SECTION 4

Washoe County
LOCAL EMERGENCY PLANNING COMMITTEE

Regional Hazardous Materials Emergency Plan

Hazard and Risk Analysis

Approved by LEPC

Section 4: Hazard and Risk Analysis

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HAZARDOUS MATERIALS EMERGENCY PLAN SECTION OVERVIEW

** Request these sections from the Washoe County Emergency Manager*

1 Introduction

1.1 Overview

The following Risk Assessment will examine the risks of a hazardous materials release within the geographical boundaries of Reno, Sparks and Washoe County, Nevada.

This risk assessment can be used by emergency planners, fire services, police departments, medical services, and environmental protection department as they prepare for, respond to, and recover from emergencies involving hazardous materials. The information provided in this overview is applicable to the risk assessments performed in the following areas:

a. Motor Transportation

b. Railroad

c. Pipeline

d. River and Water Ditches

e. Fixed Facilities

It should be understood by all persons, who refer to this section of the plan, that hazard analysis is an ongoing process that provides information to assist the emergency response teams in mitigating a hazardous materials release.

This document in its entirety should be considered as a "living document" and as such needs to be cared for and maintained. Information gathered here conceivably can be outdated by the time it's distributed. Our entire system that we live in is changing on a daily basis and while the principles that contribute to this assessment will remain sound, the numbers will change and so must the preparedness. Therefore, qualified emergency response personnel should NOT use this section without competent review, verification and correction. Nothing in this section shall be determined as an obstacle to the experience, initiative, and ingenuity of the responders in overcoming the complexities that exist under actual emergency conditions.

The three guidelines used in preparation of this report are:

1. **SARA Title III**

   SARA Title III Section 303, also known as the Community Right to Know Act, requested the NRT to publish guidance to assist LEPCs with development and implementation of comprehensive hazardous materials emergency response plans.

2. **NRT-1 National Response Team (NRT) Hazardous Materials Planning Guide**

   A government emergency planning document developed in March 1987 by a panel of 14 federal agencies to give guidance to LEPC hazardous materials planning.

3. **Technical Guidance for Hazard Analysis**

   Emergency planning for Extremely Hazardous Substances published by the USEPA, FEMA, and USDOT in December 1987. This document offers information on “how to” conduct a hazardous analysis.

1.2 Hazard Analysis

Comprehensive planning depends upon a clear understanding of what hazards exist and what risk they pose to personnel, property and the environment. Hazard Analysis is a three step decision-making process used to identify the potential hazards within a community. The three steps include hazard identification, vulnerability analysis, and risk analysis. A brief overview is presented below:

Hazard Identification typically provides specific information on situations that have the potential for causing injury to life or damage to property and the environment due to a hazardous materials spill or release.

Vulnerability Analysis identifies areas in the community that may be affected or exposed, individuals in the community who may be subject to injury or death from certain specific hazardous materials, and what facilities, property or environment may be susceptible to damages should a hazardous materials release occur.

Risk Analysis is an assessment of the probability of an accident and the actual consequences that might occur based on the estimated vulnerable zones. Risk analysis is the judgment of probability and the severity of consequence based on the history of previous incidents, experience and the best available current technological information.

The hazard analysis looks at hazardous materials located in fixed facilities and in transportation corridors. The following description defines the diversity of the hazardous products that move through the Reno, Sparks and Washoe County area.

1. **Transportation Routes** - Highways, railways, and commercial and military aviation routes constitute a major threat because of the multitude of chemicals and hazardous substances transported along them. Interstate 80 and Highway 395, and other main thoroughfares are areas of concern, as is the Union Pacific railroad tracks.
2. **Pipeline** - Several pipelines transect the Reno, Sparks and Washoe County area carrying a wide variety of products for industrial, commercial and residential use. The Kinder Morgan Pipeline Company, possibly the largest of the pipelines, services Washoe County and the Fallon Naval Air Station with petroleum products. The Paiute Pipeline and Tuscarora Pipeline supply high-pressure natural gas for service to the communities and businesses.
3. **Business and Industry** - The manufacturing and light industrial firms within the Reno, Sparks and Washoe County area offer the potential for hazardous materials incidents. These facilities use and/or store products that may be harmful to the population living and working in the area and to the sensitive ecosystems of the region.
4. **Agriculture** - Accidental releases of pesticides, fertilizers, and other agricultural chemicals may be harmful to human health and the environment. The majority of agricultural industry consists of ranching and farming operations located throughout the Reno, Sparks and Washoe County area.
5. **Illegitimate Business** - Illegitimate business, such as clandestine drug laboratories, are a significant threat to human health, property, and the environment. In many instances, the residue is dumped in remote areas of the county or along the side of

the road, posing a serious health threat to the unsuspecting person who stumbles across it.

6. **Hazardous Waste** - Hazardous waste (e.g., used motor oil, solvents, or paint) is occasionally dumped in remote areas of the county or along roadways. Like drug lab residue, illegally dumped hazardous waste poses a threat to human health, property, and the environment.

7. **Radioactive Materials** - Interstate 80, Highway 395, other main thoroughfares and the railroads are authorized routes for the shipment of radioactive materials.

8. **Acts of Terrorism** - Terrorist acts are becoming more common today and much more sophisticated. Events of recent years have prompted a move towards terrorist preparedness.

1.3 Hazard Identification

The U.S. Department of Transportation divides hazardous materials into nine major hazard classes. A hazard class is a group of materials that share a common major hazardous property, i.e., radioactivity, flammability, etc. These hazard classes include:

a. Class 1-Explosives

b. Class 2-Compressed Gases

c. Class 3-Flammable Liquids

d. Class 4-Flammable Solids; Spontaneously Combustible Materials; Dangerous When Wet Materials/Water-Reactive Substances

e. Class 5-Oxidizers Substances and Organic Peroxides

f. Class 6-Toxic and Infectious Substances*

g. Class 7-Radioactive Materials**

h. Class 8-Corrosives

i. Class 9-Miscellaneous Hazardous Materials/Products, Substances, or Organisms

Notes:

*The words "poison and poisonous" are synonyms with the word "toxic".

**Radioactive and Department of Defense (DOD) shipments are not subject to Department of Transportation (DOT) shipping regulations. Radioactive material is the least carried of the hazard classes listed above.

1.4 Chemical Identity

Hazardous Material - A substance (solid, liquid, or gas) capable of posing an unreasonable risk to health, safety, environment or property.

Extremely Hazardous Substances (EHS) - EPA uses this term for chemicals that must be responsible pursuant to SARA, Title III. The list of these substances and the threshold planning quantities are identified in 40 CFR 355. Releases of extremely hazardous substances as defined by EPA must be reported to the National Response Center.

Highly Hazardous Substance - Hazardous substance, as used by the Nevada State Emergency Response Commission, encompasses every chemical regulated by both the Department of transportation (hazardous materials) and the Environmental Protection Agency (hazardous waste), including emergency response.

Level of Concern (LOC) -. The concentration of an extremely hazardous substance (EHS) in the air above which there may be serious irreversible health effects or death as a result of a single exposure for a relatively short period of time.

Note 1: The LEPC can declare the LOC for any EHS product.

Note 2: The LEPC can declare any site or product eligible for planning.

1.5 Hazardous Waste Operations and Emergency Response Standard

Response to hazardous materials events are strictly regulated by Hazardous Waste Operations and Emergency Response Standard (HAZWOPER) 29CFR1910.120 (CFR: Code of Federal Regulations). These regulations specifically address required levels of training for all responders and what they can or cannot do on the scene of a hazardous materials event.

1.6 Local Response Capability

Regional Hazardous Materials Response Team - The Regional Hazardous Materials Response Team was formed through an inter-local agreement between Reno, Sparks and Truckee Meadows Fire Agencies. The sole purpose of the team is for hazardous materials response within the jurisdictional areas of the participating agencies. (See History of the TRIAD)

The LEAD AGENCY shall effect overall management and coordination of a hazardous materials incident. The appropriate City Fire Department on behalf of the City Manager or Truckee Meadows Fire Protection District on behalf of the County Manager shall assume the role of lead agency for all hazardous materials incidents within their jurisdictional boundaries.

The TRIAD currently recognizes 10 personnel certified as HAZ-MAT Incident Commanders, 80 personnel are trained to the technician level and the balance of personnel to the operations decon level. The TRIAD can assemble a fully functional Level A HAZ-MAT team with the necessary operational equipment in the time it takes for notification, response and setup.

2 Motor Transport

2.1 Overview

This section will focus on those risks associated with shipping hazardous materials by common carrier over the Interstate and US Highway system as well as local deliver via secondary state routes and local by-ways in the Reno, Sparks and Washoe County area.

The Reno, Sparks and Washoe County area is dissected by two main transportation corridors, Interstate 80; the east-west route and US highway 395; the north-south route. State routes in the area are S.R. 28 at Lake Tahoe, S.R. 431 the Mount Rose Highway, 341 Geiger Grade and S.R. 445, 446 and 447 that lead north out of the Truckee Meadows.

There have been several studies regarding hazardous materials commodity shipments through these corridors. NDOT did a study in 1993, the State Emergency Response Commission did a study in 1995 and ERT Consulting completed a snap shot survey in 1999. These reports vary due to the time of year, time of day and the other variables. They do, however, give an indication of commodity travel through the Reno, Sparks and Washoe County area

The focus of these studies was based on the major transportation corridors. Obviously the I-80 Corridor is the one corridor that has the most truck movement on a month by month basis. The weigh station operated by the California Highway Patrol in Truckee, California reports an average of 40,000 trucks a month that pass through that facility. Approximately 8% of the trucks or 3,200 trucks per month display hazardous materials placards. Assuming each vehicle had an average load weight of 35,000 lbs. that would convert to approximately 56,000 tons of placarded material a month moving through the I-80 corridor.

2.2 The Nevada Department of Transportation (NDOT) Study

According to the NDOT study published in 1993 sixty-seven trucks displaying or meeting laws requiring hazardous material permits travel I-80 daily. Fifty-one trucks displaying hazardous material placards travel the US 395 corridor. Additionally a combined twenty-two placarded vehicles travel state routes 431, 28, 447 daily. No data is currently available to determine how many hazardous material laden vehicles travel other internal transportation routes such as the McCarran loop.

Table 1 - US 395 Hazard Class Percentages

The US 395 corridor had the following percentages of hazard class classes traveling through its corridor on a daily basis.	
a. Class 1 - Explosives	2.2%
b. Class 2 - Gasses	19.5%
c. Class 3 - Flammable liquids	73.4%
d. Class 5 - Oxidizers and organic peroxides	1.6%
e. Class 8 - Corrosive materials	3.3%

Table 2 - US 395 Hazard Materials Tonnage

Total tonnage of hazardous materials transported over the US 395 corridor by percentage daily.	
	Tons
a. Class 1 - Explosives	6.52
b. Class 2 - Gasses	109.73
c. Class 3 - Flammable liquids	831.20
d. Class 5 - Oxidizers and organic peroxides	24.91
e. Class 8 - Corrosive materials	32.45
	1004.81

Table 3 – I-80 Hazard Class Percentages

The I-80 corridor had the following percentages of hazard class classes traveling through its corridor on a daily basis.	
a. Class 1 - Explosives	6.0%
b. Class 2 - Gasses	12.6%
c. Class 3 - Flammable liquids	50.0%
d. Class 4 - Flammable solids	1.2%
e. Class 5 - Oxidizers and organic peroxides	6.4%
f. Class 8 - Corrosive materials	20.9%
g. Class 9 - Misc. dangerous goods	0.5%

Table 4 – I-80 Hazardous Materials Tonnage

Total tonnage of hazardous materials transported through the I-80 corridor by class percentage daily.		
		Tons
a. Class 1 - Explosives	5.0%	114.13
b. Class 2 - Gasses	10.2%	230.20
c. Class 3 - Flammable liquid	49.0%	1109.23
d. Class 4 - Flammable Solids	1.6%	36.20
e. Class 5 - Oxidizers and organic peroxides	7.7%	174.73
f. Class 6 - Toxic materials and infectious substances	1.9%	43.71
g. Class 8 - Corrosive materials	23.7%	536.46
h. Class - Misc. dangerous goods	0.7%	16.89
		2217.84

Note 1: According to the NDOT study the combined daily hazardous materials tonnage traveling through the I-80 and US 395 corridors in 1993 was right at 3,223 tons or 6,446,000 lbs. daily.

Note 2: According to the 1993 NDOT study "Although they are aware of hazardous materials shipments by the department of defense it (NDOT) does not have the authority to survey these shipments." Therefore data provided in this report is exclusive of DOD shipments.

2.3 Nevada State Emergency Response Commission (SERC) Study

In addition to the NDOT study information was collected on a study commissioned by the Nevada State Emergency Response Commission (SERC). That study, using a specific formula, estimated accident frequencies for the I-80 and 395 corridors. We are suspect of these estimated projections since other historical reviews do not indicate the SERC projections are accurate.

Table 5 - Highway 395 Flow Analysis

	Value	Source
Road Miles in Community (first response coverage)	43	Miles of highway within jurisdiction
Placarded Loads	100	NDOT maximum daily count
Placarded Miles	4300	Cell 1 X Cell 4
Per Million Miles	0.0043	Cell 4/1,000,000
Nevada's Accident Frequency (per million miles)	2.07	Given
Nevada's Accident Frequency for Placarded Loads	.008901	Cell 10 X Cell 8
Normalized Segment Study Hours	1	24 Study hours/24
Expected accidents with Placarded Loads per year	3	Cell 12/Cell 14 *365
Expected Accident Frequency = 1 every	**4 months**	

Table 6 - Interstate 80 Flow Analysis

	Value	Source
Road Miles in Community (first response coverage)	59	Miles of highway within jurisdiction
Placarded Loads	150	NDOT maximum daily count
Placarded Loads	8850	Cell 1 X Cell 4
Per Million Miles	0.00885	Cell 4/1,000,000
Nevada's Accident Frequency (per million miles)	2.07	Given
Expected Accident Frequency for Placarded Loads	0.0183195	Cell 10 X Cell 8
Normalized Segment Study Hours	1	24 Study hours/24
Expected accidents with Placarded Loads per year	**7**	**Cell 12/Cell 14 * 365**
Expected Accident Frequency = 1 every	**2 months**	

3 Railroad

Union Pacific Railroad - 24hr. Emergency Number
1(800) 892-1283

3.1 Overview

The Union Pacific Railroad maintains a main line track that travels east and west along the Truckee River Corridor starting about the Town of Truckee, California and continues to the Town of Fernley, Nevada. The railroad is often within 100 yards of the Truckee and crosses the river and its tributaries at several locations. *(Refer to mapping section for exact location).*

Data supplied by Union Pacific for the calendar year of 1998 consisted of a total of 10,352 loads of hazardous materials. It is interesting to note that substantially more hazardous materials move westbound than eastbound. The amount of westbound hazardous materials is almost 3 times that of eastbound traffic.

Table 7 – 1998 Commodity Report

Union Pacific Railroad 1998 Commodity Report		
1998	Westbound Rail Traffic Loads-	
	Car loads	2,087
	Intermodal loads	5,481
	Sub Total	7,568
1998	East Bound Rail Traffic Loads-	
	Car loads	945
	Intermodal loads	1,839
	Sub Total	2,784
Total east and westbound for 1997		10,352 loads

It should be noted that these loads can and will be mixed with other freight being moved by the train on any given day. The amount of hazardous materials transported is dictated by product demand and can vary based on the season. (Example: Substantially more hydrocarbons will be shipped in the winter months than summer.)

Union Pacific is acutely aware and proactive in preparation for any incident that may occur and are well prepared to respond in the event of a train related incident. (See main plan "Notification Section" for immediate response guidelines).

4 Pipeline Risk

Kinder Morgan – 24 hr. Emergency Number
Reno, NV (775) 358-6971
Orange, CA (213) 624-9461

4.1 Kinder Morgan Overview

Kinder Morgan operates an underground pipeline that transports approximately 13 million barrels of petroleum products (gasoline, diesel, and jet fuel) from the pump station in Rocklin, California to the Sparks, Nevada Terminal. Jet fuel is then pumped from the Sparks terminal to the Fallon Naval Air Station. Kinder Morgan also shares a storage facility in the City of Sparks, NV.

Fuel enters the pipeline in Rocklin, CA and traverses the western slope of the Sierra with booster pumps at Colfax and Cisco Grove. Once the fuel reaches Donner Summit gravity forces the fuel the rest of the way to Sparks. The pipeline varies in size from 6 inch to 10-inch diameter and was constructed in the 1950's of high-grade steel pipe. Valves have been installed at the most critical locations along the pipe. These valves are a combination of automated motor driven block valves and manual block valves located along the full length of the pipeline (see table). The motor driven block valves can be operated remotely from the terminal. All the valves can be operated manually onsite.

4.2 Pipeline Location

This Trans-Sierra pipeline parallels Highway 80 and rail corridors on the Truckee River from Donner Summit to Truckee. East of Truckee the pipeline heads north roughly following the power transmission line into the City of Reno. The portion of the pipeline following the power transmission lines is primarily located through areas of low population density. Near the Mountain View Cemetery in Reno the pipeline rejoins the Union Pacific Railroad right-of-way and follows the rail through Reno and Sparks joining Highway 80 east of McCarran Rd.

The Fallon Naval Air Station portion of the pipeline follows Highway 80 and the railroad right-of-way for about 16 miles to the Tracy power plant. East of the Tracy power plant, near the Eagle Pitcher Mine, the pipeline veers to the south leaving the Truckee River and railroad corridor for about 11 miles. The pipeline rejoins the railroad corridor following the Truckee Canal southwest of Wadsworth and heads east along the railroad right of way through the City of Fallon until it reaches its final destination at the Fallon N.A.S.

4.3 Storage Facility

The Sparks terminal consists of 44 above ground steel storage tanks, 33 of which are owned and operated by SFPP Kinder Morgan. The remainder of the tanks belong to BP Air, Time Oil, Berry- Hinkly, and Shell Oil. None of the Kinder Morgan tanks are bolted down to the foundation, but are all protected by containment dikes. Capacities of the tanks range between 3,000 and 30,000 barrels. Fire protection consists of subsurface injection piping as well as numerous fire hydrants throughout the terminal.

4.4 Hazard Analysis

We as planners applaud the safety record of the pipeline today. Since the 1950's only one major incident has been reported. That spill was caused by damage due to construction equipment working over the pipeline. Over the past 40 years the pipeline has been subjected to extensive stream erosion, landslides, and tectonic activity. The fact that the pipeline has survived relatively undamaged over the years is a testament to the quality of the original construction and the ongoing efforts to maintain the pipeline.

Kinder Morgan has established an emergency response plan in the unlikely event that an accident may occur. The manual includes notification procedures, actions, and checklists for involving personnel, reporting forms, and information on Incident Command and Unified Command Systems. There is also a program for drills and exercises on response in accordance with DOT and EPA regulations. This emergency plan can be activated by calling:

Kinder Morgan – 24 hr. Emergency Number
Reno, NV (775) 358-6971
Orange, CA (213) 624-9461

There are several locations along the pipeline where leak detection can occur, the threshold of detection is about one tenth of one percent over a period of about 15 minutes. In the event of a catastrophic break, the pipeline can be shut down in about 30 seconds using automatic shutoff valves (Table 1). Isolation of manual valves is dependent on weather conditions and could require 30 minutes to an hour to close. Once the pipeline is isolated, the product remaining in the pipe can be estimated based on the distance of the block valve from the point of release.

If this break is caused by a single isolated event such as a landslide or rockslide, the damage could be detected, contained, and repaired relatively quickly assuming fair weather conditions and transportation routes are clear.

If the event is wide spread major earthquake or flood then fuel distribution would be hampered due to power outages, road closures, and perhaps pipeline shut down. Emergency services would be limited to the fuel supplies on hand. Even access to this fuel might be limited to the availability of mobile generators to power pumps. Additional emergency crews would more than likely have to be brought in to repair ruptures along the pipeline, since available personnel would be occupied at the terminal and urban core areas during a major catastrophic event.

4.5 Vulnerability Analysis

Any release from the pipeline may have severe consequences to the population and the environment. The proximity of the pipeline to the Truckee River, its inlets and outlets, signifies a potential threat to the water system. All of the communities located along the Truckee River draw their water supply from the river or from wells that are directly affected by any product release from the pipeline. Environmental damage, including the potential for wildland fire, is an additional consideration.

The pipeline location is shown in the mapping section of this plan. Sensitive population's notes are also listed on the maps and can be found listed in the Sensitive Populations Sections of this plan.

4.5.1 Risk Analysis

The risk associated with the pipeline is minimal due to the construction and the continued preventative maintenance programs in place by Kinder Morgan. But, this is not to say that the potential for pipeline failure does not exist. The following narrative describes probable scenarios of pipeline failure.

1. **Construction**

   Excavation is the most likely cause of damage to the pipeline. The potential for rupture due to nearby excavation is greatest in areas where the pipeline corridor intersects highways and railroad right of ways and areas of new construction. Breaks in the pipeline caused by excavation are also the most easily preventable type of break. Public education and awareness of the need for pipeline locates before digging or operating heavy equipment near the pipeline and coordinated efforts to make pipeline and utility locates easy to acquire and to identify will help to prevent future breaks. As the area within the pipeline corridor continues to grow and expand the potential for damage will also continue to grow.

2. **Earthquake**

   Earthquakes pose a threat to the Kinder Morgan pipeline as well as the terminal and fuel stations that are part of the distribution system fed by the pipeline. An earthquake has the potential of damaging the pipeline through three major forms of ground deformation liquefaction, surface rupture, and landslide. The Kinder Morgan pipeline is constructed of high-grade steel using modern full penetration welding techniques. Pipelines constructed similarly to the Kinder Morgan Pipeline have withstood major earthquakes in the past with minor to no damage due to the ability of welded steel pipe to withstand considerable ground deformation without failure. The ductility of high-grade steel pipe provides the pipe with a large amount of resistance to rupture due to most ground deformation and shaking.

Damage to tanks and connections, however, are common during events of extreme shaking. Tank damage such as sidewall buckling, separation of sidewalls from the bottom plate, and sloshing of liquids can result from severe shaking. If connections between pipes and tanks are not flexible they are vulnerable to damage during earthquakes. Containment dikes serve as a good line of defense in the event pipe connections break. Once contained within the dikes the petroleum products can be kept from ignition sources and the spill can be controlled.

3. Flood and Erosion

River and stream crossings and locations where the pipeline is near embankments are subject to erosion. Floodwaters pose the greatest threat to breaking the pipeline since flooding can result in large amounts of erosion and mass wasting along drainage over a very short period of time. The pipe was originally buried at least 3 feet below the riverbed. Erosion has worn away the river bottom at some stream and river crossings sometimes leaving the pipe exposed. Kinder Morgan Pipeline has been vigilant about keeping embankments in place using riprap and other erosion control measures and retrenching and reburying the pipe when it becomes exposed. These preventative measures have kept stream erosion from causing any breaks in the pipe in the past, however heavy flood waters can change the whole course of a river or stream in minutes. Some of these crossing may be at higher risk of erosion or embankment failure due to soil types, nearby tectonic activity, and gradient of the embankments and river. There are many more washes, dry creeks, marshes, and irrigation ditches that drain into the Truckee River that are transversed by the pipeline. It is imperative that, in the event of a spill, an assessment of the location is made to determine if it is in a drainage.

4. Corrosion & Settlement

Pipelines are often subject to corrosion due to saline or alkaline ground water or in some cases chemical spills near the pipeline. Corrosion can in extreme cases lead to seepage and leakage underground. Kinder Morgan has a pilot fly the pipeline once a week looking for signs that such an underground leak has occurred. Unfortunately often by the time above ground detection is made, damage may have already occurred to the watershed.

5. Landslide

In the mountainous terrain along the west portion of the pipeline through Verdi, landslides and avalanches have the potential of uncovering and/or damaging the pipeline. The greatest hazard exists where the pipeline crosses steep mountainous areas due to landslides and stream erosion. Earthquakes, flooding and times of high run off can lead to an increased likelihood of landslides. During the original construction of the pipeline crews took into account the probability of avalanche and landslides and buried the pipe along steep inclines with up to 5 feet of ground cover. This foresight has probably saved the pipe from ever being subject to breakage from an avalanche or landslide in the past.

4.6 Summary

While potential for a leak would appear to be minimal, cause for concern should be taken seriously. A leak could cause problems anywhere along the corridor particular up stream form Chalk Bluff water treatment plant and downstream from Sparks on the spur to Fallon where the pipeline crosses the river six times. A seepage of fuel would be the most difficult to detect and may be the most probable type of leak to impact the Truckee River watershed. Any release or potential for release within the Truckee River watershed area should be cause to review the Truckee River Regional Hazardous Materials Response Plan.

Table 8 – Location of Pipeline Isolation Valves

Area	Valve Type	Location
Donner Lake	Automatic	West end of Donner Lake
Truckee	Manual	West River Road, Truckee
Prosser Creek Incoming	Manual	South West bank of Prosser Reservoir
Prosser Creek Outgoing	Manual	East bank or Prosser Reservoir
Woodchopper Springs	Manual	1.1 mi. East of Prosser Reservoir
Hoke Valley	Manual	2.2 mi. East of Prosser Reservoir
California/Nevada	Automatic	Stateline in Verdi
Northridge	Manual	Northridge Golf Club
West Reno	Automatic	Dickerson Road, Reno
Coney Island	Manual	Coney Island Drive, Reno
Reno Incoming	Manual	KMEP Terminal, Sparks
Reno Outgoing	Manual	KMEP Terminal, Sparks
East Vista	Manual	3.5 mi. East of Terminal, near R.R.
West Lockwood	Manual	Lockwood Exit, near R.R.
East Lockwood	Manual	Mustang Exit, near R.R
Clark	Manual	Eagle Pitcher Mine
Fernley6	Manual	Fernley, Nevada

5 High Pressure Natural Gas Transmission Line

Paiute Pipeline
Emergency Number 1-775-882-0148

Tuscarora Gas Transmission Co.
Emergency Number 1-800-894-1488

5.1 High Pressure Natural Gas Transmission Line

There are two (2) high-pressure natural gas lines that supply our region, Paiute Pipeline and Tuscarora Gas Transmission Company. Both are gas delivery companies from which two additional companies, Southwest Gas and Sierra Pacific Power Company deliver products to the consumer. Southwest Gas and Sierra Pacific Power Company could be considered retailers while Paiute and Tuscarora could be considered wholesalers. Both transmission lines originate in Canada but enter Nevada in different locations. Conceivably both pipelines could be delivering gas from the same well head to our region.

Table 9 - High Pressure Natural Gas Transmission Line

Attribute	Paiute Pipeline	Tuscarora Gas Transmission
Date of Construction	1963	1995
Entry to Nevada	Approx. Mountain Home, ID	Herlong, CA
Size of Pipeline	12", 16", & 20"	20"
Line Pressure	1400 psi	1000 psi
Buried Depth	24" to 60"	24" to 60"
Purpose	natural gas for industry, business and residential uses	natural gas to the SPPCO Tracy-Clark Power Plant

Both lines are monitored by telemetry and can be remotely shut down. Both lines have block valves that are consistent with industry standards applicable at the time of installation. It may take 30-45 minutes for gas supplies to escape after a portion of the line has been isolated.

Both lines have vertical line of sight markers installed that provide warnings regarding location call before dig and emergency numbers, etc.

The Paiute line enters our area of concern around Olinghouse near Wadsworth, Nevada. At this point the line tees off and two 12" lines roughly parallel the I-80 corridor on the north side of the highway into Reno. When pipeline reaches Reno the gas enters the distribution system by what are known as "city gates". Once the gas enters the distribution system the gas belongs to SPPCO. Additionally line pressure is reduced to between 53-60 PSI depending on the area requirements.

The other side of the tee line crosses the Truckee River and proceeds to Fernley, Fallon, Yerington and the Carson City-Minden area where it is distributed by Southwest Gas.

The Tuscarora Line enters Nevada near Herlong, California and basically heads in a south easterly direction towards Spanish Springs and on towards Sparks, Nevada. From Sparks the line runs on the north side of I-80 to Tracey-Clark where it crosses the river and is anchored (above ground) to the bridge on the north side of the power plant.

Both of these lines could possibly be subject to damage by earth moving equipment in applications from construction to wildland fires. Both lines were constructed to with stand a 7.5 magnitude earthquake and at least the Paiute line has proven track record in this area.

Note: The hazard analysis for the Kinder Morgan Pipeline also applies to these pipeline systems

5.1.1 Responder Notes

a. Natural gas is lighter than air upon release it dissipates into the atmosphere.

b. Gas is in vapor form and its components are 96% methane, 2% ethane and 1.5% nitrogen the remaining .05% is carbon dioxide, propane, butane, pentane, and other hydrocarbons. Additionally mecapton is added as an odorizer.

c. LEL is 5% and the UELS are 75%

d. As the gas pressure decreases the potential for ignition moves closer to the source. Related ignition of combustibles materials can occur within 750 meters (820 yards) of a pipeline fire.

e. Extreme noise levels may be encountered "If it's too loud, you're too close."

f. "If its too hot, your too close" full PPE and SCBA for area searches is highly recommended.

g. Gas is released at a rate of 380 meters (1,247 feet) per second the speed of sound (in gas).

h. The shock wave of the gas release will make the ground shake.

Recommend that responders employ standard HAZ-MAT isolate and deny protocols and contact all companies to respond in the event of a major incident since you may not know whose pipeline you are dealing with.

Alignment maps can be obtained by contacting the respective companies.

6 Truckee River Watershed and Drainage System

6.1 Overview

The Truckee River Basin encompasses an area of approximately 3,060 square miles in the states of California and Nevada. The basin stretches in a generally north by northeast direction from Lake Tahoe, located in the Sierra Nevada Mountains on the border between California and Nevada, to Pyramid Lake, located approximately 50 air miles away in the desert of northwestern Nevada. Connecting this alpine source lake and the basin's desert terminal lake (Pyramid) is the 105-mile long Truckee River.

While the greater portion of the Truckee River Basin's surface area, and certainly the majority of its demands for water resources lie within the State of Nevada, most of the precipitation and virtually all of the basin's water storage lie within the State of California. Based on the California-Nevada Interstate Compact approved by the California Legislature in September 1970 and the Nevada Legislature in March 1971, Nevada was allocated approximately 90 percent of the Truckee River Basin's waters. By this compact, water supplies were also reserved for growth in the Lake Tahoe-Truckee area of California.

6.2 A Hydrologic Overview of the Lake Tahoe and Truckee River Basins

Major hydrologic features of the Truckee River Basin include Lake Tahoe and the Lake Tahoe Basin, the 105-mile long Truckee River, a number of lesser upstream storage lakes and reservoirs, various tributaries, and the Truckee River's terminus, Pyramid Lake. The Truckee River system may be thought of as consisting of five (5) major river reaches including:

a. The 15-mile reach between the Truckee River's origin beginning at the Lake Tahoe Dam near Tahoe City, California.

b. The 20-mile reach flowing through the upper Truckee River canyon between Truckee, California, and Verdi, Nevada, a reach that cuts through the Carson Range of the Sierra Nevada Mountains.

c. The 15-mile reach through the Truckee Meadows and the cities of Reno and Sparks, Nevada, to Vista.

d. The 30-mile reach from Vista to Wadsworth through the lower Truckee River canyon, and cutting through the Virginia Mountain Range.

e. The 25-mile reach below Wadsworth, Nevada, transversing a broad alluvial valley to Pyramid Lake.

6.3 The Upper Truckee River Basin

The upper Truckee River Basin, while not formally defined, may be thought of as that portion of the basin above the Truckee Meadows, an area containing the metropolitan cities of Reno and Sparks, Nevada. This upper basin includes those drainage areas encompassing the Lake Tahoe Basin, the upper Truckee River between Lake Tahoe and the town of Truckee, California, the Donner Lake drainage area to the west of Truckee, the Martis Creek drainage to the south and east of Truckee, the Prosser Creek and Little Truckee River drainage areas to the north east of Truckee, and the upper Truckee River Basin includes portions of the California counties of Alpine, El Dorado, Placer, Nevada, and Sierra. The Nevada portion of the upper Truckee River Basin includes parts of Carson City, and the counties of Douglas and Washoe.

Upon leaving Lake Tahoe, the Truckee River first heads southeast for one-half mile, then turns due west for another mile and a half. Two miles downstream from Lake Tahoe, the Truckee River eventually turns northwest and then north towards the town of Truckee, California, which is located nearly 15 miles downstream from the lake. Along this reach numerous small streams enter the Truckee River between Tahoe City and the town of Truckee, to include (those with names) Bear Creek (4.2 miles downstream), Squaw Creek (5.8 miles downstream), Deer Creek (6.6 miles downstream), Pole Creek (7.7 miles downstream), Silver Creek (8.8 miles downstream), Deep Creek (9.4 miles downstream), and Spring Cabin Creek (10.8 miles downstream).

Nearly one mile above Truckee and 13.6 miles downstream from Lake Tahoe, Donner Creek, which drains from Donner Lake (elevation 5,933 feet), enters the Truckee River. Four miles below Truckee, the waters of Martis Creek enter the Truckee River. Martis Creek drains an extensive area of some 40 square miles to the south of the Truckee River including Martis Creek, as well as West, Middle, and East Martis creeks. These combined waters feed into Martis Creek Reservoir, located just above Martis Creek's confluence with the Truckee River. Some 2.8 miles below the confluence of Martis Creek and the Truckee River, the waters of Prosser Creek enter the river. Just upstream on Prosser Creek is Prosser Creek Reservoir with a storage capacity of nearly 30,000 acre-feet, and some 11 miles above this reservoir is Warren Lake and the headwaters of Prosser Creek.

Another 2.2 miles below Prosser Creek, the Truckee River receives the waters of the Little Truckee River flowing out of Boca Reservoir, which is located less than one-half mile above the Truckee River. The Little Truckee River is the largest of the Truckee River's tributaries and drains an extensive area stretching from just below Sierraville, California, and the Sierra Valley area, both of which are located in the Feather River Basin (California).

Just over two miles downstream from the Truckee River's confluence with the Little Truckee River, the river passes the community of Hirschdale, California. Three miles below Hirschdale the waters of Gray Creek intermittently, and sometimes violently, enter the Truckee River. The importance of Gray Creek to the hydrology of the Truckee River is amplified far beyond its actual contribution to the river's flow due to its periodic tendency, during particularly severe thunderstorms, to disgorge considerable quantities of mud and debris into the river.

Just over two miles below Gray Creek, the Truckee River encounters a diversion dam located at the community of Floriston, California. Here waters are diverted into a flume to be used some 1.8 miles further downstream at the Farad powerhouse. Approximately 0.7 miles below the Farad Powerhouse, a U.S. Geological Survey (USGS) gauging station is located. This gauging station, commonly referred to as the Farad gauging station, is the most important water flow measurement site along the entire Truckee River system as it is used to insure that the river system's "Floriston rates" are met.

Approximately 2.6 miles downstream from the Farad station the Truckee River encounters another dam that diverts water to the Fleish Power Station. One mile beyond this diversion, the Truckee River leaves California and enters the State of Nevada, and a mile further along it receives the return waters from the Fleish power station. Less than one mile beyond this point, some of the Truckee River's waters are diverted again, this time into the Coldrone Ditch. Below this point the Truckee River reaches Verdi, Nevada, and after several miles, the Truckee River enters the Truckee Meadows, containing the cities of Reno and Sparks.

6.4 The Lower Truckee River Basin

The lower Truckee River Basin, while not strictly defined, may be considered as encompassing that portion of the basin including and downstream from the Truckee Meadows. This would include the Truckee Meadows and the cities of Reno, Sparks, Pleasant Valley and Washoe Valley to the south, the latter valley containing Washoe Lake and Little Washoe Lake. Both of these valleys are drained by Steamboat Creek, which then runs along the eastern portion of the Truckee Meadows and empties into the Truckee River near Vista and the beginning of the lower Truckee River canyon. Along the way, Steamboat Creek picks up the return flows of numerous irrigation ditches to the south of the Truckee River, the most important being Streamboat Ditch, Last Chance Ditch, and Lake Ditch, as well as the Boynton Slough (which picks up the waters of Cochran Ditch). The Boynton Slough is the recipient of some of these other ditches' return-flow waters as well. Also included in this lower Truckee River Basin is the lower Truckee River canyon running through the Virginia Range and extending between Vista (Sparks) and Wadsworth. The final segment of the lower Truckee River Basin lies below Wadsworth and includes a 25-mile long broad, alluvial valley stretching to Pyramid Lake. This portion of the basin also includes the Pyramid Lake Basin, and to the east over the Lake Range, the Winnemucca (dry) Lake Basin.

The Truckee Meadows is a bowl-shaped valley, approximately 10 miles wide and 16 miles long, containing the cities of Reno and Sparks with a combined population of approximately 300,000 persons. Several tributaries enter the Truckee River along this reach, the most important being Steamboat Creek, which also contains the treated effluent from the Truckee Meadows Water Reclamation Facility (formerly the Reno-Sparks joint sewage treatment plant). The Truckee Meadows constitutes the most important municipal and industrial use of the Truckee River's water in the basin, as well as the most important agricultural use of the Truckee River's waters within the basin. While municipal and industrial water use (withdrawals) in the Truckee Meadows total approximately 75,000 acre-feet per year, nearly three times this amount is diverted out of the lower Truckee River Basin at Derby Dam and into the Truckee Canal for agricultural use in the Newlands Project in the lower Carson River Basin.

On the east side of the Truckee Meadows at Vista, the Truckee River enters the lower Truckee River canyon, which cuts through the Virginia Range. Nearly 2.5 miles after leaving the Truckee

Meadows, the Truckee River comes abreast of Lockwood. Some 11.4 miles beyond this point the Truckee River passes Sierra Pacific Power company's Tracy-Clark power station cooling ponds and 3.6 miles beyond this the river reaches Derby Dam, the most significant diversion to be encountered along the entire Truckee River. From this diversion dam the Truckee Canal takes off, first paralleling the river towards the east, then turning southward along the west side of the Lahontan Valley and crossing into the Carson River Basin, heading towards the lower Carson River where it empties into Lahontan Reservoir.

Some 9.2 miles below Derby Dam the Truckee River enters the Pyramid Lake Paiute Indian Reservation. The reservation occupies almost 477,000 acres (745 square miles) with its dominant feature being the 108,000-acre (169 square-mile) Pyramid Lake. Reservation lands were initially withdrawn in 1859, a date which determined the priority date under the "reservation doctrine" for the Tribe's use (appropriation) of Truckee River waters for the irrigation of tribal lands. However, the Pyramid Lake Indian Tribe's history has been inextricably linked to the bounty of Pyramid Lake and the lower Truckee River fisheries. The concept of the federal reservation doctrine, under which these water rights were guaranteed and eventually adjudicated in the 1944 Orr Ditch Decree, is to reserve a sufficient supply of water to meet the intended purpose of the reservation. Despite the historical importance of the Pyramid Lake fishery to the Paiute Indians and the clearly defined intent of the reservation doctrine, no water has ever been allocated to the restoration of Pyramid Lake or to the preservation of the lake and river's fisheries.

Some 1.8 miles after entering the Pyramid Lake Indian Reservation, the Truckee River passes Wadsworth. Near Wadsworth, the Truckee River turns from its eastward flow and heads northward. Approximately 14.5 miles below Wadsworth, measured along the course of the Truckee River, is the Numana Dam, which is the diversion dam for irrigation on the reservation.

Approximately 3.5 miles below this is Nixon, and just over four miles below Nixon is the Marble Bluff Dam, which, along with the Pyramid Lake Fishway, was built in 1975 in an effort to reduce further erosion in the lower Truckee River and to promote the spawning runs of the Pyramid Lake Cui-Cui endangered fish species. Nearly four miles below Marble Bluff Dam, the Truckee River enters its terminus location, Pyramid Lake.

Pyramid Lake, which is wholly contained within the Pyramid Lake Paiute Indian Reservation, is 30 miles long and ranges form 4 to 11 miles wide and covers approximately 169 square miles (108,000 acres) at a surface elevation of 3,800 feet. At this lake-surface elevation, Pyramid Lake has a maximum depth of 335 feet and contains approximately 21 million acre-feet of water.

Pyramid Lake is the home of the endangered Cui-Cui fish species, a bottom sucker found only in this lake, and the threatened Lahontan cutthroat trout. The Lahontan cutthroat trout species was introduced into Pyramid Lake in the 1950's after the native sub-species, the Pyramid Lake cutthroat trout became extinct in the early 1940's. The survival of these two fish species has become a crucial issue with respect or upstream storage (Stampede and Prosser reservoirs), maintaining river flows sufficient for spawning runs and the rights or unallocated flood waters in the Truckee River.

6.4.1 Operating Procedures for Major Reservoirs

Managing flow in the rivers is a complex procedure based primarily on the integrated operation of eight reservoirs. The operation is dictated by mandates to maintain specified minimum and maximum flows measured at key points on the Truckee River. Meeting the appropriate flow rates and ensuring proper operation of the reservoirs are derived from long-term experience with the system and decades of litigation. Nevertheless, the operation of the reservoirs remains a major subject controversy, and pending litigation seeks further changes in operating procedures. The following narrative describes the operations, and is based upon legal documents, discussions with the Federal Water Master, Reno, Nevada. The Federal Water Master is primarily responsible for reservoir operation and directing most of the allocation of water throughout the Truckee system.

6.4.2 Responsibilities of Water Master

The primary responsibility of the Water Master is to administer the provisions of the Orr Ditch decree and the Truckee River Agreement which have been made one by the Federal District Court. The specific duties are set forth on pages 86 through 88 of the Orr Ditch Decree.

In addition, over the years the Water Master has assumed additional duties as follows:

a. Operating Lake Tahoe and Boca Reservoir to maintain minimum storage and make releases to maintain the Floriston Rate. (Page 4, Article III, Truckee River Agreement)

b. Operating all reservoirs to meet U.S. Corps of Engineer's flood control criteria, where applicable.

c. Release water from Stampede and Prosser reservoirs to meet flow requirements at Nixon gage for threatened and endangered species as requested by the U.S. Fish and Wildlife Service.

d. Monitor diversions from the Truckee River

e. Maintain a current file of all water rights and the ownerships thereof awarded by the Orr Ditch Decree.

f. Prepare for distribution a daily composite of reservoir storage, releases and flow data at various U.S. Geological Survey stations along the Truckee River from Lake Tahoe to Nixon, known as the U.S. District Court Water Master Daily Report.

g. Maintain a close relationship with state and federal agencies involved in water management of the Truckee River system.

The Floriston rates specify the minimum flows for the Truckee River at Farad, California, according to the season and the stage of Lake Tahoe.

Table 10 – Minimum Flows for Truckee River

Water-surface altitude at Lake Tahoe Dam (feet, NGVD of 1929)	Floriston rates: Flow at Farad Gage (ft 3/s)			
Below 6,225.25 Between 6,225.25 and 6,226 Above 6,226	Oct.	Nov.-Feb.	Mar.	Apr.-Sept.
	400	300	300	500
	400	350	350	500
	400	400	400	500

6.4.3 Annual Operations

Reservoir operations are keyed to three periods referred to herein as winter, runoff, and irrigation. These periods overlap to some extent, and during those times the flows are modified significantly to meet the requirements of the succeeding period.

As the irrigation period ends in late September or early October and with colder weather and shorter days, flood control criteria go into effect. At this time, the Water Master orders releases from reservoirs as necessary to create and maintain the flood storage capacity. During this time, flows in the Truckee River may exceed Floriston Rates. The Water Master maintains the flood storage capacity from November 1 until the runoff period or until flooding is imminent. Instructions as to the timing of filling reservoirs are provided by the U.S. Army Corps of Engineers in concert with runoff predictions by the U.S. Soil Conservation Service. In September 1974, the Water Master ordered releases from Prosser Creek, Boca, and Stampede Reservoirs. These releases caused Floriston rates to be exceeded during those months by about 200 ft 3/s. In 1976, by contrast, flows did not increase because the reservoirs were already heavily drawn down.

During the winter season the Water Master attempts to maintain Floriston rates with freedom to store or release water according to the priorities, so long as flood storage space is maintained. How much water is actually stored depends upon reservoir volume and available runoff. In 1975, Prosser Creek, Stampede, and Boca Reservoirs were almost full within flood-storage constraints during the entire winter period, and flows remained above Floriston rates. In 1977, the 350 ft 3/s flow necessary to maintain Floriston rates and water being bypassed for storage in Lahontan Reservoir. Maintenance of the higher flow did not allow the Water Master to store a significant amount of water upstream.

As the weather becomes warmer and heavy snowmelt begins in April and May, the Water Master orders water storage in the reservoirs according to the priorities. The rate at which flood-storage constraints are relaxed is dependent upon runoff predictions of the Soil Conservation Service. Because of this, the Water Master's ability to hold flow to Floriston rates is less in a wet year than in a dry year. In 1975, limitations on storing water because of runoff predictions prevented the Water Master from limiting flows to Floriston rates during the entire runoff period. In 1977, insufficient runoff and stored water prevented the rates from being met after April 1.

6.4.4 Upper Truckee River

In addition to the outflow from Lake Tahoe, the bulk of the flow of the Truckee River is derived from tributary streams between the lake outlet and the California-Nevada State line. In order to control that flow for allocation to numerous users downstream and to provide protection against downstream flooding, reservoirs were built at six sites on four of the tributaries.

Donner Lake, once an unregulated lake, was converted to a water-supply reservoir by the construction of a dam at the lake outlet to Donner Creek. Martis Creek Reservoir was specifically designed as a flood-control facility wherein a small pool is provided for recreational uses. Prosser Creek Reservoir is a multipurpose facility intended for flood control, recreation, improvement of fishery flows in the Truckee River immediately downstream, and maintenance of Floriston rates.

Independence Lake and Stampede and Boca Reservoirs lie in series along the Little Truckee River. Independence Lake is primarily a water conservation facility holding water intended for power generation and supply for the Reno area. Stampede Reservoir is a multipurpose facility intended to store water for a variety of uses including fish habitat enhancement along the lower Truckee River near Nixon, Nevada. Boca Reservoir was designed to furnish a supplemental water supply for downstream agricultural uses near Fallon and for power generation upstream from Reno and at Lahontan power plant near Lahontan Dam. Between Independence Lake and Stampede Reservoir, there is a small diversion leading from the Little Truckee River or Sierra Valley in the Feather River basin of California.

6.4.5 Middle Truckee River

Upstream from Floriston, reservoirs are used to regulate flows into the Truckee River. Downstream, diversion dams are used to regulate flows away from the river. Between Floriston and Derby Dam, the endpoints of the Middle Truckee River subunit, approximately 50 diversions leave the river for purposes of power generation, irrigation, and municipal, domestic, and industrial water supply. Except for water leaving the system by such means as evapotranspiration, most of the diverted water returns to the river at points within the subunit. Flow from several small tributaries arising in the mountains southwest of Reno reaches the river directly or through the irrigation systems, as does ground-water discharge in the Truckee Meadows. At Derby Dam, about 35 percent of the average annual flow is diverted out of the Truckee River basin and terminates in the Fernley area, Swingle Bench, and Lahontan Reservoir, thus marking Derby Dam as an endpoint to the relatively closed system that begins at Floriston. The hydrologic subunit so defined encompasses 744 mi2 and includes the mixed agricultural and urban lands centered on the Reno-Sparks metropolitan area.

Diversions for power generation, of which there are four between Floriston and Reno, simply carry water in flumes to riverside power plants. There, the water is returned to the river after passing through penstocks and rotating turbines or through bypass spillways. The principal effect on the river of this activity relates to the removal of a large percentage of the river flow along the diverted reaches during low-flow periods.

Agricultural diversions, exemplified by Steamboat and Orr Ditches transport water for tens of miles from the river. The water then flows through a complex pattern of lateral ditches and fields, picking up sediment, nutrients, pesticides, and other materials that potentially issue to watercourses tributary to the Truckee River. Although agricultural return flows may enter the river at other places, the primary returns move by way of North Truckee Drain from the north and Steamboat Creek from the south. These major watercourses also intercept urban runoff that does not otherwise enter the river via storm drains upstream. Minor flows from Galena, Whites, and Steamboat Creeks provide additional water supply for areas south of Reno.

Municipal, domestic, and industrial water supply is carried from the river to treatment facilities by the Steamboat, Highland, Idlewild and Glendale diversions. After distribution and use, the effluent is discharged through a sewage collection system to the Reno-Sparks Sewage Treatment Plant. After secondary treatment at the plant, the effluent is discharged into Steamboat Creek near its confluence with the Truckee River near Vista.

Downstream from Vista, local diversions carry water for irrigation of benchlands adjacent to the river. Exceptions include industrial diversions at Tracy Powerplant and the Eagle-Pincher Company plant. Water not consumed by evaporation at the plants is discharged to holding ponds and percolates into the river alluvium, and probably back to the river.

Problems with the water resource in this subunit are typical of rapidly urbanizing areas and are among the most severe in the Truckee and Carson River basins. Water supply is a critical issue as new development competes with downstream interests for the rights to a limited water supply. As agricultural areas of Truckee Meadows and Spanish Springs Valley are turned to urban-suburban uses, new demands for sewage treatment have arisen. Because the existing sewage treatment plant is operating at or above its rated capacity on nearly a full-time basis, many alternatives are being proposed to cope with the burgeoning effluent load. Detention basins for urban stormwater runoff and excess sewage flows are virtually nonexistent, and the risk of raw sewage spills, such as a spill that occurred in June 1980, into the river is great.

6.4.6 Fernley Area

The Truckee Canal begins at Derby Dam and carries water 31.5 miles to Lahontan Reservoir on the Carson River. Along the canal route, about 25 diversions leave the canal for agricultural irrigation and small public water supplies. Return flows from about half of these enter the Truckee or Carson River basins. However, return flows from agricultural fields immediately east of Fernley move northward into a small, closed basin. Thus, this basin is hydrologically connected to the Truckee-Carson system and is considered a separate subunit. The subunit extends from the Truckee-Carson system drainage boundaries to the low point of the closed basin in the Fernley State Wildlife Management Area, and covers about 103 mi2.

The water budget of the Fernley Area is based upon flows in the Truckee Canal, leakage and diversions from the canal, the ground-water system, and runoff into the canal during rainstorms. Leakage from the Truckee Canal, which is mostly unlined, augments the local groundwater supply as does percolation of diverted water. Agricultural return flows provide the sustenance of wetlands north of the fields to the playa near Interstate Highway 80. Vegetation and open water there became attractive to waterfowl and other animals, and the area was made into a wildlife preserve. A part of the agricultural return flows returns to the Truckee River in the vicinity of Wadsworth, resulting in increased base flows and contributing to the load of dissolved solids in the river.

Water-quality problems are directly tied to the condition of the water in the Truckee Canal. Not only does canal water go to ground water and crops, but local residents also use the canal for swimming and fishing. The future of the water resource for the Fernley Area will be heavily dependent upon decisions reached about water supply and quality in the Reno-Sparks Metropolitan Area, and consequent discharges to the Truckee River and Canal.

6.4.7 Lower Truckee River

Downstream from Derby Dam, the Truckee River flows eastward to Wadsworth and thence northward to it's modern terminus at Pyramid Lake. Along this reach, 12 diversions extract water principally for agricultural irrigation of the riverine floodplain and benchlands. Between Derby Dam and Wadsworth, three major diversions form the Truckee Canal add their return flows to the river. Additionally water may enter the river along this reach via either of two major spillways from the canal or by groundwater flow from the canal to the river. Otherwise, except for minor local rainfall, the primary source of flow for the subunit is that which passes Derby Dam.

Downstream from Derby Dam, the river channel and its immediate riparian conditions are of great hydrologic interest. Here the river flows mostly on the Pyramid Lake Indian Reservation for which attempts are being made (1) to redefine the allocation of Truckee River water in the interest of the sustenance and further development of the local culture, and (2) to reestablish fisheries that declined and failed earlier in this century. Locally, channel migration and bank failures abetted by disturbance of riparian vegetation are a continuing problem.

Below the downstream end of the subunit, the Truckee River enters Pyramid Lake across a broad delta. The interface of the delta and the lake shoreline is migratory, depending upon the volume of flow form the Truckee River, and has moved several miles during this century. In order to provide a stable reference point for hydrographic and other measurements with respect to the river and the lake, Marble Bluff Dam was chosen as the downstream terminus of the subunit.

Marble Bluff Dam was built to aid the reestablishment of fisheries in the Truckee River that declined and failed earlier in this century. The Cui-ui Lakesucker (Chasmistes cujus) and the Lahontan Cutthroat trout (Salmo clarki henshawi) that once spawned in the river now reside only in Pyramid Lake. A fishway leading from Marble Bluff Dam to the lake allows some of the fish to migrate to fish-handling facilities at the dam whence fertilized eggs stripped from the fish are transferred to hatcheries. The fish may be returned to the Lake or to points upstream in the river. However, reestablishment of continuing cui-ui and Lahontan cutthroat trout migrations is dependent on several interactive physical and chemical characteristics of the river.

6.5 Gauging Stations and Telemetry

The United States Department of the Interior (DOI) through its United States Geological Survey (USGS) offices in California and Nevada has a series of gauging stations along the Truckee River. In years gone by the USGS used these gauging stations for the purpose of collecting data on flows relating to flooding and flood potential.

Today the same gauging station(s) are used more from a client generated standpoint. Other federal state and local agencies have from time to time the need to develop databases and through cooperative agreements with USGS do so utilizing the established gauging stations. The USGS gathers data for these agencies thus defraying the operating costs of the gauging stations.

These stations also provide proof of water flow rates. Since the Federal Water Master operates under legal mandates that require minimum fixed flow rates, these stations are used to measure these legally mandated flow rates.

Some selected sites are telemetry equipped and are constantly sending data on current flow rate states. (Enclosed is a list of all gauging sites and their capability.)

At one point in time selected gauging stations along the river could detect and provide data on D/O dissolved oxygen, PH (how acidic the water is or is not) water temperature. Unfortunately this information is either not collected now or is done on a limited basis due to budget constraints within the USGS operation. Several of these placed in specific location would be of tremendous help to technical decision-makers given a HAZ-MAT event in the river. As a future issue, attempts should be made to either have deployable unit on hand or fixed sites activated to provide valuable data instantly to responders. These units may be even used for detection in an early warning fashion.

Gauging station information and current flow rates can be found on the internet.

USGS web page: http://Nevada.USGS.Gov

At the home page select table or map under "Data Online" then pick a gauging station from the listing below the map.

6.6 Travel Time for River and Waterway Flows

Travel time of flows is a basic hydrologic consideration in water management and in understanding the transport of many water-quality constituents. Travel time is the time it takes for constituents placed in the river to move downstream form one point to another. Therefore, travel time is important in estimating, for example, how long it will take for sewage discharge or a spilled contaminant to move from its point of origin to a critical place downstream.

Constituents in water disperse as they move downstream, some lagging along blanks and in pools while others near the surface in the center of flow move more rapidly. Thus, the constituents may be spread out over a considerable reach of river by the time they have moved significantly downstream. During low flows, constituents tend to spread out over great distances and remain in a given reach of the river for long periods. During high flows, constituents tend to spread out more slowly and pass through a given reach of the river more quickly.

Measurement of travel time thus includes measurement of dispersion and dilution as well as velocity of flow. Information on travel times would be useful, for example, in timing the discharge from a sewage treatment plant to coincide with high flows released from a reservoir upstream, or to avoid conflict with planned diversions downstream. Consideration of travel time is fundamental to modeling the flow and water-quality characteristics of a river, and to managing the river to meet desired goals for water quality and quantity at specific points along the river.

The potential exists for a hazardous materials event to occur with a product release in the river or waterway. Travel times for any contaminant in the river are subject to many influences and because of these influences the prudent use of personnel and monitoring equipment is essential to the success of any response effort. During hazardous materials events that either threaten or are confirmed to be near the river, monitoring teams and the data that they supply will be of the utmost importance to decision-makers. Incident commanders should contact experts in the field of hydrology to assist in determining the travel times based product release. Assistance can be found with the following agencies:

a. US Geological Survey

b. US Coast Guard

c. National Weather Service

d. Nevada Division of Emergency Management

e. Federal Water Master

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