significant coordination between the County and the GIDs; therefore, regulatory activities must be coordinated for the program's success toward efforts to improve the clarity of Lake Tahoe.

Review administrative procedures to achieve value-added results.
The National Flood Insurance Program (NFIP) recommends more protective floodplain management and construction ordinances than the County administers in its development code. The Community Rating System (CRS) program offers incentives to communities through flood insurance discounts to implement flood mitigation activities. The program has undergone national changes and therefore either existing program actions must increase, or alternative actions could be performed to achieve the highest outcome of flood risk reduction both on-the-ground and as monetary savings to residents. Currently Douglas County is rated as a Class 6 Community, affording a 20% reduction in residents' flood insurance premiums.

Select a funding mechanism to implement the stormwater program to be an effective part of County operations.
Reliable funding mechanisms that are used successfully in thousands of municipalities nationwide are considered and presented. We recommend the County review these funding mechanisms to determine which solution or solutions are achievable based on the County administration activities or existing finance system. A stable funding source to supplement grants or loans will result in a tangible benefit to residents who have experienced repetitive flooding and have expressed concern about inaction by the County.

Further, to all citizens of Douglas County that rely upon safe passage provided by stormwater services to be able to commute to work or school, rely on recreation and tourism for their business, want to feel their property is safe from damage, have peace of mind because emergency services can reach them, and a myriad of other benefits a functional stormwater program can provide, funding this Stormwater Master Plan is critical to the livelihood of everyone in or passing through Douglas County.

Figure 2 - 1937 Flood

DOUGLAS CO

The Record-Courier

FIFTY-SEVENTH YEAR GARDNERVILLE, DOUGLAS COUNTY, NEVADA, FRIDAY MORNING, DECEMBER 17, 1937 NUMBER FIFTY

Big Flood Damages Farms and Highways

Observations

•With everybody in the community talking flood and high water, a few of the highlights and humorous situations are chronicled here.

The Gardnerville fire department was called to the Sierra auto court Saturday night when a shed was discovered on fire. The new engine, under charge of Chief Glock, stopped in eighteen inches of water. Firemen started rolling out hose and one of the fire laddies delegated to take care of the suction pipe, yelled to Glock: "What are you going to hook this

Baptiste Borda Passes Away

Baptiste Borda, well known resident and business man of Gardnerville, died at his brother's farm near Dayton shortly before noon Monday and his unexpected death was a shock to the people of this community.

Mr. Borda, because of a heart ailment, was advised by his physician to take a complete rest. Intending to follow out this advice, he recently leased his hotel and saloon here.

Section of Douglas Dam Washed Out; Several Homes Flooded, Highways Inundated and Loss is Conservatively Estimated at $150,000

Rain started falling in this region last Thursday night, continuing until Saturday afternoon, bring both forks of the Carson river to flood stage and leaving in its wake an estimated damage of $150,000 to highways and farms.

Throughout Thursday night rain fell in heavy downpour and during Friday settled into a steady drizzle only to increase in intensity Friday night.

loo was flooded with 14 inches of water. Debris choked the channel at the river bridge and diverted a torrent of water through the Mack field to Cottonwood slough.

At the Dangberg Home ranch a crew of men attempted to save the bridge in the field just west of the main bridge but high water took it out.

On the West fork many farm bridges were swept away by high

motor owned by Mrs. Ida Ruhenstroth.

With the new opening in the dam, water stopped running over the main spillway. Thousands of tons of silt that had accumulated back of the dam was carried down into the Valley by the rushing waters. However, only a channel was cut through the silt and much of the accumulation of years remains above the dam.

Elmer Bruns Is Dead in Alpine

Elmer Bruns, one of the best known and most highly respected young men of Alpine county, passed away at 8:30 o'clock Monday evening following a brief illness. A few days before he suffered an attack of pneumonia and Monday, when the illness seemed to be clearing up, other complications developed and the end came quickly.

Born in Alpine county 31 years ago, Mr. Bruns grew to manhood

Douglas Farm Bureau Meets

(Pictures on Page Three)

The Ninth Annual meeting of the Douglas county farm bureau was held last Friday at the court house in Minden with a number of local farmers and representatives of the University of Nevada extension service in attendance. At the meeting directors were elected, reports of the county agents were made and important resolutions on policy of the bureau

1. Introduction

Douglas County, Towns and/or GID's provide water, sewer, road, and stormwater services to residents as a matter of safety, health and welfare. Stormwater – runoff from precipitation events – is generally a secondary concern, usually drawing interest only after major flood events. However an effective stormwater and floodplain management program is more than just flood protection; it requires watershed master planning, drainage system maintenance, water quality management, enforcement of federal regulations and reporting of these activities to the State of Nevada, requires a dedicated funding source and financial management. These activities ensure public safety, environmental protection, and compliance with state and federally mandated regulatory requirements. The Douglas County Stormwater Management Program is currently responsible for the operation and maintenance of stormwater runoff collection, treatment, conveyance, and storage infrastructure, and program reporting requirements for Douglas County.

The Carson Valley has been inundated by significant floods since it was established in the 1860's (see Timeline in Figure 5, and newspaper excerpts throughout). The 1996 Master Plan details that "Flash flooding has occurred in Genoa, Johnson Lane, Topaz Ranch Estates, Fish Springs, Ruhenstroth, and other basins located on the east side of the Carson Valley", and that "floodplain management and flood protection measures are increasingly important and should be considered." Nearly 30 years later, flash flooding continues to occur, and floodplain management remains a significant issue for residents and property owners in Douglas County (2020 Master Plan). In recent years the County has responded to a growing number of emergency flooding incidents resulting in damaged infrastructure and property. Historically, stormwater management was reactionary to emergencies but provided no clear plan to mitigate future disasters. Now however, stormwater management is no longer limited to floodplain management and flood control; stormwater discharges or runoff are now regulated by the state and federal governments, requiring reporting activities and audits to be conducted.

This comprehensive, Stormwater Master Plan (SMP) provides a County-wide prioritized list of Capital Improvement Projects (CIPs), with the overall goal of reducing risk of damage to infrastructure during flood events, while improving safety and meeting regulatory water quality mandates. Implementation and construction of CIPs are proactive measures that would provide solutions to the repetitive flooding and improve surface water quality. Included herein is a description of the major watersheds, an overview of the existing drainage reports and proposed improvement projects for these watersheds, and a prioritized list of projects to implement, as well as identification of areas of new flood risk. Finally, a discussion on funding strategies for the projects identified

DOUGLAS COUNTY 1996 MASTER PLAN

Johnson Lane has several alluvial fan washes, including Johnson Lane Wash, Buckbrush Wash, and the Airport Wash that have produced large cloud burst flows. Large population growth in this area will dictate that flood plain management and possibly flood protection measures be taken. ***Protection and management in this area has become increasingly important in light of the frequent flood occurrences.***

The East Valley, Fish Springs, Pinenut and Ruhenstroth regions have also experienced several large cloudbursts in recent years causing short duration, high-flow events to occur. These areas have a multitude of alluvial fans with encroachment by development near the high flood-prone areas. ***Flood plain management and flood protection measures should also be considered in these regions of the Carson Valley***.

Topaz Ranch Estates has several alluvial fan dry-stream basins, including Minnehaha Canyon, that have experienced both wet and dry-mantle storms in recent years. These storms have been particularly damaging to property, roads, and road structures due to encroachment and development near the stream basins. ***This area is in need of floodplain management and also flood protection.***

is provided, including recommendations for a permanent, sustainable revenue source to support floodplain and stormwater management activities.

2. Background

As of 2024, Douglas County has a residential population of about 52,000 across 738 square miles (Figure 6). Lake Tahoe, Towns, General Improvement Districts, and ranches in the agriculturally-rich lands around the Carson and Walker Rivers, and Topaz Lake to the south make up the diverse character of this rural and scenic community. As the County's population increased and development extended into more outlying areas, stormwater management and flooding issues within the County have become more prevalent and costlier to maintain and clean-up after these hazard events. The communities at the base of the Pinenut Mountains have a history of flash floods resulting from both summertime cloudburst events and winter rain-on-snow events. In the Carson Valley, sustained high Carson River flows due to heavy precipitation events or snowmelt runoff have caused widespread flooding, threatening aging flood control and irrigation infrastructure. Across other outlying areas in the County residents are impacted by water quality concerns at Lake Tahoe, local drainage with minor flooding, and post-fire flood threat where increases in flows are expected as a result of burn-scarred drainage areas. This Stormwater Master Plan provides Douglas County with a proactive approach to meet life, health, and safety responsibilities to its residents, meet regulatory mandates with effective financial support, and manage daily resources, operations and maintenance needs.

Figure 3 - Floodwaters through neighborhood

Figure 4 - Johnson Lane detention basin designed to capture floodwater

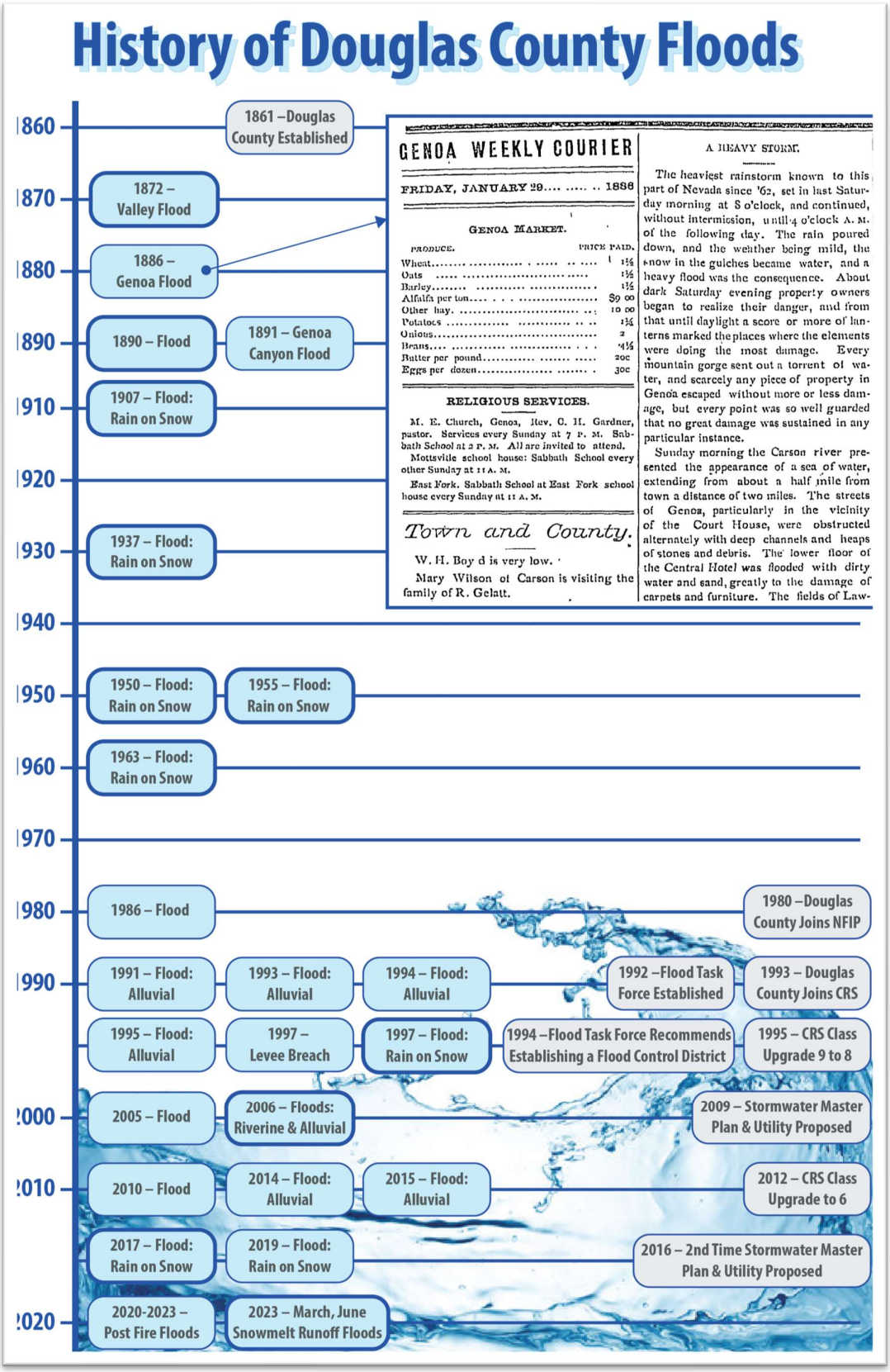
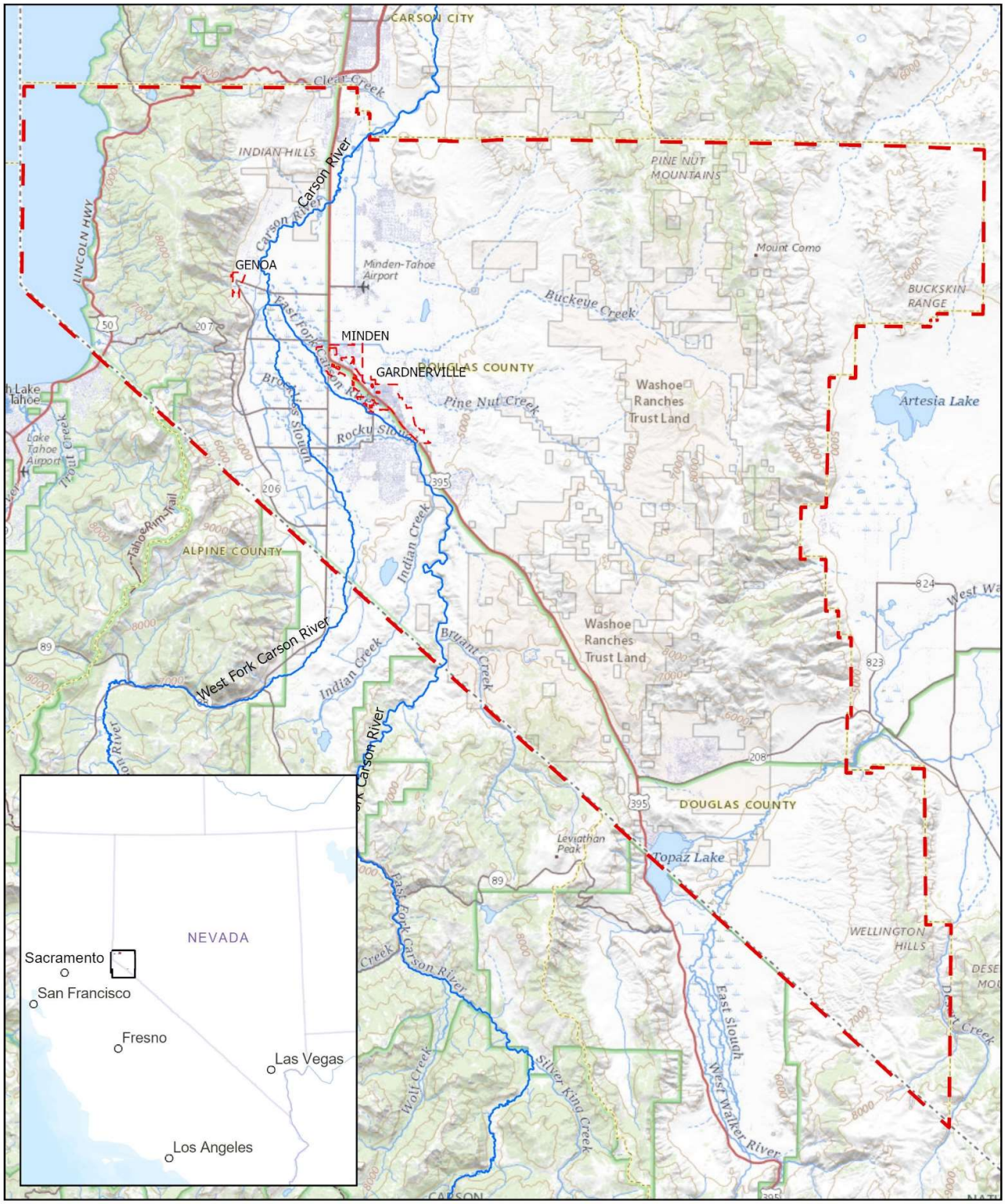


Figure 5 – Timeline of Flooding in Douglas County



Douglas County, Nevada
Stormwater Master Plan

0 2 4 6 8 10 Miles

Disclaimer: the information shown on this map is assembled GIS data created and acquired by AtkinsRealis. This data is not for survey accuracy and is meant for planning purposes only.

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FIGURE 6

VICINITY MAP

2.1 Douglas County Stormwater Program

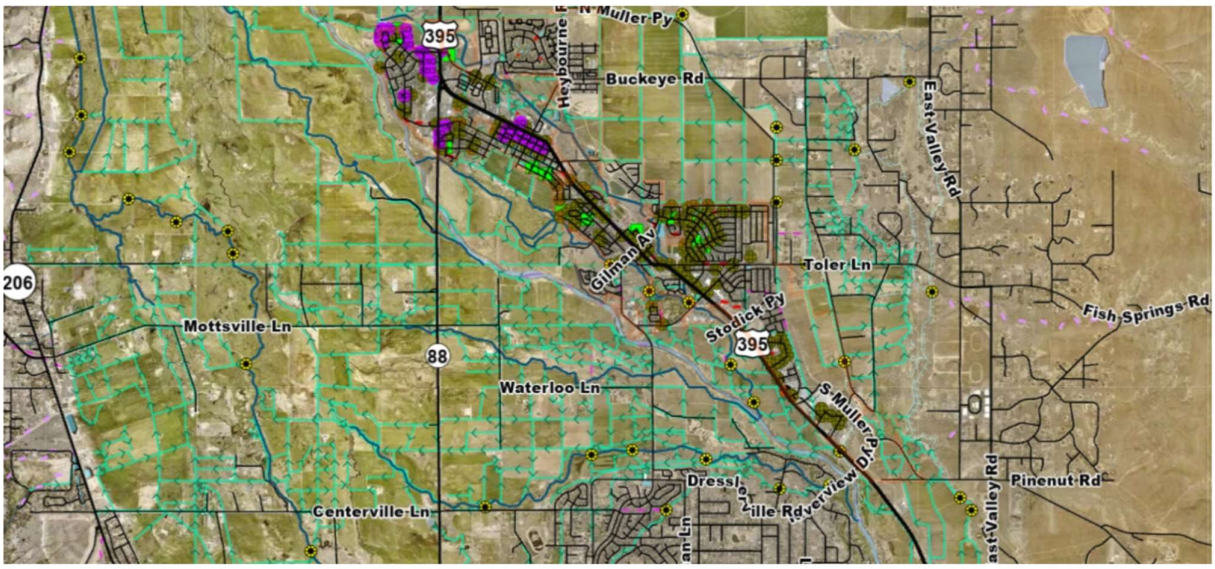
The responsibility of performing stormwater management activities varies throughout the County, based on whether it is public or privately-owned infrastructure. Douglas County is comprised of Towns (Genoa, Minden, and Gardnerville), the Washoe Tribe, 16 General Improvement Districts (GIDs), and vast farm and ranch lands. The Douglas County Stormwater Operations and Maintenance Manual (Appendix B) describes activities of the Stormwater Program. These include the regular maintenance of the existing stormwater systems, mitigation of flood risks through planning and CIP implementation, infrastructure repairs after damaging flood events, and ensuring compliance with all applicable laws and regulations. Compliance is demonstrated through reports submitted to the State of Nevada or FEMA (annual and 5-year). Stormwater infrastructure must be adequately sized and maintained to ensure full conveyance and storage capacity for the ever-present threat of a flood. While seemingly distinct, GIDs and irrigation ditches are geographically and politically connected to the County. The interconnected nature of the management of stormwater infrastructure between these entities, and the need for cooperation and coordination with the County to prevent conflicts, is conveyed in this Stormwater Master Plan.

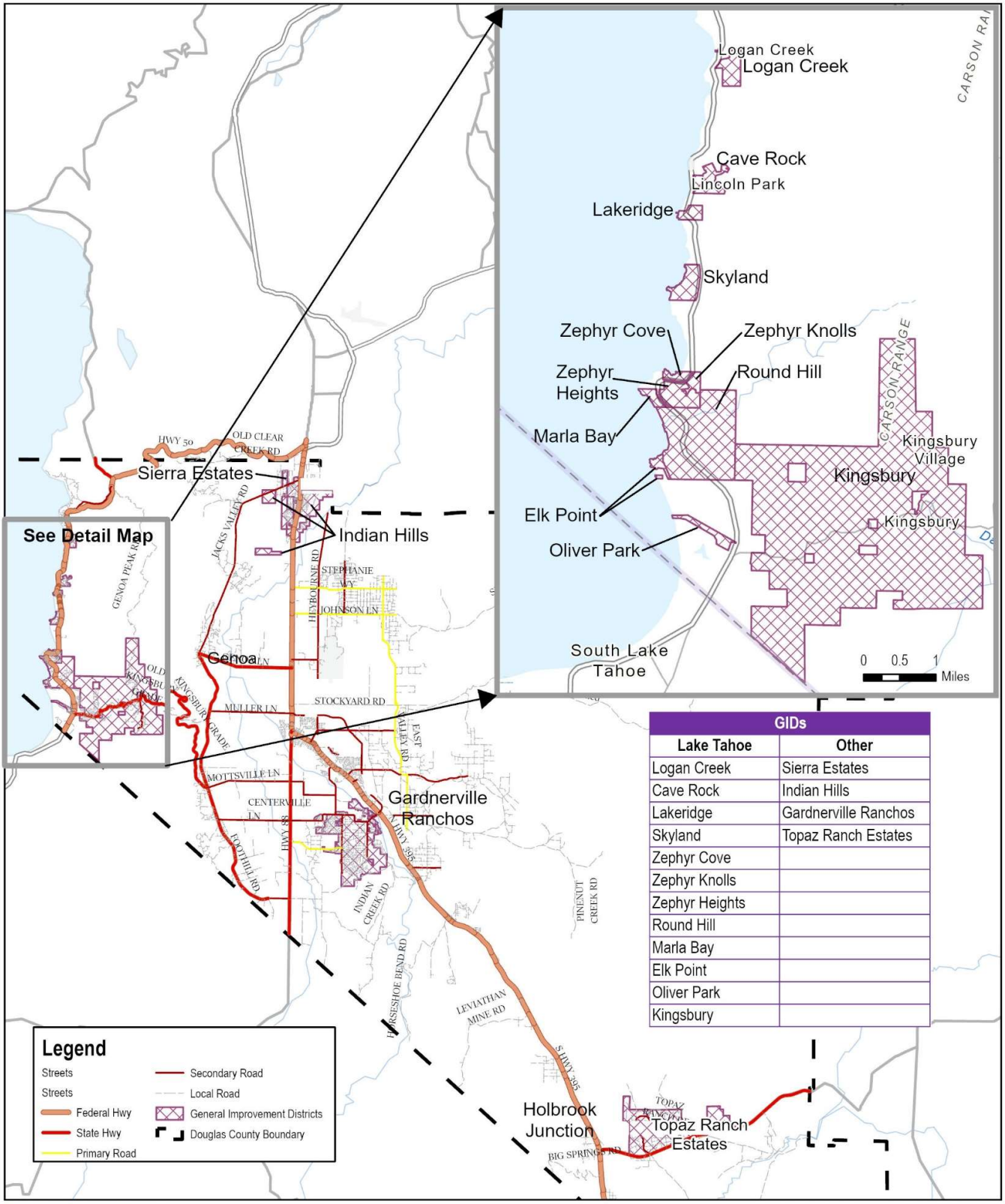
- GIDs have autonomy over public services such as water, sewer, roads and drainage infrastructure which are funded through resident user fees and additional property (ad-valorem) taxes paid to these entities to provide these services (Figure 8).

- In the Carson Valley, over 150 years of agricultural practices resulted in irrigation canals across the County, many of which are maintained and operated by an irrigation district through a ditch company, individual end water user, or water rights holder (Figure 9). While these ditches are used during the growing season to convey water from the Carson and Walker Rivers to fields for irrigation and crop-growing needs, during the wet winter months or after flash floods these ditches become inadvertent conveyances of stormwater runoff and sediment.

This section details the federal, state and local activities by which the stormwater program must abide.

Figure 7 - Irrigation ditch network (teal lines) throughout the valley and towns





GIDs	
Lake Tahoe	**Other**
Logan Creek	Sierra Estates
Cave Rock	Indian Hills
Lakeridge	Gardnerville Ranchos
Skyland	Topaz Ranch Estates
Zephyr Cove	
Zephyr Knolls	
Zephyr Heights	
Round Hill	
Marla Bay	
Elk Point	
Oliver Park	
Kingsbury	

Douglas County, Nevada
Stormwater Master Plan

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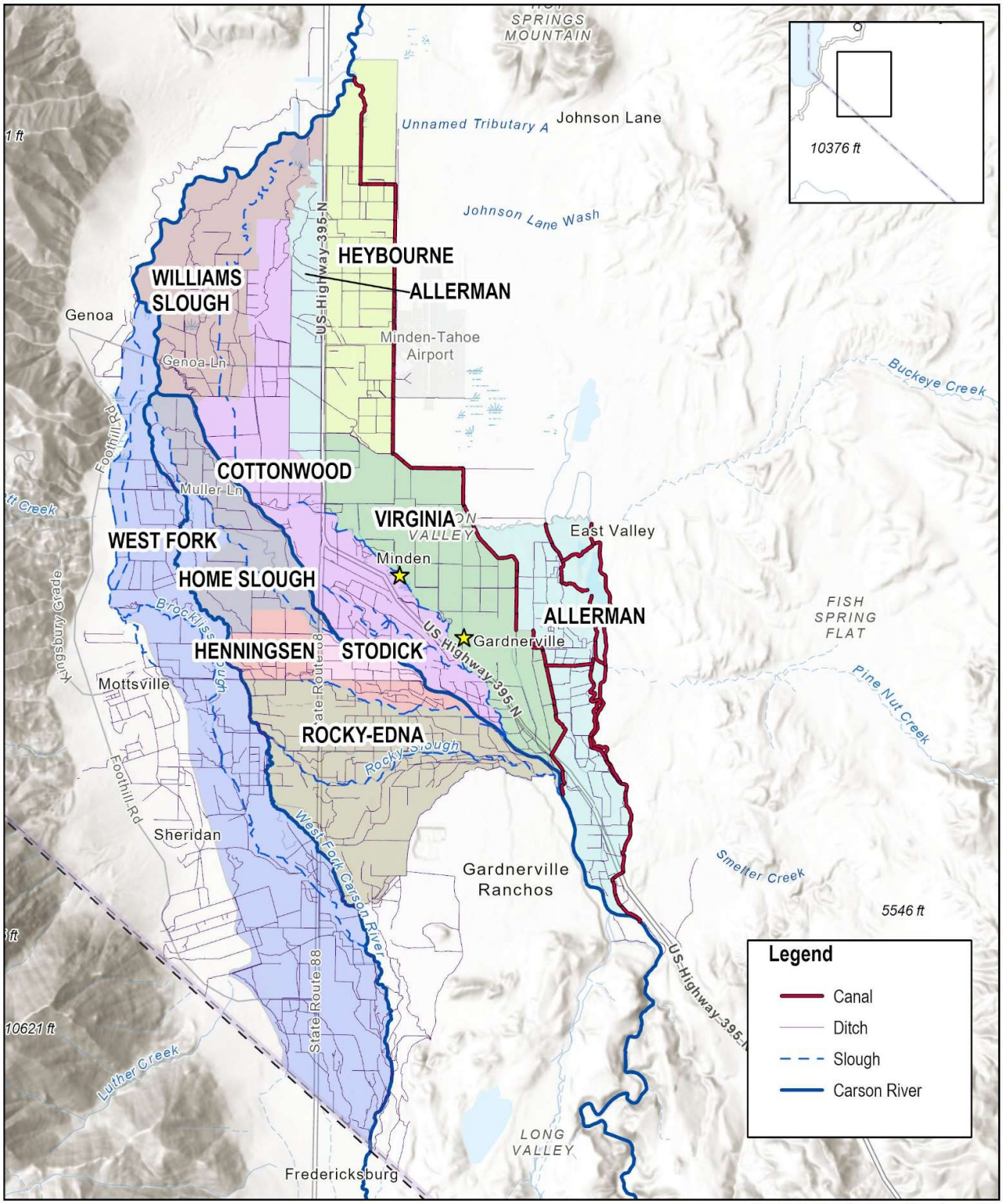
FIGURE 8 GENERAL IMPROVEMENT DISTRICTS (GIDs)



Douglas County, Nevada
Stormwater Master Plan

0 1 2 3 4 5 Miles

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FIGURE 9 **IRRIGATION NETWORKS AND OWNERSHIP**

2.1.1 Federal Stormwater Program Mandated Activities

Stormwater collects sediment and other pollutants as it flows across urban surfaces, causing adverse impacts to streams, rivers, and lakes, and thus is regulated by a variety of laws designed to mitigate these impacts. The 1972 Federal Clean Water Act (CWA) regulates the discharge of pollutants in stormwater runoff to navigable waters of the United States. The CWA establishes several programs administered by the Environmental Protection Agency (EPA) to oversee such discharges, programs which are delegated to states to implement. These Federal regulatory programs, activities and reporting requirements, are summarized in Table 3.

Table 3 – Federal Stormwater Program Activities

Environmental Protection Agency (EPA) and Nevada Division of Environmental Protection (NDEP)			
Program	**Description**	**Activities**	**Reporting**
National Pollutant Discharge Elimination System (NPDES)Permit #NVS040000	Implement a stormwater program under a 'Small MS4 Water Quality Permit' to reduce the discharge of pollutants and protect water quality.	Annual and post-storm Inspections, water quality monitoring, maintain culverts, ditches; street sweeping	Documentation and reporting submitted to NDEP annually on December 1
Lake Tahoe Fine Sediment Particle Total Maximum Daily Load (FSP TMDL)	Restore clarity of Lake Tahoe by controlling the amount of fine sediment particles (FSP) that are in stormwater runoff	Implementation of Sediment Load Reduction Plan (SLRP) through water quality improvement practices including projects (WQIPs), best management practices (BMPs), or road operations (sanding and sweeping)	Annual and post-storm inspections, monitoring and maintenance of the practices using BMP RAM, Road RAM, a compilation of which is submitted to NDEP in an annual report due March 15.
Federal Emergency Management Agency (FEMA) National Flood Insurance Program (NFIP)			
Program	**Description**	**Activities**	**Reporting**
National Flood Insurance Program (NFIP)	Provide federal flood insurance to eligible properties and enforce flood risk reduction development practices.	Enforce floodplain management ordinance, adopt and maintain flood insurance rate maps (FIRMs), maintain minimum floodplain management requirements	Periodic program audits called Community Assistance Visits (CAVs) demonstrating community compliance and enforcement of 44CFR 60.3 regulations
Community Rating System (CRS)	Perform floodplain management activities that provide a 20% discount to residents on flood insurance premiums	Outreach and education, floodplain mapping, floodplain management, drainage system maintenance, flood warning and response	Annual documentation submittal due October 1, additional 5-year submittal and audit due accordingly

National Pollutant Discharge Elimination System (NPDES)

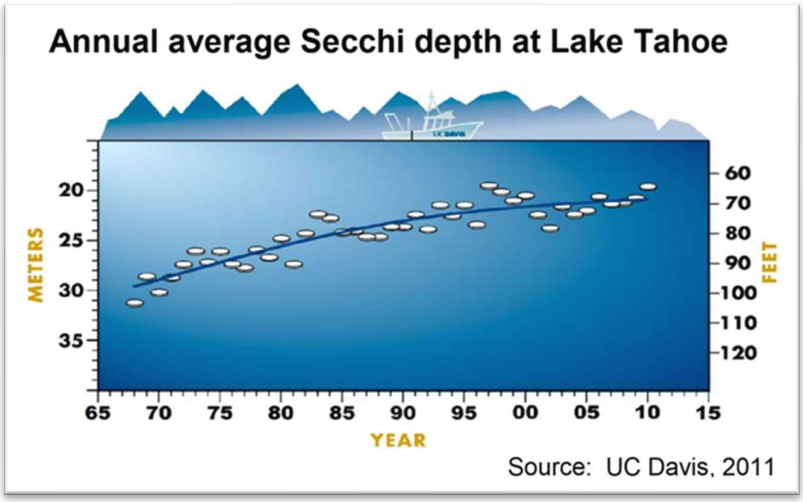
The NPDES municipal stormwater permit program of the CWA authorizes stormwater discharges from Indian Hills, Jacks Valley, Clear Creek, and a portion of the Johnson Lane area. Under this program, the County is mandated by the EPA through the Nevada Division of Environmental Protection (NDEP) to implement a stormwater program under a 'Small MS4 Water Quality Permit'[1] to reduce the discharge of pollutants and protect water quality. Inspections and activities such as cleaning culverts and ditches, street sweeping, and water quality monitoring all are required under Douglas County's MS4 permit. Documentation and reporting of activities is prepared by County personnel and submitted in an annual report to NDEP. The area within Douglas County that is overseen by this permit is shown in Figure 10. A copy of the Permit Fact Sheet is included in Appendix C.

Failure to comply with any of these programs can lead to severe consequences. Violating the CWA is a serious offense, and the EPA is authorized to take action through civil or criminal proceedings. Criminal penalties are rare, but in extreme cases a judge may impose the violator to pay restitution or be incarcerated. If a permittee is found to be in violation (through a citizen suit, inspection, or audit) the EPA is authorized to take the following actions:

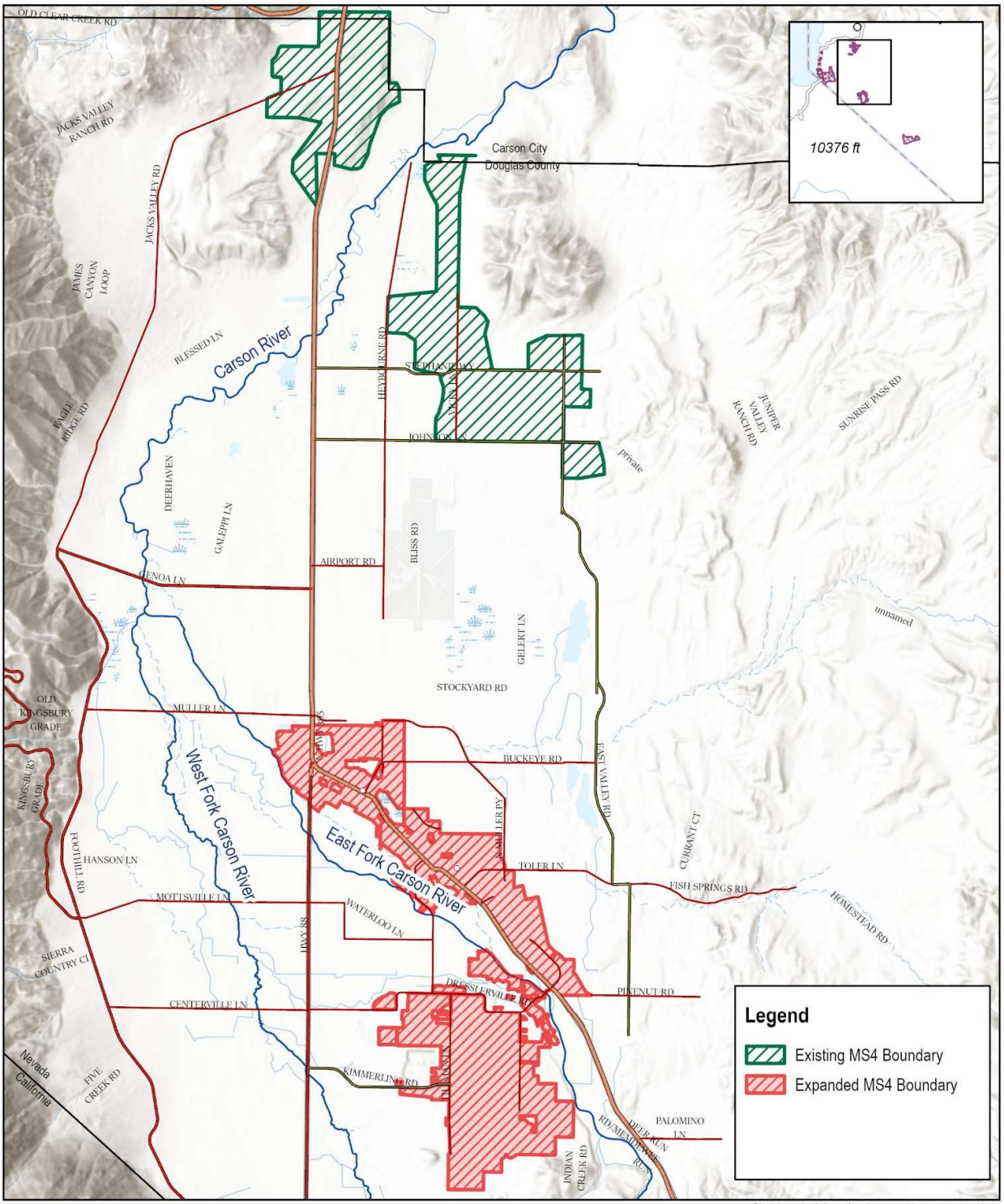
- **Settlements:** Administrative actions in the form of consent agreements, administrative orders, or judicial actions,
- **Civil penalties:** Monetary assessments paid by a person or permittee. Penalties are designed to recover economic losses due to noncompliance and compensate for the seriousness of the action,
- **Injunctive relief:** Requires a regulated entity to perform (or stop) some designated action, and
- **Supplemental Environmental Projects:** A violator may agree to perform an environmental improvement project to correct the violations, using the violator's assessed penalties to fund the project. This can be part of an enforcement settlement.

Lake Tahoe Fine Sediment Particle Total Maximum Daily Load (FSP TMDL)

Lake Tahoe's famed deep water clarity is attributed to its uncommonly clean water which allows sunlight to reach much greater depths than most other water bodies. But by the year 2000, about one-third of Lake Tahoe's unique clarity was lost. Required by EPA through NDEP, the County has prepared a Sediment Load Reduction Plan (SLRP – Appendix D) detailing actions to reduce the amount of FSP in stormwater that reaches Lake Tahoe to regain clarity. Sediment load reductions from stormwater runoff are tracked with 5-year milestones to ensure progress and accountability.



[1] Municipal separate storm sewer system (MS4)



Douglas County, Nevada
Stormwater Master Plan

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FIGURE 10 **EXISTING AND EXPANDED MS4 PERMIT AREA**

The ***National Flood Insurance Program (NFIP)*** was established through the National Flood Insurance Act of 1968. The program has two purposes: to regulate development in high flood-risk areas, and to share the burden of flood losses by offering affordable flood insurance rates. Communities throughout the nation are eligible for participation in the program by adopting and enforcing certain provisions to manage development in floodplains and reduce flood losses, and in return residents may purchase federally subsidized flood insurance. Douglas County has participated in the NFIP since March 1980. The County exceeds the minimum requirements of the NFIP's provisions by participating in the Community Rating System described below.

The ***NFIP Community Rating System (CRS)*** is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. Douglas County staff spend significant time and resources performing activities to improve flood protection, raise awareness, and ensure development regulations are enforced. Through these actions, Douglas County residents benefit from a discounted flood insurance premium rate of 20% as a CRS Class 6 Community (Table 4). The County joined the CRS program in 1993 as a Class 9 community and upgraded from a Class 9 to Class 8 in 1995 as a result of increased flood awareness and outreach through a community Flood Task Force formed in January 1992. Since that time, the County has improved to a Class 6 through many additional activities. The array of CRS credit points, Classes and Premium Discounts and reductions through participation in the program is shown in Table 5.

Table 4 – Douglas County Current NFIP Rating

Community No.	32008
Entry Date	10/1/1993
Current Effective Date	6/15/2016
Current Class	6
% Discount for SFHA	20%
% Discount for non-SFHA	10%

Table 5 - CRS Credit Points - CRS Class Designations and Benefits

CRS Points	CRS Class	CRS Premium Discount
4,500+	1	45%
4,000-4,499	2	40%
3,500-4,999	3	35%
3,000-3,499	4	30%
2,500-2,999	5	25%
2,000-2,499	**6**	**20% (Douglas County)**
1,500-1,999	7	15%
1,000-1,499	8	10%
500,999	9	5%
0-499	10	0

If a community is placed on probation in the NFIP, the suspension warning letter includes congressional notifications, a news release to local media, and an update on FEMA's website. If a community is suspended or expelled from the NFIP the following will occur:

- No property owner or renter may purchase a flood insurance policy through the NFIP,
- Existing policies will not be renewed,
- The community is not eligible for federal grants or loans,
- No federal disaster assistance may be provided to repair flood insurable buildings,
- No federal mortgage insurance or loan guarantees may be provided in flood hazard areas, and
- Banks and credit unions must notify applicants seeking loans in flood hazard areas that they are not eligible for flood insurance or flood disaster assistance.

If a community does not provide the adequate points during the audit of the CRS program, it will revert to a "Class 10" community, and residents would lose the discount. It can take years for a community to recover to the previous class standing. However, if the County increases regulations and efforts of its CRS program, a higher Class can be achieved with successively higher premium discounts. Any additional actions to move to a higher class must be sustainable year-after-year, or a reversion to a Class 10 will occur.

Figure 11 - Distribution of CRS Class Designations in the United States.

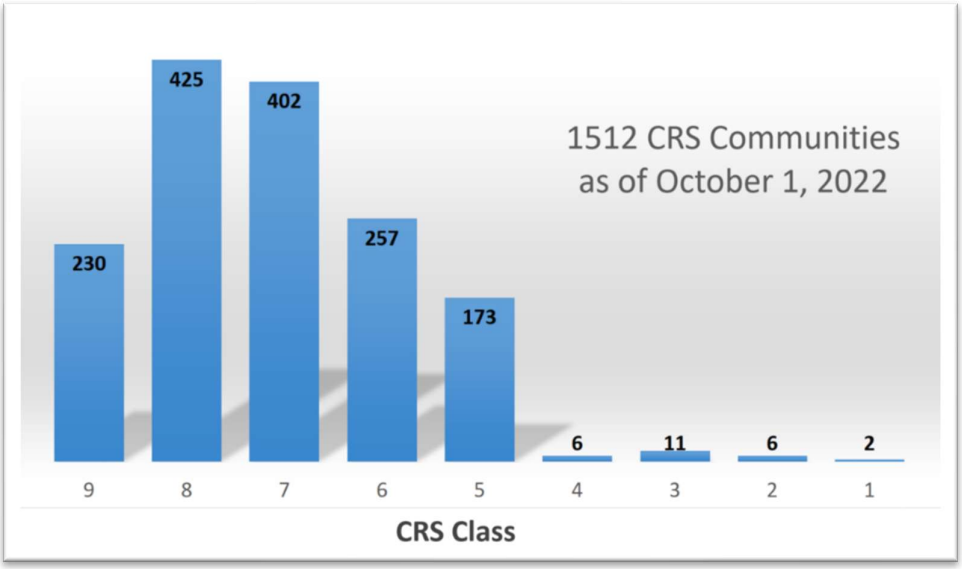


Figure 12 – 1950 Flood

You'll Find NO Flood Damaged STOCKS When You Buy In CARSON VALLEY

The Record-Courier

THE WEATHER

Date	Max.	Min.	Prec.
16	56	28	.16
17	61	37	.42
18	64	42	2.55
19	64	43	.19
20	63	48	.29
21	64	50	.00
22		33	

SEVENTIETH YEAR—NO. 45 GARDNERVILLE, DOUGLAS COUNTY, NEVADA, FRIDAY MORNING, NOVEMBER 24, 1950 TEN CENTS PER COPY

FLOOD RUIN WORST IN HISTORY

Damage which will mount into hundreds of thousands of dollars followed in the wake of unprecedented rains which during the last week resulted in the worst flood in the history of Carson Valley.

Two men were injured and two others had a narrow escape from serious injury or death as a result of the flood conditions.

Most seriously hurt was William Frevert.

Frevert was injured when a truck he was driving plunged through a bridge near Centerville.

Frevert was taken to the veterans hospital in Reno where he underwent surgery Wednesday. His knee cap had been torn loose, he sustained several

The truck was tightly wedged at the bottom of the river

Rescuers, headed by Julian Larroquy, succeeded in freeing Frevert with difficulty. It was said that had not the floor of the bridge collapsed beneath the truck in one piece, preventing the vehicle from plunging to the bottom, that Frevert probably would have been drowned.

The truck was badly damaged.

Carl Kidman sustained a severe cut on his nose and a badly sprained arm when a truck in which he was riding with Harry Atchison went through a bridge on Walley lane late Tuesday.

Atchison escaped with minor bruises.

Kidman had arrived at Douglas-Tahoe airport only a few

had expressed a desire to inspect his ranch holdings and see if his cattle were safe and Atcison volunteered to drive him through the flood waters.

The bridge collapsed as the car reached its center, dropping the pair into the flood.

The truck was badly damaged.

E. G. Hand, M.D., also had a narrow escape while attempting to cross flooded Genoa lane to reach a patient.

His car was crowded off the paved roadway onto the badly washed shoulder and mired down. A passing car rescued the physician, who was forced to step from his flooded car into the swift water.

Clarence Bussey arrived on the scene and salvaged the physicians

caped damage.

Many bridges were washed away or damaged to an extent which makes them unsafe for traffic.

Residences were flooded.

Fences were washed away in many places.

Headgates on irrigation ditches were wrecked.

Stretches of roadway were washed into fields.

Fields which had been plowed and recently planted were badly damaged.

Gardnerville and Minden were practically isolated from all but air traffic for many hours.

Ranches on the westside of the valley were surrounded by water as the Carson river spread into a vast lake which covered nearly

believed to have been kept to a minimum.

During seven consecutive days starting November 14 and ending Monday, November 20 a total of 3.64 inches of rain was recorded at the U.S. forest service weather station in Minden according to Dick Coles, who acts as observer.

Higher in the mountains the precipitation was even heavier, approaching cloudburst proportions. At Woodfords, the California highway weather station, operated by Robert Fickle, reported a total of 7.41 inches of rain in the six days ending November 21.

Heaviest rain struck on November 18 (Saturday) in Minden when during the 24-hour period

24-hour downpour was measured in the same period with 3.90 inches.

Highway between Gardnerville and Centerville was closed. A stretch of roadway near the Meneley residence was carried away by the flood waters.

Max Jones residence in the same area was flooded and heavy damage resulted The Otto Hussman residence was surrounded by water.

The carrying away of the roadway at that point undoubtedly saved other residences in the immediate vicinity from heavy flood damage

In the vicinity of the Manke mill the roadway was cut through.

Bridge at the Trinity Lutheran church was undermined to an

degree.

George Egan, Nevada department of highway engineer, said the structure would be unsafe for heavy traffic although it would carry passenger cars.

On Nevada highway 17, to Centerville from Minden, three bridges were swept away. One a short distance above Centerville, another near the Mack ranch and the other at Waterloo.

Muller or Walley Lane, Genoa Lane, Waterloo Lane, and Centerville Lane connecting with the foothill and western section of the Valley were badly damaged

Genoa lane finally began carrying traffic late Tuesday although a long stretch of it was underwater and highway officials said

2.2 Douglas County Plans, Regulations and Policies

In general, emergency access routes must be kept clear to maintain the health and safety of residents. Failure to enforce development codes and standards, and reasonably foreseeable or known but unmitigated conditions, pose a threat, and has resulted in properties vulnerable to flooding being constructed and additional burden on County maintenance crews to react to flood-fighting calls. Stormwater management is also related to, or coordinated with, local plans, regulations, and policies. Therefore, the stormwater program must also be an integral part of County operations in order to support the actions in these plans and policies. These exemplify the importance of having an effective, funded and managed stormwater program. A summary of these plans and policies as they relate to corresponding goals of the stormwater program is detailed as follows:

2.2.1 2020 Douglas County Master Plan - Goals and Policies (Goal 6 - Public Safety)

Public Safety Goal 1:

- Provide the community with increased safety from natural hazards through compatible design and development practices that protect ecosystem values and minimize damage to life, property, and fiscal resources.
- Consider dedicating flood-prone areas, including wetlands, sloughs, arroyos, alluvial fans, detention facilities, and other flood risk areas for public usage as parkways, sports facilities, neighborhood parks, recreational areas, and wildlife habitat. Obtain adequate rights-of-way for the conveyance of storm water to the Carson River.

Public Safety Goal 3: Encourage maintenance of historic stormwater discharge rates and volumes into surface water systems via the promotion of state-of-the-art stormwater management techniques.

- Assist the agricultural community in maintenance of irrigation systems used for drainage and/or flood control.
- Require sufficient easement widths for improvements and maintenance along all conveyance ditches that will be used for stormwater flood flows.
- Review encroachments and structure setbacks and require easement placements on future maps to eliminate conflicts and to ensure that maintenance of the conveyance ditch and/or storm drain system can be achieved.
- Continue to work with the Carson Water Subconservancy District, the Bureau of Land Management (BLM), and the United States Forest Service (USFS) to address the upstream source area of flooding.
- Give top priority to areas where flooding of structures occurs for both structural and non-structural improvements.

2.2.2 Douglas County Municipal Code Title 20.50

Title 20.50 (Floodplain Management) and 20.100.060 (Public Drainage) apply to development in the floodplain. Title 20.50 was first created by ordinance 158 on June 5, 1956, as a Douglas County Subdivision ordinance where minimal drainage requirements were required in code. On March 13, 1980, ordinance 331 was approved by the commission, creating flood hazard areas within Douglas County. The county joined the Nation Flood Insurance Program (NFIP) by adopting this code, which allowed the county to regulate the uses of land considering the economic importance of the land to its owner and the county, and the hazards to life or property incidental to its use. This was the first-time regulations were put in place establishing areas requiring floodplain zoning regulations. This was created to reduce the loss of life or property and economic loss caused by flooding.

The purpose of the current code today is to promote the public health, safety, and general welfare, and to minimize adverse impacts to public and private losses due to flooding in specific areas through the implementation of provisions designed to minimize rescue and relief efforts associated with flooding, prolonged business interruptions, notifying property owners that land is located in a special flood hazard area, and to coordinate with local partners to implement the Carson River Regional Floodplain Management Plan in conjunction with Carson River Subconservancy District. The current code defines the adverse impacts and the requirements needed for the development of land within the Special Flood Hazard Areas (SFHA). The current code sets special requirements for development within the FEMA SFHA and are usually more restrictive than the federal requirements. These more restrictive regulations support the participation in the CRS program allowing for a discount to the county residents located within the special flood hazard areas because they are complying with more restrictive requirements. Some of the restrictions are as follows:

- Land division is not allowed for any parcels for residential purposes that are less than 19 acres in size.
- Sets requirements on the types of applications that are needed to be submitted and reviewed prior to issuing the development permits,
- Provides standards for construction within the special flood hazard area.
- Provides for violations and sets penalties for the non-permitted activity within the special flood hazard areas.

Most recently, Title 20.50 was updated to comply with the federal changes to the CRS program. These are the development standards for floodplain management and public drainage standards that are reported through an audit process and it is required these new regulations to be included in the county codes.

2.2.3 2024 Douglas County Strategic Plan

The 2024 Strategic Plan includes “Managed Stormwater” as one of its six main goals and objectives, with direction to adopt and implement the Stormwater Master Plan.

Strategic Objective of Balanced Growth and Infrastructure: The County recognizes the importance of proactively managing development while simultaneously addressing critical infrastructure and service needs. This approach is particularly pressing now as the region grapples with increasing traffic congestion, necessitating key projects to improve transportation systems. Furthermore, the updates are essential to ensure that the county's infrastructure and its workforce can adequately support a growing community while also preserving valuable open spaces and agricultural lands, which are also vital to stormwater systems. These updates are indispensable in creating a thriving and sustainable community in Douglas County, making it imperative to act promptly and effectively.

2.2.4 Carson River Watershed Floodplain Management Plan

Developed by the Carson River Coalition and adopted by the Douglas County Board of Commissioners in 2008, and updated every 5 years, this established a long-term vision and strategies for floodplain management to reduce flood damage impacts. Strategies can be applied regionally and locally; local strategies support the CRS program and improve the County’s floodplain protection and management activities.

2.2.5 Douglas County Engineering Department - Engineering Design Criteria and Improvement Standards

The 2017 edition of the criteria regulates design and construction of public infrastructure under Section 6.1.1., Storm Drainage Planning for all development, and Section 6.1.3.7 Low Impact Design (LID) practices.

2.2.6 2020 Hazard Mitigation Plan

Contains objectives and actions related to stormwater and flooding (Table 2). These are possible action items for which coordination with the State and local emergency managers could be of benefit.

Action	Description
1F	Develop County building codes and ordinances that protect people and structures from drought, earthquake, flood, severe weather & wildfire.
2A	Develop emergency evacuation programs for neighborhoods in flood prone & wildland fire areas by increasing the public awareness about evacuation programs.
5B	Adopt or update policies that discourage growth in flood-prone areas.
5D	State Route 88 culvert expansion at Mottsville Lane, and Rocky Slough.
5K	Implement recommendations for Johnson Lane Area Drainage Master Plan
5L	Construct 100-year flood crossing on one east/west collector road connecting Foothill Road and State Route 88 or US Highway 395
5M	Complete Area Drainage Master Plan for Jacks Valley/Indian Hills Area
5N	Develop Flood Warning System Plan
6B	Develop Storm Water Management Plan for snow melt.

2.3 Future Stormwater Program Requirements

Community services that are most impacted by growth are transportation, water and wastewater service, solid waste, and floodplain management (2020 Master Plan). Whether due to increasing regulatory demands or population growth, effective planning requires anticipating future stormwater management activities due to increased population and the associated road networks, buildings and traffic. New infrastructure, such as the four recently constructed detention basins in the Johnson Lane area, require inspections, maintenance such as removing accumulated sediment, debris, and vegetation, performing occasional repairs, and annual reporting procedures. This is required documentation for both the CRS and MS4 programs, and these actions are added to the list of actions that the stormwater staff must already accomplish.

Development within the communities and expansion of homes into the larger properties that are zoned A-19 (agricultural nineteen-acre minimum parcel size) also means that regulatory requirements, permitting and inspections increase. Documentation and reporting are now performed as needed in these areas where people elect to construct within the flood plain. As populations grow, the NPDES, TMDL, and NFIP mandated programs have incremental regulatory goals for which actions must be completed, documented, and reported to avoid violation of federal and state regulations. The following is a brief description of the regulatory increases to these programs.

2.3.1 NPDES MS4 Permit

Currently, Jacks Valley, Clear Creek, CAMPO, and parts of Johnson Lane are within the area of influence for stormwater discharges to the Carson River through the Small MS4 Water Quality Permit. Expansion of the permit footprint to include Minden, Gardnerville, and Gardnerville Ranchos is expected to occur at any time, adding additional structures and miles of conveyance that must be maintained by staff, including additional reporting requirements. As shown in Figure 10, once the boundary expands from the northern portion of the County to include the entire County, the burden of inspections, monitoring, maintenance and reporting responsibilities will increase. There is currently no plan or ability to meet these increased responsibilities under the existing funding and staffing scenario.

2.3.2 Lake Tahoe Total Maximum Daily Load

The County must meet five-year incremental milestones of sediment load reductions from runoff at Lake Tahoe. This requires implementation of more WQIPs, more road miles swept, and more individual homeowners (private parcels) to reduce the runoff directly from their properties. Each successive action includes the inspection, monitoring, and maintenance protocols detailed in the Road RAM or BMP RAM, results from which are reported at prescribed frequencies in the online LTInfo Lake Clarity Tracker. These activities are necessary to stay in compliance with the Interlocal Agreement between the County and NDEP. As detailed in the SLRP, these actions have been identified for each milestone, and will be implemented when the CIP is adopted and funded. While many projects have been implemented by individual GIDs, the inspections, maintenance and reporting activities are still the responsibility of the County through the Interlocal Agreement (ILA). The 2016 SLRP (Appendix D) details the costs associated with continued implementation of the program and anticipated ongoing costs. The agreement between the County and NDEP precludes the individual GIDs from having an ILA which would require them to perform the water quality modelling, perform inspections and maintenance, and the annual reporting activities.

2.3.3 NFIP Community Rating System

Flood insurance policy holders in the County currently benefit from a 20% discount on their annual premiums due to the County's designation as a Class 6 CRS community. The County spends a significant amount of time conducting activities for this program. Maintaining that rating became more difficult when the CRS Coordinator's Manual was updated in 2022 and the requirements increased. Since points are evaluated on a 5-year cycle, the most recent CRS program audit reduced the number of points the County received. The reduction was not enough to downgrade the rating, however the new manual created additional burden to the previous documentation and reporting process for this program. More activities will be needed for future audits to make up the points lost in the manual update.

Although a Class 6 rating is a significant achievement and is within the top 1% of communities (Figure 11), a rating increase to a Class 5 would result in an additional 5% for a total 25% discount on premiums. An analysis of the current activities and level of documentation may help the County determine the most efficient distribution of activities to maintain the current number of credits for a Class 6, or assess whether the cost expenditures and staff time associated with improving to a Class 5 is realistic or economically feasible. Figure 11 depicts all the CRS communities in the United States.

2.4 Summary of Program Responsibilities

As it stands, the stormwater program can effectively manage the existing demands, but the County is still vulnerable to flood damages, and does not have the capacity to meet regulatory expansions at the current level of distribution out of the County's General Fund. As development continues to occur, no amount of maintenance will be sufficient for a system that is under-capacity.

In coordination with Carson Water Subconservancy District and FEMA, for over 10 years the County has invested in evaluations of existing flooding and drainage hazards that pose a threat to health safety and

welfare of the county and public, and proposed long-term solutions to protect people and infrastructure from certain anticipated storm and hazardous conditions or scenarios. Only one of these proposed projects has been implemented to date, for which construction was the result of litigation by residents due to the perceived County's inability to secure or commit funding to solve the repeating problem. This was a $1,075,000 project funded by county and insurance policies due to the litigation filed by the residents of the Johnson Lane area. The spring and summer floods of 2023 again brought increased public pressure to implement more solutions and to propose solutions in previously unstudied areas. The following sections will describe how the Stormwater Program will prepare for future needs by conducting watershed studies, prioritizing and implementing CIPs, collaborating with key stakeholders with common goals, and securing a reliable funding source to carry out these projects and tasks.

3. Watershed Studies

The Douglas County Stormwater Program provides for the health and safety of residents by ensuring stormwater can be collected and conveyed safely away from people and structures, or treated to prevent water quality degradation of lakes and streams. This requires operation and maintenance of stormwater, flood control, and water quality infrastructure. Stormwater management – managing the water that runs off the land surface from precipitation events – includes dealing with large-scale riverine floods, alluvial fan flooding, post-fire debris flows and flash floods, and protecting water quality as the runoff travels across urbanized or paved surfaces.

The type of stormwater issue or flood risk is based on location within a watershed. A watershed is an area of land that drains all rainfall to streams or to a common watershed outlet; i.e., a drop of water that falls within the watershed boundary has the capacity to reach the outlet. The Carson River watershed is 184 miles, from high in the Sierra Mountains to the Carson Sink (**Figure 13**). Within this overarching watershed are numerous hydrologically distinct smaller watersheds (Figure 14). Individual watersheds vary as a function of slope, land cover, soils, vegetation, and geology; these characteristics determine the type of flooding that will occur: alluvial fan, riverine, debris, or mud flows. Overbank or riverine flooding along the Carson River can be a result of rain-on-snow events in the upper watershed; sustained high flows due to warm spring runoff; or inputs from flash floods on tributaries. These floods have had a devastating impact in the Carson Valley, where nearly 10 large scale flood disasters have impacted the community since it was settled in the 1860's (See Timeline, **Figure 5**). Floods in 1950, 1955, 1962, 1997 and 2005 caused widespread damage to the farms, ranches, roads, bridges and other infrastructure, including the "golf course levee" (3.2.1, Gardnerville) and the historic Dangberg irrigation reservoirs. The year 2023 again brought significant flooding due to a fast-paced melt of snow following an above-average precipitation winter. The golf course levee again was under threat of imminent failure, and the irrigation storage reservoirs were inundated and damaged, both requiring emergency actions to prevent significant damage.

As the community footprint expanded beyond the low-lying lands along the Carson River to the adjacent hillslopes, more development became subject to flooding, and more runoff from urbanized areas entered the lakes and rivers. While widespread reports of the significant damage due to riverine flooding was documented, alluvial fan flooding in Douglas County was not documented until the 1990s. This wasn't because it wasn't happening, but because the area hadn't been built upon yet. Flood damage is typically only reported if it impacts life or property. Since the 1980's, there has been significant development on the alluvial fans all along the base of the Pine Nut Mountains, resulting in more residents susceptible to the damaging impacts of these flood events. Alluvial fan flooding occurs when thunderstorms in the hills produce rain and the storm flow is carried to a canyon outlet where the discharge spreads out creating a 'fan' formation. Alluvial fan floodplains are not easily predictable, carry high velocity flows, and often carry sediment and result in a high risk of flood damage. Development in floodplains is regulated in these areas, however if an area is not mapped within a floodplain it will not be restricted.

This section presents a compilation of the flood risk studies that have been conducted in many of these watersheds. These studies were performed to identify the type of risk, the area prone to that risk, and proposed mitigation projects. While the watershed studies conducted to date and evaluated in this plan are predominantly concerned with reducing flood risk, stormwater management in the Lake Tahoe basin and watershed areas have a related but separately distinct focus on water quality. In addition to tangible, on the ground solutions, there are also administrative actions to prevent or inform flood risk to prevent further damage or losses such as outreach and education activities.

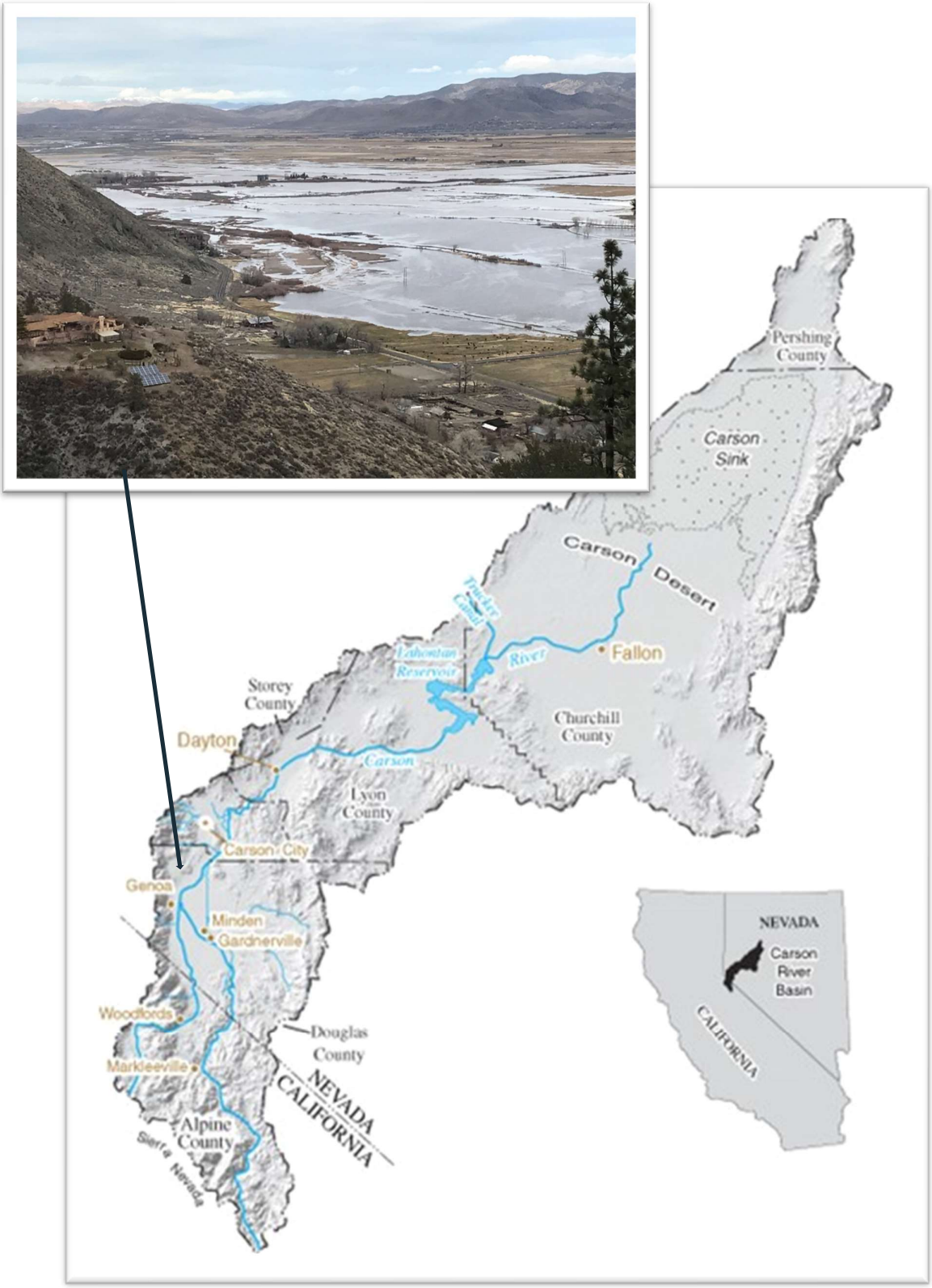
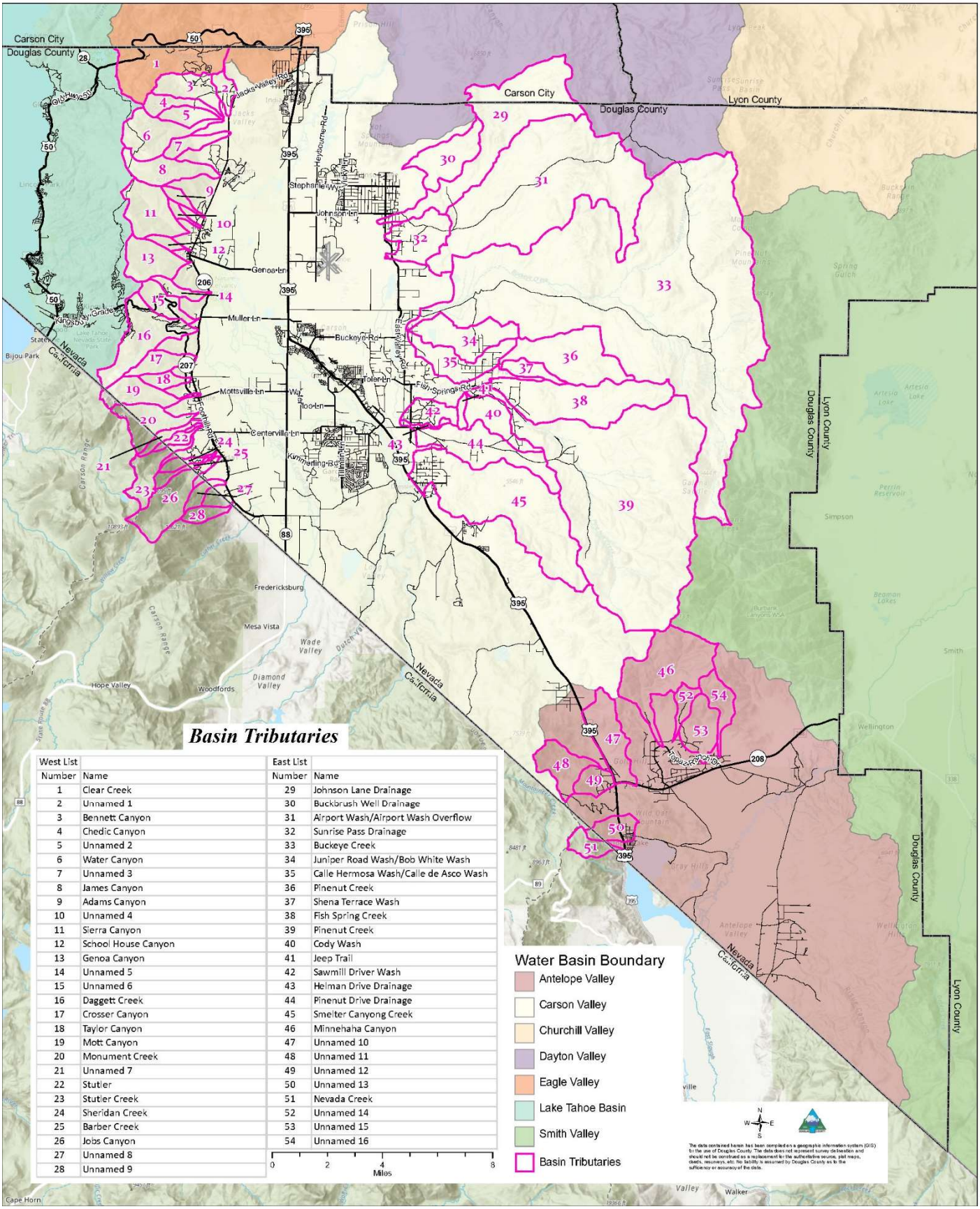


Figure 13 - Carson River Watershed stretches 184 miles from Alpine County, to the Carson Sink.

Figure 14 – County Watersheds



3.1 Existing Watershed Studies and Repetitive Maintenance Areas

Property damage as a result of floods in Douglas County has been reported since the 1880's, both from riverine flooding (Carson River), and as a result of alluvial fan or debris flows from steep canyons (Pine Nut Mountains, Genoa, Topaz). In an effort to identify projects to mitigate or prevent flooding in these repetitively flooded areas, Douglas County has partnered with Carson Water Subconservancy District (CWSD) to acquire FEMA grant funds to perform flood risk studies in many watersheds. These studies identify the type of flood risk, the area prone to flooding, and proposed mitigation projects. The outcome of the study is generally an area drainage master plan (ADMP), comprised of one or more flood mitigation or control alternatives, and include conceptual or 15% design plans and cost estimates. Projects and alternatives are named as potential capital improvement projects (CIP), evaluated and ranked for future implementation by the jurisdiction or agency. Funding for a selected solution can be secured to advance the conceptual plans and cost estimate to 100% design plans with associated expected funding for construction.

3.1.1 Carson Valley and Topaz Lake

The watersheds that have been specifically identified and evaluated for flood risk and drainage master plans include Alpine View Estates, Johnson Lane, Buckeye Creek, Pine Nut Creek, Ruhenstroth, and Topaz Lake. As a result of each watershed study, a mitigation strategy or Capitol Improvement Project(s) (CIP) have been identified, a list of which can be found in Table 6. A brief description of the areas and projects follows.

JOHNSON LANE AREA DRAINAGE MASTER PLAN (JE FULLER, 2018)

The JLADMP presented five alternatives with 15% design and cost estimates for flood mitigation in the Johnson Lane Area affected by alluvial fan flooding. The Pine Nut North alternative was advanced to 100% design and implemented in 2023. There are four remaining alternatives or CIPs for flood protection in the lands to the east of the community that would benefit many additional residents and infrastructure.

BUCKEYE CREEK REGIONAL DETENTION POND FEASIBILITY STUDY (RO ANDERSON, 2014), AND BUCKEYE CREEK FLOOD MITIGATION STUDY (JE FULLER, 2023)

The first Buckeye Creek Study was conducted to determine the potential for a flood control reservoir for Buckeye Creek and Airport Wash flows located on the Douglas County Sewer Improvement District (DCSID) site. The Buckeye Creek Flood Mitigation Study (JE Fuller, 2023), evaluated how to reduce the effective Buckeye Creek 100-year discharge as much as feasible, presenting a conceptual design of a large flood control basin. Potential locations for flood mitigation basins, and the proposed Muller Parkway alignment, along with an alternative location for the proposed flood control basin (Grandview) were presented but are not included in this Stormwater Master Plan per direction from the Board of County Commissioners on March 21, 2024. A Phase 2 study is currently being pursued to identify the feasibility of routing a portion of Buckeye Creek to the north to an abandoned reservoir to evaluate if that is a more cost-effective solution to the flood control basin on Grandview Estates HOA property.

PINE NUT CREEK BASIN FEASIBILITY STUDY, (KIMLEY HORN, 2023)

Initiated by Douglas County, this study sought to determine the feasibility and cost of proposed drainage infrastructure along Pine Nut Creek upstream of the primary irrigation diversion ditch "Allerman Canal"

to reduce the risk of flooding downstream. The goal of the study was to determine the required storm water infrastructure upstream of the primary irrigation ditch (Allerman Canal) to limit Pine Nut Creek to the capacity of the Upper Allerman and Lower Allerman Canals and eliminate the breakout runoff west of the Lower Allerman Canal. The study provided a feasibility level planning study for the proposed storm water infrastructure for Pine Nut Creek upstream of Allerman Canal. Stormwater basins were proposed for seven (7) alternative sites and one dam site.

SMELTER CREEK - RUHENSTROTH AREA DRAINAGE MASTER PLAN, (JE FULLER, 2021)

This study identified and evaluated flooding and sedimentation hazards within the project area, developed concepts for all-weather access crossings of Smelter Creek for existing conditions, and identified flood hazard mitigation alternatives to minimize the impact of flooding to the community. The Smelter Creek alternatives include siting of a large detention basin on Smelter Creek, and downstream channel and culvert improvements. There are also two flood mitigation alternatives presented for an unnamed tributary through the southern portion of the Ruhenstroth area.

ALPINE VIEW ESTATES DRAINAGE MASTER PLAN, (JE FULLER, 2019)

This study of the unincorporated community of Alpine View Estates and its watershed drainage area was conducted to evaluate and identify existing flooding hazards and developed a series of potential drainage improvements with the goal of reducing the hazards identified. Three alternatives were presented for improvements to the drainage system in this area.

SOUTH DOUGLAS COUNTY/TOPAZ LAKE (RO ANDERSON, 2015)

The community at Topaz Lake is located about 30 miles south of Minden/Gardnerville. Maintenance work by county crews is a significantly greater task than in the Carson Valley because heavy equipment must be transported from the maintenance yard at the airport. A drainage study has been conducted for this community to improve drainage due to local flooding as a result of aging or undersized infrastructure. Implementation of these improvements would benefit the residents and place less demand on County maintenance resources.

Table 6 – Project Alternatives

Project ID	Project Name
101	Rain/Flow gauges
Alpine View Estates	
1001	Bavarian Drive and Zurich Court
1002	Between Bavarian Drive and Jacks Valley Road
1003	Cul-de-sac on Bernese Court
Buckeye Creek	
2002	Buckeye Road 36" pipe/box culvert (Upper Allerman)
2003	Crossing at Buckeye Road and Martin Slough
2004	Buckeye Creek Detention Basin on DCSID Site
Johnson Lane	
3001	Hot Springs Buckbrush (100-yr)
3002	Pine Nut South (25-yr)
3003	Unnamed Wash A (25-yr)
3004	Pine Nut North (25-yr) (Completed)
3005	Pamela Place
3006	Johnson Lane Wash Dam

Project ID	Project Name
Fish Springs	
4001	Mel/Myers Basins
4002	Pine Nut Creek Dam
4003	Bently Basins
4004	Janelle Basin
4005	Denmar Basin
4006	Redhawk Basin
4007	Syphus Basin East (upstream) of Allerman Canal
Smelter Creek/Ruhenstroth	
5001	Phase 1 Sediment Basin upstream
5002	Phases 1-8 (25-yr)
5003	Unnamed Tributary, Alternative 1 (25-yr Storm Drain)
5004	Unnamed Tributary, Alternative 2 (25-yr Basin)
Other County Areas	
6001	Topaz Lake
7001	East Valley Dip Section (Pine Nut Road)
7002	Waterloo Culvert Crossing at the Cottonwood Slough
7003	Buckeye Rd at Martin Slough

3.1.2 Lake Tahoe

Generally, development at Lake Tahoe evolved around a defined creek. Stormwater runoff from roads and disturbed areas then entered the adjacent creek and flowed into the Lake, carrying sediment and pollutants associated with urban activities with resultant negative impacts to water quality. The advent of the Lake Tahoe TMDL caused significant efforts to prevent, detain or treat runoff prior to entering the Lake. Implementation of Water Quality Improvement Projects (WQIPs) at Lake Tahoe requires on-going inspections, maintenance and reporting actions to verify and document the incremental TMDL sediment load reductions. Engineering evaluations have been performed within many of the GIDs and other small communities to identify feasible locations at which to construct a project. These have led to construction of numerous WQIPs within Douglas County at Lake Tahoe, in large part due to widely available state and federal grant funding dedicated to Lake Tahoe to implement the TMDL. This grant funding has been secured with matching Douglas County funds for project design and implementation. Figure 19 shows the areas at Lake Tahoe for which a WQIP project has been implemented (Table 7). Table 7 lists projects for which a) a WQIP has been implemented and is receiving TMDL Credits, b) a WQIP has been identified for implementation, and c) WQIPs that were implemented prior to 2004 that could be retrofitted for future TMDL credit.

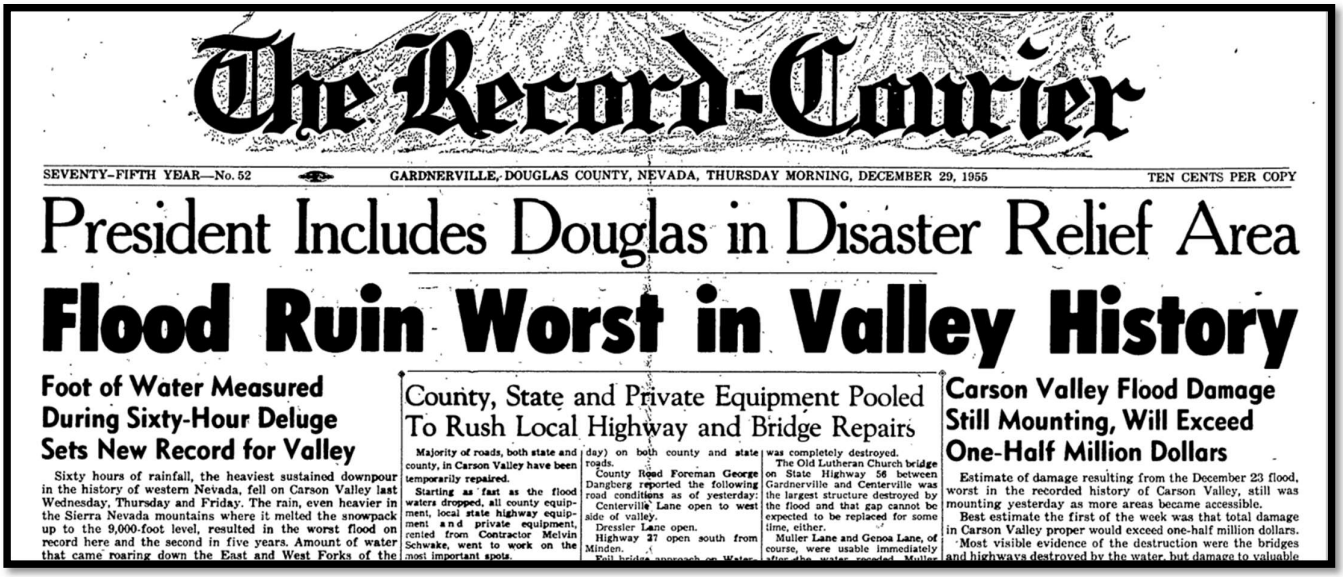
Table 7 – Completed and Planned Lake Tahoe TMDL Projects

a) Completed Projects	b) Proposed Projects	c) Pre-2004 Projects
Burke Creek Highway 50 Crossing	Lower Kingsbury WQIP	Hidden Woods
Cave Rock WQIP	Marla Bay/Zephyr Heights WQIP	Elks Point
Kingsbury Grade GID Road Operations		Lower Kahle
Kahle Basin WQIP		
Lake Village WQIP Phase 1		
Lake Village WQIP Phase 1a & 1b		
Lakeridge WQIP		
Logan Creek WQIP		
Oliver Park WQIP		
Warrior Way WQIP		

Figure 15 - Carson River and Irrigation Ditch Intersection

Figure 16 - Kahle Water Quality Basin – Lake Tahoe

Figure 17 - 1955 Flood.



The Record-Courier

SEVENTY-FIFTH YEAR—No. 52 GARDNERVILLE, DOUGLAS COUNTY, NEVADA, THURSDAY MORNING, DECEMBER 29, 1955 TEN CENTS PER COPY

President Includes Douglas in Disaster Relief Area

Flood Ruin Worst in Valley History

Foot of Water Measured During Sixty-Hour Deluge Sets New Record for Valley

Sixty hours of rainfall, the heaviest sustained downpour in the history of western Nevada, fell on Carson Valley last Wednesday, Thursday and Friday. The rain, even heavier in the Sierra Nevada mountains where it melted the snowpack up to the 9,000-foot level, resulted in the worst flood on record here and the second in five years. Amount of water that came roaring down the East and West Forks of the

County, State and Private Equipment Pooled To Rush Local Highway and Bridge Repairs

Majority of roads, both state and county, in Carson Valley have been temporarily repaired.

Starting as fast as the flood waters dropped, all county equipment, local state highway equipment and private equipment, rented from Contractor Melvin Schwake, went to work on the most important spots.

day) on both county and state roads.

County Road Foreman George Dangberg reported the following road conditions as of yesterday:

Centerville Lane open to west side of valley.

Dressler Lane open.

Highway 27 open south from Minden.

was completely destroyed.

The Old Lutheran Church bridge on State Highway 56 between Gardnerville and Centerville was the largest structure destroyed by the flood and that gap cannot be expected to be replaced for some time, either.

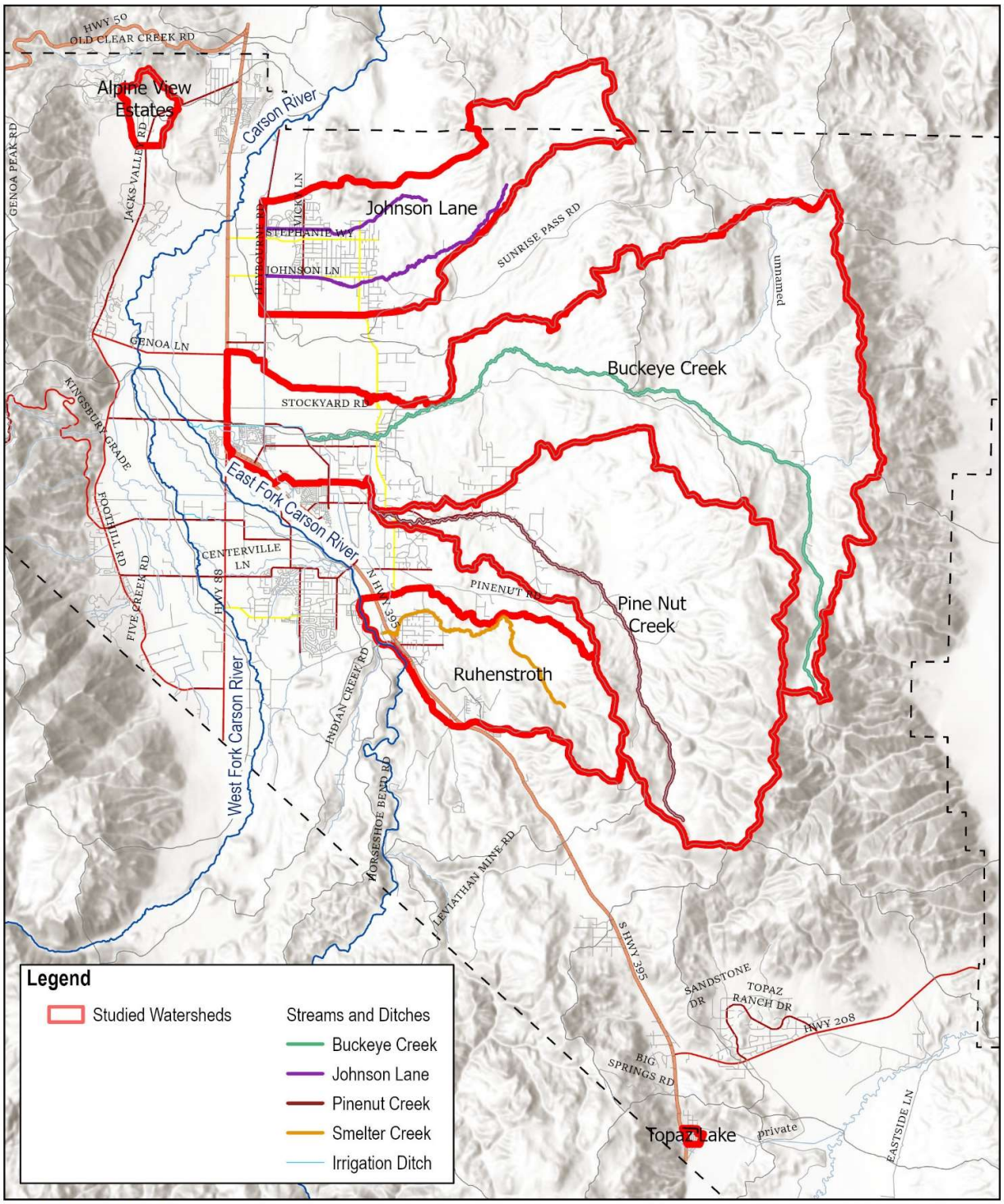
Muller Lane and Genoa Lane, of course, were usable immediately

Carson Valley Flood Damage Still Mounting, Will Exceed One-Half Million Dollars

Estimate of damage resulting from the December 23 flood, worst in the recorded history of Carson Valley, still was mounting yesterday as more areas became accessible.

Best estimate the first of the week was that total damage in Carson Valley proper would exceed one-half million dollars.

Most visible evidence of the destruction were the bridges and highways destroyed by the water, but damage to valuable



Douglas County, Nevada
Stormwater Master Plan

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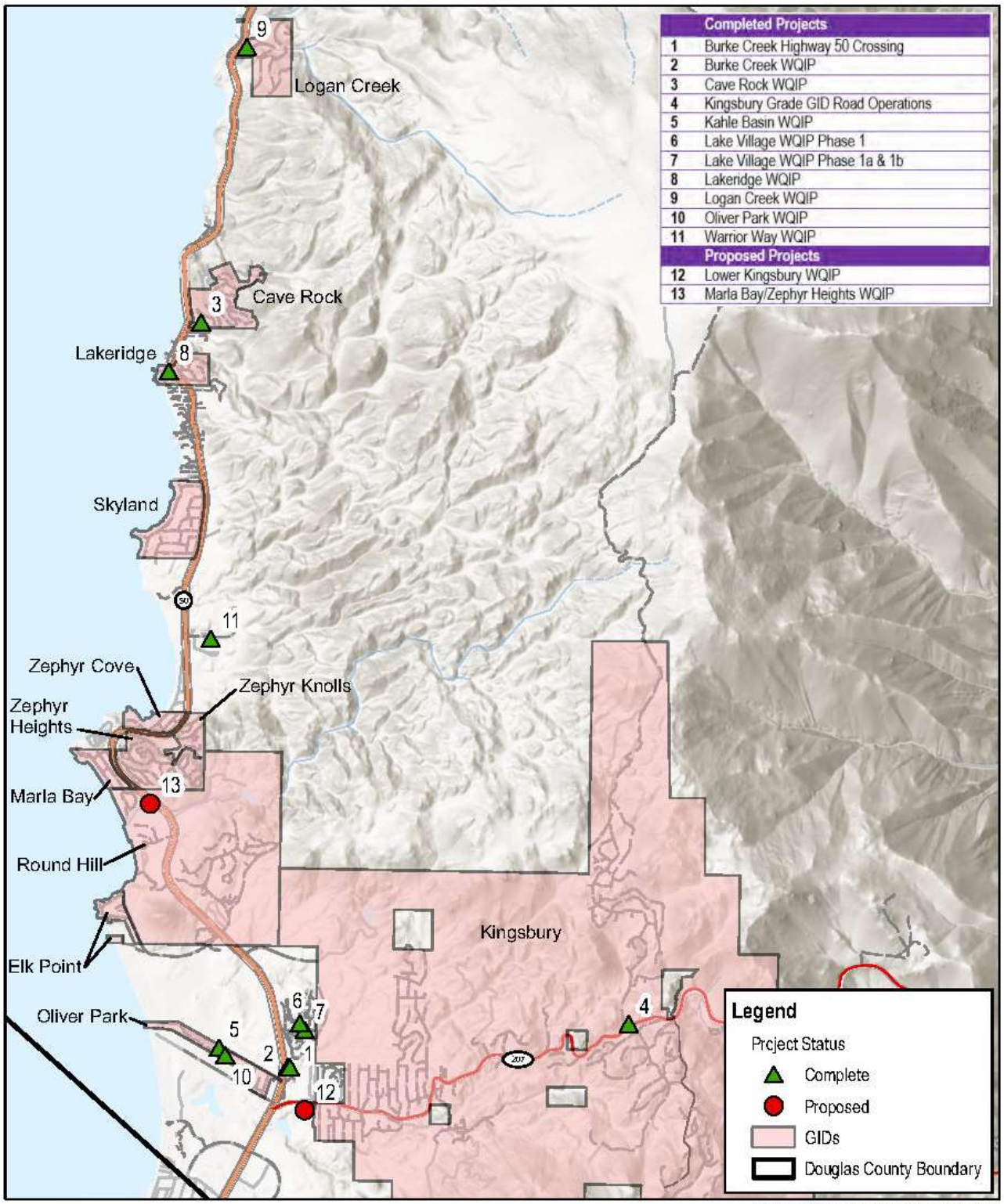
FIGURE 18 **EXISTING WATERSHED STUDIES**



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Douglas County, Nevada
Stormwater Master Plan

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FIGURE 19 LAKE TAHOE TMDL - COMPLETED & PROPOSED PROJECTS

3.2 Areas of Future Growth or Increased Risk

While flood risk studies have been conducted on watersheds that have repeatedly experienced damaging flood events, there are other areas in the County for which improved infrastructure would prevent or minimize flooding or provide water quality benefits. These include areas that require more frequent maintenance due to culvert or channel clogging, areas prone to new risk of flooding due to development or hazard (post-fire).

The following is a brief description of studies that could be conducted to prevent or remediate the concerns:

- Floodplain delineation. As part of its commitment to the NFIP, the County must implement and enforce floodplain management and development regulations in mapped floodplains. In areas of the County where flooding has become a growing concern but for which there are no flood hazards mapped, including these areas as part of FEMA mapped floodplains would lead to reduced risk of flooding due to reduced hazard. The past 10 years of flooding has raised awareness that development in flood prone areas should be discouraged, and the County can proactively get ahead of unwise development with flood risk studies.

- Drainage infrastructure improvements. Many County roads have undersized and/or aging drainage infrastructure for which county staff must regularly respond due to post-storm runoff and sediment loads. Culverts and channels clogging leads to overtopped roadways, road damage and closures, and in some cases has prevented access to residents for critical support services.

- Area drainage master plan. Mitigation alternatives could be designed and constructed to reduce ongoing risk in developed areas in a designated floodplain that experience flooding.

- Private/public infrastructure conflicts. Intersections of private and public infrastructure where the designed capacity cannot convey or store the extra commingled water and becomes constriction or choke points. This also leads to overtopping, flooding, and in many cases prevents the water from being conveyed downstream to its intended end user who thereby suffers economic damage

- Post-fire watersheds. Burned areas are left with little to no vegetation and hydrophobic soils making them susceptible to debris flows and flash floods.

- TMDL Watersheds. At Lake Tahoe, GIDs or County property have been identified for which water quality improvement projects could be implemented to meet TMDL requirements.

- Additional projects or studies that support County-wide floodplain management activities.

County staff have identified potential projects and study areas that meet these future or current risk or hazard scenarios, a compilation of which can be found in Table 8 and Figure 22. Areas of potential high risk due to future development or land transfer are shown in Figure 23. These potential projects have been prioritized with the same general criteria used herein to rank projects for implementation. The County should seek funds for a flood risk or drainage improvement study, and then move the resultant design alternatives to the Capital Improvement Project list for ultimate prioritization and implementation.

Figure 20 - East Valley Road closure during flooding

Table 8 – Emerging flood risk or drainage improvement project areas

	Location	Project Type and Benefits
1	CRS consultant study	Evaluate existing CRS documentation and reporting protocols to improve CRS class or streamline responsibilities
2	Buckeye Wash Feasibility Phase 2	Feasibility/flood hazard mitigation study to potentially route water north instead of large detention basin upstream;
3	Complete NEPA for Pine nut creek dam	Environmental documentation required to secure permits for construction of detention basin on BLM land
4	Sawmill Pine Nut Road Wash Study - Upstream storage	Flood risk study to determine alternatives such as detention basins upstream to mitigate flood damage to private property, home and roads
5	Big Ditch	Flood risk and drainage design study to evaluate improved drainage infrastructure to prevent roadway overtopping on Centerville; high maintenance and sedimentation issues
6	Muller/Virginia Ranch Rd Culvert	Flood risk and drainage design study to evaluate existing infrastructure that is undersized to convey flow; impacts roads, hospital and other care facilities near this location
7	Stutler canyon	Watershed flood risk and mitigation study to mitigate high sedimentation and flood risk at Foothill and Centerville; road closures affect travel to Lake Tahoe; uncertain of watershed area causing flood risk
8	Leviathan	Floodplain delineation and flood risk hazard analysis to prevent flooding for future development
9	Marla Bay/Zephyr Heights	Install a water quality improvement project such as detention basin to capture sediment to prevent from entering Lake Tahoe
10	Holbrook Junction - Penrod	Implement drainage design alternative for which engineering design has been completed; maintenance issue and private property damage to mobile home park
11	Shena Terrace Wash	Flood risk and drainage design study to identify mitigation alternatives to address roadway overtopping and closures
12	TREGID	Flood risk study to mitigate alluvial fan flooding from Minnehaha canyon flooding homes, property and washing out drainage system infrastructure.
13	Airport Wash	Flood risk study to determine alternatives such as detention basin upstream to mitigate flood damage to roads, private property, agricultural fields, airport, and future development
14	Complete NEPA on Ruhenstroth	Environmental documentation required to secure permits for construction of detention basin on BLM land
15	Holbrook Junction - Highlands	Flood risk and drainage design study to improve drainage conditions in this area that is susceptible to post-fire mudslides; impacts private property and roads damaged/closed
16	Lower Kingsbury planning and design	Install a water quality improvement project such as detention basin to capture sediment to prevent from entering Lake Tahoe

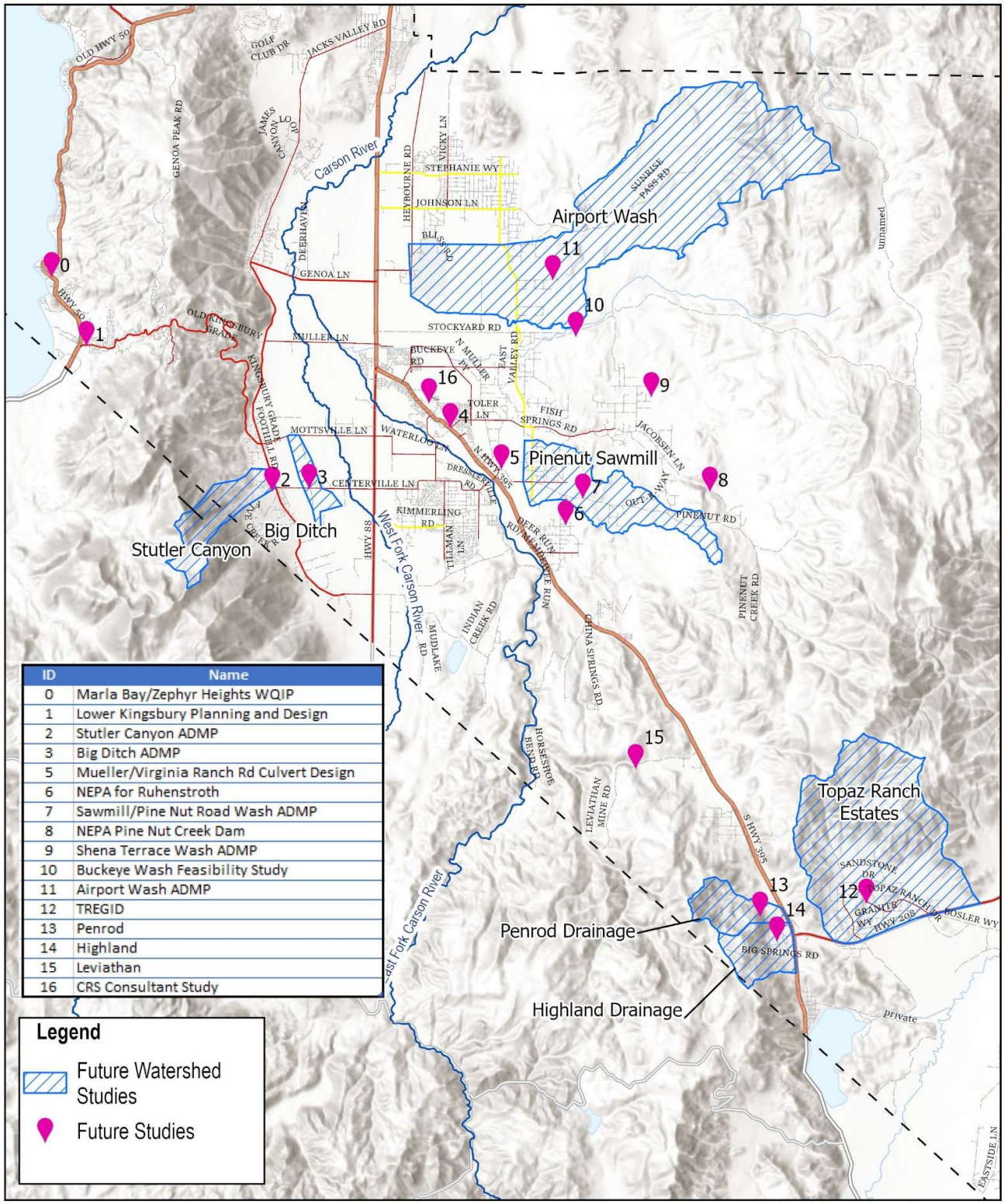
3.2.1 East Fork Carson River Levee Issue

Significant riverine flooding in 1997 and again in 2023 raised awareness of the potential failure of a levee structure of unknown origin or ownership. Conflicting opinions of ownership (residents, the Carson Valley Golf Course) resulted in numerous entities contributing to repairing the breached levee in 1997, and again in 2023 to prevent another compromise of this structure that would have flooding of many homes, businesses and roads. The levee is located along the East Fork Carson River adjacent to the Carson Valley Golf Course in the Gardnerville Ranchos. Initial research concluded that the levee was constructed by a rancher in the late 1800's to avoid their fields from being flooded by the river.

Currently there exists a neighborhood that has a subdivision map that dates back to 1965. After the January 1, 1997 flood event, the levee failed, resulting in the severe flooding of several homes in that subdivision. Douglas County, in conjunction with the Carson Water Subconservancy District (CWSD), Nevada Division of State Lands (NDSL), Gardnerville Ranchos GID, and Nevada Division of Environmental Protection worked together to secure funds to perform emergency repairs on the levee prior to the spring melt off that year. In addition, some homeowners were able to structurally raise their homes out of the floodplain. Research shows that repairs were made once again in 2005-06 to repair the compromised levee once again due to damage caused by the high sustained flows on the Carson River. The levee was once again repaired in January 2024 due to sustained high flows during the 2022-23 winter runoff.

The issue at hand with this particular levee is that no entity claims ownership of the structure. Immediate action is hindered each time maintenance and repair is required due to the uncertainty of ownership or responsibility, despite that it acts as a flood control structure, protecting homes, business, and infrastructure from flood damage. Because it is above the high-water mark, the Nevada Division of State Lands does not have jurisdiction over it, as they would if it were below the high-water mark. The levee is located on the Carson Valley Golf Course property; however they were not the ones to construct it, as it was constructed prior to the existence of the golf course. When repair work was necessary in 1997 and again in 2023 to prevent imminent failure, funds were acquired from multiple sources to perform the repairs, a process that took months, and required approvals by the Board of County Commissioners before work could proceed. This is at a detriment to those that are susceptible to flooding in the event of failure. Inaction or delay could lead to additional flooding, major property damage, life and safety issues, and access in or out of the properties during a flood event. A funding mechanism must be in place to enable immediate repair regardless of ownership or responsibility. This is a life and property safety issue without a procedure developed for an entity to facilitate and fund maintenance and repair of this levee in the future.

Figure 21 - Levee along Carson River below golf course



ID	Name
0	Marla Bay/Zephyr Heights WQIP
1	Lower Kingsbury Planning and Design
2	Stutler Canyon ADMP
3	Big Ditch ADMP
5	Mueller/Virginia Ranch Rd Culvert Design
6	NEPA for Ruhenstroth
7	Sawmill/Pine Nut Road Wash ADMP
8	NEPA Pine Nut Creek Dam
9	Shena Terrace Wash ADMP
10	Buckeye Wash Feasibility Study
11	Airport Wash ADMP
12	TREGID
13	Penrod
14	Highland
15	Leviathan
16	CRS Consultant Study

Douglas County, Nevada
Stormwater Master Plan

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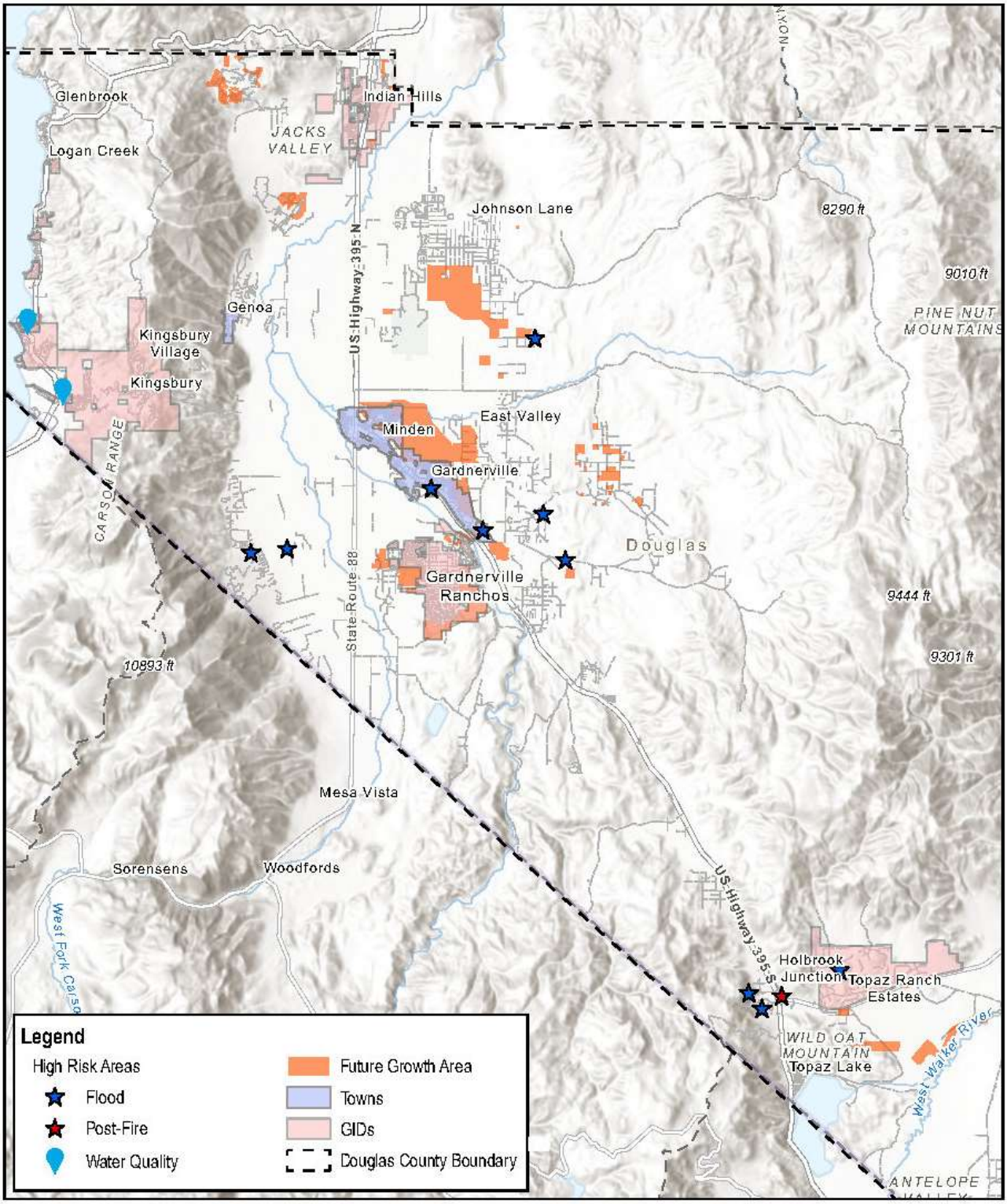
FIGURE 22 PROPOSED FLOOD RISK/HAZARD IDENTIFICATION STUDIES



Douglas County, Nevada
Stormwater Master Plan

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FIGURE 23 **FUTURE GROWTH & HIGH RISK AREAS**

4. Capital Improvement Projects and Prioritization

4.1 Project Compilation

An effective stormwater management program ensures public safety, environmental protection, and compliance with state and federally mandated regulatory requirements. Sections 2 and 3 herein compiled regulatory program requirements and activities, mitigation project alternatives, and areas recommended for future study based on increased flood risk or hazard. Construction of flood control and/or water quality improvement projects are important parts in a stormwater management program. However, in order for the County to proceed with any level of Capital Improvement Project implementation and make effective stormwater management decisions, it was necessary to rank and prioritize proposed projects for implementation. To solve all problems everywhere all at once is clearly cost prohibitive. Therefore, a method was developed to prioritize implementation of capital improvement projects, while maintaining existing program duties.

The compilation of existing flood risk, water quality, and drainage improvement or mitigation projects (capital improvement projects), and project benefits can be found in Table 9. Projects are organized within their respective watershed for easy reference and classification.

Table 9 – List of Project Alternatives

ID	Project Alternative	Project Type and Benefits
101	Rain/Flow gauges	Install monitoring equipment on the Carson and Walker Rivers and within the drainages areas of the Pinenut Mountains necessary to have advance flood warning; test hazard scenarios and mitigation tools (HAZUS); receive CRS Points, HMP action
Alpine View Estates		
1001	Bavarian Drive and Zurich Court	Install and upsize culverts to reduce roadway overtopping and flooding to adjacent properties
1002	Between Bavarian Drive and Jacks Valley Road	Install and upsize culverts/channels to reduce roadway overtopping and flooding to adjacent properties
1003	Cul-de-sac on Bernese Court	Improve culverts, drainage ditches, driveway culverts to reduce roadway overtopping and flooding to adjacent properties
Buckeye Creek		
2002	Buckeye Road 36" pipe/box culvert (Upper Allerman)	Upsize culverts to reduce flood hazards in populated areas; ensures safe/effective conveyance away from infrastructure
2003	Crossing at Buckeye Road and Martin Slough	Install and upsize culverts/channels to reduce roadway overtopping and flooding to adjacent properties; irrigation ditch conflicts
2004	Buckeye Creek Detention Basin DCSID Site	Install detention basin to reduce downstream flooding
Johnson Lane		
3001	Hot Springs Buckbrush (100-yr)	Install detention/sediment basins and conveyance channels to reduce risk of downstream flooding; reduces risk to existing and future development
3002	Pine Nut South (25-yr)	Install detention basin to reduce risk of downstream flooding; reduces flood risk to existing development downstream
3003	Unnamed Wash A (25-yr)	Install detention basin to reduce flood risk in area of future growth
3004	Pine Nut North (25-yr) (Completed)	Install detention basins to reduce risk of downstream flooding
3005	Pamela Place	Install detention basin to prevent localized flooding to homes and property
3006	Johnson Lane Wash Dam	Install dam to mitigate downstream flooding
Pine Nut Creek		

ID	Project Alternative	Project Type and Benefits
4001	Mel/Myers Basins	Install detention basin to reduce risk of downstream flooding; reduces flow into irrigation channels
4002	Pine Nut Creek Dam	Acquire property to install detention basin to eliminate overtopping of irrigation infrastructure; reduce downstream flood hazard; reduce maintenance burden post-storm
4003	Bently Basins	Acquire property to install detention basins and culverts to mitigate flood risk to adjacent properties
4004	Janelle Basin	Install detention basin to reduce downstream flood risk; Developer of property will construct basin and grant an easement accordingly
4005	Denmar Basin	Acquire property to install detention basin to reduce downstream flood risk
4006	Redhawk Basin	Install detention basin to reduce risk of downstream flooding
4007	Syphus Basin East (upstream) of Allerman Canal	Acquire property to install detention basins to prevent irrigation channel overflows
Smelter Creek		
5001	Phase 1 Sediment Basin upstream	Install sediment basin to reduce risk of downstream flooding; reduce maintenance burden post-storm; improves drainage conveyance network through community
5002	Phases 1-8 (25-yr)	Install and Upsizing Sediment Basin/Culverts/Channels to reduce flood risk in the community; strengthens/improves drainage infrastructure network through community
5003	Unnamed Tributary, Alternative 1 (25-yr Storm Drain)	Install new and upsize existing basins, culverts, and channels to reduce risk of downstream flooding; regional solution to flooding
5004	Unnamed Tributary, Alternative 2 (25-yr Basin)	Acquire property; Install and Upsizing Detention/Retention Basin/Channels/Small-scale basins/conveyance to reduce flood risk in the community; strengthens/improves drainage infrastructure network through community; regional mitigation solution
Other County Areas		
6001	Topaz Lake	Install and upsize existing culverts and channels to reduce risk of local drainage problems/flooding; reduces maintenance burden
7001	East Valley Dip Section (Pine Nut Road)	Upsize culverts to prevent frequent road overtopping; prevent roadway safety hazard
7002	Waterloo Culvert Crossing at the Cottonwood Slough	Design and construct upsized culverts for the Cottonwood Slough undercrossing of Waterloo Lane
7003	Raise Buckeye, install box culverts at Martin Slough crossing	Upsize culverts to prevent 100-year frequent flooding of the martin Slough from road overtopping the road and allow for this connection to 395 during emergencies; Reduces irrigation ditch conflicts

4.2 Prioritization Methodology

A review of the studies and proposed projects compiled in Section 3 resulted in identification of common goals and objectives. The next step was to perform a comparative assessment to attempt to prioritize these projects in a way that ensured fairness and accountability to residents and properties throughout the County. Based on the common goals and objectives, criteria were established that address property and safety, growth, flooding, water quality, maintenance demand, implementation potential and cost. In order to prepare a ranked list of projects for implementation, it was necessary to develop quantitative and qualitative criteria and metrics to apply to the potential projects. Similar criteria and methodology have been used in Stormwater Master Plans nationwide by AtkinsRéalis and others (City of Hillsboro, Oregon; City of Miami, Florida; County of Henrico, Virginia; etc.). County staff participated in three iterations of criteria review for applicability to the County goals, in line with the Douglas County Master Plan and Strategic Plan. An overview of the final criteria and basis of scoring from 1-5 is shown in Table 10. By comparing the total scores for each project, staff can rank and prioritize projects based on a consistent set of criteria that directly reflects changing community needs. The score for each individual criterion

is assigned a weight based on relative importance, and the overall score of a project is the weighted sum of all the criteria. Criteria selection and weighting can be re-evaluated as part of a Stormwater Master Plan update.

Table 10 - Prioritization Criteria

Criterion	Description	1	2	3	4	5
Flooding Category (30 points)						
Frequency of Issue	The more frequently the event occurs, the higher the priority	Only in extreme events	Once in last 10 years	1-2 times per year	More than 1-2x year	Ongoing
Level of Impact	The more severe the impacts, the higher the priority	Roads/infrastructure impacted but not damaged	Private property/houses	Property and infrastructure damaged	Property, infrastructure, roads closed	Buildings, property and infrastructure; safety concern
Number of Parcels affected	The more parcels impacted, the higher the priority.	1-5 properties	6-15	16-40	41-100	More than 100
Maintenance Category (15 points)						
Maintenance Intensity; Post-storm maintenance/cleanup level of effort	Areas that are prone to higher maintenance and clean-up after storms are more desirable, as solving them will free up maintenance staff to work on other areas/responsibilities	Very minor/none	Regular maintenance prevents the problem	One-day cleanup by County staff	Staff spends multiple days cleaning up; multiple agencies	Emergency contracts with vendors/outside assistance
Constructability/Feasibility Category (35 points)						
Floodplain	Projects in higher return frequency floodplain are higher priority.	X Unshaded	500-yr (X Shaded)	Potential	FEMA A or AE	Alluvial Fan
Easements	Parcels or easements that are owned by the County are a higher priority, as no money will be required to purchase the property, and there is no landowner coordination required.	Property or easement acquisition required		County has the easement or ROW		County owns the land or ROW
Implementation	Longevity, feasibility, partnering, community goals. Higher score for 1)Permanent, proactive solution, 2) design and permitting within a year, 3) project can be constructed opportunely with another project, 4) the project serves other community goals	Low Potential	Meets 1 principle	Meets 1 or 2 principles	Meets most principles	Meets all principles
Cost	The higher the cost, the lower the rank	> $5m	$2.5 - $5 m	$1 - 2.5 m	$500k - $1 m	< $500k
Regulatory Category (20 points)						
Regulatory Requirements	Areas/projects that must be implemented to meet regulatory requirements are a high priority. Examples include that the Lake Tahoe TMDL has a federal regulatory requirement for a project/maintenance to be conducted; projects that meet CRS requirements, projects under litigation.	No regulatory requirement		FEMA NFIP CRS, NPDES MS4		TMDL or Litigation
Public Agency Coordination/Permitting	Project implementation requiring coordination and approvals from multiple agencies are less desirable.	Multiple coordinating agencies - no prior working history	One agency - no prior working history	State and Federal - established relationship	State or Federal - established relationship	No coordination needed

4.3 Results and Conclusions

Applying the prioritization criteria to the list of all proposed projects in Section 3 resulted in a general ranking of all alternatives as shown in Table 11. In addition, prioritization within each primary area of concern was tabulated (Table 12), providing the County with options to address individual issues systematically over time without prioritizing one community over others. This is intended to be a "living" document and list of projects that will be updated on a 5-year interval to coincide with Master Plan and Strategic Plan updates. Once projects are implemented, they are removed from the list, and as studies are conducted and new project alternatives are identified, they will be added to the list and ranked. A map of these projects is included in Figure 25.

This prioritized list of stormwater capital improvement projects recommended for design and implementation provides the County Commission established priorities for the County Manager and stormwater staff with a path forward to initiate stormwater, floodplain, and watershed protection activities in a fair and comparable way. Prioritization of projects will also facilitate funding requests during the budget cycle with a CIP projects list to confirm the priorities year to year. Once a stable funding structure has been identified to fund the stormwater program and begin project implementation, the individual projects in this list will be analyzed for their funding ability or potential.

All projects in the prioritization list have been identified as a result of public comment and conceptual analysis. Prior to any construction, all projects will go through a rigorous evaluation, environmental analysis and costing. This process will include but is not limited to geotechnical analysis, soils analysis, environmental analysis, neighborhood impact and cost-benefit analysis. As a result, a robust public process including neighborhood noticing, workshops and public hearings will take place prior to funding and ultimate construction of any stormwater related improvement. Douglas County may also eliminate projects or take projects out of order based on need and funding opportunities which may favor certain projects over others.

Table 11 – Prioritized list of capital improvement projects

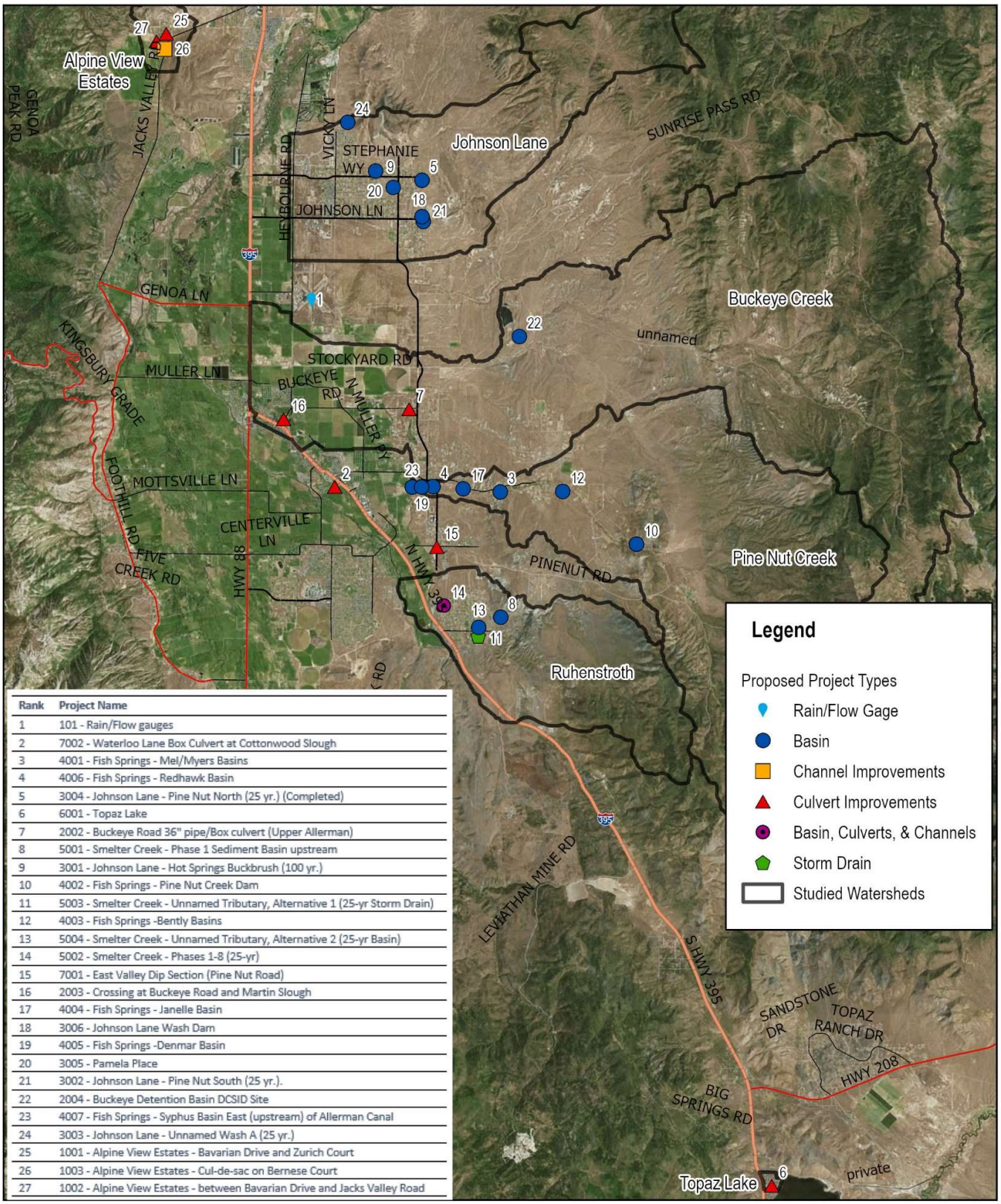
Rank	Project Name
1	101 - Rain/Flow gauges
2	7002 - Waterloo Lane Box Culvert at Cottonwood Slough
3	4001 - Fish Springs - Mel/Myers Basins
4	4006 - Fish Springs - Redhawk Basin
5	3004 - Johnson Lane - Pine Nut North (25 yr) (Completed)
6	6001 - Topaz Lake
7	2002 - Buckeye Road 36" pipe/Box culvert (Upper Allerman)
8	5001 - Smelter Creek - Phase 1 Sediment Basin upstream
9	3001 - Johnson Lane - Hot Springs Buckbrush (100 yr)
10	4002 - Fish Springs - Pine Nut Creek Dam
11	5003 - Smelter Creek - Unnamed Tributary, Alternative 1 (25-yr Storm Drain)
12	4003 - Fish Springs -Bently Basins
13	5004 - Smelter Creek - Unnamed Tributary, Alternative 2 (25-yr Basin)
14	5002 - Smelter Creek - Phases 1-8 (25-yr)
15	7001 - East Valley Dip Section (Pine Nut Road)
16	2003 - Crossing at Buckeye Road and Martin Slough
17	4004 - Fish Springs - Janelle Basin
18	3006 - Johnson Lane Wash Dam
19	4005 - Fish Springs -Denmar Basin
20	3005 - Pamela Place
21	3002 - Johnson Lane - Pine Nut South (25 yr).
22	2004 - Buckeye Detention Basin DCSID Site
23	4007 - Fish Springs - Syphus Basin East (upstream) of Allerman Canal
24	3003 - Johnson Lane - Unnamed Wash A (25 yr)

Rank	Project Name
25	1001 - Alpine View Estates - Bavarian Drive and Zurich Court
26	1003 - Alpine View Estates - Cul-de-sac on Bernese Court
27	1002 - Alpine View Estates - between Bavarian Drive and Jacks Valley Road

Table 12 – List of prioritized projects by area

Area	Project Alternative
	Tier 1
Johnson Lane	3004 - Johnson Lane - Pine Nut North (25 yr) (Completed)
Ruhenstroth	5001 - Smelter Creek - Phase 1 Sediment Basin upstream
Buckeye Creek	2002 - Buckeye Road 36" pipe/Box culvert (Upper Allerman)
Fish Spring	4001 - Fish Springs - Mel/Myers Basins
County	101 - Rain/Flow gauges
	Tier 2
Johnson Lane	3001 - Johnson Lane - Hot Springs Buckbrush (100 yr)
Ruhenstroth	5003 - Smelter Creek - Unnamed Tributary, Alternative 1 (25-yr Storm Drain)
Buckeye Creek	7001 - East valley Dip Section (Pine Nut Road)
Fish Spring	4006 - Fish Springs - Redhawk Basin
County	7002 - Waterloo Lane Box Culvert at Cottonwood Slough
	Tier 3
Johnson Lane	3005 - Pamela Place
Ruhenstroth	5004 - Smelter Creek - Unnamed Tributary, Alternative 2 (25-yr Basin)
Buckeye Creek	2003 - Buckeye at Martin
Fish Spring	4002 - Fish Springs - Pine Nut Creek Dam
County	6001 - Topaz Lake
	Tier 4
Johnson Lane	3002 - Johnson Lane - Pine Nut South (25 yr).
Ruhenstroth	5002 - Smelter Creek - Phases 1-8 (25-yr)
Fish Spring	4003 - Fish Springs -Bently Basins
County	

Figure 24 - Flooding overtops Buckeye Road



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Douglas County, Nevada
Stormwater Master Plan

0 1 2 3 4 5 Miles

Disclaimer: the information shown on this map is assembled GIS data created and acquired by AtkinsRealis. This data is not for survey accuracy and is meant for planning purposes only.

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FIGURE 25

PROPOSED CARSON VALLEY STORMWATER CAPITAL IMPROVEMENT PROJECTS

5. Stakeholder Considerations

When a program effectively identifies and collaborates with its stakeholders, there are benefits to both parties. Stakeholders of the Stormwater Program in Douglas County share common goals such as public health and safety, maintaining infrastructure, preserving water quality, and keeping costs low and efficient. Stakeholder partnerships allow the County to gather information needed to plan and implement projects effectively, generating buy-in from the community and coordination with County staff to perform maintenance on commingled infrastructure. Communication and collaboration enable community leaders to make more informed decisions.

An effective stormwater management program with CIP implementation requires program funding, funding partnerships, and coordination with landowners or other stakeholders to adequately cover the maintenance activities. The adjacency, encroachment, and commingled nature of private and public stormwater infrastructure in Douglas County requires an approach that considers the impacts or benefits to all partners. Nearly 15 years of collaboration of the 113 projects implemented in Douglas County at Lake Tahoe demonstrates how partnerships with the GIDs and County can be successful. Infrastructure that is maintained by County staff is shown in Figure 30.

Key stakeholders to the Stormwater Program are discussed herein to emphasize the importance of continued collaboration and to establish an on-going alliance with the ranchers in the flood-prone areas all working towards a common goal and better stormwater management.

As described throughout this document, stormwater issues affect everyone in the County in some way or another. Stormwater management includes flooding and water quality concerns as a result of storm runoff, and this must be financially managed to ensure protection of life health and safety, safety of property and protection of the environment. Residents in Douglas County are impacted by at least one of the following:

- Direct flooding: properties are inundated by floodwaters and receive property/structural damage, or
- Indirect flooding: Properties or residents may not be directly impacted by rising floodwaters, but roads or schools may be closed. Emergency services may be delayed or unable to respond in a timely manner due to flooded roads or evacuation response, access to and from homes and services within the community during these events, and
- Stormwater quality: This action has been mandatory at Lake Tahoe since for at least 20 years. The Lake Tahoe TMDL is the water quality program that requires every jurisdiction around the lake to perform certain activities to improve lake clarity. As improvements are constructed, maintenance obligations increase.

The County and other entities and property owners have long had informal partnerships to address certain stormwater concerns. At Lake Tahoe, water quality improvements have been made within GID boundaries, assisting the County to meet regulatory requirements. Without these partnerships, GIDs would be required to hold their own ILA and model their pollutant load reductions to Lake Tahoe. Irrigated agricultural land provides the County with an economic base, provided water and lands resources are functional, including drainage/irrigation ditches. The County recognizes the importance of these stakeholders and relationships and the valuable asset they are when managing stormwater quality and quantity. In the future, it will be essential to continue to coordinate effectively with these stakeholders.

The impacts of flooding from the Pinenut Mountains continue to impact communities downstream (Ruhenstorth, Buckeye, East Valley, Johnson Lane) due to the intersection of the ditch network along the entire valley from north to south, as shown in Figure 28.

5.1 General Improvement Districts (GIDs) and Towns

The purpose of a GID or Town is to seek autonomy from a municipality in services such as water, sewer, garbage collection, snow removal, and stormwater. A GID or Town has the ability to collect money from its residents to perform the services. In Douglas County, some services – such as the use of street sweepers or vacuum trucks – exceed the on-hand resources of the GID or Town. In such cases, the GID or Town may contract with the County to perform the service. Douglas County provides regular maintenance of stormwater infrastructure within the Town of Genoa and occasionally within the Towns of Gardnerville and Minden. At Lake Tahoe, TMDL activities are performed within many of the GIDs. However, the County has the legal responsibility for EPA compliance. The agreement directly with the County instead of an ILA with each of the GIDs simplifies the administration of the TMDL. Douglas County provides regular maintenance of stormwater infrastructure at Lakeridge GID, Logan Creek GID, and Cave Rock GID. The agreement stipulates the following activities that must be regularly performed to remove sediment from road surfaces and sediment-trapping BMPs, such as:

- Sediment Load Reduction Plan (SLRP): A SLRP was initially prepared in 2016 documenting the actions that the County must perform to demonstrate that the target load reductions are being achieved. The plan is updated every 5 years to track load reduction progress.
- Pollutant Load Reduction Model (PLRM): PLRM is a water quality model developed specifically for the Lake Tahoe TMDL to simulate sediment load reductions as a result of ongoing mitigation activities. A baseline PLRM model was developed that is used to model the load reduction associated with project implementation. This baseline model is updated every 5 years to account for load reduction activities as they are implemented.
- BMP Rapid Assessment Method (RAM): Water quality BMPs (detention basins, etc.) must be inspected yearly and maintained to ensure a minimum of 75% capacity is available for infiltration or treatment of stormwater runoff. There are specific protocols to inspect, document and report these measurements as detailed in the BMP RAM user manual.
- Road RAM: Road operations include sanding prior to winter storms for safe travel and sweeping the sand after the storm has passed. The County must coordinate with the GID to inspect the road surface prior to and after sand clean up. Inspections must follow the procedures outlined in the Road RAM user manual and are reported on the online platform at least four times per year.

Partnerships and collaboration with the County and GIDs have different benefits:

- Continued regulatory implementation of the Lake Tahoe TMDL, and
- Continued assistance from the County to help GIDs and Towns maintain their stormwater or drainage system infrastructure when the GID or Town is not able to perform or does not have the equipment to perform certain activities.

5.2 Irrigation Network and Facilities

Somewhat unique to the Carson Valley is an irrigation ditch network developed over 150 years ago to provide access to the river water in the newly settled lands in the County. These ditches divert water from the Carson River through an integrated network of canals, sloughs, and ditches that spider-web across the Carson Valley. These ditches were designed to convey a certain amount of flow based on Alpine[2] decreed water rights from the Carson River. However, as the towns of Minden and Gardnerville grew around the ditches and farmlands, stormwater runoff was captured and conveyed into this drainage network. When the ditches and culverts are already at conveyance capacity either during the irrigation season or after storms, additional stormwater runoff can overwhelm them, causing localized flooding and road closures due to the systems backing up. Sediment and debris entrained in the runoff fills in the drainage capacity of the ditches and impairs the control structures and causes culverts and pipes to clog and flood roads and

[2] Alpine Decree: https://www.cwsd.org/11347/

other drainage facilities. The impact of this encroachment onto and around drainage easements can cause conflict between the County, water rights holders, and residents when necessary maintenance cannot be performed.

As part of this Stormwater Master Plan process, County staff coordinated meetings with the members of the ranching community in December 2023 and February 2024, to identify maintenance or access issues that lead to conflicts with residents or the County. These meetings resulted in the identification of key areas where coordinated maintenance between the irrigators and the County would be beneficial to minimize irrigation/stormwater conveyance conflicts (Figure 28). County stormwater program staff coordinated maintenance at numerous locations after these meetings; one result was the installation of a trash rack on the Cottonwood Slough under Waterloo Lane (Figure 26). Partnerships between the County and these community members would foster collaboration and cooperation to effectively make drainage improvements, and conduct maintenance on existing channels. Key issues identified for which competing uses between the irrigators, adjacent landowners, and the development community are as follows:

Blocked drainage easements:

- Parcel maps do not include all easements, therefore when large blocks of land are divided into smaller parcels, purchasers are not aware of the easement or of the requirement that the water right holder has the right to perform maintenance on the ditches on their property. Such information isn't known or conveyed by realtors.
- Access to these easements sometimes requires law enforcement personnel to mediate conflicts between the landowner and the maintenance crew.
- Easements around ditches for access and maintenance vary from 30-50' to 100' wide, but encroachment due to urbanization impedes maintenance access.
- Abandoned or no longer utilized irrigation ditches that intercept flood flows (i.e., Upper Allerman Canal)

Lack of coordination with developers:

- Stormwater infrastructure designed for housing or commercial development can inadvertently intercept the irrigation flows, preventing them from getting to their rightful user.
- Inadvertent direct alteration of the irrigation ditch can alter slope or capacity, restricting flow downstream.
- Culverts under roads designed to pass irrigation flows can be insufficient to also carry stormwater flows. New or upsized culverts and drainage infrastructure under local and state roads must be constructed to effectively pass larger flows and prevent road overtopping, flooding and road closures. Accumulation of trash in the ditches as they pass through town is an unwanted additional maintenance burden and eyesore.

Similarly, Washoe County, including the City of Reno, has for decades relied on irrigation ditch systems such as the Highland, Last Chance, Steamboat, and Lake ditches to capture stormwater runoff from developed properties, in some cases having made direct connections of storm drains to outlet to these ditches. But the historic ditches — some built more than 150 years ago — were designed to carry water from the Truckee River to agricultural lands, not to serve as storm drains for a major metropolitan areas or neighborhood developments. This has led to these canals and ditches being overwhelmed by stormwater on several occasions in the past 20 years, with major issues having occurred as recently as 2005 and 2017, and this has caused significant flooding and major clean-up for some neighborhoods.

Figure 26 - Trash rack installed under Waterloo Lane as a result of meetings with agricultural community members.

A 2017 Reno Gazette Journal[3] article cited the then Public Works director to have said that construction of separate storm drain projects, so as to separate stormwater from irrigation ditches and no longer use these for stormwater conveyance, could well exceed $100 million.

Facing that kind of price tag to construct separate storm drain systems, and perhaps better recognizing the value of utilization of existing irrigation ditches throughout the area, the City of Reno has entered into agreements with at least three of the 11 active ditch companies to ensure that more frequent maintenance and inspection occur. The same article cited that the City paid approximately $350,000 a year in total to certain ditch companies to ensure a relationship for the continued use of the ditches, and sought improved maintenance by the ditch companies. While this does not solve the storm exceedance and capacity issues regarding use of existing ditches, it does defer the issue to a future time when storm drain master planning provides some alternatives, and seems to recognize the necessary partnership with ditch companies to continue conveying stormwater.

5.3 Nevada Department of Transportation (NDOT)

Growth and development in the County have led to several road building or widening projects within the County and in Carson City. NDOT partners with the County to effectively plan for the impacts of these projects on the existing drainage system where infrastructure intersects. Drainage infrastructure upgrades must be planned and implemented considering both downstream and upstream impacts. Upgrading the pipe size in one location means that downstream infrastructure will be overwhelmed if not similarly upgraded along with the upstream improvements. When the County conveyances intersect the NDOT right of way, this infrastructure must be sized to convey the additional stormwater safely and adequately without causing flooding to the road or right of way. Such instances occur at Muller Lane and Highway 395, Highway 88 at the Carson River, Centerville Lane and Waterloo Lane at the West Fork of the Carson River, and the Lower Old Virginia Canal under Highway 395. The County and NDOT must maintain an open line of communication when improvement projects are planned and implemented, similar to the improvement NDOT is making at the Ezell Ditch crossing at the Highway 395 and Toler Lane intersection. The County designed the improvement, and NDOT was able to work in the design into their reconstruction project.

In addition to planning and design, in the event when an immediate maintenance action is needed to prevent road flooding, there must be an understanding in place to allow the County to perform the maintenance in a reasonable time frame. A Memorandum of Understanding (MOU) would allow for this immediate culvert cleaning or other need, without worrying about 'red tape' or financial accountability, in the event the County is able to perform the work before the state was able to do so.

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[33] Reno Gazette Journal, Article by Anjeanette Damon, "Reno's irrigation ditches fail during floods, damaging homes." January 13, 2017. Available online at https://www.rgj.com/story/news/2017/01/13/renos-irrigation-ditches-fail-during-floods-damaging-homes/96374378/

Figure 27 - 1963 Flood

5-Day Weather Forecast

No precipitation at beginning of period. Possibility of precipitation at end of period. Temperatures above normal.
Normal high: 60. Normal low: 21.

The Record-Courier

Minden, Nev.

82nd Year — No. 6 | Gardnerville, Douglas County, Nevada, Thursday Morning, February 7, 1963 | Ten Cents Per Copy

FLOOD BRINGS MILLION DOLLAR LOSS

County Threatens Federal Agency with Injunction

BLM Sale Stoppage Is Sought

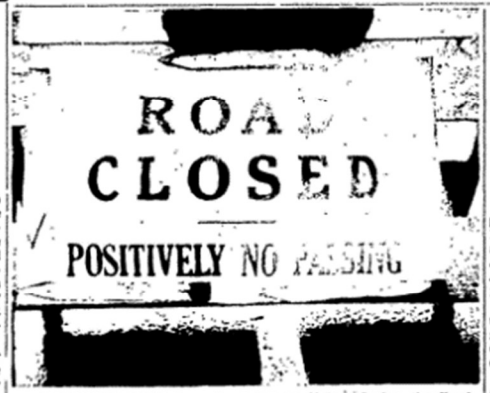
Douglas County took a firm stand Tuesday night against the auction here of what it calls improperly subdivided tracts by the Bureau of Land Management, and warned the BLM that if no satisfactory answer is reached by noon on Monday, Feb. 11, the County will consider legal action, most probably in the form of an injunction to halt the auction.

The auction is scheduled for Feb. 14. Sixty tracts are to be sold near the Douglas-Ormsby County line.

One hundred and ninety lots in Ormsby County are to be auctioned off at the same time. Douglas County has requested Ormsby County to take a stand against the sale

The BLM was informed of the Douglas County action Wednesday in a letter from District Attorney John Chrislaw.

Chrislaw said the BLM has made no provision for school sites, has not taken the natural terrain into consideration in the mapping of rights-of-way, and would create 17 openings onto Highway S. 395 in a space of less than one



A FAMILIAR SIGN throughout Carson Valley during the flood was the one pictured above, notifying residents that flood conditions had caused closing of yet another road to traffic.

Ranches, Ditches, Roads Hit Hard

Last week's flood in Carson Valley wrought damage that is estimated at more than one million dollars, according to a flood damage report prepared by the Douglas County Civil Defense Chairman Ted Bergevin, assisted by several other men, made a personal survey Sunday of a great number of ranches, making contact both via the telephone and on foot.

J. Canyon Trustees Study Bids

The trustees in the bankruptcy proceedings on the James Canyon Ranch Creamery, Inc., last week applied for authority to sell the James Canyon Ranch to the Aluminum Plumbing Fixture Corporation for $487,500.

The sale would include all of the ranch except the property now leased to the Beatrice Food Company under a lease signed Oct. 26, 1961.

A special meeting of the creditors to consider the application has been scheduled for this Tuesday, Feb. 12, at 10:30 a.m., in Room 301, U. S. Post Office Building, Reno.

The sale would be made on a down payment of $400,000 in cash, with the balance of $87,500 to be paid in five years, at an interest rate of four and three-quarters percent interest.

The creditors are also being asked to consider two petitions by Zellerbach Paper Company, one to reclaim $799, and a second seeking an order directing the trustee to pay the company $5,484.84 out of the assets of the

CRADLEBAUGH BRIDGE was blocked to traffic for more than 48 hours by the flood-waters of the Carson River. State Highway Department crews maintained watch to see that motorists did not cross the bridge.

Disaster Area Declared

Valley Nearly Isolated

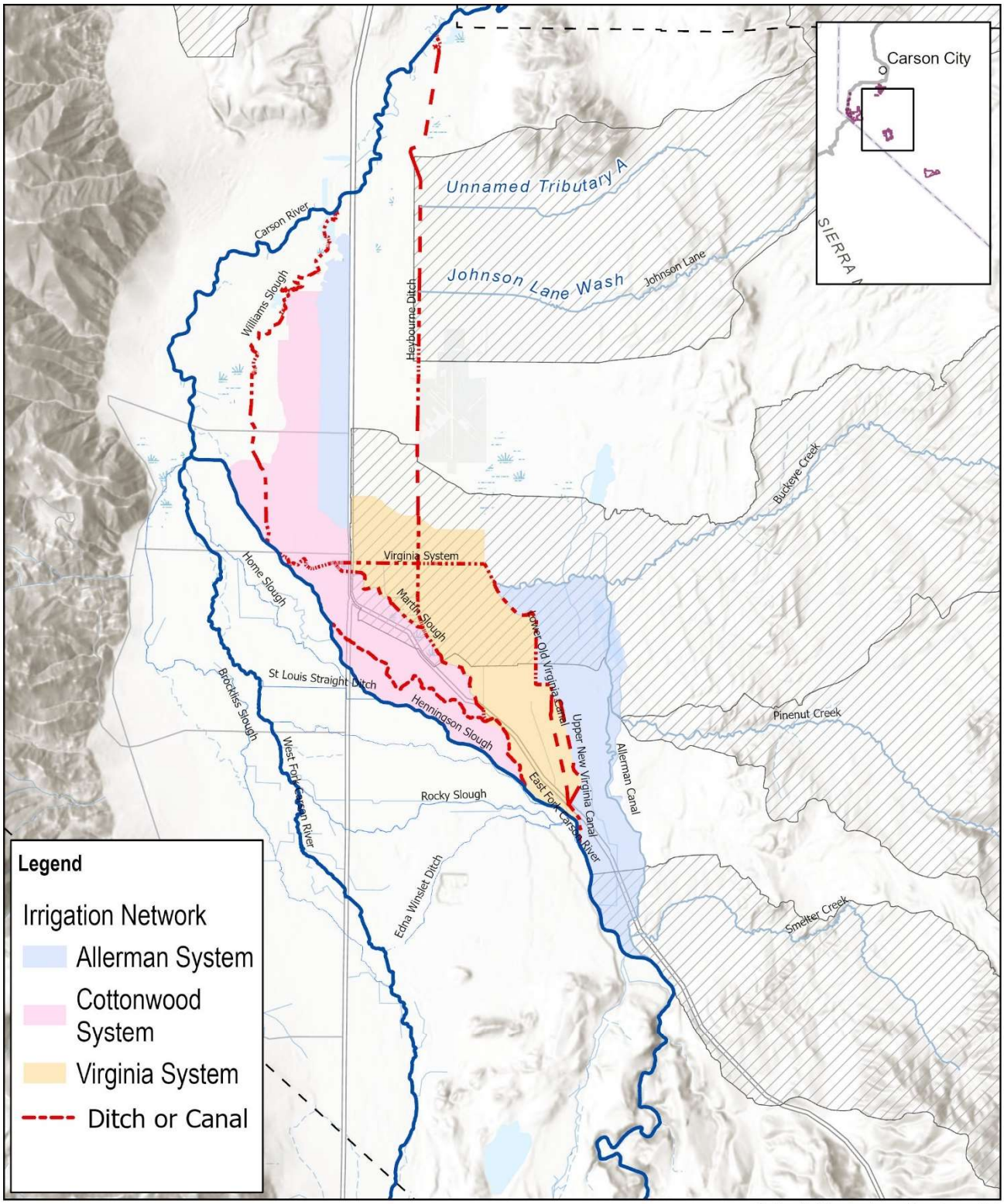
An intense three-day downpour of rain, sweeping down from the mountains over frozen earth, last week brought western Nevada its third devastating flood in a little more than 12 years, and caused more than one million dollars in damage in Carson Valley alone.

(For damage estimates, see story, "Ranches, Ditches", on this page.)

The rushing flood waters had a devastating effect on many ranches, washing away land, ditches and fences, depositing debris and mud, and invading barns and houses.

Highways and roads were immersed in many places by the swirling, muddy waters, and Carson Valley residents were cut off from each other and from access to Carson City, Alpine, Lake Tahoe, and California.

The road to Yerington was open throughout the storm, however; and individuals did make their way into the Valley from Carson on Friday night along the Jacks Valley Road, although they had to be pulled out of the mud by a caterpillar to complete their



Douglas County, Nevada
Stormwater Master Plan

0 0.6 1.2 1.8 2.4 3 Miles

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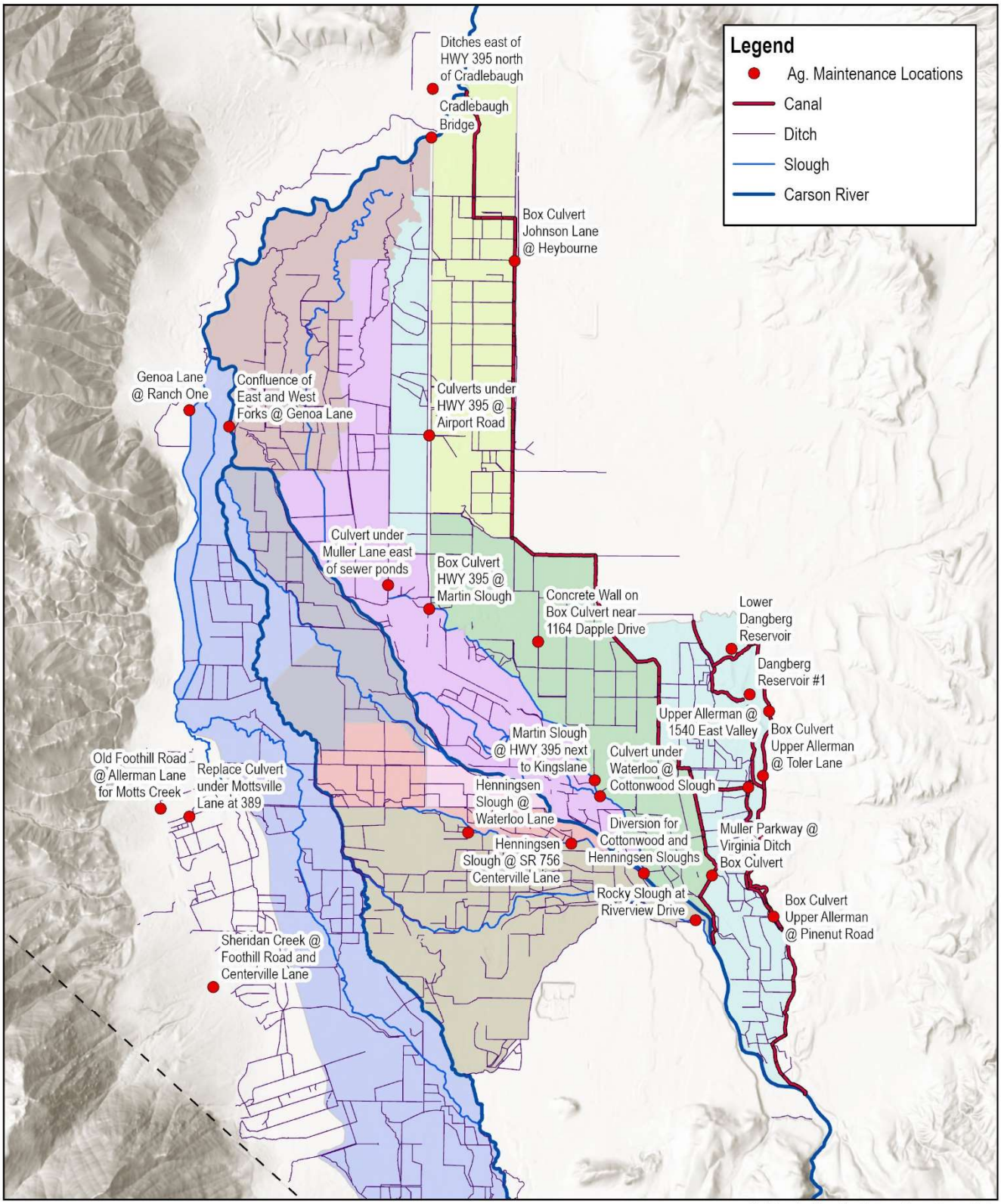
FIGURE 28 **DRAINAGE AREAS & IMPACTED IRRIGATION NETWORKS**



Douglas County, Nevada
Stormwater Master Plan

0 1 2 3 4 5 Miles

Disclaimer: the information shown on this map is assembled GIS data created and acquired by AtkinsRealis. This data is not for survey accuracy and is meant for planning purposes only.

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FIGURE 29 IRRIGATION/STORMWATER OVERLAP LOCATIONS

6. Recommendations

Overall, the County is able to meet its regulatory requirements with existing staff and resources. However, as new improvement projects are constructed and regulatory demands increase, there is an attendant increase in inspections, monitoring, maintenance, and reporting. Additional measures must be taken to improve resilience of County residents. The recommendations in the SMP are as follows:

- Adopt and fund the Stormwater program and proposed Capital Improvement Plan,
- Conduct a CRS Class Advancement Study to evaluate 1) if a larger flood insurance discount could be obtained for residents of Douglas County, or 2) more effective utilization of existing credits to maintain current class
- Revise the Ordinance (Title 20.50) to strengthen stormwater regulations as needed to gain additional CRS credits, and
- Additional stakeholder coordination and communication in times of higher stormwater runoff events.

6.1 Stormwater Capital Improvement Program

The implementation of a CIP program that is properly staffed and funded is the most important tool for the future of the stormwater and floodplain management program within Douglas County. The project list developed in Section 4 is a summary of the identified issues and projects that were evaluated as the most pressing for the County to implement. This list is intended to be updated as needed or as projects are completed or as priorities change. An implementation schedule is recommended as soon as a funding source can be identified, projects budgeted and grants can be matched and obtained.

6.2 CRS Class Advancement Study

Douglas County has been a Class 6 CRS community for approximately 15 years. Maintaining this class requires a significant amount of staff time and Country resources but brings significant benefits to the County and its residents. Because of changes to the documentation and reporting procedures, it is advisable that the County investigate the level of effort involved to move from a Class 6 to a Class 5 community. A Class 5 rating would increase the discount that flood insurance policy holders receive on their annual premiums from 20% to 25%. The community as a whole benefit from a CRS advancement due to the actions that would be taken to further reduce flood risk. A cursory effort reviewing the amount of points the County is currently receiving for flood management activities was completed and identified two activity areas that may receive additional points, though not without significant effort. However, an analysis of the complete program could assess if this same level of effort, though under different actions or CRS activities, would garner the credits to attain and maintain CRS Class 5.

CRS Activity 450 specifically provides credit for communities adopting regulations and undertaking planning efforts related to stormwater management, erosion and sediment control, and stormwater runoff water quality. CRS Activity 430 provides credit for communities adopting floodplain regulatory standards that exceed the minimums required under the NFIP. The County currently receives 32 points out of 755 possible for CRS Activity 450, and 430 points out of 2,042 possible for CRS Activity 430. A formal study is recommended to provide exact estimates for increasing points awarded, but the following activities may be evaluated:

- Review current regulations and assess the feasibility of adopting regulatory updates, revising language pertaining to the following areas:
    - Stormwater runoff peak flow, volume, and water quality improvement measures
    - Low-Impact Development (LID)
    - Private stormwater facility management

Floodplain management higher standards creditable under CRS, that the County already has in place but is not receiving credit for items or areas such as:

- Substantial Improvement (SI)
- Manufactured home elevation
- Enclosures below structures
- Evacuation plans for new residential subdivisions
- Non-conversion agreements (Can't convert uninhabitable space (i.e. an unfinished basement or garage) into habitable space (finished, carpeted, refrigerator, tv etc)
- Storage of hazardous materials
- Assess the existing area drainage master plans (ADMPs) that identify specific actions and recommendations to improve the County's credit. CRS Activity 450 provides credit for Watershed Master Plans (WMP), but has very stringent criteria for the planning, technical analysis, regulatory, and funding aspects of the WMP that must be met to receive credit.

Additional details on the CRS program point calculations is available from the Stormwater Department. A full study is recommended assess the potential for additional points with more detail.

6.3 County Development Code Revisions (Title 20.50)

An important aspect of floodplain and stormwater management relies on construction or development standards designed to minimize or prevent flood threat. Title 20.50, Floodplain Management, should be evaluated to ensure sound standards that are in line with modern day building codes and safety practices are enforced. As stated previously, there are quantifiable benefits to adopting regulations for the CRS program as well. Revisions and updates to the local ordinance is a lengthy process, so only general recommendations are listed at this time. These measures could also be implemented less formally as a policy but will not carry the same effect.

- Encourage adoption of an LID Ordinance
- Incorporate LID principles into all development proposals to decrease stormwater runoff, improve water quality, and promote groundwater recharge
- Adopt an ordinance for the consistent use of a hydraulic model for the Carson River system
- Set measures to restrict building in floodplains
- Increase setback requirements; Increase required freeboard
- Increase compensatory storage requirements
- Encourage or incentivize open space preservation
- Adopt a stricter "No Adverse Impact" policy that limits increases in base flood elevation to less than 1 ft

6.4 Additional Stakeholder Coordination

Douglas County was established as a farming and ranching community over 150 years ago. While in many communities in the western United States the use of the irrigation ditches has become a way of the past, their importance in the Carson Valley is still just as strong today. However, there are now competing

interests for water, unintended uses of the ditches to convey stormwater, and access and maintenance issues due to encroachment by new development and growth in the County. Regional growth has also brought state highways, resulting in criss-crossing of roads, and public or private drainage infrastructure. Effective communication and coordination must be maintained before, during and after flood events to ensure safe passage through the community and flooding is not exacerbated. The following are steps that can be taken to improve or solidify these relationships.

- NDOT MOUs – County agrees to perform maintenance and bills NDOT for work done
- Irrigation Ditch Companies - Formalize an agreement where the County works with the ditch company and water rights landowners to maintain infrastructure
- Levee Stakeholders – CVCD, Gardnerville Ranchos, Golf Course, NDOT. Establish a working relationship for involved stakeholders to take ownership and responsibility for the levee. Decide on a formal agreement for long-term maintenance.

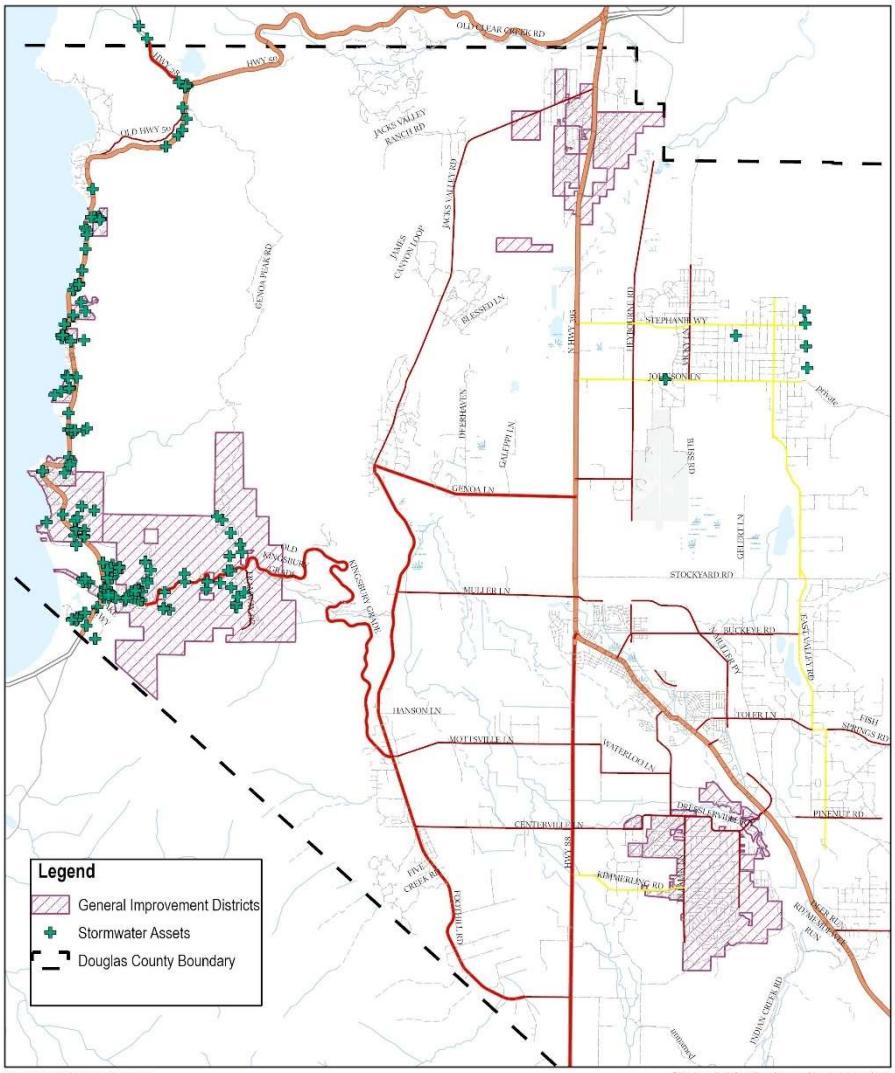

FIGURE 30 DOUGLAS COUNTY MAINTAINED STORMWATER ASSETS

APPENDICES

APPENDIX A – Funding Strategies

Current Budget

The Stormwater Program receives approximately $1.1 million annually from the General Fund. This budget provides salary and benefits for the Program Manager, Maintenance Supervisor, three Maintenance Operators, and one Engineering Technician. The program is responsible for the inspection and maintenance of the stormwater and drainage system for all County-owned infrastructure which includes conveyance channels, culverts, pipes, and regional and county owned detention/retention basins. In addition to routine maintenance, the stormwater crew must respond to post-storm cleanup events by clearing the roads and conveyance channels of sediment and debris as the situation arises in the event. Staff also provide maintenance to local jurisdictions when requested, such as Logan Creek GID, Lakeridge GID, and the Town of Genoa, who do not have specialized equipment such as vactor trucks. In such cases, the County may be reimbursed by the requesting entity for stormwater infrastructure maintenance. As discussed in previous sections, the Stormwater Program administers the Community Rating System (CRS), Municipal Separate Storm Sewer System (MS4), and Tahoe Lake Total Maximum Daily Load (TMDL) programs by keeping records of the Best Management Practice (BMP) inspections, maintenance, and reporting. The program is also responsible for administrating several outside contracts with nearby Conservation Districts for Lake Tahoe Stormwater Monitoring (Tahoe Resource Conservation District), Carson River bank stabilization projects (Carson Valley Conservation District), and general engineering services (Nevada Tahoe Conservation District). The allocated dollar amounts for each task are summarized in Figure 31.

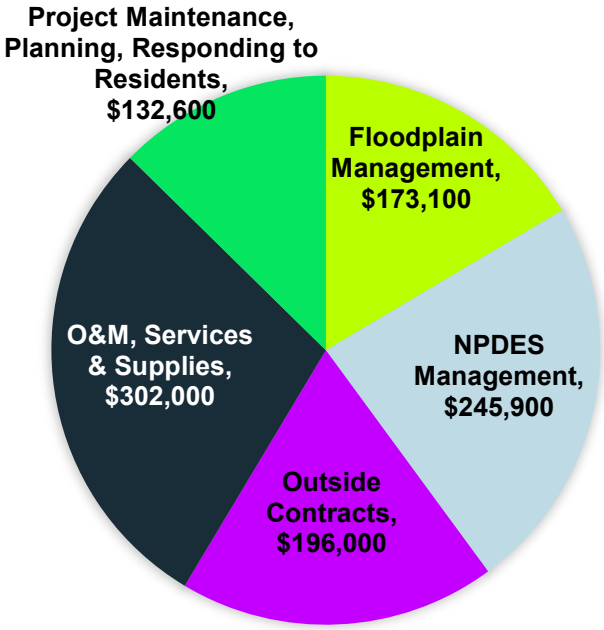

Figure 31. Stormwater Program FY 23 Annual Budget

Budget Shortfalls or Deficiencies

As described, the budget allocated to the Stormwater Program covers routine maintenance and repairs performed by staff, and inspections, maintenance and reporting responsibilities of the regulatory programs as detailed in the Douglas County Stormwater Operations and Maintenance Plan (Appendix B). There are no additional funds for emergency maintenance (potential failure of levee or dams) or clean-up after damaging flood events (unplanned costs). In recent years, this has been an unexpected burden to the County. Before the Stormwater Program was created in 2014, County General Funds were used on an as-

needed basis for emergencies. The magnitude of this can be seen by the comparison of the annual budget allocation of the Stormwater Program (black bars) to the amount spent on emergency repairs and clean-up after flood events (purple bars) (Figure 32). This shows that sporadic events in 2014, 2015 and 2017 cost the County the equivalent over $2M each year. Planning ahead with preventive maintenance and capital projects to manage stormwater would reduce the costs of post-event repairs and reduce the overall impact of flood events in Douglas County.

The year 2023 thrust flood emergencies back in the limelight, with flash floods occurring on nearly all Pinenut tributaries, including Smelter Creek, Pinenut Creek in Fish Springs, Buckeye Creek near Buckeye Road, Johnson Lane, and also Brockliss Slough at West Fork Vista. A costly repair incurred by the County occurred during the winter of 2023 when Smelter Creek breached its banks and flooded several homes in the Ruhenstroth community. The County responded by sending personnel to conduct cleanups of sediment from the roads and drainage ditches and repair asphalt and concrete roads that were destroyed by fast-moving water (Figure 33). Similar events and cleanup were required in the Pinenut tributaries and Buckeye Creek. Emergency contracts were initiated with local contractors to help with response efforts and cleanup, as County staff could only attend to one or two sites at a time.

Figure 34 shows damages incurred during the heavy spring runoff Carson River flow where large branches and sediment blocked an irrigation diversion channel and lead to backwater flooding, with the potential to impact roads and private property. Attempts were made to remove the debris by explosives, cranes, and excavators. Paying for emergency flood events out of the County general fund or reserve funds is reactive instead of proactive, and reduces available funding for other community services.

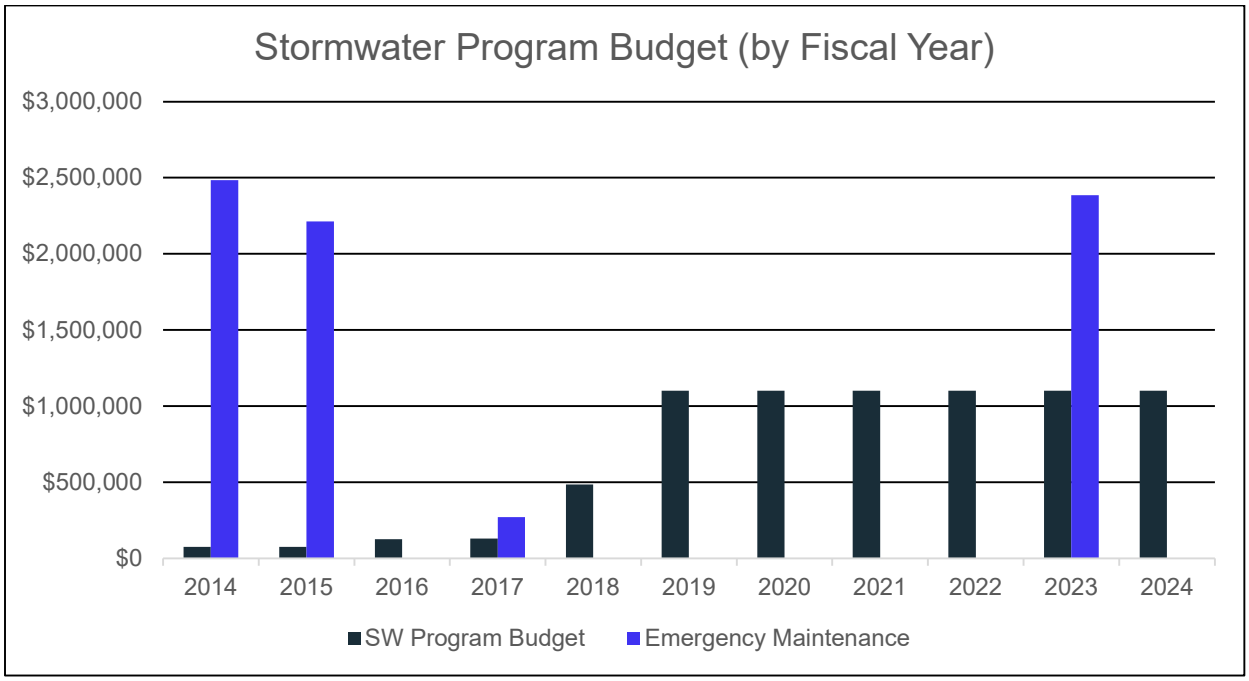

Figure 32 Stormwater or emergency response expenditures

Figure 33 - Road washout during the Smelter Creek flooding event in early 2023.

County staff has been creative in finding ways to budget and fund unexpected or unanticipated 'emergencies' that come up as a result of extreme weather events. A recent example is the East Fork Levee Repair on the Carson River, where a potential breach of the golf course levee would have flooded several homes along the Carson River. Sustained high river flows exacerbated this already weakened levee from deferred maintenance and repairs. The Stormwater Program coordinated with Carson Valley Conservation District to secure $260,000 in funds and coordinate the repairs, completed in early 2024. Contributions were split amongst the County ($65,000), Nevada Division of Water Resources ($65,000), Carson Water Subconservancy District ($93,000), and the Carson Truckee Water Conservancy District ($37,000). As described in Section 3.2.1, unknown ownership or willingness to take responsibility of this levee led to the years of deferred maintenance (i.e. none) leading to the levee's weakened state, and also also led to no one to pay for the repair despite the threat of imminent flooding. Careful planning for Stormwater management would allow for preventive maintenance of key infrastructure and avoid last-minute scrambling to hobble together funding for urgent repairs.

Figure 34 - Debris buildup in the Carson River blocking an irrigation diversion.

Emergency repairs can be costly due to overtime needs or contractor availability. In addition to a lack of funds to pay for emergency situations, the growing backlog of CIP projects intended to mitigate flood risk and improve water quality does not currently have a reliable funding source. Taking just the top 10 projects from the prioritized list included in Section 6 of this SMP, the cost is estimated at over $80 million; the County would need to allocate an additional $2.6 million annually if the projects are to be completed within the next 30 years. There is currently no dedicated funding source for Stormwater CIPs. Funded implementation of a Stormwater Master Plan might not raise $2.6 million annually, but it could at least provide significant and

impactful funding for critical or high-impact. Without funding, Stormwater needs will only continue to grow, the list of projects getting longer and longer, without any project needs being addressed until an emergency arises.

Mitigation projects are intended to protect residents and businesses, ideally before they are damaged by floods. Residents have regularly professed their frustration at County officials for not doing more to protect residents from repeated flood events. This culminated in the residents of Johnson Lane suing the County to force implementation of the four detention basins upstream from that neighborhood within the BLM lands. However, willingness by the County to prepare a Stormwater Master Plan shows that it is serious about implementing solutions to the areas of concern and safety of existing infrastructure. The prioritized list provides the County with a list of established priorities, and the stormwater staff with a path forward to initiate mitigation activities and watershed protection measures in a fair and transparent way. The CIP projects were prioritized based on frequency of damage and disruption to the public, construction feasibility, costs, and others. Once a stable funding structure has been identified, these projects can be implemented.

Strategies to Address the Funding Gap

The County must identify a stable funding mechanism to support stormwater program activities. There must be enough funding for:

1) Day-to-day program operations (regulatory or other required inspections, monitoring and maintenance, other routine maintenance or preventive actions),
2) CIP implementation,
3) Increasing regulatory inspections, monitoring and maintenance, and
4) Account for inflation (operations costs, staffing, and equipment replacement)

As shown in Figure 31, the funding allocation starting in 2019 at $1.1 million has never been increased in the past 5 years. According to the consumer price index, $1.00 in 2019 has the same buying power as $1.23 in 2024, about a 4% increase each year[4]. If the program budget had kept pace with inflation, over $600,000 could have been allocated towards on-going maintenance or a CIP project. Essentially, the stormwater program has 20% less in 2024 than what is needed to complete the same tasks that were allocated for in 2019.

A variety of strategies used to close a funding gap have been implemented locally, statewide, and nationwide. These strategies are used in communities based on:

- Equity (who pays what amount and how is that determined),
- Legal actions to take (are there ordinance measures that need to be implemented or public votes needed),
- Comprehensiveness (how much capital is available and in what timeframe).

Applicability or likelihood of a strategy succeeding in a specific community are based on:

- Ease of implementation (administrative burden),
- Availability of funding programs,

[4] CPI Inflation Calculator (bls.gov)

- Ability to generate the required revenue, and
- Likelihood of public support.

A description of these strategies is included herein. However, the County does not need to meet the entire burden alone; there are grant and loan programs from which funds can be secured and 'matched' to County funds, allowing the County a reduced financial burden. The sources of these funds are either Federal, State, or Regional programs that administer funds for qualified projects. More details on grants and loans are included in the following sections.

Federal/State/Regional Grant Programs

There are numerous grant and loan programs available through both State and Federal governments. The Stormwater Program has been successful in the past at securing funds for drainage master plan studies and smaller construction projects from regional entities such as the Carson Water Subconservancy District (CWSD), Tahoe Regional Planning Agency (TRPA), Natural Resources Conservation Service (NRCS) Watershed Programs, and the State of Nevada Public Lands Management Act (SNPLMA). Grants are an attractive funding source since the money can be used to fund construction of high dollar projects, without repayment. Grant programs are available from FEMA for flooding-related projects but are typically competitive at a national level. However, almost all grant programs come with a match requirement of 10-25% of the requested value. For a $10 million project, this would equate to the County needing to provide from $1 million to $2.5 million dollars in matching funds which may or may not be available. Grant programs typically have a period of performance of around 36 months, which for complex projects with multiple stakeholders and permits may not be enough time. In most cases grants are a one-time award and do not cover on-going O&M costs. Applications to FEMA's Hazard Mitigation Grant Program (HMGP) have been submitted for various flood control projects in the County. Funding construction projects for FEMA grant programs (HMGP, FMA, etc) require the project to pass a Benefit-to-Cost Ratio (BCR) of 1.0 or greater, which can be difficult for large projects with a small area of impact, like many of the proposed projects in the County.

Regardless of any drawbacks, applicability of grants should be evaluated for all projects. The County has applied for grants for some of the projects in the prioritized list; when successful, a project has a higher chance of implementation. AtkinsRéalis has performed an initial review of prioritized projects and identified most applicable grants for projects. This should be the first step in implementation of any project, to see what monies may be available. For more specific details and examples of grant programs, see Table 13.

Match Requirements Case Study – Three Forks, Montana

Match requirements are not inconsequential when it comes to grant funding. In 2022 Three Forks, Montana was selected for a Flood Mitigation Assistance (FMA) grant totaling $4.15M to construct flood improvements. The community was required to match 25% or $1.4M. A bond was issued to cover the match, to be repaid with revenue from a Special Improvement District (SID). The costs establishing the SID was over $30k alone, plus interest to be repaid over the 20-year period on the bond (over $800k). Neither of these costs count towards the match requirement.

Federal/State/Regional Loan Programs

Loan programs are also available for zero or low interest rates. The EPA's Water Infrastructure Finance and Innovation Act (WIFIA) and the State Revolving Fund (SRF) are popular loan programs among municipalities to manage stormwater programs and build CIP projects. Loan programs such as the SRF also require a match requirement, and also require repayment, so a reliable funding stream must be

identified. Many municipalities use bond revenues or public-private partnerships to repay the loan. On-going costs such as maintenance are not typically covered, as these programs are for one-time projects. For qualifying projects however, these can be a good strategy to fund large construction projects and studies since the money is available when the grant or loan is awarded. Loan programs are typically attractive for projects that may otherwise be difficult to obtain financing. For more specific details and examples of loan programs, also see Table 13.

Table 13. Summary of available grant and loan programs

Program Name	*Hazard Mitigation Grant Program (HMGP)*	*HMGP Post-Fire*	*Flood Mitigation Assistance (FMA)*	*Building Resilient Infrastructure & Communities (BRIC)*	*Safeguarding Tomorrow Revolving Loan Fund (STORM)*	*NRCS Emergency Watershed Protection*	*Water Infrastructure and Finance Innovation Act (WIFIA)*
Program Type	Post-Disaster	Post-Disaster	Pre-Disaster	Pre-Disaster	Pre-Disaster	Post-Disaster	Pre-Disaster
Description	Provides funding for communities to rebuild to reduce or mitigate future natural disaster losses.	Provides funding for communities to rebuild with a focus on reducing losses from wildfires.	Provides funding for communities to reduce or eliminate risk of repetitive losses on NFIP-insured structures.	Provides funding for effective and innovative projects that will encourage the whole community to adopt mitigation policies.	Provides low interest loans to allow jurisdictions to reduce vulnerability to natural disasters.	Provides funds for recovery from natural disasters that address watershed impairments.	Provides low interest loans to allow jurisdictions to improve water-related infrastructure.
Eligible Activities	New Hazard Mitigation Plans (HMPs) and updates, planning-related activities, project scoping activities, codes and standards, management costs, physical mitigation projects	Same as HMGP with a focus on wildfire risk	New HMPs and updates, project scoping activities, financial technical assistance, partnerships, management costs, physical mitigation projects (except safe rooms, wildfire mitigation, secondary power sources, and earthquake early warning systems)	Same as HMGP, includes direct non-financial technical assistance	Same as HMGP	Debris-removal (wind and waterborne), stabilizing streambanks, protection from erosion jeopardizing public infrastructure, repairing damaged upland sites post-fire or drought, repairing levees and structures, purchase of buyouts and floodplain easements.	Broadly applied to drinking water, wastewater, and stormwater improvements projects.
Funding Availability	Within 12 months of a Presidential Disaster Declaration	Until March 31 of the next fiscal year in which the Fire Mitigation Assistance Grant (FMAG) event occurred	Annual NOFO. Typically posted in the fall, applications are due to the State a few months prior to the federally posted deadline.	Annual NOFO. Typically posted in the fall, applications are due to the State a few months prior to the federally posted deadline.	Distributed at State's discretion	NRCS State Conservationist can declare a local watershed emergency to initiate EWP program assistance. Local sponsor has 60 days to submit written formal request for assistance.	Annual NOFO.
Nationally Competitive	No	No	Yes	Yes	No	No	No
Cost Share (Fed/Non-Fed)	75/25	75/25	75/25 *Up to 90/10 for disadvantaged communities, and up to 100/0 for severe rep. loss properties	75/25 *Up to 90/10 for disadvantaged communities	90/10	75/25	
Period of Performance	36 months	36 months	36 months	36 months	36 months	220 Days	35 years
Website	fema.gov/grants	fema.gov/grants	fema.gov/grants	fema.gov/grants	fema.gov/grants	nrcs.usda.gov	epa.gov/wifia

Funding Strategies

Grants and loans are an attractive solution to secure money up front for project implementation due to their low match amount and the option to repay the loan over long time periods. However, funds must be available to match the grant or pay back the loan. To close this funding gap, it is recommended that the County evaluate strategies to secure a steady source of funds. The following strategies have been implemented locally, statewide, and nationwide, and should be evaluated to find the best fit based on specific County factors such as planned growth or development, how amenable the community is to paying fees, etc. A description of these strategies follows:

- Developer Impact Fees or Credits
- Special Assessment Districts
- Utility Fees, and
- Tax Increment Financing

Developer Impact Fees or Credits

Developer Impact Fees (DIFs) or Credits can be used to either require or incentivize companies interested in developing land within the County to pay into stormwater management. When paired with a prioritized list of projects, this can ensure that structures in the proposed development are adequately protected from flooding and protecting water quality. Per Nevada Revised Statute (NRS) 278B.16, a local government may by ordinance impose an impact fee in a service area to pay the cost of constructing a capital improvement or facility expansion necessitated by and attributable to new development. This is typically a one-time fee assessed on the developer. Developers can be incentivized to pay this fee by offering expedited permitting or a waiver of permit review fees when the impact fee is paid. This fee does not fund on-going maintenance costs and is unlikely to generate enough funds to implement larger construction projects. The revenue stream is also unreliable since it is only collected when there are development projects going on. Based on the County's sustainable growth initiative voted on in 2002 and implemented in 2007, the scale of development that has occurred over the past 16 years or will in the future occur is not great enough to bring in enough funds annually to make this a viable option or strategy. However, it could be evaluated on a case-by-case basis.

- Sacramento Area Flood Control Agency uses an impact fee to offset development impacts on the floodplain and is used to fund flood mitigation and flood control projects in the City and County.
- Washoe County utilizes a Regional Road Impact Fee to fund transportation and roadway projects. Fees are collected when building permits are issued.
- Clark County assesses impact fees to mitigate traffic impacts and fund the Desert Conservation Program.

Special Assessment Districts

Special Assessment Districts (also called Special Improvement Districts, SADs or SIDs) can be created to raise revenue for a particular project and isolate the fees to the designated district that will be the primary beneficiary of that project. These are typically implemented as an additional property tax assessment. In Nevada, Special Assessment Districts are allowed per NRS 271. According to state law, at least 50% of all property owners in the proposed district must not oppose the tax. The assessment may only be levied against parcels which have been identified as having received a direct benefit from the public project, where the cost of these projects is apportioned, or divided, among properties that benefit from them. Determining the assessable tracts and the assessment to be levied is left to the governing body. The special assessment payments could be used to pay off bonds that are sold by the municipality to cover the cost of the projects. These districts are best implemented in areas that are economically stable and in favor of a proposed project. The size or scale of the assessment district is also a factor, as a smaller tax base would mean fewer people to shoulder the large burden to cover the cost of a project.

- The City of San Mateo, California used a special assessment district to fund the North Shoreview Flood Improvement Project.
- Lewis County, Washington approved a special assessment to their Flood Control District 1 to fund ditch cleaning and provide on-call flood related services.
- The City of Reno uses a Special Assessment District for street rehabilitation projects including sidewalks, curbs and gutters, and pavement.

Utility Fee

A Utility Fee would require all County residents to contribute regularly in the form of a monthly fee similar to water and wastewater service providers. A stormwater utility would provide for engineering, construction and maintenance of drainage, flood control, and water quality infrastructure. A dedicated stormwater fee would ensure the community has a sufficient and stable revenue source to effectively implement and manage its stormwater and flood control program activities.

As of 2022, there are over 2,057 stormwater utilities in 41 states.
-Western Kentucky University Stormwater Utility Survey, 2022

As shown in Figure 35, thousands of communities nationwide have implemented utility fees as a reliable way to fund stormwater programs due to their ability to generate large dollar amounts quickly and consistently. This potentially eliminates reliance on the General Fund, which takes funds away from other community services. Utilities also work regardless of population size. Locally, utility fees have been utilized for years in nearby Carson City, City of Sparks, and Washoe County. The City of Reno is in the process of implementing a stormwater fee as well. More specifics on the funds obtained within these jurisdictions is presented in Section A2.3.

The first step in proposing a utility fee is to determine an equitable cost or rate to each resident. A popular method of calculating fees due to its perceived fairness is the Equivalent Residential Unit (ERU) system. An Equivalent Residential Unit is usually the average impervious (paved) area on a single-family residential parcel. Fees for non-residential properties are proportional to the ratio of the parcel's impervious area to the ERU. Since fees are charged based on the amount of impervious area on a property, the larger, more impervious properties that generate larger volumes of stormwater runoff are asked to pay more of the share. Credits can be offered for properties that go above and beyond the existing stormwater treatment requirements or otherwise contribute to the maintenance of the County's drainage system.

In Douglas County, creation of a stormwater utility was proposed in 2009, and again in 2016, however both times it did not move forward due to criticism that it was viewed as a new tax or residents were unwilling to contribute if they felt it did not directly benefit them. This reaction may be more of a perception issue, as most people do not think about the ways that they impact and are impacted by stormwater. While a person may not face flood issues directly to their property or maintain a private parcel BMP, they still indirectly rely on the stormwater infrastructure to keep roads safe, businesses and schools open, and enhance recreation at the lake.

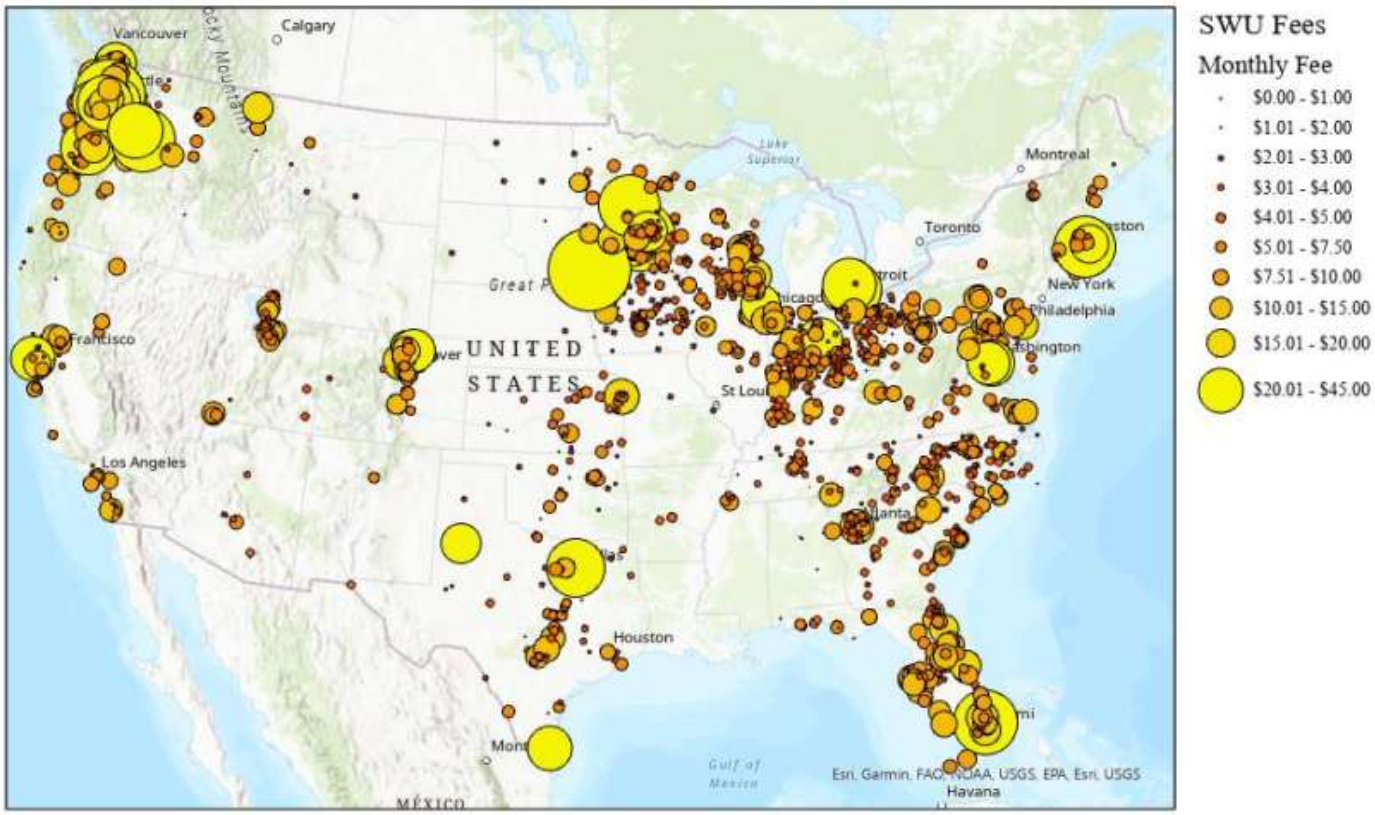

Figure 35. Stormwater Utility Fees distributed nationally (Western Kentucky University, 2022)

Tax Increment Financing

The final proposed strategy is Tax Increment Financing (TIF), which uses the existing property tax rate but captures the incremental growth in future property tax revenue and allocates all or a portion of it to pay for stormwater improvements. The paying residents do not see an increase in their tax bill and the stormwater program can focus on investments to improve infrastructure. Nevada State Law under NRS 278C authorizes the creation of a TIF district, with public entities such as schools, libraries, police, and fire, also dependent on incremental revenue from the growth in tax base. Allocating a portion to stormwater would require coordination with these other services to ensure equitable funding distributed among all services, or instead drawn from the general fund. TIFs only generate revenue if property values increase, which is assumed to happen if there are infrastructure improvements but may generate no additional revenue if property values are stagnant or decrease. A TIF strategy will not move the County away from a property-tax based revenue source for stormwater. TIF districts are used extensively in Clark County, NV, as well as nationwide in cities such as Chicago, San Francisco, Denver, etc.

6.4.2 Summary of Funding Strategies

The general descriptions and a summary of the advantages and disadvantages to each funding strategy are summarized in the following table.

Table 14 - Summary of potential funding strategies.

Potential Funding Strategy	*Description*	*Pros*	*Cons*
Federal/State/Regional Grants	Public agencies releasing solicitations for qualified projects	• Able to provide large amounts of capital. • Successful for the County in the past • Funds don't have to be repaid	• Competitive • Limited period of performance • Match requirements • Doesn't fund on-going maintenance.
Federal/State/Regional Loans	Low or zero-interest loans given to fund qualifying projects	• Able to provide large amounts of capital. • Non-competitive • Extended repayment schedule	• Need a revenue source to repay borrowed funds. • Limited period of performance • Match requirements • Doesn't fund on-going maintenance
Developer Impact Fees/Credits	Charges imposed on developers (fees) or incentives given (credits) to build projects	• Funds are collected up front. • Encourages collaboration between builders and the Stormwater Program • Easy to implement	• Fluctuating revenue, so variable ability to fund larger projects. • Spot funding - funds must be spent in the development area, leaving a gap in funding for areas not currently being developed
Special Assessment Districts	Fees charged on property owners within a designated district	• Visible benefit – payers of District fees see the projects in their area(s)Efficient revenue source when set up. • Can be used for operations & maintenance costs long-term	• Requires public support. • Shifts the burden to a subset of users within the system, often based on visible Stormwater accumulation. Allows up/downstream system users to benefit from projects without paying for them. • Size matters – larger Districts can afford larger projects, smaller ones can't. • Limits projects to locations within certain districts, with no funding mechanism for activities outside the districts
Stormwater Utility Fee	Charges property owners a stormwater system fee based on impervious area	• Spreads the cost over all system users, not a subset. • Reliable – revenue is predictable and can be used to fund supplemental funding sources of grant match and loan repayments. • Works in any real estate market • Funds on-going maintenance	• Requires broad public support. • Initiative was proposed in the County previously and failed
Tax Increment Financing	Captures a portion of future property tax revenue and sets the increment aside for specific investments	• Not a tax increase or new fee • Funds on-going maintenance	• Speculative – only generates revenue if property values increase. • Can be complex to administer. • Diverts future property tax increases to the Stormwater program when they could be used for other things. • Doesn't move the County away from property-tax-funded Stormwater activities

Table 15 lays out a proposed path forward for the Stormwater CIP. The approach is to utilize a broad range of strategies so one group isn't overburdened. The stormwater staff may be directed by the Board of County Commissioners to weight things differently or change priorities over time, so this should be interpreted as a dynamic, living list.

Table 15 - Strategic Approach to Funding the Stormwater CIP

Rank	*Project*	*Cost*	*Recommended Approach*
1	Rain/Flow Gages	$6,500	Grant
2	Waterloo Lane Box Culvert	$500,000	Grant, Loan, or Utility Fee
3	Fish Springs – Mel/Myers Basins	$7,700,000	Grant
4	Fish Springs – Redhawk Basin	$7,700,000	Utility Fee
5	Topaz Lake	$160,000	Grant
6	Buckeye Road (Upper Allerman)	$500,000	Grant
7	Smelter Creek Sediment Basin	$4,600,000	Grant
8	Johnson Lane Hot Springs Buckbrush	$8,100,000	HMGP grant– application in
9	Fish Springs – Pine Nut Creek Dam	$24,300,000	Utility Fee
10	Smelter Creek Alt 1	$11,400,000	HMGP grant– application in
11	Fish Springs – Bently Basins	$12,000,000	SAD/SID, Grant, or Loan
12	Smelter Creek Alt 2	$2,500,000	SAD/SID
13	Smelter Creek Phases 1-8	$16,800,000	SAD/SID
14	East Valley Dip Section	$169,000	Grant or Loan
15	Buckeye Rd at Martin Slough	$1,800,000	HMGP grant– application in
16	Fish Springs – Janelle Basin	$11,700,000	SAD/SID
17	Fish Springs – Denmar Basin	$14,000,000	SAD/SID
18	Pamela Place	$500,000	HGMP grant – application in
19	Johnson Lane – Pine Nut South	$1,100,000	SAD/SID
20	Fish Springs – Syphus Basin	$13,000,000	SAD/SID
21	Buckeye Creek	$43,200,0000	Loan – STORM or WIFIA
22	Johnson Lane Unnamed Wash A	$240,000	Grant
23	Alpine View Estates Bavarain Dr	$810,000	DIF/TIF
24	Alpine View Estates – Bernese Ct	$250,000	DIF/TIF
25	Alpine View Estates – Jacks Valley Rd	$810,000	DIF/TIF

Approaches to Stormwater Funding in Northern Nevada

Municipalities in northern Nevada such as the City of Reno, Carson City, City of Sparks, and Washoe County have a stormwater utility fee to fund their stormwater program (see Table 16). A nationwide study conducted in 2021 reviewing 2,057 stormwater utilities found that a system that uses an accurate ERU and tiered rate structure is the fairest and most frequently used[5]. An ERU higher than the average places the burden on residential customers to carry more of the cost, while lowering the ERU increases the burden on large landowners. A well-documented rate study can help keep the fee structure equitable across all represented bodies.

[5] Western Kentucky University Stormwater Utility Survey 2022 (wku.edu)

Variations in the utility fee structures used in northern Nevada to fund CIPs are as follows:

- Since 2017, the City of Sparks imposed a flat quarterly rate for dwellings and residential units to pay for sewer and storm drain services. Residential properties are assessed a fee per unit regardless of the size of the property. A unit may be defined as a single-family home, multi-family apartment building, mobile home, or rooming house. This approach is simplified and does not account for each parcel's contribution to the drainage system. For example, a large parcel that is largely undeveloped will pay the same rate as a completely built-out parcel. However, this utility is successfully providing funds for the North Truckee Drain Realignment Project.
- In 2015, Washoe County implemented a stormwater utility to fund the Stormwater Management Fund. This fund provides monies for stormwater drainage or flood control related purposes. The utility uses an ERU approach, but the assessed fee is the same for all residential and non-residential properties. The ERU is determined by the amount of impervious area on a property compared to the average single family residential parcel and charges a fee based on the amount of ERUs on a parcel. Therefore, the amount of impervious area on a property is the basis for the assessed fee regardless of the property's use. The North Spanish Springs Flood Detention Facility was constructed using these funds.
- In 2003, Carson City created a Stormwater Utility dedicated to fixing the city's flooding issues. Carson City has separate rates for single-family residential properties and grouped impervious area properties. Lower fees are charged for residential properties with less structural square footage than properties with more structural square footage. Non-residential properties are grouped into tiers based on the amount of impervious area on the property, and the more impervious (paved) area the higher the monthly rate. A revised fee structure was adopted in 2023 to increase revenue to fund growing project costs and regulatory responsibilities (CRS and MS4). Projects are largely funded by $4.88M in bonds.
- On December 13, 2023, the City of Reno approved and then six days later delayed a stormwater utility fee that is expected to generate about $15 million per year. The new stormwater fund would be used to complete $470 million in capital improvement projects over the next 32 years. Right now, stormwater projects are paid through sewer fees. For residential property, the stormwater utility fee proposed was comparable to others in the region, as shown in Table 3. The fee would become effective in January 2025 but was met with opposition, particularly from large landowners such as the airport, University of Nevada Reno, and the Washoe County School District that claim the fees are fiscally burdensome[6]. The City Council decided to postpone the decision citing the need to evaluate further details on implementation.

[6] Reno City Council delays stormwater fee increase decision after facing opposition (thisisreno.com)

Table 16 - Summary of Stormwater Utility Rates for Communities in Nevada

Jurisdiction	*Customer Size*	*Monthly User Rate*
Carson City	**Single Family Residential by Structure Square Footage**	
First Implemented: 2003	Single Story less than 1,600 SF	$6.90
Population: 59,630	Multi-Story less than 2.400 SF	
	Single Story less than 1,600 SF	$10.23
	Multi-Story less than 2.400 SF	
	Single Story less than 1,600 SF	$11.90
	Multi-Story less than 2.400 SF	
	Grouped Impervious Area Properties Rates	
	Small – Less than 0.25 acre	$30.00
	Medium – 0.25 to 0.99 acre	$60.00
	Large – 1 to 4.99 acres	$90.00
	Very Large – 5 acres and larger	$120.00
Washoe County	**Land Use**	**Monthly User Rate**
First Implemented: 2015	Single-Family Residential Parcel	$9.31
Population: 506,016	Multi-Family Residential Parcel	$9.31/ERU
	Non-Residential Parcel	$9.31/ERU
City of Sparks	**Type of Unit**	**$/Quarter**
First Implemented: 2017	Single-Family Residential	$109.70/Unit
Population: 111,158	Multiple-family Residential & Mobile Home	$109.70/Unit
	Rooming house	$109.70/Quarter plus $60.51/Unit
City of Reno (proposed)	**ERU Definition**	**Monthly per ERU Rate**
Population: 278,577	1 ERU = 3,500 sf impervious surface	$9.80

Recommended Path Forward

There is no magic bullet to provide a reliable funding stream widely accepted by everyone to solve all of the immediate, or even long-term, stormwater program activities. However, using multiple approaches and tailoring them to a specific sub-region and stormwater goal may help overcome some of the funding challenges. There are many challenges in trying to implement public financing techniques, especially when the community is accustomed to the services for no or very little cost, nor are they aware that they are benefitting from such services, unlike those of water or sewer for which a tangible benefit is apparent. It is anticipated that proposing a new type of fee structure in a community that is tax averse and unsupportive of development is going to require careful and strategic planning. Thus, several outreach steps are recommended before implementing any of these strategies, such as identifying and recruiting public financing champions and supportive stakeholders, conducting public outreach to gather questions and concerns, and holding public workshops to educate and dispel the concerns of any hard-line sceptics. Internally, it is recommended that the County financial planners and managers determine which implementation strategy they have the capacity to administrate, agree on a plan comprehensive enough to meet the financial needs of the CIP, engage legal departments to implement any required measures, and champion the Master Plan long-term.

The Stormwater Master Plan demonstrates the need for increased planning efforts and implementation of projects, which provides a compelling case for arguing that these improvements will lead to a more resilient, safer, and cleaner community. The Stormwater Program is an investment for the community because it provides for the protection of life, property, infrastructure, and the environment.

Short Term Funding Measures

The County anticipates that the momentum brought on by the repeated and recent flood events, and willingness of the County Commission to fund this Stormwater Master Plan, will translate to on-the-ground implementation of actions. To accomplish short-term goals (3-5 years) of program activities and begin implementation of projects in this CIP list, the recommended first steps are two-fold: to 1) identify, apply and secure eligible grants, and 2) present a more detailed analysis of the funding options to the Board of County Commissioners and seek direction on the desired funding mechanism.

Grant Funding Potential

The first step for all stormwater projects should include evaluation of grant funding potential for a project, and preparation of a grant application if the project qualifies. The lead time on grants can be long, and there are often delays of 2-3 years to receive funding even when funding is approved. Included in Table 4 is the results of a review of the projects currently on the CIP priority list and the grant program identified with the most potential to fund that project. Note that grant programs are usually cyclical, and funding is available during a specific time period. However, maintaining a list of projects (like the CIP) is a useful tool to prepare for open application periods, especially for grants that require shovel-ready projects. Table 17 shows the projects with the highest likelihood of eligibility. A more thorough review of each project will be made as it is moved up the project list toward potential implementation.

Table 17 - Recommended Grant Programs for Stormwater Projects in the CIP

Rank	*Project*	*Cost*	*Recommended Approach*
8	Johnson Lane Hot Springs Buckbrush	$8,100,000	HMGP – application in
10	Smelter Creek Alt 1	$11,400,000	Complete NEPA study to move project forward
15	Buckeye Rd at Martin Slough	$1,800,000	HMGP – application in
18	Pamela Place	$500,000	HMGP – application in
1	Rain/Flow Gages	$6,500	CWSD (as a component of other hazard mitigation planning activities); USGS Water Use Grant Program; Mesonet; Local volunteers for NWS Community Collaborative Rain, Hail, and Snow Network
2	Waterloo Lane Box Culvert	$500,000	HMA grant; DOT RAISE IJAA grant
3	Fish Springs – Mel/Myers Basins	$7,700,000	HMA grant; USBR Water Conservation Field Service Program if federal water pulls
5	Topaz Lake	$160,000	HMA grant
6	Buckeye Road (Upper Allerman)	$500,000	HMA grant; DOT RAISE IJAA grant
7	Smelter Creek Sediment Basin	$4,600,000	HMA grant; DOT RAISE IJAA grant
13	Smelter Creek Phases 1-8	$16,800,000	HMA grant; DOT RAISE IJAA grant
14	East Valley Dip Section	$169,000	HMA grant or STORM loan
22	Johnson Lane Unnamed Wash A	$240,000	HMGP grant
11	Fish Springs – Bently Basins	$12,000,000	Need to establish ownership/site control, then apply for HMA grant

Funding Options

Staff is seeking direction from the Board of County Commissioners to bring a more detailed funding presentation forward to a future Board of County Commissioners meeting. The desired outcome of that presentation is Board direction to pursue a funding mechanism for the Stormwater Master Plan.

Long Term Funding Measures

It is hopeful that within 3-5 years a funding mechanism will have gained traction and that funds will be collected and managed in support of the stormwater program goals. In the event a stormwater utility or other fee does not move forward however, the County must look at other strategies to close the funding gap. The County should evaluate the steps necessary to enact developer impact fees and tax increment financing. These types of fees are permitted under Nevada Revised Statutes and have been successfully applied in other municipalities. These may be easier to implement since they do not require public support or direct input. However, the extent of future development, and limited population from which to benefit from a property tax increase likely preclude these from being high money generators. In addition, it will take longer to generate funds, and it may be several years before a project is fully funded. Initially however, the funds raised could be used to pay for minor maintenance requirements of other projects that are constructed. These measures are not public facing so have a better chance of implementation without the need for public support.

A loan program is a feasible approach to generate funds for project implementation and maintenance. Securing a loan as a stop-gap measure to get some money in the bank to fund projects is viable. The longer repayment schedules offer communities time to look for solutions or for a political climate to shift. Procuring a federal loan for the typical size of the CIP (millions of dollars) may require at least 3-5 years of background work, and might be better positioned if federal interest rates are lower in the future.

Finally Special Assessment Districts should be implemented if a specific project is addressed and the community is supportive. Only 50% of the assessed district would need to approve the measure, which is a significantly smaller base than attempting to initiate a county-wide measure. The faster growing areas of the County may be good targets and more likely to support an assessment district.

APPENDIX B – Douglas County Stormwater Operations and Maintenance Manual

Douglas County
Stormwater Facilities
Operation and Maintenance Plan

Douglas County Public Works

August 2018

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Attachment A: Drainage System Inspection Form
Attachment B: BMP RAM Field Observation Datasheets
Attachment C: Stormwater Infrastructure Inventory Maps

1 INTRODUCTION AND BACKGROUND

This manual was developed to be used by Douglas County Public Works staff to outline the guidelines for inspection, operation and maintenance of public stormwater facilities within Douglas County. All stormwater management systems require maintenance. Appropriate operation and maintenance activities ensure that stormwater infrastructure will continue to function properly and yield expected water quality and environmental benefits, protect public safety, fulfill permit requirements, and protect the community's financial investment.

1.1 Douglas County Stormwater Programs and Permit Requirements

Lake Tahoe Total Maximum Daily Load (TMDL)

The Lake Tahoe TMDL is a science based plan to restore Lake Tahoe's famous clarity. The program was initiated to better understand the causes of clarity loss, determine how much pollution needs to be reduced, and develop a realistic implementation approach to restore historic clarity. Each jurisdiction around the Lake is responsible for reducing the amount of fine sediment particles (FSP) that reach Lake Tahoe. This can be accomplished in three ways: road operations, parcel best management practices (BMPs), and large scale water quality improvement projects.

Maintenance is a critical element to staying in compliance with Douglas County's Interlocal Agreement with the Nevada Division of Environmental Protection. Douglas County has five year milestones to meet, and must conduct annual monitoring and maintenance to stay in compliance with the Interlocal Agreement.

State of Nevada Small MS4 Water Quality Permit

Polluted stormwater is often discharged into local rivers and streams without treatment. Common pollutants include oil and grease from roadways, pesticides from lawns, sediment from construction sites, and carelessly discarded trash, such as pet waste, cigarette butts, paper wrappers and plastic bottles. Once these pollutants make it into the Carson River and irrigation canals, they can contaminate drinking water supplies, negatively impact agricultural operations, degrade recreational uses, and interfere with habitat for fish, other aquatic organisms, and wildlife.

Douglas County is mandated by the EPA and the State of Nevada to implement a stormwater program under the Small MS4 permit to reduce the discharge of pollutants, protect water quality, and satisfy the water quality requirements of the Clean Water Act. Maintenance activities such as cleaning culverts and ditches, street sweeping and water quality monitoring all are required under Douglas County's MS4 permit with the Nevada Division of Environmental Protection. The current permit area includes North Douglas County (Indian Hills, Jacks Valley, Clear Creek) and Johnson Lane.

Federal Emergency Management Agency's (FEMA) Community Rating System (CRS)
The National Flood Insurance Program's (NFIP) Community Rating System is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions. Douglas County participates in the program, and as a result, flood insurance premiums are discounted by 20%.

A major component of this program is the inspection and maintenance of the drainage system, with particular attention paid to areas of development where parcels are less than five acres in size and have infrastructure such as storm drains and ditches, detention/retention basins, natural watercourses, irrigation canals. These areas are inspected and maintained if needed to prevent debris blockages that would result in flooded buildings or damaged infrastructure.

1.2 Responsibilities for Drainage Maintenance

Drainage maintenance is the responsibility of several jurisdictions within Douglas County. The unincorporated Towns of Minden, Gardnerville and Genoa all have their own drainage maintenance responsibilities and programs. General Improvement Districts (GIDs) are legal jurisdictions, created under the authority of Nevada Revised Statutes (NRS). There are several GIDs in Douglas County, most of which have drainage maintenance responsibilities. There are five major GIDs that comprise the majority of the population and land area within the GIDs. They are Indian Hills GID and the Gardnerville Ranchos GID in the Carson Valley watershed, Kingsbury GID and Roundhill GID in the Lake Tahoe Basin and Topaz Ranch Estates GID in the Antelope Valley watershed.

Drainage maintenance in the area of the County outside of the Towns and GID is performed by Douglas County. Responsibilities for the County's Stormwater facilities falls under the Public Works Department, including directing the overall maintenance activities of stormwater operations staff. Stormwater Operations staff is responsible for tracking inspections for County storm drainage facilities, and for prioritizing and scheduling maintenance, and repair work to be performed by the County's drainage maintenance crews. Community Development/Public Works currently has a Stormwater Program Manager, who is responsible for the County's drainage system maintenance operations.

As additional stormwater infrastructure is being designed and reviewed within development applications, the Stormwater Program Manager should be included in the review of any facilities that may be maintained by Douglas County in the future.

Individual site inspections will be conducted in response to citizen complaints and/or drainage service requests. These calls are generally received by the Stormwater Program Manager or Public Works. When an inspection identifies the need to maintain, repair, or clean a publicly owned drainage facility, the Stormwater Program Manager will coordinate the maintenance according to the priority assigned (see Section 2.3). Procedures will be developed for instances when an inspection identifies the need to maintain, repair, or clean privately owned, on-site drainage facilities.

1.3 Use of the Stormwater Maintenance Management Plan

This plan is designed to outline the inspection, operation and maintenance requirements for all public and private storm drainage facilities in Douglas County. Where possible, the information contained in the manual should be used in conjunction with the record drawings for each facility. Record drawings for most public storm drainage facilities and many private facilities are on file in the Community Development Department, located at 1594 Esmeralda Avenue, Minden, NV 89423.

2 INSPECTION AND MAINTENANCE REQUIREMENT FOR PUBLIC DRAINAGE FACILITIES

2.1 Inspection Frequency

A good preventative maintenance program begins with inspection. All drainage channels, creeks, streams and storm drainage facilities maintained by Douglas County are to be inspected at least once a year and after large storm events (1" of rain within a 24 hour period).

Critical drainage facilities are defined as areas that if not maintained would result in flooded buildings or damaged infrastructure. These facilities should be inspected annually and after large storm events (1" of rain within a 24 hour period), using the inspection checklist included in **Attachment A.**

2.2 Inspection Criteria

The inspection of public storm drainage facilities will consist of a detailed evaluation of the existing condition of each component of the system. Inspections include the drainage system (natural and manmade watercourses, conduits, and storage basins); and the conveyance system (channels, culverts and bridges, etc.) that need to be maintained in order to prevent and reduce damage from storms. The highest priorities are the parts of the conveyance system that lie within the developed areas of the community. However, drainage ways in undeveloped areas are included if a culvert or bridge crossing is significant. A complete list of all sites for which annual and post-storm inspections are made, along with a GIS map of the county showing the sites is included in **Attachment C.**

Criteria for facilities to be inspected:

- ✓ Natural watercourses or channels
- ✓ Constructed storm drains and ditches
- ✓ Douglas County maintained culverts
- ✓ Detention/retention basins built to store high flows
- ✓ Components where buildings would be damaged if system is not kept clear
- ✓ Watercourses identified on the Flood Insurance Rate Map
- ✓ Important watercourses not in the floodplain (B, C, D, or X zones)
- ✓ Sites of flood insurance claims
- ✓ In developed areas (<5 acres), facilities where debris blockages would result in flooded buildings
- ✓ Irrigation canals where they intercept drainage ways either on purpose or not
- ✓ Douglas County has legal authority to inspect and maintain.

Inspection items may vary based on the type of facility being inspected, however the following items are typical of most facilities:

- ✓ Note the condition of the side slopes and bottom with emphasis on the amount of erosion or sediment present;
- ✓ Note the condition of earthen berms and levies;
- ✓ Note the condition of inlet and outlet structures, grade control structures, and rip rap;
- ✓ Note the condition of landscaping, vegetation, and erosion protection measures;
- ✓ Note the condition of fences (if present), and signs of unnatural erosion or vandalism;
- ✓ Note the presence of sediment or debris that could obstruction the free flow of water through the conveyance system; and
- ✓ Note the presence of trash, shopping carts, lawn clippings, and other rubbish that could obstruct the free flow of water through the conveyance system.

Inspections will be scheduled and reported on by either the Stormwater Program Manager or Public Works operations staff. The information collected from these inspections will be tracked and used to generate work orders. The inspector will take photographs and complete a written report for each inspection on a standard Douglas County System Inspection Form, see Attachment A. The report will be completed to include conditions whether they are satisfactory, or in need of maintenance or repair. Written recommendations for remediation shall be included in the report for all components requiring corrective action.

For all reports of conditions requiring maintenance or repair by another entity, a Notice to Correct will be completed and forwarded to the appropriate maintenance agency (Nevada Department of Transportation, Town of Gardnerville, Town of Minden, private property owner). Notice to Correct correspondence will include specific detailed recommendations for remediation, as well as a reasonable timeframe (not to exceed 30 days) for required

maintenance or repairs to be completed. Copies of all inspection report forms, and Notice to Correct correspondence will be kept on file at Douglas County Public Works.

Upon completion of the required maintenance or repairs to a drainage system component, the Stormwater Program Manager is to be notified so that a follow-up inspection can be performed. Immediately upon being notified the inspector shall perform a visual inspection to evaluate corrective actions. The inspector will take photographs and complete a written report on a standard Douglas County Drainage System Inspection form. Copies of all inspection forms, notice to correct forms and follow-up inspection forms shall be kept on file at the Community Development Department and Public Works.

All County maintained storm drainage facilities will be inspected annually and after major storm events that could adversely impact the drainage system (1" of rain within a 24 hour period). Additionally, facilities will be inspected immediately in response to written or verbal complaints.

Operational problems or possible design flaws discovered during the inspection of County storm drainage facilities will be directed to the Stormwater Program Manager or the Douglas County Engineer for analysis and recommendation.

Sand oil separators that have been required to be installed by private landowners must be inspected and maintained annually. Inspection and maintenance records will be requested by the Stormwater Program Manager where sand oil separators have been required.

2.3 Prioritization of Maintenance and Repair

All storm drainage maintenance and repair work will be prioritized. Work orders for maintenance and repair work generated by inspections will be carried out by drainage maintenance personnel, or private contractors hired by the County, as early as practical. When there is a backlog of work to be accomplished, drainage maintenance crews will perform the highest priority assignments first, and then make their way down the list according to the priorities and completion dates assigned to the remaining work.

Emergency work will be given the highest priority where life and safety issues are involved. This work will be initiated as soon as the manpower and equipment are available to perform the needed tasks. **(Priority High – Emergency)**

The next highest priority will be given to removing obstructions to flow and correcting the underlying cause of these obstructions; and to addressing immediate threats to property damage. This work includes any facilities where needed maintenance inhibits a resident's access to their property. This work will be initiated as soon as resources are available. **(Priority High)**

The next highest priority is any infrastructure where maintenance is a permit requirement of achieving compliance. The majority of these facilities are water quality improvement projects in the Lake Tahoe Basin, which need to be maintained to remain in compliance with the County's Interlocal Agreement with the Nevada Division of Environmental Protection. This work will be initiated on an annual schedule based on field observations. This work should be completed within three months of work order date. **(Priority Medium)**

Routine preventative maintenance activities will be given a lower priority, but will be carried out as early as practical by drainage maintenance personnel. Routine work may include, but is not limited to, removal of sediment and debris; spraying, trimming or removing vegetation; and minor repairs to earthen slopes, berms and levees, or surrounding fences. This work will be initiated on an annual schedule, but can be flexible on when performed depending on work load. This work should be completed within six months of work order date. **(Priority Low)**

Typical procedures for the maintenance and repair of County storm drainage facilities are as follows:

<u>Removal of Sediment and Debris</u>

- Removal of sediment and debris will consist of excavation and transport of excavated material to an approved off-site landfill, stockpile, or disposal site.
- Monuments or staff plates may be installed within basins and channels to assist operators in locating the bottom limits of excavation. Potentially submerged structures may be marked with a staff gauge to prevent damage by heavy equipment.
- Excavation and removal of sediment material from the basin or channel bottom will be to the original lines and grades indicated on the as-built drawings for these facilities, or to the depth indicated by the monuments or staff gauges.
- Operators must use caution to avoid undercutting the existing rip rap or concrete slope protection when excavating near or around the toe of protected slopes.
- Utilities may need to be marked prior to excavation.

<u>Repair of Erosion</u>

- Remove loose material, repair and stabilize eroded surfaces, using mechanical compaction.
- Remove slide material and rebuild failed slopes with suitable fill material, keying compacted material into the slope.
- Replace any soil removed by burrowing rodents, using mechanical compaction. Consider removing burrowing animals from sensitive areas.
- Re-establish vegetation.

<u>Repair of Rock Rip Rap Slope Protection</u>

- Remove rock from undermined and/or eroded areas; pull back geotextile filter fabric (where present); fill scoured areas; re-compact material supporting the rock rip-rap; replace geotextile fabric and rip-rap.

Cleaning and Maintenance of Pipes, Drainage Inlets and Manholes

- Remove and dispose of sand, silt, trash and debris to approved disposal locations.
- Clean and flush storm drain inlets and pipe lines by use of water hose and heavy duty vacuum or by jet flushing. All material removed from the storm drainage system shall be hauled to an approved disposal area.
- Check for any signs of leakage at pipe joints, or damage to pipes or structures.
- All public storm drains are to be cleaned and maintained in accordance with the best management practices (BMPs) adopted as part of Douglas County's Stormwater Management Plan (SWMP) and in the Lake Tahoe Basin TRPA's BMP Handbook.

Cleaning and Maintenance of Streams, Open Channels and Ditches

- Sand, silt, gravel, trash and debris, and any other restrictions to the flow of water will be removed, including excess vegetation. Sand, silt, gravel, trash may be removed with the use of hand tools, or may be removed with the use of heavy equipment designed for the application.
- Vegetation, including wood and trees may be cut and removed by hand, cut with the use of power tools designed for the application and then removed, or burned with approval of the East Fork fire Department or the Tahoe Douglas Fire Department as appropriate.
- Large rocks and boulders may be removed with the use of hand tools, or with the use of heavy equipment designed for the application.
- All material removed will be hauled away from the site to an approved landfill or stock pile area, including all grass clippings and cuttings from trees and shrubs.
- All streams, channel, and ditches in the urbanized portion of the County are to be cleaned and maintained in accordance with the best management practices (BMPs) and with FEMA guidelines.

Repair or Replacement of Damaged Elements of Stormwater Facilities

- Rusted, bent, cracked, or chipped pipe will be repaired to design or be replaced.
- Damaged or missing manhole covers or grates will be repaired to design or be replaced.
- Cracks in the walls, top slab or bottom of catch basins, manholes or other concrete structures will be repaired to design or the structures replaced.
- Any storm drainage facilities that are deteriorated due to age and/or use will be repaired to design or be replaced.

- Any inspection may reveal that important elements of the storm drainage system are damaged or missing, and/or that design flaws or operational problems may be the root cause of the damage that needs to be repaired. In either event, the Stormwater Program Manager or Douglas County Engineer may be requested to perform a detailed evaluation of the site prior to implementing a solution. The replacement or type of repairs of these elements will depend upon the results of the evaluation and the recommended course of action.

2.4 Inspection Check List

The regular inspection of the public storm drainage facilities will consist of observation and notations of the condition of each of the components of the system. A Check list was developed to aid in the inspection process, located in Attachment A. A sample is shown on the following page.

Douglas County, NV - Drainage System Inspection Form			
Location & Type		Observations	
Date		Trash	
Inspector		Debris	
Annual		Obstruction	
Post-Storm		Structural	
Type of Component		Maintenance	
ID & Location			
Fill out this section if maintenance is needed			
Notice to Correct sent?		Remediation Notes	
Date		Date	
Notice Sent to:		Inspector	
Remediation Necessary:		Observation/Verification	

2.5 Field Observation Datasheets

In order for Douglas County to stay in compliance with the Interlocal Agreement with the Nevada Division of Environmental Protection, registered water quality improvement projects must be shown to be maintained and functioning. Using the BMP RAM Field Observation Datasheets in **Attachment B**, a series of items need to be inspected to determine if these

drainage elements are functioning or in need of maintenance. Theses field observation datasheets are to be used annually for facilities registered or being considered for credit in the Lake Tahoe TMDL, and on facilities covered in Douglas County's Special Use Permit through the US Forest Service. A complete inventory of **Lake Tahoe facilities can be found in Attachment C.**

Attachment A

Drainage System Inspection Form

Douglas County, NV - Drainage System Inspection Form			
Location & Type		Observations	
Date		Trash	
Inspector		Debris	
Annual		Obstruction	
Post-Storm		Structural	
Type of Component		Maintenance	
ID & Location			
Fill out this section if maintenance is needed			
Notice to Correct sent?		Remediation Notes	
Date		Date	
Notice Sent to:		Inspector	
Remediation Necessary:		Observation/Verification	

Attachment B

BMP RAM Field Observation Datasheets

WET BASIN

BMP RAM Field Observation Datasheet	
BMP ID	
Observation Date	
Observer Name	

Vegetation Cover					
	Vegetation Type				
	Wetland / Riparian Species	Tree Species	Grass Species	No Vegetation (Bare Soil)	Total = 100%
% cover					

Material Accumulation	
Staff Plate Description	Depth (ft) Lowest value visible

Conveyance			
Location	Functioning as intended?	If **NOT** functioning as intended, indicate type of action required	
		Requires debris removal?	Possible advanced maintenance?
	(Y/N)	(Y/N)	(Y/N)
All inlets			
All outlets			

Notes:

INFILTRATION BASIN

BMP RAM Field Observation Datasheet	
BMP ID	
Observation Date	
Observer Name	

Vegetation Cover

	Vegetation Type				
	Wetland / Riparian Species	Tree Species	Grass Species	No Vegetation (Bare Soil)	Total = 100%
% cover					

Infiltration Observations

Number of Surface Types & # of measurements necessary*		Measurement Type	

Location

LOC	1		2		3		4		5		6		7	
MSMTS	t*	r*	T	r	t	r	t	r	t	r	t	r	t	r

*Where t is Time in minutes and r is Reading in inches

Conveyance

Location	Functioning as intended?	If **NOT** functioning as intended, indicate type of action required	
		Requires debris removal?	Possible advanced maintenance?
	(Y/N)	(Y/N)	(Y/N)
All inlets			
All outlets			

*Infiltration surface types and number of measurements required:

Number of distinct surface types	**1**	**2**	**3**	**4**
Number of Measurements Required	3	6	9	12

Notes:

TREATMENT VAULT

BMP RAM Field Observation Datasheet	
BMP ID	
Observation Date	
Observer Name	

Treatment Vault Capacity	
# of measurements	

Location Description	Depth (ft)

Conveyance			
Location	Functioning as intended?	If **NOT** functioning as intended, indicate type of action required	
		Requires debris removal?	Possible advanced maintenance?
	(Y/N)	(Y/N)	(Y/N)
All inlets			
All outlets			

Notes:

DRY BASIN

BMP RAM Field Observation Datasheet	
BMP ID	
Observation Date	
Observer Name	

Vegetation Cover

	Vegetation Type				
	Wetland / Riparian Species	Tree Species	Grass Species	No Vegetation (Bare Soil)	Total = 100%
% cover					

Infiltration Observations

Number of Surface Types & # of measurements necessary*		Measurement Type	

Location

LOC	1		2		3		4		5		6		7	
MSMTS	t*	r*	t	r	t	r	t	r	t	r	t	r	t	r

*Where t is Time in minutes and r is Reading in inches

Material Accumulation

Staff Plate Description	Depth (ft) Lowest value visible

Conveyance

Location	Functioning as intended?	If **NOT** functioning as intended, indicate type of action required	
		Requires debris removal?	Possible advanced maintenance?
	(Y/N)	(Y/N)	(Y/N)
All inlets			
All outlets			

*Infiltration surface types and number of measurements required:

Number of distinct surface types	**1**	**2**	**3**	**4**
Number of Measurements Required	3	6	9	12

Notes:

CARTRIDGE FILTER

BMP RAM Field Observation Datasheet	
BMP ID	
Observation Date	
Observer Name	

Confined Space	
Does the floor of the treatment BMP have standing water? (Y/N)	
If yes, repeat observation in 24 – 48hrs: Does the floor of the treatment BMP have standing water? (Y/N)	

Conveyance			
Location	Functioning as intended?	If **NOT** functioning as intended, indicate type of action required	
		Requires debris removal?	Possible advanced maintenance?
	(Y/N)	(Y/N)	(Y/N)
All inlets			
All outlets			

Notes:

BED FILTER

BMP RAM Field Observation Datasheet	
BMP ID	
Observation Date	
Observer Name	

Infiltration Observations			
Number of Surface Types & # of measurements necessary*		Measurement Type	

Location														
LOC	1		2		3		4		5		6		7	
MSMTS	t*	r*	t	r	t	r	t	r	t	r	t	r	t	r

*Where t is Time in minutes and r is Reading in inches

Conveyance			
Location	Functioning as intended?	If **NOT** functioning as intended, indicate type of action required	
		Requires debris removal?	Possible advanced maintenance?
	(Y/N)	(Y/N)	(Y/N)
All inlets			
All outlets			

*Infiltration surface types and number of measurements required:

Number of distinct surface types	**1**	**2**	**3**	**4**
Number of Measurements Required	3	6	9	12

Notes:

SETTLING BASIN

BMP RAM Field Observation Datasheet	
BMP ID	
Observation Date	
Observer Name	

Material Accumulation (Depth)	
Staff Plate Description	Depth (ft) Lowest value visible

Conveyance			
Location	Functioning as intended?	If **NOT** functioning as intended, indicate type of action required	
		Requires debris removal?	Possible advanced maintenance?
	(Y/N)	(Y/N)	(Y/N)
All inlets			
All outlets			

Notes:

BIOFILTER

BMP RAM Field Observation Datasheet	
BMP ID	
Observation Date	
Observer Name	

Vegetation Cover					
	Vegetation Type				
	Wetland / Riparian Species	Tree Species	Grass Species	No Vegetation (Bare Soil)	Total = 100%
% cover					

Runoff*
Time (seconds)

Conveyance			
Location	Functioning as intended?	If **NOT** functioning as intended, indicate type of action required	
		Requires debris removal?	Possible advanced maintenance?
	(Y/N)	(Y/N)	(Y/N)
All inlets			
All outlets			

*determine the number of measurements required based on the BMP area footprint in this table below

BMP area (ft^2)	**<100**	**100-500**	**500-1000**	**>1,000**
Number of Measurements Required	3	4	5	6

Notes:

INFILTRATION FEATURE

BMP RAM Field Observation Datasheet	
BMP ID	
Observation Date	
Observer Name	

Vegetation Cover

	Vegetation Type				
	Wetland / Riparian Species	Tree Species	Grass Species	No Vegetation (Bare Soil)	Total = 100%
% cover					

Runoff

Time (seconds)

Conveyance

Location	Functioning as intended?	If **NOT** functioning as intended, indicate type of action required	
		Requires debris removal?	Possible advanced maintenance?
	(Y/N)	(Y/N)	(Y/N)
All inlets			
All outlets			

*determine the number of measurements required based on the BMP area footprint in this table below

BMP area (ft^2)	**<100**	**100-500**	**500-1000**	**>1,000**
Number of Measurements Required	3	4	5	6

Notes:

POROUS PAVEMENT

BMP RAM Field Observation Datasheet	
BMP ID	
Observation Date	
Observer Name	

Infiltration Observations			
Number of Surface Types & # of measurements necessary		Measurement Type	

Location										
LOC										
	t*	r*	t	r	t	r	t	r	t	r
1										
2										
3										
4										
5										

*Where t is Time in minutes and r is Reading in inches

Conveyance			
Location	Functioning as intended?	If **NOT** functioning as intended, indicate type of action required	
		Requires debris removal?	Possible advanced maintenance?
	(Y/N)	(Y/N)	(Y/N)
All inlets			
All outlets			

Notes:

SEDIMENT TRAP

BMP RAM Field Observation Datasheet					
Observation Date					
Observer Name					
Sediment Trap Capacity		**Conveyance**			
BMP ID	Depth (ft)	Inlet/Outlet	Functioning as intended?	If **NOT** functioning as intended, indicate type of action required	
				Requires debris removal?	Possible advanced maintenance?
			(Y/N)	(Y/N)	(Y/N)

Notes:

DROP INLET

BMP RAM Field Observation Datasheet			
Observation Date			
Observer Name			
Conveyance			
BMP ID	Functioning as intended?	If **NOT** functioning as intended, indicate type of action required	
		Requires debris removal?	Possible advanced maintenance?
	(Y/N)	(Y/N)	(Y/N)

Notes:

Attachment C

Stormwater Infrastructure Inventory Maps

Legend

- DropInlet_All
- CRS_Inspections_Update

Drainage_Features

- <all other values>

Type

-
- BACK CURB/SIDEWALK
- BRIDGE
- CULVERT
- CURB/GRATE
- DIP SECTION
- GUARDRAIL
- IN CURB
- IN STREET GRATE
- IN STREET/MANHOLE
- IN WALK
- NDOT CULVERT
- UNKNOWN
- VAULT
- Culvert_Features

Detention Basins

- <all other values>

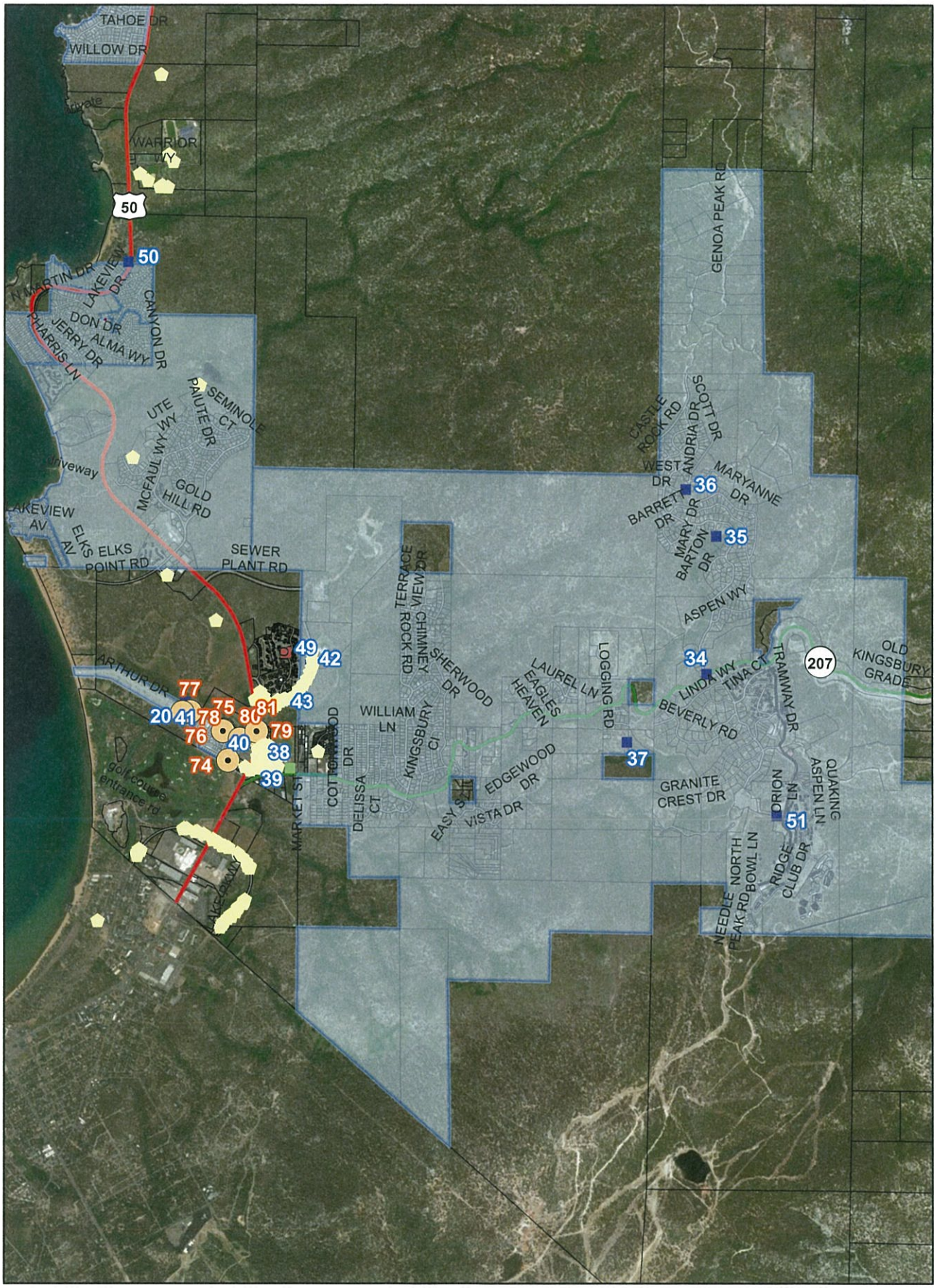
Owner

- Douglas County
- GRGID; IHGID
- Lake Village HOA; The Springs POA; Wildhorse HOA; Winhaven Gardens; Winhaven HOA
- MGSD
- NDOT?
- Private
- Town of Gardnerville
- Town of Minden
- USFS

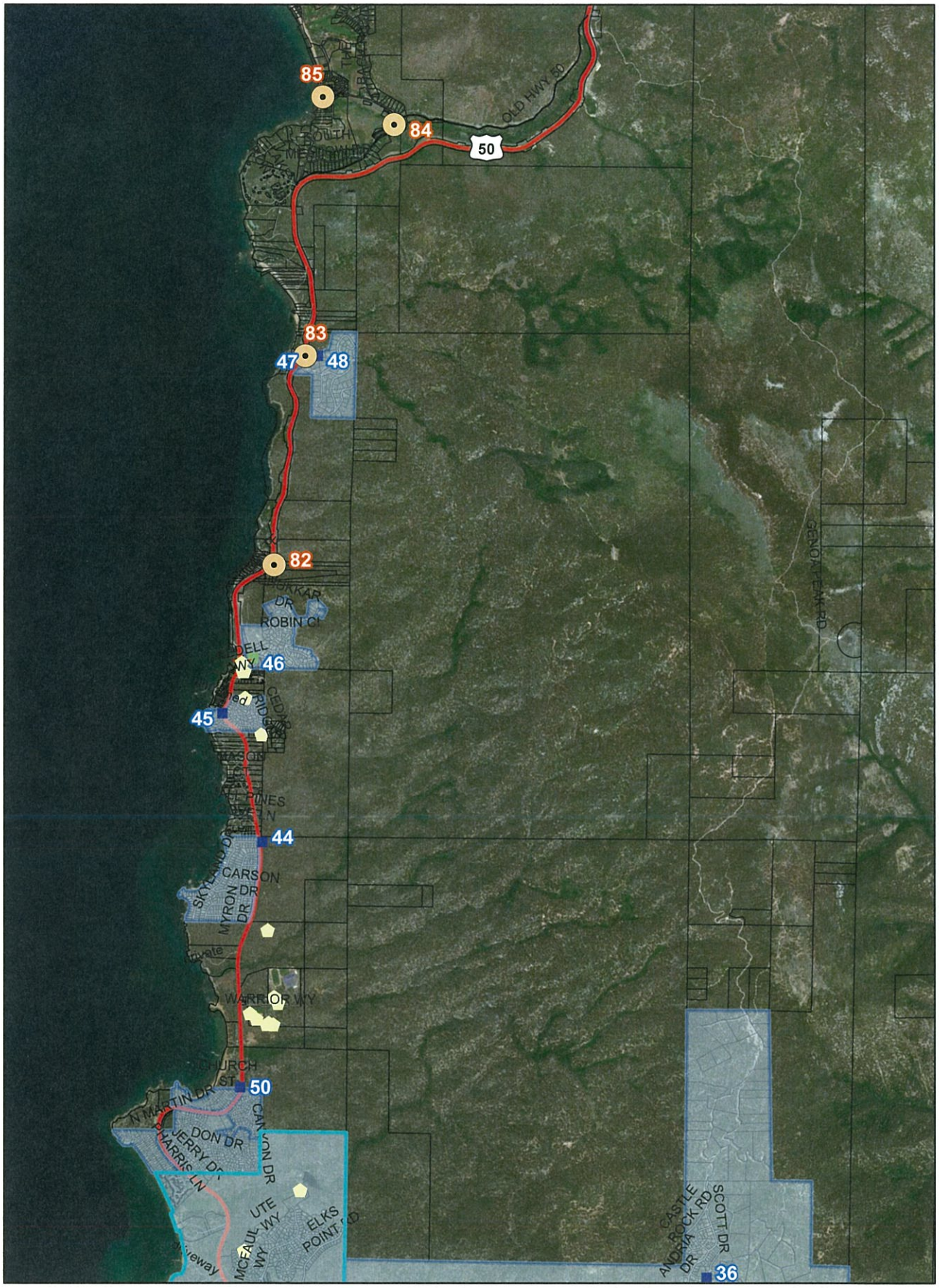
DOUGLAS_GIS.GISDATA.Town_Boundary

- <all other values>

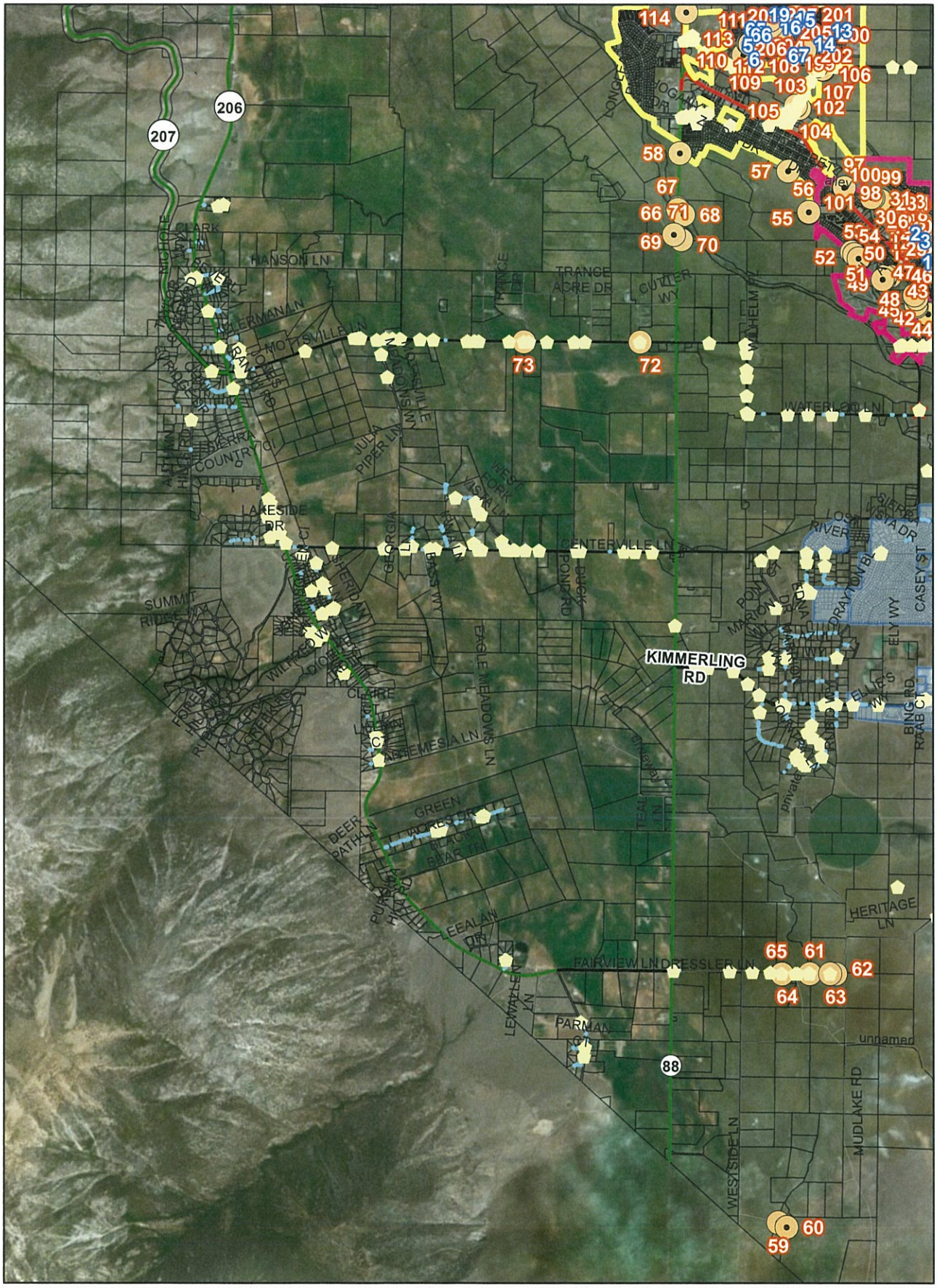
KGID/Stateline/Roundhill



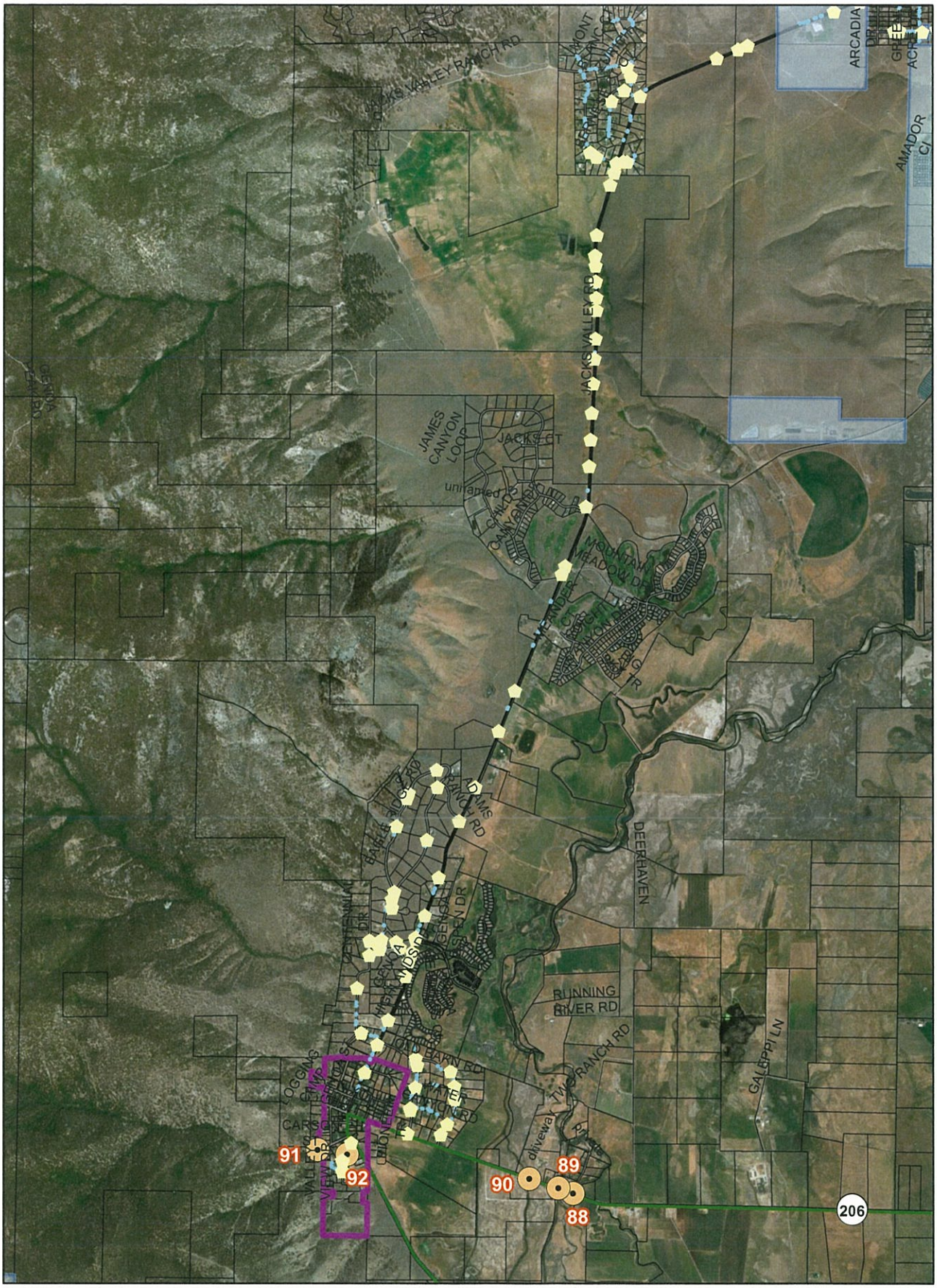
Cave Rock/Glenbrook



Foothill


206
207
88
CLARK LN
HANSON LN
TRANCE ACRE DR
CUTLER WY
WATERLOO LN
CENTERVILLE LN
LAKESIDE DR
SUMMIT RIDGE WY
KIMMERLING RD
EAGLE MEADOWS LN
GREEN
DEER PATH LN
LEEALAN DR
FAIRVIEW LN
DRESSLER LN
PARMAN CT
HERITAGE LN
MUDLAKE RD
WESTSIDE LN
CASEY ST
BING RD
unnamed

Jacks Valley/Genoa



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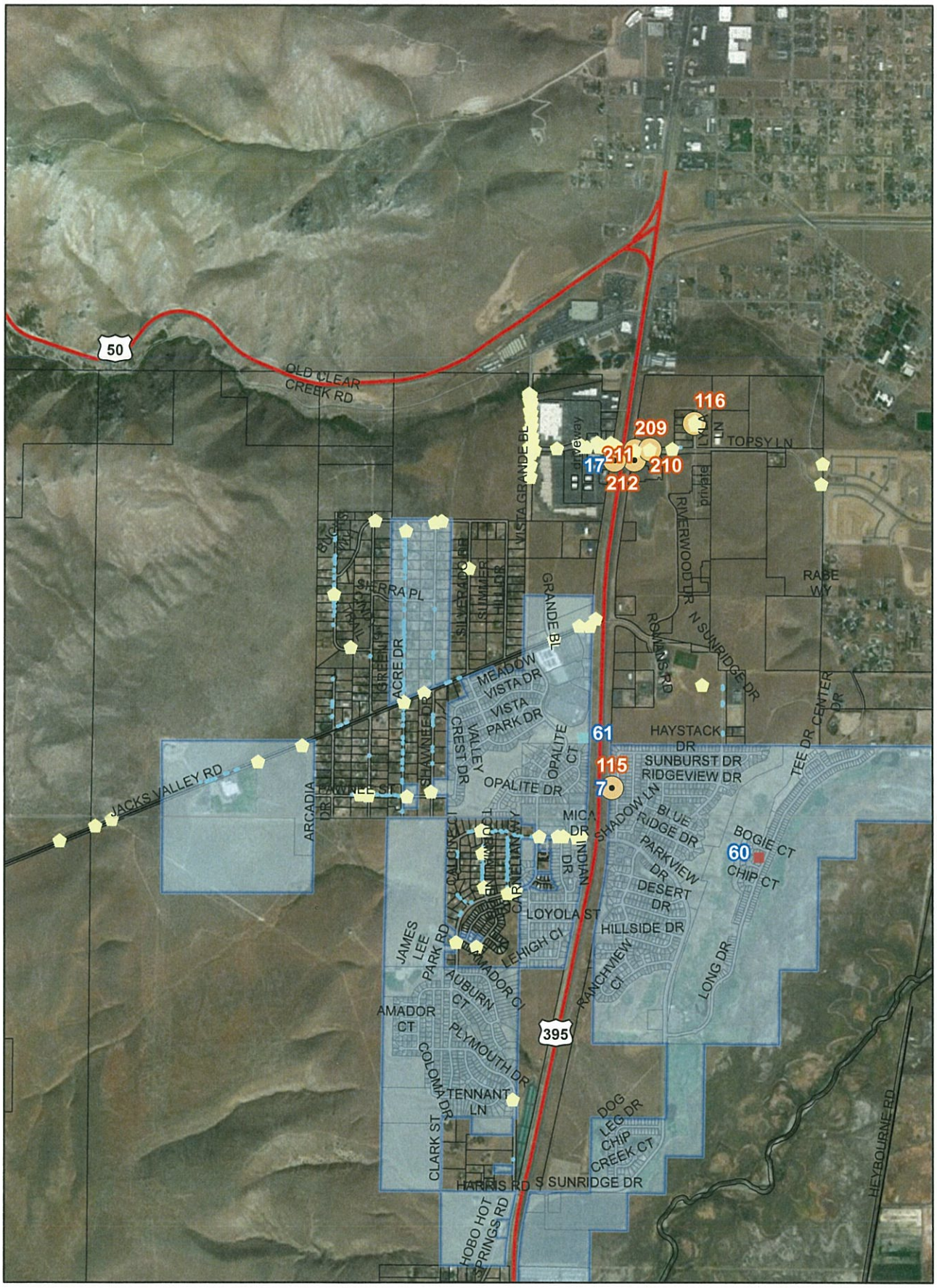

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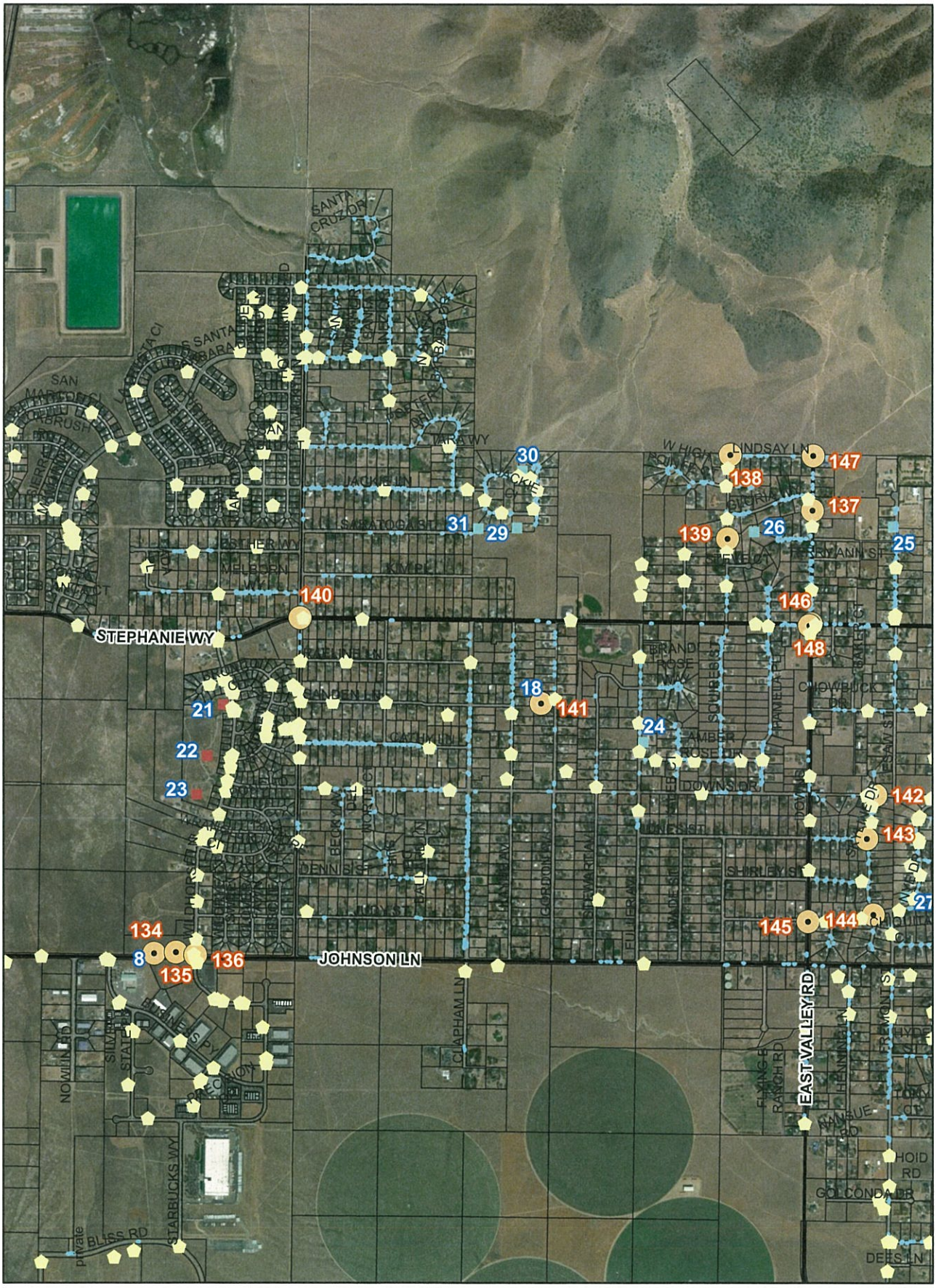
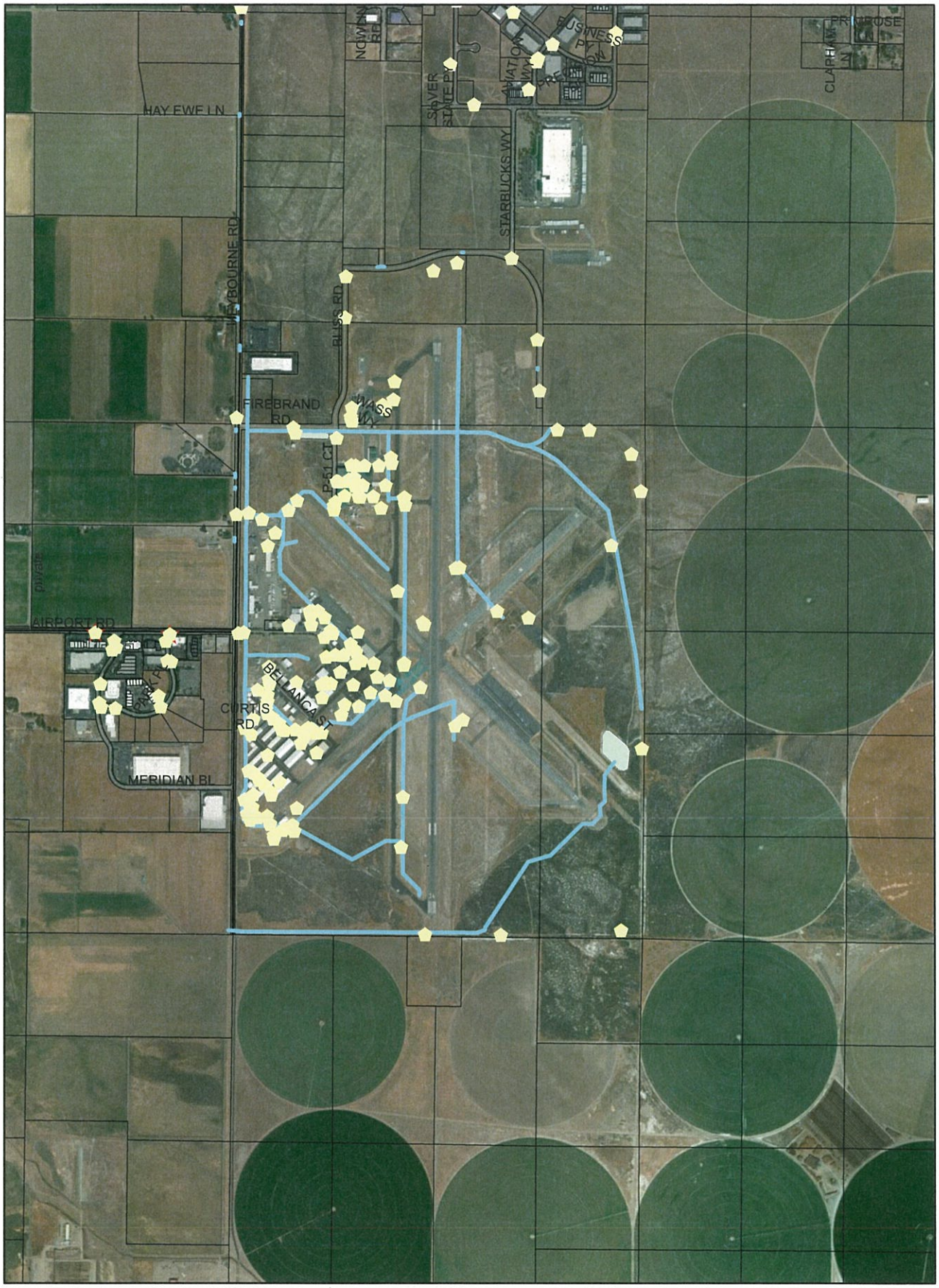
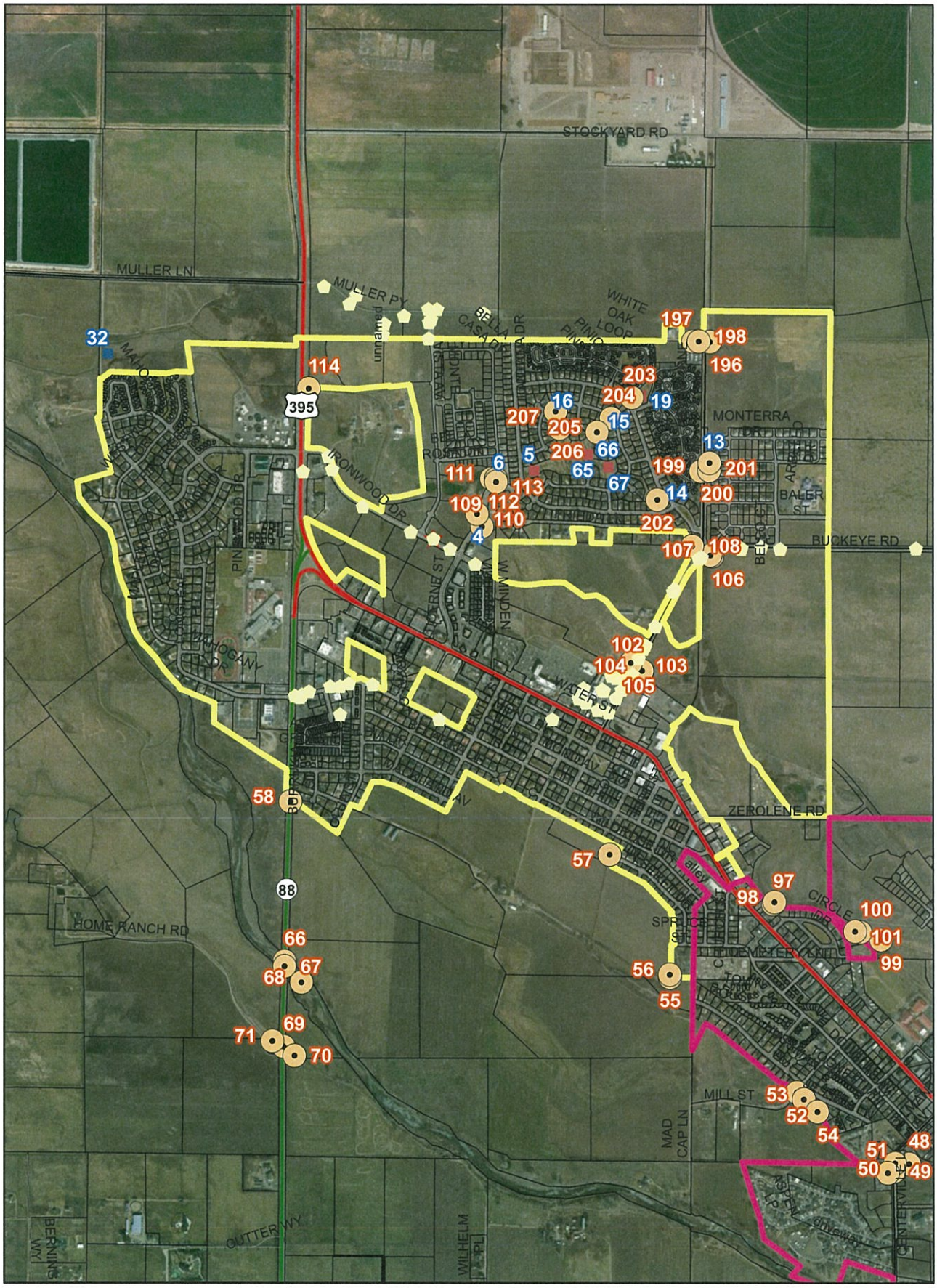


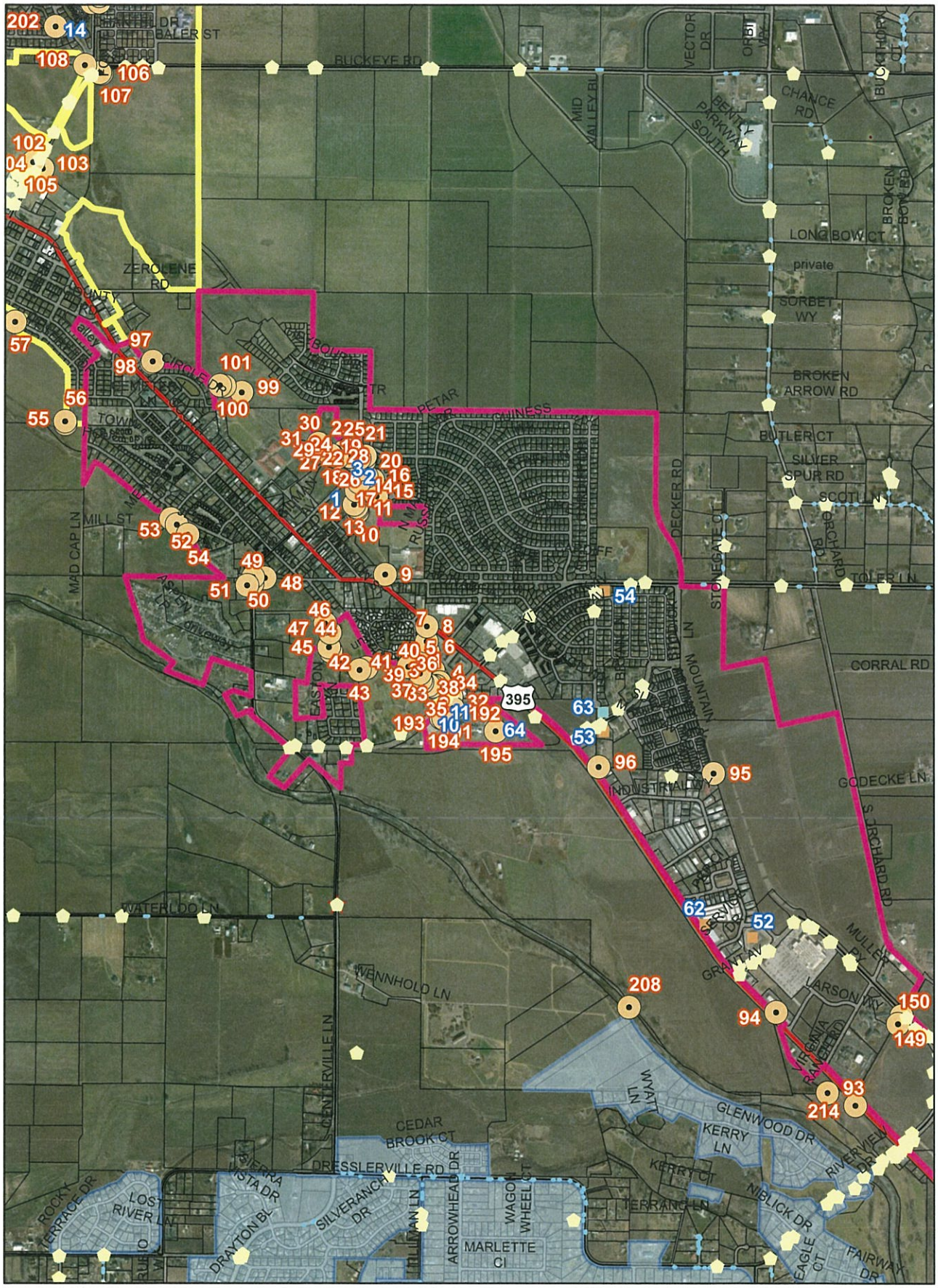
Minden-Tahoe Airport



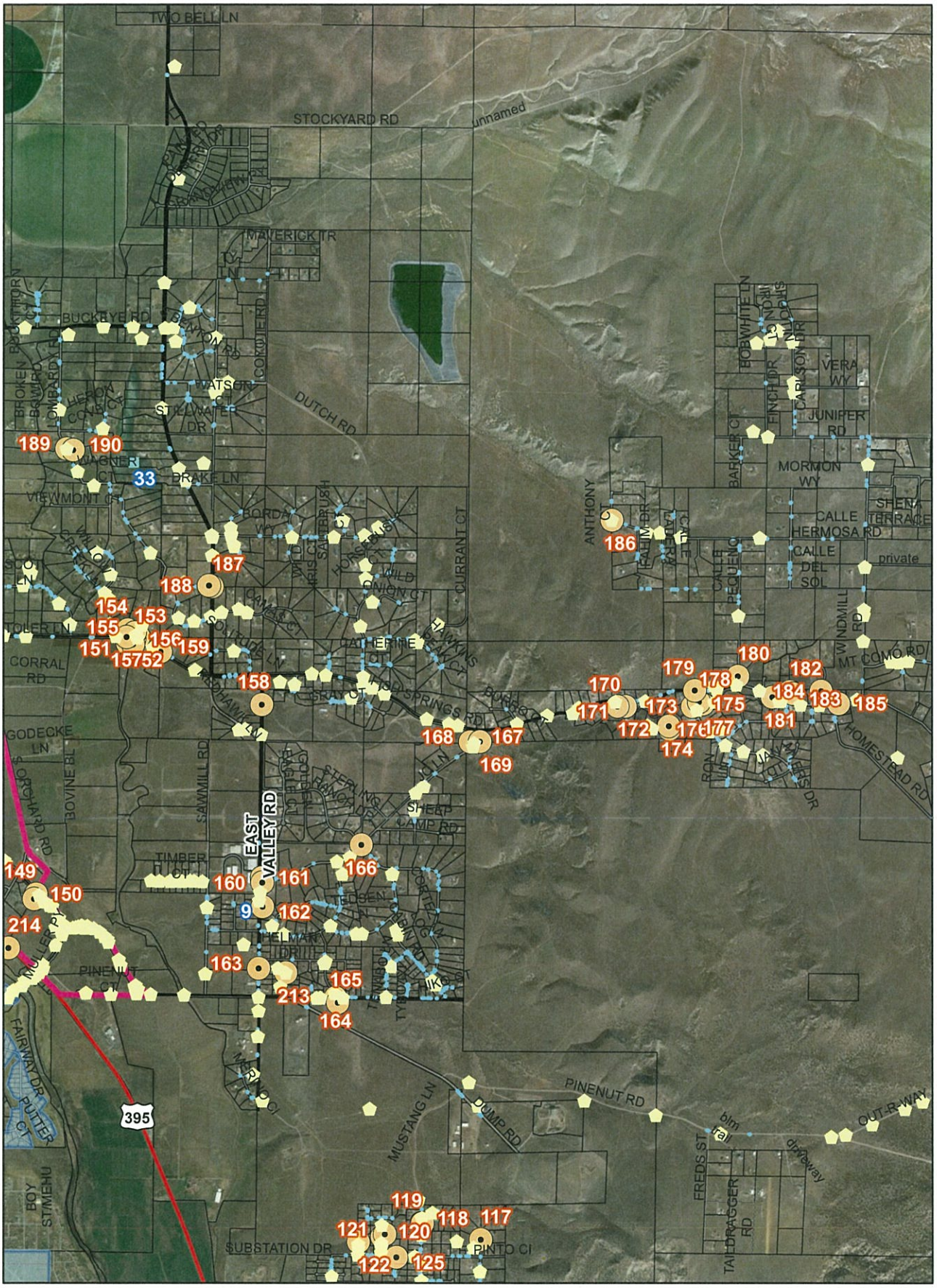
Town of Minden



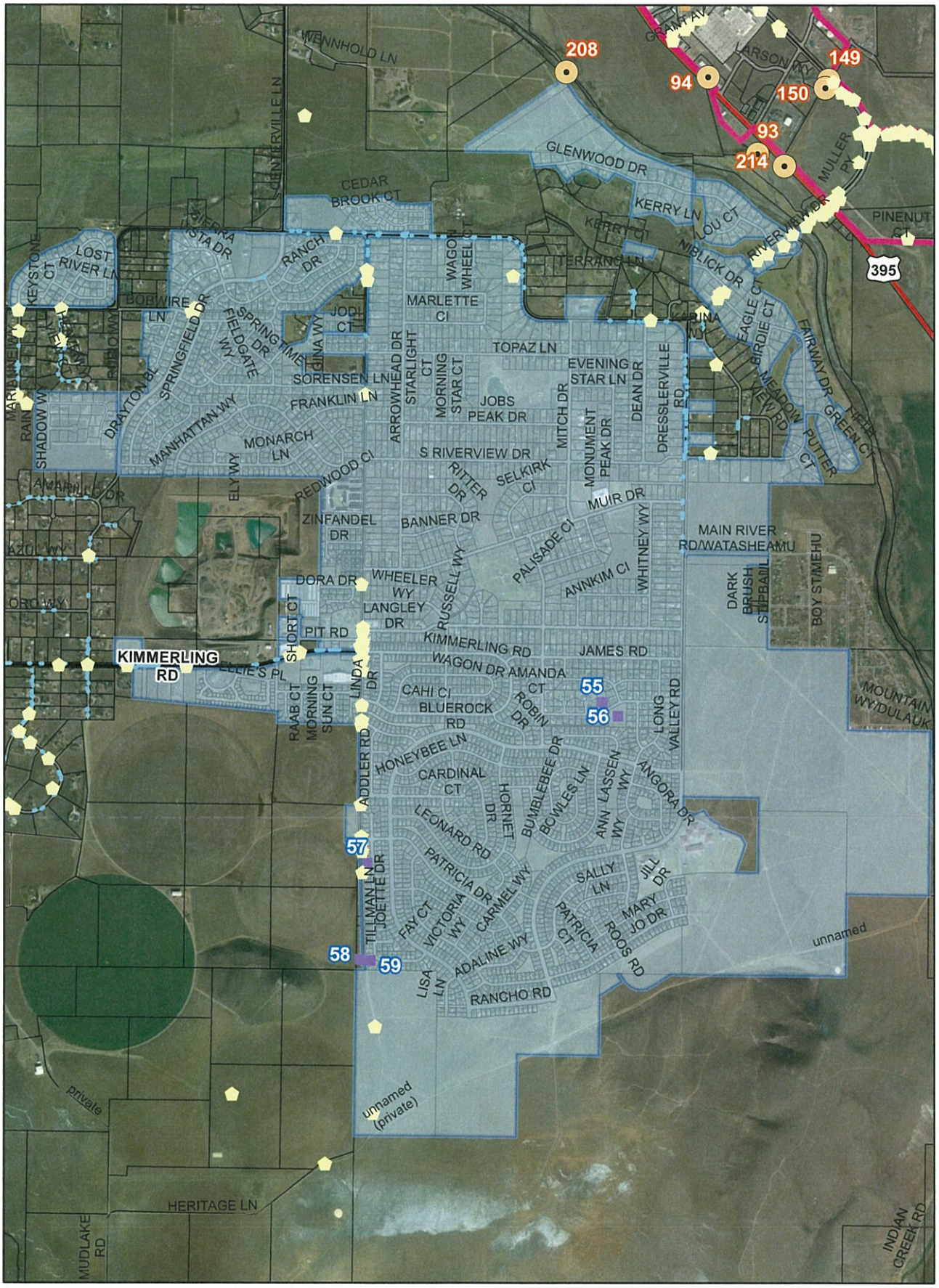
Town of Gardnerville



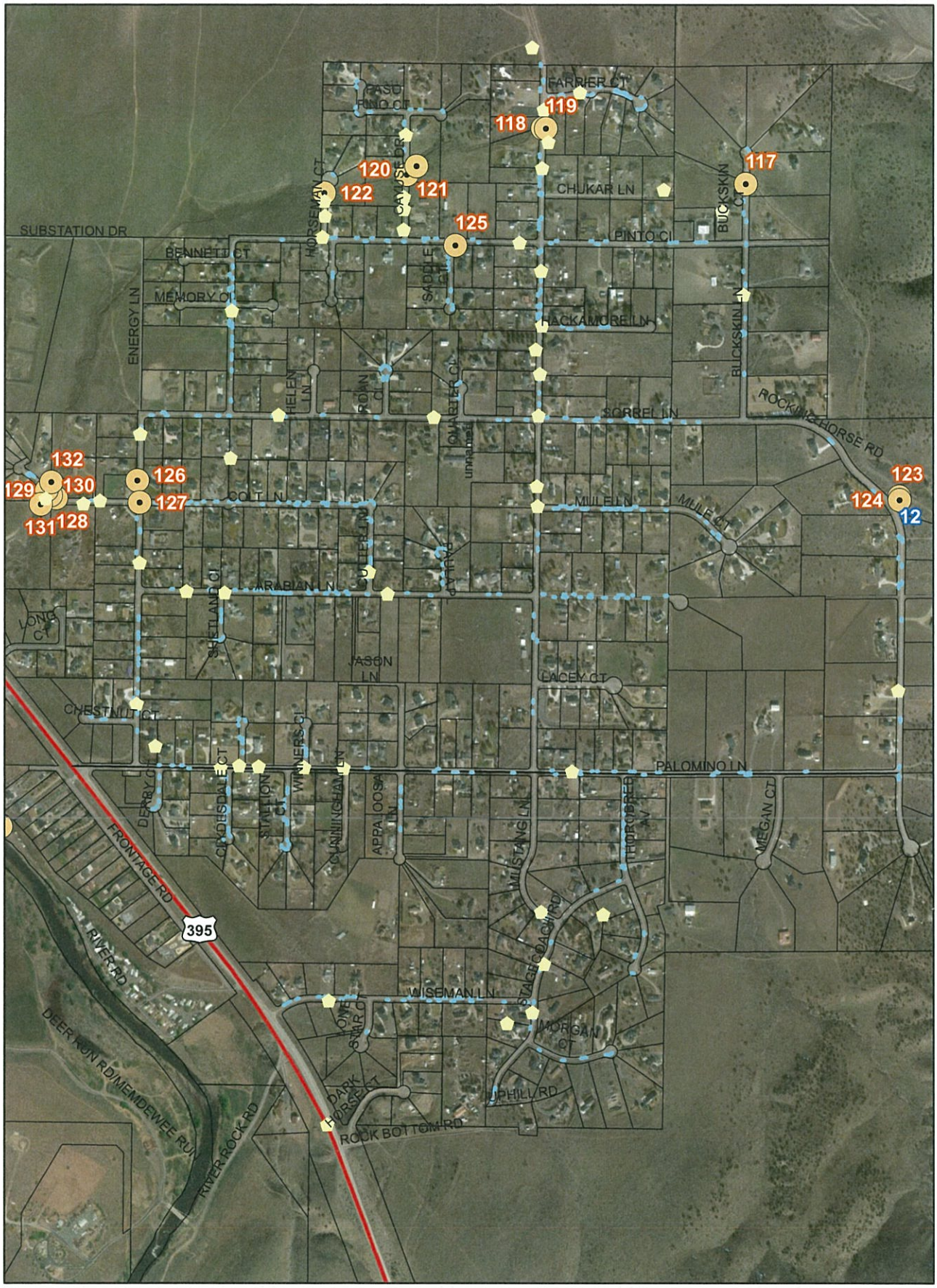
East Valley/Fish Springs/Pine Nut



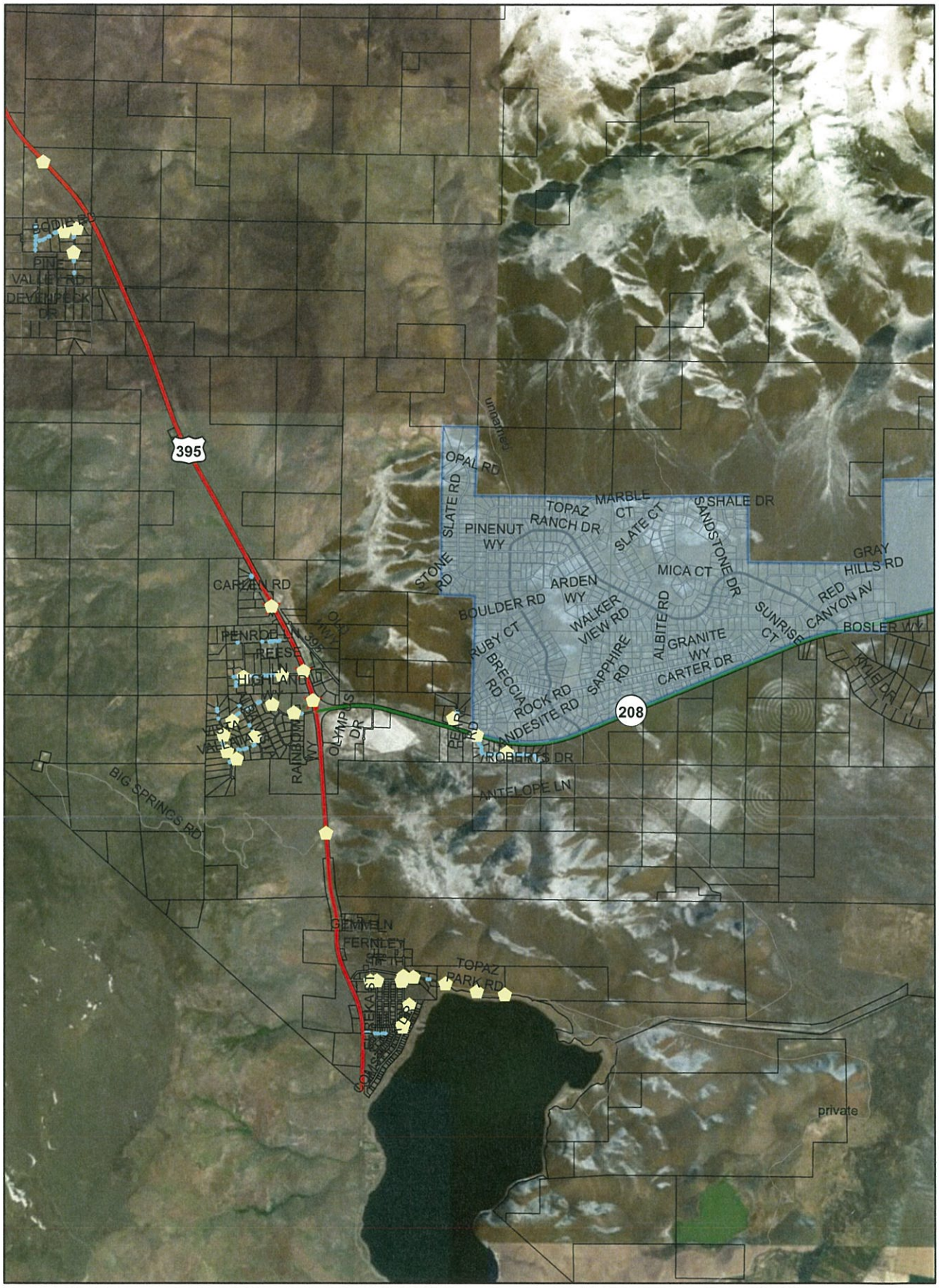
Gardnerville Ranchos GID



Ruhenstroth



Topaz Ranch Estates GID/Topaz Lake



APPENDIX C – NPDES MS4 Permit Fact Sheet

FACT SHEET (pursuant to NAC 445A.236)

Permit Name: General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems ("Small MS4s")

Permit Number: NVS040000

Location: This permit will immediately affect all or portions of the following areas:

- Carson City
- Douglas County
- Lyon County
- City of Elko
- Nellis Air Force Base, Las Vegas
- Nevada Department of Transportation (within any regulated MS4)
- Coyote Springs.

Background Relating to the General Permit

Polluted storm water runoff is often transported to MS4s and ultimately discharged into local rivers and streams without treatment. EPA's Stormwater Phase II Rule established an MS4 stormwater management program that is intended to improve the Nation's waterways by reducing the quantity of pollutants that stormwater picks up and carries into storm sewer systems during storm events. Common pollutants include oil and grease from roadways, pesticides from lawns, sediment from construction sites, and carelessly discarded trash, such as per waste, cigarette butts, paper wrappers, and plastic bottles. When deposited into nearby waterways via MS4 discharges, these pollutants can impair the waterways, thereby discouraging recreational use of the resource, contaminating drinking water supplies, and interfering with the habitat for fish, other aquatic organisms, and wildlife. In 1990, EPA promulgated rules establishing Phase I of the National Pollutant Discharge Elimination System ("NPDES") stormwater program. The Phase I program for MS4s requires operators of "medium" and "large" MS4s, that is, those that generally serve populations of 100,000 or greater, to implement a stormwater management program as a means to control polluted discharges from these MS4s. In 1992, EPA promulgated a rule establishing the Stormwater Phase II Rule that extended coverage of the NPDES stormwater program to certain "small" MS4s, but the Phase II Rule takes a slightly different approach on how the stormwater management program is developed and implemented.

A small MS4 is any MS4 not already covered by the Phase I program as a medium or large MS4. A small MS4 can be designated by the permitting authority as a *regulated* small MS4 in one of three ways:

1. **Automatic Nationwide Designation**

   The Phase II Final Rule requires nationwide coverage of all operators of small MS4s that are located within the boundaries of a Bureau of the Census-defined "urbanized area" ("UA") based on the latest decennial Census. Once a small MS4 is designated into the program based on the UA boundaries, it cannot be waived from the program if in a subsequent UA calculation the small MS4 is no longer within the UA boundaries. An automatically designated small MS4 remains regulated unless, or until, it meets the criteria for a waiver.

2. **Potential Designation by the NPDES Permitting Authority – Required Evaluation**

   An operator of a small MS4 located outside of a UA may be designated as a regulated small MS4 if the NPDES permitting authority determines that its discharges cause, or have the potential to cause, an adverse impact on water quality. The Phase II Final Rule requires the NPDES permitting authority to develop a set of designation criteria and apply them, *at a minimum*, to all small MS4s located outside of a UA serving a jurisdiction with a population of at least 10,000 and a population density of at least 1,000-people/square mile.

3. **Potential Designation by the NPDES Permitting Authority – Physically Interconnected**

   Under the final rule, the NPDES permitting authority is required to designate any small MS4 located outside of a UA that contributes substantially to the pollutant loadings of a *physically interconnected* MS4 regulated by the NPDES storm water program. The final rule does not set a deadline for designation of small MS4s meeting this criterion.

Operators of regulated small MS4s are required to design their programs to:

- Reduce the discharge of pollutants to the maximum extent practicable ("MEP");
- Protect water quality; and
- Satisfy the appropriate water quality requirements of the Clean Water Act ("CWA").

Implementation of the MEP standard will typically require the development and implementation of Best Management Practices ("BMPs") and the achievement of measurable goals to satisfy each of the six minimum control measures ("MCMs"). The Phase II Rule defines a small MS4 storm water management program as a program comprising six elements that, when implemented in concert, are expected to result in significant reductions of pollutants discharged into receiving water bodies.

The six MS4 program MCMs are outlined below:

1. Public Education and Outreach - Distributing educational materials and performing outreach to inform citizens about the impacts polluted stormwater runoff discharges can have on water quality.

2. Public Participation/Involvement - Providing opportunities for citizens to participate in program development and implementation, including effectively publicizing public hearings and/or encouraging citizen representatives on a stormwater management panel.

3. Illicit Discharge Detection and Elimination - Developing and implementing a plan to detect and eliminate illicit discharges to the storm sewer system (includes developing a system map and informing the community about hazards associated with illegal discharges and improper disposal of waste).

4. Construction Site Runoff Control - Developing, implementing, and enforcing an erosion and sediment control program for construction activities that disturb one (1) or more acres of land (controls could include silt fences and temporary storm water detention ponds).

5. Post-Construction Runoff Control - Developing, implementing, and enforcing a program to address discharges of post-construction stormwater runoff from new development and redevelopment areas. Applicable controls could include preventative actions such as protecting sensitive areas (e.g., wetlands) or the use of structural BMPs such as grassed swales or porous pavement.

6. Pollution Prevention/Good Housekeeping - Developing and implementing a program with the goal of preventing or reducing pollutant runoff from municipal operations. The program must include municipal staff training on pollution prevention measures and techniques (e.g., regular street sweeping, reduction in the use of pesticides or street salt, or frequent catch-basin cleaning).

The Phase II program for MS4s is designed to accommodate a general permit approach using a Notice of Intent ("NOI") as the permit application. The operator of a regulated small MS4 must include in its permit application, or NOI, its chosen BMPs and measurable goals for each minimum control measure. To help permittees identify the most appropriate BMPs for their programs, EPA will issue a menu of BMPs to serve as guidance. NPDES permitting authorities can modify the EPA menu or develop their own lists.

The rule identifies a number of implementation options for regulated small MS4 operators. These include sharing responsibility for program development with a nearby regulated small MS4, taking advantage of existing local or State programs, or participating in the implementation of an existing Phase I MS4's storm water program as a co-permittee. These options are intended to promote a regional approach to stormwater management coordinated on a watershed basis.

Permittees need to evaluate the effectiveness of their chosen BMPs to determine whether the BMPs are reducing the discharge of pollutants from their systems to the MEP and to determine if the BMP mix is satisfying the water quality requirements of the CWA. Permittees also are required to assess their progress in achieving their program's measurable goals. While monitoring is not required under the rule, the NPDES permitting authority has the discretion to require monitoring if deemed necessary. If there is an indication of a need for improved controls, permittees can revise their mix of BMPs to create a more effective program.

Projected Impact:

Six entities were initially subject to the Small MS4 General Permit in 2002 and included all or portions of the following areas:

1. ***Carson City*** – Automatic designation by EPA through Bureau of the Census UA designation.
2. ***Lyon County*** - Automatic designation by EPA through Bureau of the Census UA

designation.

3. ***Douglas County*** - Automatic designation by EPA through Bureau of the Census UA designation.
4. ***Nellis AFB*** - Automatic designation by EPA through Bureau of the Census UA designation.
5. ***Indian Hills General Improvement District*** - Automatic designation by EPA through Bureau of the Census UA designation.
6. ***City of Elko*** - An operator of a small MS4 located outside of a UA maybe designated as a regulated small MS4 if the NPDES permitting authority determines that its discharges cause, or have the potential to cause, an adverse impact on water quality. The Phase II Final Rule requires the NPDES permitting authority to develop a set of designation criteria and apply them to all small MS4s located outside of a UA serving a jurisdiction with a population of at least 10,000 and a population density of at least 1,000-people/square mile. NDEP has determined that the City of Elko will require coverage under this general permit because its discharges have the potential to cause an adverse impact on the Humboldt River water quality.

A seventh entity, **Coyote Springs Development**, filed an NOI in 2007 requesting inclusion under this permit. Coyote Springs is a private development consisting of 6,881 acres approximately 50 miles northeast of Las Vegas. Coyote Springs requested coverage under this permit even though they do not yet meet the criteria for a UA.

Hospitals, prisons, universities, and other facilities that exist in Nevada's regulated MS4 areas that are operators of small MS4s may be required to obtain coverage under this Small MS4 General permit.

What's New with This General Permit

This general permit has added language to this permit that addresses the following issues:

Discharges to Water Quality-Impaired Waters. When discharges to water quality-impaired waters that are contained in the current 303(d) Impaired Water Body listing issued by the Nevada Division of Environmental Protection, Bureau of Water Quality Planning, the permittee must investigate whether discharges from the permittee's MS4 will contribute significantly to any 303(d) listing, and when the permittee discharges into a water body with an established Total Maximum Daily Load ("TMDL"), the permittee shall comply with all applicable TMDL requirements. This information can be found on NDEP's website.

Additional Information Required in the SWMP. Additional information will be required to be included in the SWMP. This information will include more details about each of the MCMs, including mapping outfalls, public participation and education, illicit discharge detection and elimination, Low-Impact Development measures, and good housekeeping practices.

Salt Stockpiles. For storage piles of salt or piles containing salt used for deicing or other commercial or industrial purposes, the permittee must enclose or cover these

piles to prevent exposure to precipitation. The permittee must implement appropriate measures (e.g., good housekeeping, diversions, containment) to minimize exposure resulting from adding to or removing materials from the pile. Piles do not need to be enclosed or covered only if stormwater from the pile is not discharged directly or indirectly to waters of the U.S. or discharges from the piles are authorized and controlled under another NPDES permit.

Public Participation in the revised Stormwater Management Program. The public will have an opportunity to review and comment on the draft initial (for new Permittees) and revised Stormwater Management Programs ("SWMP"). Comments from interested parties will be included in the final SWMP submitted and the Permittee will be required to include any comments and explain how it will act on any comments received from interested parties.

Annual Report Template. To make annual reports more consistent amongst MS4s, an Annual Report template has been developed that will require all MS4s to report the same information.

Receiving Water Characteristics:

Varies depending on location.

Permit Requirements:

This permit is in response to requirements of the CWA and implementing federal regulations, and is based on an approved SWMP that includes MCMs such as public education and participation, construction site stormwater runoff control, illicit discharge detection and elimination and good housekeeping practices. This is a continuation of a program begun in 2002 under the previous general permit, NVS040000. Like the previous permit, this permit authorizes certain Stormwater Discharges from Small MS4s to WOS.

Rationale for Permit Requirements:

The conditions set in permit language are the minimum requirements to maintain and implement an effective stormwater program within the confines of U. S. EPA published rules (40CFR Part 122) for use in stormwater permits.

NDEP Guidance Materials

Various guidance materials concerning stormwater and BMPs can be found on NDEP's website.

Prepared by: Steve McGoff, P.E.
Staff III Engineer
April 26, 2010

APPENDIX D – Lake Tahoe TMDL Sediment Load Reduction Plan

Stormwater Load Reduction Plan

Douglas County, Nevada

Prepared by:

Nevada Tahoe Conservation District

400 Dorla Court
Zephyr Cove, NV 89448

Contact:
Karin Staggs
(775) 586-1610 x23
kstaggs@ntcd.org

Submitted: August 16, 2014

Revised November 30, 2014

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List of Acronyms

BMP	Best Management Practices
BMP RAM	Best Management Practices Rapid Assessment Methodology
CAP	Credit Accounting Program
CICU	Commercial, Institutional, Communications, Utilities
CHP	Constant Head Permeameter
ECP	Erosion Control Project
EIP	Environmental Improvement Program
EMC	Event Mean Concentration
FSP	Fine Sediment Particles
GIS	Geographic Information System
ILA	Interlocal Agreement
IMP	Implementer's Monitoring Plan
LCCP	Lake Clarity Crediting Program
MFR	Multi-family residential
NDEP	Nevada Division of Environmental Protection
O&M	Operations and Maintenance
PLRM	Pollutant Load Reduction Model
PLRP	Pollutant Load Reduction Plan
RAM	Rapid Assessment Methodology
Road RAM	Road Rapid Assessment Methodology
SFR	Single-family residential
SLRP	Stormwater Load Reduction Plan
SNPLMA	Southern Nevada Public Lands Management Act
TIST	Tahoe Integrated Stormwater Tool
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TP	Total Phosphorus
TRPA	Tahoe Regional Planning Agency
TSS	Total Suspended Solids
UPC	Urban Planning Catchment
WQIP	Water Quality Improvement Project

1.0 BACKGROUND

In August 2013 the Nevada Division of Environmental Protection (NDEP) and Douglas County (County) entered into an Interlocal Agreement to Implement the Lake Tahoe Total Maximum Daily Load (ILA) which outlines goals, commitments and actions both parties agree to pursue in good faith. According to the ILA, the County agrees to prepare and submit a Stormwater Load Reduction Plan (SLRP) by August 16, 2014, specifying the actions it anticipates implementing to meet the 2016 load reduction milestone and to identify preliminary approaches to meet the 2021 and 2026 load reduction milestones. On September 29, 2014, NDEP provided comments on the submitted SLRP, and those comments have been addressed in this final version of the document. Beginning on March 15, 2015, an Annual Stormwater Report is expected to be submitted to NDEP; the report is expected to summarize activities conducted by Douglas County toward meeting the TMDL. In late 2013, NDEP recognized the limited functionality and instabilities associated with the suite of tools provided to implement the Lake Clarity Crediting Program (Crediting Program), and on November 25, 2013, NDEP issued a letter that partially delayed the implementation of the ILA. Copies of both the ILA and the November 25, 2013 letter from NDEP, are provided in Appendix A, in addition to a one month extension granted by NDEP to submit this document.

Section 1 provides background information describing the previous work that directly informed the development of this SLRP, which includes the County's baseline load estimate, load reduction milestones specified in the ILA, and existing condition load estimate. Section 2 presents the County's SLRP to meet the 2016 load reduction milestone, which describes the 1) overall load reduction approach; 2) urban planning catchments proposed for registration; 3) estimated cost; 4) process for implementing Lake Clarity Crediting Program (Crediting Program) guidelines; 5) finance planning; and 6) barriers and constraints to implementation. Section 3 describes the County's preliminary approach to meet future load reduction milestones.

1.1 BASELINE CONDITION LOAD ESTIMATE

The baseline period for estimating pollutant loads discharged to Lake Tahoe for fine sediment particles (FSP), total phosphorus (TP) and total nitrogen (TN) is defined in the ILA as September 30, 2004. This is considered the baseline condition and the point of reference for estimating pollutant loading. The *Nevada Tahoe TMDL Implementing Agencies Stormwater Load Reduction Plans, Baseline and Existing Conditions Final Technical Documents* (Final Technical Documents, NTCD, NHC and 2N, 2013) was submitted to NDEP in December 2013. The County's baseline load estimate established in that report and included in the ILA is shown in Table 1.

Table 1. Douglas County baseline pollutant load estimate.

Urban Area (acres)	Surface Runoff (acre-ft/year)	Pollutant Loading			
		FSP	TP	TN	Units
3,383	465	82,800	460	1,870	lbs/year
		4.13E+18			# particles/year

A summary of the first three load reduction milestones applicable to the current SLRP process, and included in the ILA, are presented in Table 2.

Table 2. Lake Tahoe TMDL load reduction targets for Douglas County.

Milestone	Pollutant Load Reductions				Credit Targets
	FSP	TP	TN	Units	
2016	8,300	32	150	lbs/year	41
2021	17,400	64	262	lbs/year	87
2026	28,200	97	355	lbs/year	141

1.2 EXISTING CONDITION LOAD ESTIMATE

Using the PLRM models developed for the baseline analysis, water quality improvements implemented after the baseline (2004) conditions were incorporated into new models to assess FSP load reduction. A comparison of the baseline (82,800 lbs/year) and existing (70,200 lbs/year) conditions results in a load reduction of approximately 12,600 lbs/year. This estimate represents all modeled catchments within the County at Lake Tahoe; only a subset of these catchments will be registered to meet the 2016 load reduction milestone. Methods and approach for the existing condition load estimate are also provided in the *Final Technical Documents* (NTCD, NHC and 2N, 2013).

2.0 PLANNED ACTIONS TO ACHIEVE THE 2016 MILESTONE

2.1 SUMMARY OF APPROACH

Using information and results generated from PLRM (nhc et al. 2009) and the Crediting Program Handbook (NDEP and LRWQCB, 2011), the following approach was selected to meet the 2016 load reduction milestone:

1. **Register Catchments with Significant Parcel BMP Implementation:** Chapter 60.4 (Best Management Practices Requirements) of the Tahoe Regional Planning Agency (TRPA) Code of Ordinances stipulates that all developed property in the Tahoe Basin must be designed or retrofitted with BMPs. In compliance with TRPA regulations, many Douglas County property owners have participated in the parcel BMP program. There are three types of developed private property: single-family residential (SFR), multi-family residential (MFR) and commercial/institutional/communications/utilities (CICU). Compared to SFR parcels, MFR and CICU typically have a higher estimated rate of pollutant generation, and therefore realize a larger load reduction from BMP implementation. Catchments with notable load reductions as a result of parcel BMP implementation will be registered. The level of BMP implementation in these catchments will be based on TRPA records of BMP certification. NTCD staff has preliminarily verified existence of these BMPs using the TRPA database and field visits.

2. **Register Selected WQIPs (2004-2016)**: Since the baseline period, the County has completed the water quality improvement projects (WQIPs) listed in Table 3 (excerpt from Final Technical Documents, Table 13). The County expects to register WQIPs implemented in catchments having notable load reductions according to the PLRM modeling. In addition to the improvements installed with the WQIPs, the parcel BMPs and improved road operations may be accounted for within these catchments toward a future milestone.

Table 3. Water quality improvement projects in Douglas County.

Project Name	SLRP Catchment/UPC	Year Completed
Lakeridge	LR01	2006
Lower Kahle	KUC	2006
Logan Creek	LC01	2007
Lake Village Phase 1	LV01	2007
Lake Village Phase 2	LV02	2012
Round Hill	RH04	2007
Lincoln Park	LP01	2006
Hidden Woods	HW01	2007
Warrior Way	WW01	2012
Cave Rock Retrofit	CR02	2014

3. **Register Pilot Program for Improved Road Operations:** Jurisdictions have been encouraged by regulators and research to improve road operations through decreased application of abrasives, increased frequency of sweeping, more efficient sweepers, and use of road abrasive sources with less FSP. Load reduction estimates using PLRM V1 and recent studies have indicated that road operations may be more cost-effective to achieve pollutant load reductions than implementation of other types of treatments (2N Nature and nhc, 2011). Douglas County is participating in the *Road Operations Effectiveness Study* (Study, NTCD and 2N, ongoing), results from which are intended to determine the cost-effectiveness of different road operations strategies performed in the Tahoe Basin. Results from the study will be used to assess the feasibility of expanding the County's use of advanced road operations as a more prominent load reduction strategy for future load reduction milestones. North Benjamin Drive (3 miles in length), where road operations are performed by Kingsbury General Improvement District (KGID) will be registered to support achievement of the 2016 milestone.

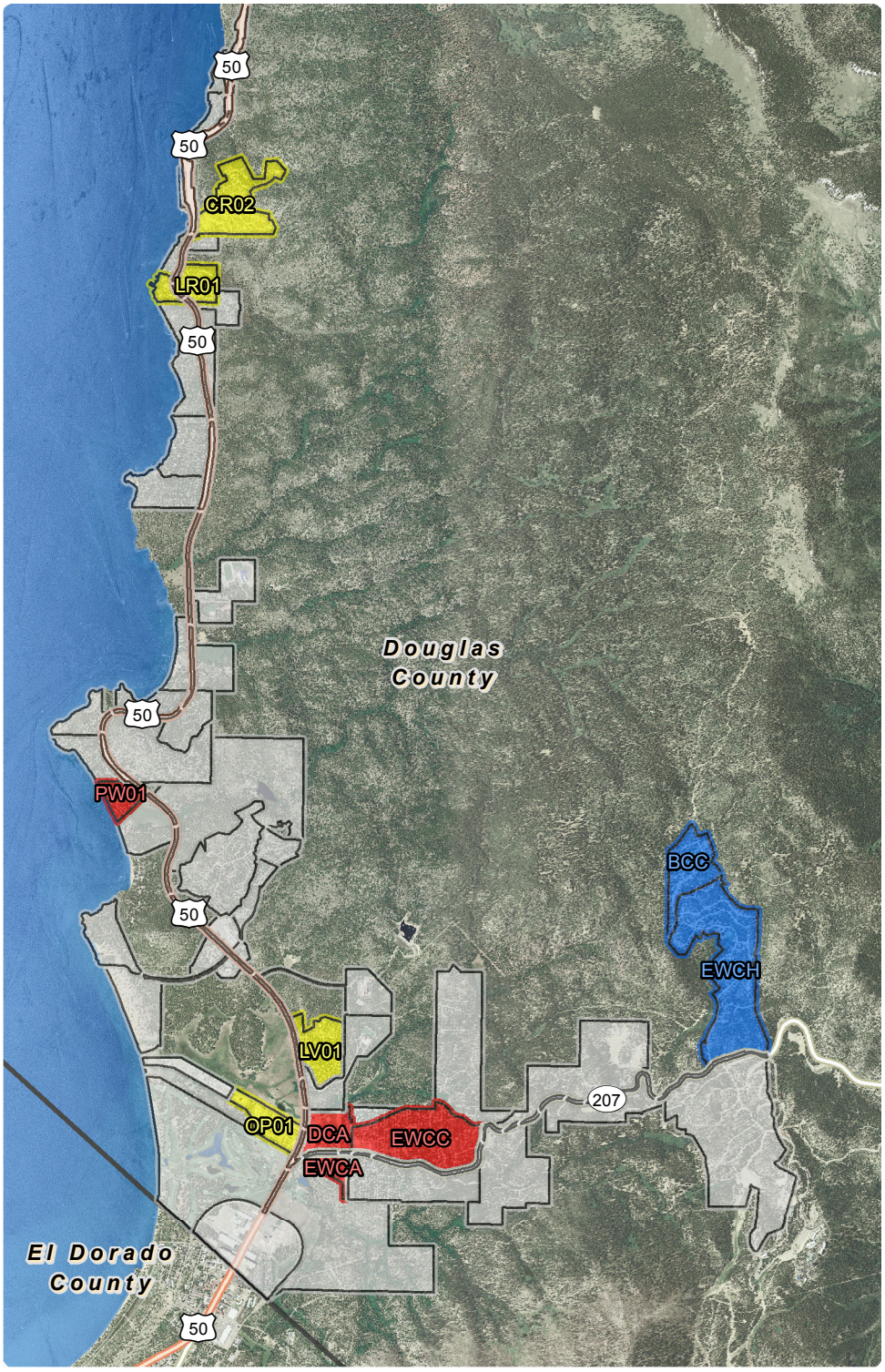
2.2 Catchment Registration

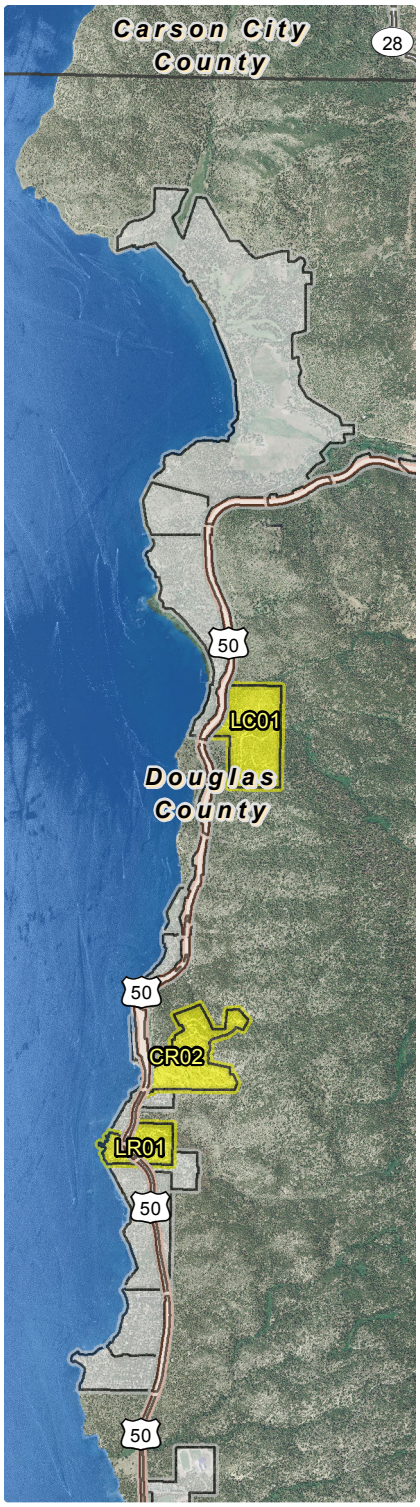
Table 4 and Figure 1 identify the Urban Planning Catchments (UPCs) or individual catchments and their associated pollutant controls that the County plans to register pursuant to the Crediting Program guidelines to obtain the necessary Lake Clarity Credits to show progress per the ILA through the 2015 (8%) and the 2016 milestone (10%).

The County will register individual catchments and UPCs to meet 100% of the first milestone load reduction according to the revised PLRM modeling by August, 2016. The PLRM models developed for the baseline and existing conditions scenarios were run using the version of PLRM (nhc et al. 2009) available in 2012; the Lake Tahoe Stormwater Tools update is scheduled for completion in April, 2015. The PLRM models will be revised after the release of the updated PLRM which will likely result in final load reduction estimates, targets and reductions that differ from the estimates included in Table 4. This Draft Catchment Registration Schedule will be updated to reflect the changes resulting from the revised PLRM modeling upon release of the revised Stormwater Tools and included in the Annual Stormwater Report due March 15, 2016.

Table 4. Draft Catchment Registration Schedule.

UPC	Description	Pollutant Controls	Year Implemented	Modeled FSP Load Reduction (lbs)	Projected Lake Clarity Credits	Planned Registration Timeline
CR02	Cave Rock GID WQIP Retrofit	Bed/filter dry basin	2015	500	3	Jun-15
PW01	Pinewild Condominiums	Parcel BMPs	2004-2013	400	2	Aug-15
LC01	Logan Creek GID	Treatment vaults, infiltration basins	2007	330	2	Aug-15
LR01	Lakeridge GID WQIP	Dry basins, treatment vaults	2006	460	2	Dec-15
KUC	Kahle Drive WQIP	Wet basin, treatment vaults	2006	1,900	10	Dec-15
EWCC	Comm/resid from Ponderosa west to Terrace View	Parcel BMPs	2004-2013	790	4	Dec-15
BCC, EWCH	N. Benjamin Drive to Upper Andria Drive	Advanced Road Operations	2014	850	4	Dec-15
TOTAL ESTIMATED FSP LOAD REDUCTION (8% through 2015)				**5,230**	**26**	
EWCA	Comm. core on south corner of Hwy 207	Parcel BMPs	2004-2013	2,110	11	Aug-16
DCA	Kahle Community Center and commercial corridor	Parcel BMPs	2004-2013	820	4	Aug-16
LV01	Lake Village Phase 1	Infiltration Basin	2007	1,200	6	Aug-16
TOTAL ESTIMATED FSP LOAD REDUCTION (10% - 2016 milestone)				**9,380**	**47**	





Data Sources: NAIP Color Orthophoto, 2006. ESRI Streetmap USA, 2012.

Private Parcel BMPs

Road Operations

Water Quality Improvement Projects

Stormwater Load Reduction Plan: Douglas County

2016 Milestone Catchments

Scale - 1:60,000 1 inch = 5,000 feet

0 0.5 1 2 Miles

NV West State Plane	NAD 83	horiz. units: feet
Prepared by NHC		August 2014

Figure 1: Catchments planned for registration to meet 2016 Milestone.

Nevada Tahoe Conservation District

2.3 ESTIMATED COST

Estimates of the total and annual expenditures necessary to carry out the SLRP and administer, operate and maintain the infrastructure intended for registration to meet the first milestone are detailed herein. These costs include 1) project implementation, 2) ongoing operations and maintenance, and 3) the procedural costs of participating in the Crediting Program to demonstrate TMDL implementation progress. The Stormwater Tools Update will not be completed until spring 2015, therefore these estimates are made using the best available information and may not accurately include the costs to implement the new tools (including remodeling baseline and existing conditions).

2.3.1 Project Implementation

Water quality improvement project implementation costs include planning, environmental documentation, permitting, design, acquisition and construction, and are based on final design and funding reports. These costs have already been expended by the County, and are included herein to detail the amount of funding spent to implement the Lake Tahoe TMDL. Over $7.5 million will have been spent on the WQIPs that will be registered to meet the 2016 load reduction milestone.

Table 5. Total implementation costs to achieve 2016 TMDL milestone.

IMPLEMENTATION COST	
Load Reduction Action	**Total Cost**
WQIPs	$7,500,000
Roads	$150,000
Parcel BMPs	$1,500,000
TOTAL IMPLEMENTATION COST	$9,150,000

The cost of improved road operations for water quality is based on the price of the sweeper used on roads within the catchments targeted for the Road Operations Effectiveness Study. The cost of the Schwartze A7000 sweeper acquired by KGID for sweeping of their roads is approximately $150,000.

An estimated cost of parcel BMP implementation was derived from TRPA data summarizing the cost of BMP design and installation. The TRPA cost data was used to calculate the average cost of BMP installation per impervious acre independent of the land use type (single-family, multi-family residential, and commercial areas). This unit area cost ($/impervious acre) was then multiplied by the impervious area of individual parcels with BMP certificates to estimate the total cost of BMP implementation within the catchments planned for registration. Based on these assumptions, it is estimated that $1.5 million has been spent to implement parcel BMPs planned for registration.

In total, approximately $9 million has been spent within Douglas County at Lake Tahoe on water quality projects and TMDL implementation necessary to meet the 2016 milestone, as shown in Table 5.

Table 6. Implementation costs of water quality improvement projects to meet 2016 TMDL milestone.

Project	Total Cost
Lake Village Phase I	$1.5 million
Kahle Drive WQIP	$1.3 million
Lakeridge GID WQIP	$3.6 million
Cave Rock GID Retrofit	$250,000
Logan Creek GID WQIP	$1.0 million

2.3.2 Operations and Maintenance

As summarized in Table 7, the estimated initial cost of operations and maintenance of water quality improvement project infrastructure required to meet the first milestone is approximately $31,500. The costs of water quality operations and maintenance actions in registered catchments were derived by estimating the number of equipment hours and maintenance personnel needed to maintain typical stormwater treatment and supporting drainage infrastructure; as well as to operate and maintain street sweepers. These estimates are based on extensive data collected by Washoe County's Mainstar maintenance database. The average hourly cost for equipment operation and maintenance personnel time were calculated from data extracted from this database. Cost recovery for equipment was included in the estimate of cost for each maintenance activity.

Table 7. Summary of initial costs to achieve 2016 milestone and annual costs (2017-2021) to sustain credit award to 2021 milestone.

INITIAL COSTS	Load Reduction Action	Operations and Maintenance	Crediting Program Participation	Total Cost
	WQIPs[1]	$31,500	$16,400	$47,900
	Roads[2]	$0	$4,400	$4,400
	Parcel BMPs[3]	$0	$8,800	$8,800
INITIAL REGISTRATION COSTS		**$31,500**	**$29,600**	**$61,100**
ANNUAL COSTS	**Load Reduction Action**	**Operations and Maintenance**	**Crediting Program Participation**	**Total Cost**
	WQIPs	$31,500	$8,000	$39,500
	Roads	$10,800	$2,800	$13,600
	Parcel BMPs[3]	$0	$4,400	$4,400
ANNUAL COSTS TO MAINTAIN CREDITS[4]		**$42,300**	**$15,200**	**$57,500**

Notes:

1. County maintenance costs for WQIPs associated with catchment registration assumes full-scale maintenance will be performed on treatment BMPs to meet the standard benchmark condition as defined by the Crediting Program.
2. Road operations for water quality are ongoing and no initial operations or maintenance costs are assumed in this estimate. It will be necessary to perform Road RAM as part of Crediting Program participation, summarized initially and annually for road operations.
3. Costs associated with registration of parcel BMPs only accounts for time to verify certifications with TRPA for registration and does not include costs to maintain parcel BMPs.
4. An additional potential annual cost to satisfy the ILA is the participation in the IMP monitoring; this is expected to cost each Lake Tahoe jurisdiction approximately $35,000. This amount is not included in this table.

It is expected that Douglas County's costs will be similar to those derived for Washoe County at Lake Tahoe since the same types of activities will be performed. Some of the improvement projects were installed over 5 years ago, therefore it is anticipated that full-scale maintenance will be required to bring the infrastructure to a benchmark performance condition. For this reason, the initial and annual maintenance costs are the same in Table 7. It may not be likely that all infrastructure will require full-scale maintenance annually; however accounting for that possibility will ensure sufficient funding is secured. Appendix B provides detail of the maintenance costs within each project that may need to be performed annually to meet Crediting Program requirements.

There are no initial costs for maintenance and operations of road operations for water quality because road operations are ongoing, and the equipment has already been purchased. The estimated annual cost of maintenance and operations of road practices considers cost recovery of equipment, cost of abrasives applied and personnel for the segment of roads within KGID that is intended to be registered and for which ongoing road condition data has been collected through the Road Operations Effectiveness Study.

An analysis of operations and maintenance data collected from local jurisdictions, including a cost recovery factor for sweeper purchase, yields approximately $150 per lane mile. North Benjamin Drive is 2 lanes, where approximately 3 lane miles will be registered, and under the existing conditions modeling scenario the sweeper must be run 12 times per year. Therefore the annual maintenance and operations of that segment of road is ((2*3)*$150*12) = $10,800 (Table 7 and Appendix B). If the County adds Epokes to its Road Operations in the Tahoe Basin, the associated costs will be incorporated.

At the current time, there is no cost to the County for parcel BMPs; any maintenance costs are to be incurred by the parcel owner, therefore the initial cost of operations and maintenance is listed in Table 7 as $0. There is also currently no requirement for the County to incur annual costs of BMP maintenance on private property within catchments planned for registration, therefore the annual cost is also listed as $0.

2.4 PARTICIPATION IN THE LAKE CLARITY CREDITING PROGRAM

The ILA specifies that the County will participate in the Crediting Program, using the standardized tools and protocols to quantify, track and report load reduction progress. In conjunction with PLRM, the revised BMP RAM and Road RAM tools will be used as they are the only currently approved methods to assess, score and document the condition of stormwater treatment controls and road conditions. The County will receive Lake Clarity Credits for the ongoing implementation and registration of pollutant controls, including operations and maintenance practices, which effectively result in reductions of pollutant loads to Lake Tahoe. The County anticipates that some time will be required to learn and apply the revised Stormwater Tools to the catchments planned for registration to meet the 2016 load reduction milestone. Based on this consideration, the County expects to complete catchment registration through 2015 along the timeline shown in the Catchment Registration Schedule (Table 4).The impact of the revised Stormwater Tools on the Lake Clarity Crediting Program implementation will not be known until after the completion of this SLRP; therefore, Douglas County reserves the right to alter the implementation schedule in accordance with the provisions of the ILA.

The administrative costs of participating in the Crediting Program, including initial application of the Stormwater Tools to the UPCs planned for registration, and annual costs associated with inspections and maintenance according to BMP RAM or Road RAM are summarized in Table 7. Appendix C provides more detail on the estimated hours associated with these costs. All Lake Clarity Crediting Program costs are based on time estimates to perform tasks required by the individual tools found in the user’s manuals.

2.4.1 Initial Costs of Catchment Registration

As shown in Table 7, the estimated initial cost to participate in the Crediting Program is $29,600. This includes modeling the catchments in the revised version of PLRM prior to registration (baseline and existing conditions models for a potentially revised load reduction), performing BMP RAM, Road RAM, and ultimately registering each catchment in the catchment registration tool. This requires applications of GIS, Microsoft Excel, and the online use of BMP RAM and Road RAM. After the initial application of each tool, annual measurements of the relevant RAM parameters will be made to demonstrate functionality or acceptable condition in order to receive the expected Lake Clarity Credits.

The costs for initial registration are higher than the annual costs due to revised modeling in PLRM, the initial application of the infrastructure or roads into BMP RAM and Road RAM, and the upload of all output from the three tools into the catchment registration tool (expected to be released for beta testing in

December 2014). This will require establishment of benchmark and expected conditions for the RAM procedures, which will generally involve installation of a staff plate, collection of infiltration measurements and assessment of vegetation cover percentage, or on-going Road RAM measurements. Road RAM protocols require extensive application of GIS to determine road class, type and condition for initial establishment in Road RAM. The catchment registration tool will be used to upload and track data output from the other Tools to demonstrate achieved load reductions using annual RAM scores[1].

2.4.2 Annual Costs of Catchment Registration

The estimated annual cost to participate in the Crediting Program to demonstrate TMDL implementation progress is $15,200. Annual Crediting Program costs include time to perform BMP and Road RAM protocols including annual inspections, potential maintenance, and the requirement to perform and upload the RAM measurements into the online database. Road RAM observations must be performed multiple times throughout the year and the data uploaded into Road RAM and reported to the catchment registration tool. An additional cost of preparing an Annual Stormwater Report due on March 15 of each year hereafter will also be incurred.

2.5 FINANCE PLANNING

2.5.1 Initial Catchment Registration

The estimated cost for initial catchment registration to meet the 2016 milestone is $61,100. Of this amount, $29,600 is associated with Crediting Program participation. Operations and maintenance costs are $31,500, an amount estimated to ensure stormwater treatment infrastructure meets the standard benchmark conditions defined by the Crediting Program prior to catchment registration. To meet the first milestone load reduction through Crediting Program participation, the County has funded a Stormwater Program Manager position through its General Funds. Responsibilities of this internal position will include the PLRM modeling, annual reporting, BMP RAM and Road RAM inspections. In order to perform the maintenance required to bring the infrastructure to benchmark conditions, the County will hire a contractor to perform the work, as it does not have dedicated maintenance equipment at Lake Tahoe.

The County has previously appropriated funds for maintenance of water quality improvement projects toward meeting the TMDL. At the current time, there is approximately $119,000 available for this use ($99,000 immediately available, $20,000 to potentially be transferred from Warrior Way maintenance account). The County also has access to $99,000 of TRPA Water Quality Mitigation Funds, and $159,000 of TRPA Operations and Maintenance Funds. TRPA funds require a 1:1 match for their use; therefore, funding for maintenance required to meet the TMDL will be equally used between the County funds and TRPA funds. To meet the 2016 load reduction goal, the $32,000 maintenance costs will be met by the County internal maintenance budget ($16,000) matched to $16,000 of TRPA Mitigation funds (Table 8). Douglas County currently has the financial capability to meet the 2016, 5-year milestone, which coincides with the August 16, 2016 end date of the ILA.

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[1] The updated version of PLRM will require users to enter baseline and expected road condition scores, where baseline conditions scores will be provided by NDEP and expected road condition scores will be selected by Douglas County and monitored through road condition assessments. These will determine the load reduction estimates as a result of improved road operations. Road condition assessments will be performed to verify the assumptions used to achieve the estimated expected condition scores and associated load reductions and Lake Clarity Credits.

2.5.2 Annual Award of Lake Clarity Credits

WQIPs

After registration of the selected catchments, the Crediting Program requires BMP RAM to be performed at least once per year on treatment BMPs. The treatment BMPs associated with WQIPs planned for registration, along with the expected frequency of inspections and maintenance to meet BMP RAM requirements, are detailed in Table 9. BMP RAM inspections will be used to inform the County staff when maintenance is required. The maintenance of the treatment BMPs listed is expected to cost approximately $31,500 per year, while the required yearly costs to maintain the Credits through the Crediting Program are approximately $8,000 per year. The $8,000 administrative task to meet Crediting Program participation (PLRM, BMP RAM, Road RAM and the registration tool) will continue to be performed by the County Stormwater Program Manager, funded through the County's General Fund. To continue to perform annual maintenance, the County will use a match of TRPA O&M Funds ($10,000) and TRPA Mitigation Funds ($6,000) to County Erosion Control funds ($16,000) annually, through the 2021 milestone (Table 8).

Table 8. Distribution of match funds to sustain credits through 2021.

Fund Source	Available	(Withdrawals) 2016	2017	2018	2019	2020	2021	Remaining
DC Match	**$119,000**	$16,000	$16,000	$16,000	$16,000	$16,000	$16,000	**$20,000**
TRPA O&M	**$159,000**	0	$10,000	$10,000	$10,000	$10,000	$10,000	**$109,000**
TRPA Mitigation	**$99,000**	$16,000	$6,000	$6,000	$6,000	$6,000	$6,000	**$40,000**

Table 9. Expected BMP RAM observations and frequencies.

UPC	BMP Name	Treatment BMP Type	Primary Treatment Process	BMP Ram Observation	Frequency Of Observation
LC01	DCDB0011, 12	Dry basin	Infiltration	Infiltration rate, runoff, vegetation cover	Annually in late spring, additional observation if maintenance is required (All)
	DCIB0008	Infiltration basin	Infiltration	Infiltration rate, vegetation cover	
	DCIF0001	Infiltration feature	Infiltration	Runoff, vegetation cover	
	DCTV0006	Treatment vault	Particle capture	Treatment vault capacity	
KUC	DCWB0001	Wet basin	Particle capture, nutrient cycling	Material accumulation, vegetation cover	
	DCTV0052, 46, 53, 45	Treatment vault	Particle capture	Treatment vault capacity	
LR01	DCDB0005, 6	Dry basin	Infiltration	Infiltration rate, material accumulation, vegetation cover	
	DCTV0002, 3	Treatment vault	Particle capture	Treatment vault capacity	
LV01	DCDB0042	Dry basin	Infiltration	Infiltration rate, vegetation cover, material accumulation	
	DCIB0008, 12	Infiltration features	Infiltration	Infiltration rate, runoff, vegetation cover	
	DCTV0029	Treatment vault	Particle capture	Treatment vault capacity	
CR02	DCBF0001	Bed filter	Infiltration	Infiltration rate	

This demonstrates that the County has the internal and match funding available to sustain the infrastructure planned for registration to the next milestone (2021). However, additional funding will be necessary for participation in the Implementers Monitoring Program (IMP, 2013) per the ILA, monitoring costs of which are unknown at this time but will be passed on to the jurisdictions in 2017 when the current SNPLMA funding expires (initial estimate of $250,000 annual overall will cost each jurisdiction approximately $35,000). Increased funding for Lake Tahoe will be requested annually during the County budget process with the goal to increase funding for maintenance of existing infrastructure, construction of new improvements and administration of the Crediting Program. The County intends to secure additional funds using the following mechanisms:

1. TRPA Water Quality Mitigation Funds. The County will continue to use available TRPA Funds up to the amount of match that is acquired.
2. Warrior Way Maintenance. According to the agreements with the grantors, the County was required to make a 20-year guarantee on maintenance of the infrastructure. An amount of $5,000 is transferred from the County's General Fund annually for maintenance. The level of maintenance actually required annually has proven to be significantly less. County staff will apply to the County Commissioners to allow the excess funding set aside for Warrior Way maintenance to also be used for maintenance of other water quality improvement projects at Lake Tahoe. The primary use of the funds will remain for maintenance of the Warrior Way water quality improvement project, in satisfaction of the grantor funding agreement, but the remainder would be allotted to other projects.
3. Douglas County General Funds. It is anticipated that the County will have to go before the County Commission and request an additional $30,000 per year, beginning in 2019, to perform and sustain maintenance levels on infrastructure registered to meet the TMDL according to the Crediting Program. This will account for additional costs will be realized over the next few years as changes are made to the Crediting Program, and other previously unforeseen costs are realized (IMP Monitoring, parcel BMP certification).
4. Private Infrastructure. Any new infrastructure will require an inspection and maintenance log for TRPA BMP certification, and the entity will demonstrate inspections and maintenance. This will be funded by the entity implementing the infrastructure, and tracked by the County for registration of Credits through submittal of a written maintenance agreement, per County Code Section 20. County staff will work with private entities to ensure maintenance actions are performed to ensure BMPs or infrastructure are working effectively.
5. Grant funds are generally not intended to be used for maintenance of infrastructure. It may or may not be possible to request that such funds be allowed to be used for maintenance, as this is a dependent variable in achieving credit.

Road Operations for Water Quality

Estimated annual cost to operate and maintain street sweepers in the registered catchments is roughly $10,800. KGID performs road operations using funds that are collected from KGID residents. KGID road operations and this funding mechanism are expected to continue, not only from a water quality standpoint, but for safety of the residents. County staff will perform the required initial Road RAM protocols, and will likely continue to perform the required annual condition assessment monitoring thereafter.

Parcel BMPs

The costs associated with maintenance of parcel BMPs is the responsibility of the property owner. Although maintenance is required in order to maintain a valid BMP certificate of completion (TRPA code), there is no maintenance tracking or assessment program for single-family residential parcels. For multi-family residential parcels and commercial parcels certified over the last five years, the property owner is required to submit maintenance logs or completed BMP maintenance checklists to TRPA. In the future, it may be necessary to verify that maintenance has been performed on registered private property BMPs, but the costs of verification and responsibilities for performing verification have not been defined or agreed upon. At the current time, methods for evaluating the condition of multi-family and commercial BMPs using field assessments or maintenance logs are under development. TRPA will provide some assistance to County toward initial development and verification of maintenance logs on parcels planned for TMDL credits. However, additional work will likely be required on an annual basis that will possibly require additional funding. Such additional costs cannot be realistically discussed until revisions to the current Lake Clarity Crediting Program Handbook are complete in 2015.

In anticipation of this potential additional cost and labor associated with registration of parcel BMP certifications for TMDL credit, TRPA has applied for and received notice of preliminary award of grant funds to assist the jurisdictions of Washoe and Douglas Counties in meeting TMDL requirements through the parcel BMP program. If awarded, this funding will last for one year, and will be primarily directed toward preparing BMP maintenance logs for multi-family and commercial parcels that have received certification, but for which maintenance logs were not a requirement upon initial certification. These logs will be directed to catchments/UPCs intended for registration.

2.6 BARRIERS/CONSTRAINTS

There are significant time and monetary costs associated with the implementation of actions necessary to meet the load reduction milestones specified in the Lake Tahoe TMDL. As detailed in the Lake Tahoe TMDL Synthesis of Findings (Lahontan and NDEP, 2014), the need for improvement in the integration and alignment of the Stormwater Tools is a priority, as well as the need to reduce the administrative costs. Additional costs will be incurred by jurisdictions due to refinement and quality assurance of re-modeled catchments slated for registration using the revised PLRM. Regulators and jurisdictions must be aware of these costs and time constraints as management strategies and policies are adjusted.

The primary barriers or constraints to the County to meet the 2016 load reduction milestone, as well as all future load reduction milestones, are those of availability of funding, uncertainty with respect to registering and maintaining parcel BMP credit awards and road operations, and the changes that the Stormwater Tools revisions will have on Crediting Program implementation. The costs herein are draft estimates; County staff will maintain records of time spent on performing these duties and the maintenance costs and frequency of such maintenance. This will allow for a more accurate future evaluation of costs toward TMDL implementation and finance planning.

The total estimated cost spent on improvements to meet the first load reduction goal through water quality improvement projects, advanced road operations and parcel BMP implementation is over $9 million. An additional $57,500 annually is required to participate in the Crediting Program through inspections and maintenance of the infrastructure to maintain credit award to meet the first milestone. By the time the 2021 milestone approaches, the load reduction will double (from 8,300 lbs to 17,400 lbs), therefore the

expected levels of project implementation, inspections, maintenance and Crediting Program participation will double. This assumes that the County will not be implementing additional infrastructure – that projects intended for registration for the next milestone will be funded by private entities or are already in-the-ground, as is currently anticipated. If that is not the case, the County must pursue additional funding (grant, in-kind match, etc.) to implement additional projects for registration in order to meet the future load reduction milestones. This scalar increase of implementation, inspections, operations and maintenance will similarly occur for the 2026 milestone, where costs will effectively triple from the 2016 milestone, and implementation of additional water quality improvement projects may be necessary and further attempts will be made to secure additional funds.

The increased uncertainty in use of the Stormwater Tools and the adaptive management process being used to regulate the TMDL has become more apparent to the jurisdictions. Potential changes in the baseline road conditions and changes being proposed for parcel BMP implementation indicate Douglas County will be eligible for significantly fewer credits than anticipated in this SLRP and prior assumptions made as the TMDL was developing. This SLRP was prepared under the Crediting Program (NDEP and LRWQCB, 2011), and abides by numerous assumptions based on this version. Changes proposed to the Crediting Program may change the County's ability to meet the TMDL, to a great extent, as the County was going to rely on registering additional parcel BMPs and improved road operations for credit under the SLRP modeling conducted 2012-2014.

Until a few years of following the Crediting Program and registering catchments are conducted, the true costs of TMDL implementation are unknown. As stated, County staff will maintain records of time spent on performing these duties and the maintenance costs and frequency of such maintenance. BMP RAM annual inspections will determine if full-scale maintenance will be required annually. If minimal maintenance is required annually, available or acquired funding may instead last longer.

3.0 PRELIMINARY APPROACH TO ACHIEVE FUTURE MILESTONES

The County intends to use a blend of load reduction actions (WQIPs, parcel BMPs, road operations) to meet future milestones. However, specific priorities and approaches to achieve the required load reductions cannot be defined at this time given the ongoing and numerous changes to the programs and tools supporting the Lake Tahoe TMDL (Stormwater Tools, Lake Tahoe TMDL Management System, and Crediting Program). The changes will ultimately affect baseline load estimates, as well as Credit or load reduction calculations. Until the Lake Tahoe jurisdictions have access to the revised tools and understand the final administrative changes that will accompany this adaptively managed TMDL Management System, there is too much uncertainty to make any detailed, long-term selection of approaches. However, as new projects are added on as the new milestone approaches (2021), there will be additional costs of inspections, maintenance and Crediting Program participation as discussed.

The County will continue to apply for grant funds, use funds from the TRPA Water Quality Mitigation and Operations and Maintenance accounts, and from interest earned on those accounts. In addition, the County can request General Funds to maintain the infrastructure according to the results of inspections. There is approximately $200,000 in the Douglas County's TRPA Air Quality Mitigation account; if the County determines that a significant load reduction can be achieved through road operations, it will partner with its Lake Tahoe agencies (GIDs) to purchase an advanced sweeper for use on County and GID roads at the Lake.

As summarized in Section 2, the County is in a good position to reach the 2016 load reduction milestone. It is expected that if progress in all planned courses of action continues over the next decade, and assuming sufficient funding is available, the County should also readily achieve the 2021 milestone. To the extent that grant funds and TRPA mitigation funds are available, the County plans to continue implementation of WQIPs to reduce stormwater loads generated and delivered to Lake Tahoe. In addition, parcel BMP implementation will continue to be encouraged, especially on multi-family or commercial properties. Large-scale projects such as the Edgewood Lodge and Golf Course Improvement Project and the Burke Creek Restoration Project will likely form the cornerstone of the County's approach to achieve the 2021 milestone. The Road Operations Pilot Program will also be instrumental in determining if the County can garner more credits from improved road operations within its jurisdiction.

Water quality improvement projects in Douglas County at Lake Tahoe have been primarily funded by U.S. Forest Service Erosion Control Grants authorized under the Lake Tahoe Restoration Act and Nevada Division of State Land Grants from two Nevada Tahoe bond acts. Grant funding to continue this work has decreased significantly since the EPA approval of the Lake Tahoe TMDL. Existing U.S. Forest Service funding under the Lake Tahoe Restoration Act is fully allocated, and there is no estimate of if or when the Act will be reauthorized. Much of the Nevada Tahoe Bond funds have also been allocated, and similarly there is no estimate of when additional bonds will be sold.

The County is in a unique situation in that is has the lowest baseline pollutant load in the Tahoe Basin among the stormwater jurisdictions, but because of that lower load it may be successively harder to reach future load reduction goals. The highest load producing land uses are roads and commercial areas, followed by multi-family residential areas, whereas the predominant land use in the County that of is single-family residential homes. Greater load reductions will be attained by performing actions in catchments with higher loads, such as commercial and multi-family, and the majority of focus will be placed in these areas to meet future load reduction milestones. The County will need to continue to rely on grant funds, private party infrastructure improvements, and TRPA mitigation funds to help achieve the required load reductions.

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APPENDIX A

Interlocal Agreement to Implement the Lake Tahoe TMDL
Correspondence from NDEP re ILA extension
Correspondence from NDEP re SLRP extension

Doc Number: **0830008**

09/04/2013 09:11 AM
OFFICIAL RECORDS
Requested By:
DC/COMMUNITY DEVELOPMENT

DOUGLAS COUNTY RECORDERS
Karen Ellison - Recorder

Page: 1 Of 15 Fee: $ 0.00
Bk: 0913 Pg: 378

Deputy ar

Assessor's Parcel Number: N/A

Date: SEPTEMBER 3, 2013

Recording Requested By:

Name: JEANE COX, COMMUNITY DEVELOPMENT

Address:

City/State/Zip:

Real Property Transfer Tax: $ N/A

INTERLOCAL AGREEMENT #2013.203

(Title of Document)

COPY

This page added to provide additional information required by NRS 111.312 Sections 1-2 (Additional recording fee applies)

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APPROVED AUGUST 15, 2013 ITEM #4
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DEPUTY

INTERLOCAL AGREEMENT
TO IMPLEMENT THE
LAKE TAHOE TOTAL MAXIMUM DAILY LOAD

WHEREAS, as one of the rare large alpine deepwater lakes in the world with unique transparency, color and clarity, Lake Tahoe is designated a Water of Extraordinary Aesthetic or Ecologic Value; and

WHEREAS, degradation of Lake Tahoe's water quality threatens its ecological functions and its value as an outdoor recreation resource, international tourism attraction, and economic asset; and

WHEREAS, stormwater runoff from urban land uses is attributed to be the largest source of pollutant loads that impairs Lake Tahoe water quality and the management and control of storm water runoff provides the principal opportunity to control these pollutants; and

WHEREAS, to restore Lake Tahoe's water quality and clarity to acceptable levels, the United States Environmental Protection Agency (USEPA) approved the Lake Tahoe Total Maximum Daily Load (TMDL). Pursuant to NRS 445A.580, the Lake Tahoe TMDL is a component of the planning process established for impaired water bodies in Nevada, which the Parties believe may be more effectively achieved through the cooperative implementation of water quality improvement actions as opposed to a regulatory permit; and

WHEREAS, the Parties are public agencies as defined in NRS 277.100(1)(a); and

WHEREAS, NRS 277.110(2) provides that any two or more public agencies may enter into agreements with one another for joint or cooperative action under the provisions of NRS 277.080 to 277.170, inclusive; and

WHEREAS, the Parties have agreed to work together in good faith using a collaborative agreement approach to design implementation plans and invest in water quality improvement actions to implement the TMDL on a feasible schedule.

NOW, THEREFORE, the Parties hereby execute and abide by the terms and conditions contained within this Interlocal Agreement (Agreement).

BK : 0913
PG : 379
9/4/2013
0830008 Page 2 of 15
COPY

I. PARTIES AND ROLES

1. The *Parties* to this Agreement are Douglas County (County) and the Nevada Division of Environmental Protection (NDEP). Herein, these entities in sum shall be collectively referred to as the *Parties*. Any singular entity may be referred to as *Party*. The term *Urban Jurisdictions* refers collectively to the three implementing entities with which NDEP has established individual agreements: Washoe County, Douglas County and the Nevada Department of Transportation (NDOT).

2. The County will serve as the lead entity for all undertakings related to the planning, execution and coordination of implementation, tracking and reporting of urban load reduction actions within its jurisdiction. The County will communicate, coordinate and cooperate with public and private entities, including other Urban Jurisdictions, in cases where joint management actions are desirable or beneficial. It may be necessary to establish formal agreements with applicable participatory public and private entities to achieve the intended purposes of this Agreement. At the County's request, NDEP will actively participate in the coordination and establishment of such agreements.

3. In lieu of issuing a regulatory permit to achieve the goals established for the Lake Tahoe TMDL, NDEP will oversee implementation of the TMDL within the State of Nevada via this Agreement while it remains in effect. NDEP will develop and adaptively manage in a transparent and inclusive manner, programs, policies and protocols to track, report, evaluate and ensure incremental progress towards achieving the goals established by the TMDL.

II. BACKGROUND

1. The Federal Clean Water Act requires states to adopt standards to protect beneficial uses designated for waterbodies and to monitor and assess these waters for impairment. Assessment of Lake Tahoe monitoring data prompted its listing on Nevada's List of Impaired Waterbodies for non-attainment of the clarity standard and impairment of the Water of Extraordinary Aesthetic or Ecologic Value beneficial use designation.

2. Non-attainment of water quality standards requires the development of restoration plans called Total Maximum Daily Loads under the federal Clean Water Act. The Nevada Division of Environmental Protection (NDEP) collaborated with the California Lahontan Regional Water Board (Lahontan) for more than a decade to develop the Lake Tahoe TMDL to address Lake Tahoe's degraded clarity. The USEPA approved NDEP's TMDL on August 16, 2011.

3. The overarching goal of the TMDL is to return Lake Tahoe to its historic annual average deepwater clarity of 97.4 feet (Numeric Target). An interim "Clarity Challenge" target of 80 feet annual average clarity was also established. Achieving this interim target will indicate reversal of the historic declining clarity trend.

4. The TMDL identifies fine sediment particles (FSP), total phosphorus (TP) and total nitrogen (TN) as the pollutants of concern for deepwater clarity. Each controls the distance that light is able to penetrate into the water column. However, the light scattering effect of FSP less than sixteen micrometers in diameter (<16 μm) was determined to exhibit a greater influence on clarity.

5. The TMDL analysis indicates that achieving the TMDL goal is possible with substantial pollutant load reductions from the urban stormwater source category. This stems from the findings that stormwater runoff from urban land uses is the largest loading source of FSP and phosphorus to the Lake and also the greatest opportunity to reduce loadings of these pollutants. Broader application of conventional urban stormwater treatment will be beneficial; however the TMDL concludes that implementation of innovative and advanced controls are necessary in order to meet the Clarity Challenge. Examples include: alternatives to roadway abrasives applications, advanced roadway sweeping practices and equipment, and enhanced stormwater treatment using biological or chemical processes.

6. The TMDL establishes five-year pollutant load reduction milestones that are anticipated to achieve the Clarity Challenge within 20 years and the Numeric Target within 65 years. The milestone schedule for the urban stormwater source category indicated in Table 1 is referenced against the date of TMDL approval, August 16, 2011 and furthermore assumes that global climate change, catastrophic events and/or funding constraints will not adversely affect progress. The Clarity Challenge is represented by the 15 year load reduction milestone, followed by a 5 year monitoring and assessment period.

Table 1. Pollutant Load Reduction Milestone Schedule for the Urban Stormwater Source (see #4 above for pollutant acronym definition).

Pollutant	Five-Year Milestone Load Reduction (Percentage from Jurisdictional Baseline Values)												
	5 yr	10 yr	15 yr	20 yr	25 yr	30 yr	35 yr	40 yr	45 yr	50 yr	55 yr	60 yr	65 yr
FSP	10%	21%	34%	38%	41%	45%	48%	52%	55%	59%	62%	66%	71%
TP	7%	14%	21%	23%	26%	28%	31%	33%	36%	38%	41%	44%	46%
TN	8%	14%	19%	22%	25%	28%	31%	34%	37%	40%	43%	46%	50%

7. The Lake Clarity Crediting Program (LCCP) was developed jointly by NDEP and Lahontan to define standardized protocols for the comprehensive and consistent quantification, tracking and reporting of load reduction actions taken by local governments and state transportation agencies. The program incentivizes the entities to implement priority controls to improve water quality and improves accountability for the expenditures of public funds on such actions.

III. PURPOSE

The purpose of entering into this Agreement is to acknowledge and establish a commitment by each signatory Party to apply their collective efforts to restore and protect Lake Tahoe's clarity. In identifying the actions and responsibilities of each Party, this Agreement provides the framework for the successful implementation of the Lake Tahoe TMDL, and the attainment of the goals set forth therein, on a schedule which is feasible. Inherent in the use of an agreement approach is the acknowledgement that implementation success is, in part, dependent upon the establishment of a process which cultivates a collaborative and cooperative venture between the implementing and regulating entities.

This Agreement outlines goals, commitments and actions which the Parties agree to pursue in good faith. The Parties understand and agree that, based on all relevant facts and circumstances, if the cooperative agreement approach on which this Agreement is based is unsuccessful in achieving the intended outcomes, NDEP may at any time re-evaluate whether a more regulatory approach to achieving TMDL implementation is warranted.

IV. COMMITMENTS & ACTIONS

1. Stormwater Load Reduction Plan

   A. The County will prepare a Stormwater Load Reduction Plan (SLRP) that specifies the actions it anticipates to implement in order to meet the 2016 five-year FSP milestone and, if jointly determined feasible by the Parties, the ten and fifteen year milestones to meet the Clarity Challenge (Table 1). The SLRP will consist of a technical report providing the following information/analyses:

      i. <u>Baseline Pollutant Load Analysis</u>
      The County will provide an estimate of the pollutant loading from urban land uses that existed within its boundaries as of September 30, 2004 (or May 1, 2004 if the County can demonstrate that no substantial runoff occurred between these dates). The baseline analysis will be developed in accordance with specifications outlined in the Lake Tahoe TMDL and Lake Clarity Crediting Program (Section IV.2) Handbook.

      ii. <u>Existing Pollutant Load Analysis</u>
      The County will provide a list and map of catchment areas in which it has implemented pollutant controls between the Jurisdictional Baseline Pollutant Load Analysis and December 31, 2012 and which it intends to register pursuant to the Lake Clarity Crediting Program (Section IV.2). A description and timeline of the pollutant controls implemented along with the estimated pollutant load reduction potential will be provided for each catchment area.

iii. Future Load Reduction Analysis
The County will provide a prioritized list and map of catchment areas in which it plans to implement pollutant controls between January 1, 2013 and September 30, 2016 in order to meet the annual credit targets contained in Table 2 (Section IV.2.B). A description and proposed timeline of the pollutant controls to be implemented along with the estimated pollutant load reduction potential associated with the implementation of the controls will be provided for each catchment area.

If jointly determined feasible by the Parties, the County will provide a preliminary implementation approach for meeting the Clarity Challenge. The approach will specify management strategies that are anticipated to achieve the ten and fifteen year milestones contained in Table 1. A description and proposed timeframe along with the estimated pollutant load reduction potential associated with implementation of the management strategies will be provided.

iv. Budget
The County will provide an estimate of the total and annualized expenditures necessary to carry out the SLRP and administer, operate and maintain the jurisdiction's stormwater management program.

v. Finance Plan
The County will identify, to the extent reasonably possible, any anticipated or feasible funding sources and/or mechanisms to implement the County's SLRP.

vi. Barriers/Constraints
The County will identify any actual and/or potential constraints to implementing pollutant controls identified in the SLRP as well as potential mechanisms to overcome the identified issues.

B. The County shall submit its SLRP to NDEP for approval by August 16, 2014. NDEP will approve or deny approval within 30 days of receipt of the SLRP. If denied, NDEP will provide a list of items to be resolved in order for the SLRP to be approved. The County will have 45 days to address comments and re-submit the SLRP for approval.

C. For any reason after initial SLRP approval and prior to submittal of the first Annual Stormwater Report (Section IV.4), the County may submit a written request to NDEP to amend its SLRP. The request must include a justification of the need and purpose for the modification and a discussion of whether the amendment will affect associated pollutant loading estimates, implementation schedule, budget or finance plan.

D. The County will implement, to the extent feasible and financial resources are available, the controls and activities identified in its SLRP according to the indicated schedule. The County will oversee and administer all activities including planning and design, construction, operations and maintenance and

coordination of financing for all pollutant controls to be implemented within its jurisdiction. The County shall administer inspections, operations and maintenance activities to ensure that its implemented pollutant controls function as designed to enhance and protect downstream water quality.

E. The Parties acknowledge that implementation progress is contingent upon available funding. The County, as an implementing entity, is expected to pursue both self-funded and external funding sources to implement its SLRP. NDEP will support the County towards this end, and will furthermore work with the County to seek and implement feasible solutions if funding is identified as a constraint to achieving load reduction goals.

2. Lake Clarity Crediting Program

A. The County will participate in the Lake Clarity Crediting Program (LCCP or Program). The LCCP standardizes the tools and protocols to consistently quantify, track and report load reduction progress, and facilitates demonstration of accountability for public expenditures on load reduction actions. NDEP will administer the LCCP in accordance with the Program Handbook. Credits will be awarded to the County for the ongoing implementation and registration of controls, including operations and maintenance practices, which effectively result in reductions of pollutant loads to Lake Tahoe.

B. County implementation progress will be measured, tracked and assessed in accordance with the protocols contained in the Program Handbook. Annual credit targets offer a means by which to assess and demonstrate incremental progress toward achieving the 2016 five-year milestone. Table 2 displays the cumulative annual credit targets established for the County. Annual credit targets were developed according to Equation 1. The *Annual Load Reduction Percentage* factor varies by year and is calculated cumulatively as 2% per year. Table 2 combines 2012 and 2013 since this Agreement will have been executed in 2013.

Table 2. Annual credit targets established for Douglas County with cumulative load reduction percentage values shown in parenthesis.

Jurisdiction	Baseline Load (E+16 Fine Sediment Particles)	Cumulative Credit Targets (refer to Eq 1)			
		2012 (2%) 2013 (4%)	2014 (6%)	2015 (8%)	2016 (10%)
Douglas County	413	17	25	33	41

$$\text{Cumulative Annual Credit Target} = \frac{\text{(Annual Load Reduction Percentage)} \times \text{(Urban Jurisdiction Baseline FSP Load)}}{\text{1.0E+16 Fine Sediment Particles} < 16\ \mu\text{m}} \quad \text{(Eq 1)}$$

C. In accordance with the Program Handbook, the County is eligible to receive the full credit potential for their registered controls when actual conditions, as determined by condition assessment inspections (Section IV.3.A) are equal or better than the expected, or modeled, conditions. Only partial credit will be awarded when the actual conditions are consistently lower than the expected conditions.

D. NDEP will manage the LCCP jointly with Lahontan through a transparent and inclusive program improvement process as described in the Program Handbook. The County may submit recommendations for programmatic adjustments/improvements, which will be considered and carried out as needed and/or if resources allow.

3. Monitoring & Inspection

A. Condition Assessment Monitoring

i. The Parties acknowledge that condition assessments are imperative as the LCCP involves comparing actual field conditions, as determined by field inspection, against the expected, or modeled, conditions to determine the appropriate credit award.

ii. The County will implement an inspection program to assess condition of roadways and functionality of stormwater treatment best management practices (SWT BMPs).

iii. The County may retain a qualified third party to conduct the condition assessment observations on its behalf.

iv. NDEP will administer a validation inspection program in accordance with the Program Handbook.

v. The Best Management Practices Maintenance Rapid Assessment Methodology (BMP RAM) and the Road Rapid Assessment Methodology (Road RAM) are the approved methods to assess, score and document the actual condition of SWT BMPs and roadways, respectively. An alternative assessment methodology may be used with approval from NDEP. In order to receive approval, the County must submit a written request including a detailed proposal and description of the alternative methodology. NDEP may approve the proposal if criteria contained in the LCCP Handbook and other considerations are satisfied.

vi. The County is encouraged to develop and employ methods to assess the condition or performance of other key or essential hydrologic or pollutant source controls for which assessment methods have not been established [for example: slope stabilization techniques or other structural BMPs not addressed by the BMP RAM].

B. Stormwater Monitoring

i. The Parties acknowledge that stormwater monitoring at the catchment and BMP scales is important for the following reasons:

a. Verification that the County's pollutant load reduction actions are effective and are resulting in measurable pollutant load reductions at the catchment scale;
b. Confirmation and validation that appropriate credit values are awarded for the implementation of pollutant controls;

c. Evaluation of cost-effectiveness of pollutant controls;

d. Optimization of BMP installation and maintenance practices to maximize water quality benefit;

e. Calibration, validation or improvement of water quality models.

ii. Subject to budgetary authority, available funding and staffing resources, the County will implement a stormwater monitoring program to meet the stated needs above. Nevada and California Urban Jurisdictions have collaboratively initiated development and implementation of an Implementers Monitoring Program (IMP). The United States Forest Service (USFS) has earmarked $750,000 of Southern Nevada Public Lands Management Act (SNPLMA) funds to implement the approved monitoring plan. Lahontan and NDEP maintain approval authority over the monitoring plan. Match totaling $850,000 will be provided by the Nevada and California Urban Jurisdictions. IMP monitoring activities will commence in Water Year (WY) 2014 (October 1, 2013 – September 30, 2014) and will encompass three years of water quality monitoring activities associated with Water Years 2014-2016. Implementation of the approved IMP shall fulfill, without any or additional financial contributions, the County's Stormwater Monitoring commitments for the term of this Agreement.

iii. The IMP will be administered by the Tahoe Resource Conservation District (TRCD). On behalf of the County, TRCD will develop and submit an annual electronic report to NDEP for approval that presents, summarizes and interprets the results of the data collected during the previous water year (October 1 – September 30). The first report is due on March 15, 2015. NDEP will approve or deny approval within 30 days of receipt of the monitoring report. If denied, NDEP will provide a list of items to be resolved in order for the monitoring report to be approved. On behalf of the County, TRCD will have 45 days to address comments and re-submit the monitoring report.

iv. The Parties acknowledge that implementation of the IMP is contingent upon available funding and budget allocations as determined by the governing boards of the respective Urban Jurisdictions. Should funding or budget allocations be insufficient or become unavailable to dedicate

toward implementation of the approved IMP, the monitoring plan will be re-evaluated and, if necessary, be revised such that the scope of the monitoring effort shall be reduced to the level of the available funding. The scope of the stormwater monitoring effort will furthermore be re-evaluated and revised as necessary for the next or any subsequent terms of this Agreement taking into consideration the budgetary authority, available funding and staffing resources of the County.

4. Annual Stormwater Report

A. By March 15, 2015 and then each year after, the County will submit to NDEP for approval an annual report summarizing the load reduction activities undertaken during the previous water year (October 1-September 30). The initial report will summarize and analyze activities undertaken in WY 2014 (10/1/13 – 9/30/14).

B. The report will include the following components:

i. List of catchments registered with credit awards;

ii. Assessment of progress toward credit targets and the five year milestone;

iii. If progress is insufficient to meet credit targets or five year milestone:

a. Provide explanation of causes or conditions for the shortfall;

b. Assess whether target/milestone attainment is possible and describe the proposed actions to do so;

iv. Actions planned for the next water year;

v. Necessary adjustments to the County's SLRP.

C. NDEP will approve or deny approval within 30 days of receipt of the County's Annual Stormwater Report. If denied, NDEP will provide a list of items to be resolved in order for the report to be approved. The County will have 45 days to address comments and re-submit the report for approval.

V. Term & Update

The term of this Agreement shall terminate on August 16, 2016, which is five years from the date of TMDL approval. As the implementation timeframe to achieve the TMDL numeric target is 65 years, this Agreement may be reviewed and, if necessary, revised and approved by the Parties before or upon the termination date above. If the Parties fail to approve and execute a renewal of this Agreement, with or without any amendments prior to the termination date, then the Parties agree to use best efforts to comply with the terms and conditions of this Agreement until a subsequent agreement is approved and executed by the Parties. If the Parties fail to approve and execute a

subsequent agreement within 6 months of the termination date, NDEP may pursue the issuance of a storm water permit.

VI. Modification

At any point during this term, the Agreement may be modified with the consent in writing of all signatory Parties. Modifications to the Agreement will not result in a change to or extension of the initial term (Section V) of this Agreement.

VII. Evaluation & Contingency

1. NDEP will evaluate the performance of the County and make a determination of whether the commitments set forth in this Agreement are in good faith being met, or whether there exist other causes preventing their performance. Factors that will be considered in the evaluation of performance and/or the need to act on a contingency include but are not limited to: attainment of annual and five-year credit targets; the degree to which a target is not met; the County's good faith attempt to perform any commitments; economic, budget allocations, feasibility or availability of funding sources or other impediments; and past performance.

2. If NDEP determines the County has failed to perform its commitments under this Agreement and such failed performance has not been caused by the regulatory action of NDEP itself or by the actions or inactions of another party, NDEP will consider and evaluate the need to implement a more regulatory approach, including but not limited to issuance of a permit, but in no event will such failed performance result in liability, loss or penalty other than NDEP's regulation through issuance of a stormwater permit.

3. If a lack of available funding or insufficient budget allocations are identified as a primary factor limiting the County's performance or causing the failure of performance and the attainment of credit targets or any other commitment under this Agreement, NDEP may consider extending the implementation timeframe through modification to the load reduction milestone schedule.

4. In consultation with the County, NDEP will annually evaluate the effectiveness of this Agreement. If the Agreement is determined to be ineffective at achieving its intended purpose, NDEP will investigate the reasons for its ineffectiveness and will develop recommendations for subsequent revisions to this Agreement.

VIII. Termination

If any Party fails without adequate cause, excuse or justification to abide by any material term of this Agreement, the non-violating Party may give the violating Party a 30 day written notice to cure such failure. If such failure has not been cured during

such opportunity to cure period, such failure shall then constitute a breach of this Agreement. If the County is the breaching party, NDEP may then give notice of termination of this Agreement and pursue TMDL regulation and implementation through issuance of a stormwater permit and any other related regulatory powers available.

IX. Funding Out

Notwithstanding any other provision herein, as required by NRS 244.320 and NRS 354.626, the Parties acknowledge that the participation of the County in this Agreement is contingent upon the appropriation of public funds to support the commitments and activities described herein and that the Agreement will terminate if the appropriation of funds does not occur. In this event, immediate written notice of termination will be given and this Agreement shall terminate without penalty, expense or sanction to the County asserting the failure to appropriate public funds necessary to perform under this Agreement. If the Agreement terminates because of the County's failure to appropriate funds or its failure to obtain available funding resources necessary to perform the obligations under this Agreement, NDEP may then pursue the issuance of a stormwater permit.

X. Dispute Resolution

1. The Parties agree to work together in good faith to address and resolve any issues or dispute.

2. The LCCP Handbook contains the communication protocols to resolve disputes that may arise between NDEP and the County during the processes to: (1) develop Catchment Credit Schedules (CCSs), and (2) award credits based on Annual Reports. A form is included by which questions and issues are identified and the manner by which they were addressed and resolved documented.

3. If an issue arises that is not related to the processes described in the LCCP Handbook, it will be handled by progressive elevation within the respective Parties' management.

4. The NDEP Administrator is the final decision making authority for any dispute that is elevated to that level.

XI. Severability

If any provision of this Agreement or any provision of any document incorporated by reference shall be held invalid, such invalidity shall not affect the other provisions of this Agreement which can be given effect without the invalid provision, if such remainder conforms to the requirements of applicable law and the fundamental

purpose of the Agreement, and to that end the provisions of this Agreement are declared to be severable.

XII. Reservation of Rights

1. Nothing in this Agreement is intended to restrict the authority of any Party to act as provided by law, statute or regulation.

2. This Agreement is not intended to, and does not create any right, benefit or trust responsibility by any party against the Parties to this Agreement, their respective agencies, officers, or any person.

3. This Agreement is an internal agreement between the Parties and does not confer any right or benefit on any third person or party, private or public.

XIII. Limitations

Nothing in this Agreement shall be construed to require actions by the Parties which are inconsistent with local, State, or Federal laws and regulations or any court order.

XIV. Execution In Counterparts

The Parties may execute this Agreement in counterparts, each of which is deemed an original and all of which constitute only one agreement.

XV. All Writings Contained Herein

This Agreement contains all the terms and conditions agreed upon by the Parties. No other understandings, oral or otherwise, regarding the subject matter of the Agreement shall be deemed to exist or to bind the Parties hereto.

XVI. Signatories

Each undersigned representative to this Agreement certifies that he or she is fully authorized by the Party whom he or she represents to enter into the terms and conditions of this Agreement and to execute and legally bind such Party to this document.

COPY

DOUGLAS COUNTY REPRESENTATIVE

X Greg Lynn, Chair Douglas County Commission
Name (Printed)

X _____ X August 15, 2013
Signature Date

NEVADA DIVISION OF ENVIRONMENTAL PROTECTION REPRESENTATIVE

X Colleen Cripps, PhD, Administrator
Name (Printed)

X _____ X 8/16/13
Signature Date

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Douglas County State of Nevada

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By [illegible] Deputy

STATE OF NEVADA
Department of Conservation & Natural Resources
DIVISION OF ENVIRONMENTAL PROTECTION
Brian Sandoval, Governor
Leo M. Drozdoff, P.E., Director
Colleen Cripps, Ph.D., Administrator

October 30, 2014

Mr. Erik Nilssen, P.E.
Douglas County Engineer
P.O. Box 218
Minden, NV 89423

SUBJECT: Stormwater Load Reduction Plan Extension Request

Dear Mr. Nilssen,

This letter is to confirm receipt of your request for a one month extension to submit Douglas County's Stormwater Load Reduction Plan (SLRP). Your request is approved and the submittal date is hereby extended to November 30, 2014. We appreciate your diligent efforts to address comments received on the draft document and to maximize the value of the SLRP.

Sincerely,

Dave Gaskin, P.E.,
Deputy Director

cc: Kathy Sertic, NDEP
Jason Kuchnicki, NDEP

ndep
NEVADA DIVISION OF ENVIRONMENTAL PROTECTION
protecting the future for generations

STATE OF NEVADA
Department of Conservation & Natural Resources
DIVISION OF ENVIRONMENTAL PROTECTION

Brian Sandoval, Governor
Leo M. Drozdoff, P.E., Director
Colleen Cripps, Ph.D., Administrator

November 25, 2013

Mr. Erik Nilssen
Douglas County Engineer
P.O. Box 218
Minden, NV 89423

Ms. Kristine Klein
Senior Licensed Engineer
Washoe County Engineering Division
P.O. Box 11130
Reno, NV 89520

Mr. Matt Nussbaumer
Principal Hydraulic Engineer
Nevada Department of Transportation
1263 South Stewart Street
Carson City, NV 89712

RE: CLARIFICATION OF & PARTIAL DELAY IN IMPLEMENTATION OF INTERLOCAL AGREEMENT COMMITMENTS

Dear Nevada TMDL Implementers:

In August 2013, Douglas County, Washoe County and the Nevada Department of Transportation, hereafter collectively referred to as Urban Jurisdictions, entered into independent Interlocal Agreements (ILAs) with the Nevada Division of Environmental Protection (NDEP) to implement the Lake Tahoe Total Maximum Daily Load (TMDL). Execution of the ILAs was immediate upon signature by the respective Parties. Under Section IV.2, Urban Jurisdictions are committed to participate in the Lake Clarity Crediting Program and document achievement of annual credit targets contained in Table 2 of the respective agreements. Urban Jurisdictions are furthermore committed to implement an inspection program (Section IV.3.A) to assess the condition of roadways and stormwater treatment best management practices (SWT BMPs).

In June 2013, an initial stakeholder meeting was held as part of the Lake Clarity Crediting Program (Crediting Program) Stormwater Tools Improvement Project (Improvement Project) to gain input on priority improvements to be accomplished. Implementers highlighted that the Crediting Program registration process was very difficult and inefficient due to the limited functionality of and instabilities associated with the existing suite of tools. Implementers asked if it made sense to delay Crediting Program implementation until after operational improvements to the stormwater tools have been carried out.

Given these circumstances, NDEP agrees that it does make sense to delay implementation of the Crediting Program until after the suite of stormwater tools have been updated. Rather than registering controls to achieve 2013 credit targets, NDEP authorizes Urban Jurisdictions to delay Crediting Program registration until 2015 at which time you will

be obligated to achieve respective 2015 Credit Targets. Implementation of the inspection program to assess condition of roadways and SWT BMPs is subsequently also delayed until controls are registered through the Crediting Program.

Note that the provision to implement a stormwater monitoring program (Section IV.3.B) remains unaffected by this act. Furthermore, the provision to submit an Annual Stormwater Report (Section IV.4) remains intact; however the contents of the initial and secondary reports are modified as follows. Rather than provide a list of registered catchments, Urban Jurisdictions should provide a list of catchments to be registered in 2015 to achieve the associated credit target. Rather than quantitative assessment of progress toward credit targets and the five year milestone, progress assessment should feature a qualitative summary of activities and accomplishments to date. In 2016, Annual Stormwater Report contents will revert to the components described in the ILAs.

During the interim while implementation of the Crediting Program is delayed, NDEP advises Urban Jurisdictions to take the following actions necessary to register controls and perform condition assessments of SWT BMPs:

1. Prioritize actions and catchments to be registered in 2015;
2. Establish benchmark and threshold values for all key and essential SWT BMPs identified in all catchments to be registered in 2015;
3. Assess condition of these SWT BMPs;
4. Perform any maintenance necessary to get these SWT BMPs in an appropriately functioning condition.

Please note that the above actions represent the minimal actions to facilitate Urban Jurisdiction's registration of controls in 2015. Urban Jurisdictions that have implemented controls beyond what is necessary to attain 2015 credit targets are encouraged to take these actions as well for all existing key and essential SWT BMPs that they anticipate registering after 2015.

Finally, as an information item, a number of potential amendments related to Crediting Program protocol have been identified by stakeholders and TMDL Program Managers through the Tools Improvement and TMDL Management System projects. Over the coming year, NDEP will work jointly with the Lahontan Water Board, toward addressing at least the most relevant and pressing issues. The Crediting Program Handbook will be updated to reflect any adjustments in protocol.

As always, NDEP values your participation, input and cooperation. Together, we are already making great strides toward restoring and preserving Lake Tahoe!

Sincerely,

David Gaskin

David Gaskin, P.E.

CC: Kathy Sertic, NDEP
Jason Kuchnicki, NDEP
Karin Staggs, NTCD

APPENDIX B

Project maintenance costs to meet Crediting Program annual requirements

Water Quality Improvement Project	Estimated Annual Maintenance Cost ($/yr)
LC01	$6,900
KUC	$5,700
LR01	$6,400
LV01	$7,800
CR02	$4,700
Total Estimate:	$31,500

Logan Creek GID (LC01)

Key/Essential Assets	Number	Linear Feet	Notes	Unit Cost	Maintenance per year	Cost Estimate
DI/MH	37			$86.27	1	$3,200
Conveyance Pipe		750		$0.19	1	$100
Dry Basins	2		DCDB0011, DCDB0012	$713	0.5	$700
Infiltration Basin	1		DCIB0008	$713	0.5	$400
Infiltration Feature		48	DCIF0001	$3.10	0.33	$0
Treatment Vault	1		DCTV0006	$446	1	$400
Swale		120		$1.95	0.25	$100
General erosion control	1		lump sum	$1,000	1	$1,000
General road shoulder and storm drain maintenance	1		lump sum	$1,000	1	$1,000
					Total:	**$6,900**

Oliver Park GID (KUC/OP01)

Key Assets	Number	Linear Feet	Notes	Unit Cost	Maintenance per year	Cost Estimate
DI/MHs	15			$ 86.27	1	$1,300
Conveyance Pipe		3524		$ 0.19	1	$700
Wet Basin	1		DCWB0001	$1,500	0.5	$800
Treatment Vault	2		DCTV0052, DCTV0046	$446	1	$900
General erosion control	1		lump sum	$1,000	1	$1,000
General road shoulder and storm drain maintenance	1		lump sum	$1,000	1	$1,000
					Total:	**$5,700**

Lakeridge GID (LR01)

Key/Essential Assets	Number	Linear Feet	Notes	Unit Cost	Maintenance	Cost Estimate
DI/MH	26			$86.27	1	$2,200
Conveyance Pipe		3320		$0.19	1	$600
Dry Basins	2		DCDB0005,	$713	0.5	$700
Treatment Vault	2		DCTV0003,	$446	1	$900
General erosion control	1		lump sum	$1,000	1	$1,000
General road shoulder and storm drain maintenance	1		lump sum	$1,000	1	$1,000
					Total:	**$6,400**

Lake Village HOA (LV01)

Key Assets	Number	Linear Feet	Notes	Unit Cost	Maintenance per year	Cost Estimate
DI/MH	36			$ 86.27	1	$3,100
Conveyance Pipe		3758		$ 0.19	1	$700
Dry Basins	1		DCDB0042	$713	0.5	$400
Infiltration Basin	2		DCIB0012,	$713	0.5	$700
Treatment Vault	1		DCTV0029	$446	1	$400
Rock-Lined Conveyance Ditch		1114		$ 1.95	0.25	$500
General erosion control	1		lump sum	$1,000	1	$1,000
General road shoulder and storm drain maintenance	1		lump sum	$1,000	1	$1,000
					Total:	**$7,800**

Cave Rock Estates GID (CR02)

Key/Essential Assets	Number	Linear Feet	Notes	Unit Cost	Maintenance per year	Cost Estimate
DI/MH	15			$86.27	1	$1,300
Trench Drain	2	64		$0.19	1	$0
Bed Filter	1		DCBF0001	$713.38	0.5	$400
Settling Basin	1		DCSB0013	$446.09	0.5	$200
Rock-Lined Conveyance Ditch		908		$1.95	0.25	$400
Swale		749		$1.95	0.25	$400
General erosion control	1		lump sum	$1,000	1	$1,000
General road shoulder and storm drain maintenance	1		lump sum	$1,000	1	$1,000
					Total:	**$4,700**

APPENDIX C

Estimate of costs to participate in the Crediting Program to meet the 2016 milestone

Douglas County	2016 Milestone		Load Reduction (lbs/year)				PLRM		BMP RAM		Road RAM		Parcel BMPs	Registration Tool		INITIAL COSTS				ANNUAL COSTS			
Strategy	**Catchment**	**Registration Opportunities**	Road Operations	PP BMPs	WQIPs	Actions (See *Notes)	Initial Model	Revisions	Initial Hours	Annual Hours	Initial Hours	Annual Hours	Verify BMP Cert status with TRPA	Initial Hours	Re-register	**Initital Crediting Program Hours**	Operations and Maintenance Costs	Crediting Program Cost ($100/hr)	***2016 Milestone Implementation Cost***	**Annual Crediting Program Hours**	Operations and Maintenance Costs (Appendix C)	Crediting Program Cost ($100/hr)	***Annual Cost to Maintain Credits for 2016 Milestone***
TOTALS			**850**	**4,130**	**4,325**											**296**	**$ 31,500**	**$ 29,600**	***$ 61,100***	**152**	**$ 42,300**	**$ 15,200**	***$ 57,500***
PP BMPS	DCA	31% of 31 acres CICU		820		1, 2	6	0	0	0	0	0	12	6	1	*24*	$ -	$ 2,400	***$ 2,400***	13	$ -	$ 1,300	*$ 1,300*
	EWCA	51% of 12 acres CICU		2,100		1, 2	6	0	0	0	0	0	8	6	1	*20*	$ -	$ 2,000	***$ 2,000***	9	$ -	$ 900	*$ 900*
	PW01	100% of 20 acres MFR		420		1, 2	6	0	0	0	0	0	8	6	1	*20*	$ -	$ 2,000	***$ 2,000***	9	$ -	$ 900	*$ 900*
	EWCC	46% of 11 acres CICU		790		1, 2	6	0	0	0		0	12	6	1	*24*	$ -	$ 2,400	***$ 2,400***	13	$ -	$ 1,300	*$ 1,300*
	SUBTOTAL			**4130**			**24**	**0**	**0**	**0**	**0**	**0**	**40**	**24**	**4**	***88***	**$ -**	**$ 8,800**	***$ 8,800***	**44**	**$ -**	**$ 4,400**	***$ 4,400***
WQIPS	LC01	WQIP- DCDB0011, DCDB0012, DCIB0008, DCBF00XX			325	1, 4, 5	8	0	20	16	0	0	0	8	4	*36*	$ 6,900	$ 3,600	***$ 10,500***	20	$ 6,900	$ 2,000	*$ 8,900*
	KUC	DCWB0001, DCTV0052-0054, 46			1,900	1, 4, 5	8	0	12	8	0	0	0	8	4	*28*	$ 5,700	$ 2,800	***$ 8,500***	12	$ 5,700	$ 1,200	*$ 6,900*
	LR01	DCDB0008, DCDB0009,			450	1, 4, 5	8	0	20	12	0	0	2	8	4	*38*	$ 6,400	$ 3,800	***$ 10,200***	18	$ 6,400	$ 1,800	*$ 8,200*
	LV01	DCIB0012			1150	1, 4, 5	8	0	16	8	0	0	4	8	4	*36*	$ 7,800	$ 3,600	***$ 11,400***	16	$ 7,800	$ 1,600	*$ 9,400*
	CR02	DCBF0001			500	1, 4, 5	8	0	8	8	0	0	2	8	4	*26*	$ 4,700	$ 2,600	***$ 7,300***	14	$ 4,700	$ 1,400	*$ 6,100*
	SUBTOTAL		**0**	**0**	**4325**		**40**	**0**	**76**	**52**	**0**	**0**	**8**	**40**	**20**	***164***	**$ 31,500**	**$ 16,400**	***$ 47,900***	**80**	**$ 31,500**	**$ 8,000**	***$ 39,500***
ROAD OPERATIONS	EWCH, BCC	N. Benjamin, Andria Drive	850			1, 3, 6	12	0			24	24	0	8	4	*44*	$ -	$ 4,400	***$ 4,400***	28	$ 10,800	$ 2,800	*$ 13,600*
	SUBTOTAL		**850**	**0**	**0**		**12**	**0**	**0**	**0**	**24**	**24**	**0**	**8**	**4**	***44***	**$ -**	**$ 4,400**	***$ 4,400***	**28**	**$ 10,800**	**$ 2,800**	***$ 13,600***

***NOTES**

1 Re-model in PLRM
2 Verify parcel BMP certification with TRPA
3 Apply Road RAM
4 Perform BMP RAM on treatment infrastructure, assess maintenance required to re-establish performance; set benchmark and threshold values
5 Perform maintenance if necessary to establish WQIP BMP at 'baseline' functioning condition; establish benchmark and thresholds
6 Establish estimated "goal value" for Road Conditions (Score 1-5)

AtkinsRéalis

Karin Peternel
AtkinsRéalis USA Inc.
10509 Professional Circle
Suite 103
Reno, NV 89521

Tel: +1 775 828 1622
Fax: +1 775 581 1687

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