Item #8

City of Carson City
Agenda Report

Date Submitted: August 26, 2008 **Agenda Date Requested:** September 4, 2008
Time Requested: 10 Minutes

To: Mayor and Supervisors

From: Parks and Recreation Department/Open Space

Subject Title: Action to accept the Carson River Mercury Site Superfund Study Area report prepared by Resource Concepts, Inc.

Staff Summary: In anticipation of potential land purchases along the Carson River, the Open Space Advisory Committee commissioned this study of the Superfund Study Area. The study summarizes the extent of mercury contamination and the role of the Nevada Division of Environmental Protection in reviewing projects within the designated Superfund Areas.

Type of Action Requested: (check one)
(____) Resolution (__) Ordinance
(_X_) Formal Action/Motion (__) Other (Specify)

Does This Action Require A Business Impact Statement: (__) Yes (_X_) No

Recommended Board Action: I move to accept the Carson River Mercury Site Superfund Study area report prepared by Resource Concepts Inc.

Explanation for Recommended Board Action: The purpose of this study is to obtain information from an expert third party regarding the significance and potential liabilities that may arise from purchasing lands and developing projects such as trails within the Superfund designated areas for the Carson River.

Applicable Statute, Code, Policy, Rule or Regulation: Comprehensive Environmental Response Compensation and Liability Act (CERCLA)

Fiscal Impact: The study cost was $3,880

Explanation of Impact: The Open Space approved budget contains funds that are used for the payment of these types of studies and services.

Funding Source: Open Space Professional Services account

Alternatives:
1. Not to accept the study.
2. To request additional work or information.

Supporting Material:
Carson River Mercury Site, Superfund Study area prepared by Resource Concepts, Inc.

Prepared By: _____ **Date:** 8/29/08
Juan F. Guzman, Open Space Manager

Reviewed By: _____ **Date:** / /
Roger Moellendorf, Parks & Recreation Director

_____ Date: 8/26/08
Larry Werner, City Manager

_____ Date: 8/26/08
District Attorney's Office

_____ Date: 8/26/08
Finance Department

Board Action Taken:

Motion: _____ 1: _____ Aye/Nay

2: _____

_____

_____

_____

_____

_____

_____
(Vote Recorded By)

CARSON RIVER MERCURY SITE
SUPERFUND STUDY AREA
Summary Information for Carson City

April 2008

Introduction

In August 1990, the USEPA designated the portion of the Carson River Basin from New Empire to the Carson Sink as a National Priority Listed site under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA or Superfund) (Figure 1). EPA's Office of Solid Waste and Emergency Response (OSWER) in Washington, D.C. oversees the Superfund program. Currently, the NDEP is implementing the Superfund program elements authorized by USEPA such as soil sampling and analysis and remediation for residential development and recreational land use.

Pollutants of Concern

When the Carson River Mercury Site was originally designated, the Pollutants of Concern (POC) included mercury, arsenic and lead. The EPA conducted a baseline human health risk assessment (1990-1994) on these three trace metals in soil, sediment, surface water, ground water and biota in the Carson River Basin and in Washoe Valley. The estimates of the potential severity of human health effects from these trace metals followed the guidelines for the Risk Assessment Guidance for Superfund (1989). The assessment included evaluating the following:

- Concentrations of trace metals,
- Trace metal toxicology, and
- The degree of human exposure to these trace metals.

To characterize the human health risk, EPA combined the results of the exposure assessment and toxicological evaluation. This risk assessment determined that mercury was the primary Pollutant of Concern for the Superfund Study Area. Arsenic human health risk concerns related to ground water consumption continues to be regulated under the Safe Drinking Water Act. Lead human health risk concerns have been eliminated for additional investigation under the Superfund.

Mercury is toxic to humans and other organisms. It affects the central nervous system as well as the kidneys and developing fetuses. It can also bioaccumulate or increase in concentration as it progresses through the food chain.

Primary Source of Mercury

In the 1850s, placer gold deposits were discovered in Gold Canyon near Dayton, NV. During the 1850s, mining consisted of working placer deposits in Gold Canyon and Six Mile Canyon. The rich silver and gold ore deposits eventually became known as the Comstock Lode. Gold

was more dominant in Gold Canyon and silver was more dominant in Six Mile Canyon. Initially, all of the ore was shipped to San Francisco for processing. In 1860, mining companies began operating their own local mills to process the ore and recover gold and silver.

The primary ore-processing method used from 1860 to 1900 was the "Washoe Process", which was effective on the Comstock Lode high-grade gold and silver ore.

The Washoe Process utilized the following process steps to recover gold and silver:

1) The raw ore was wet crushed in a stamp mill to form a slurry;
2) The crushed ore was separated from the slurry in settling tanks;
3) The crushed ore was charged with mercury in the amalgamation pads where the mercury would form an amalgam with the gold and silver;
4) Finally, the amalgam was separated from the slurry and the gold and silver was recovered in a retort.

It is believed that a majority of the mercury released into the environment was associated with the tailings separated for the amalgam slurry and discharged into ditches and drainages at the processing mills. Other possible release sources considered by EPA included mercury spills at the mills, fugitive air emissions throughout the process, and air emissions from the retorts. It has been estimated that a minimum of one pound of mercury was lost for each ton of ore processed or approximately 14,000,000 pounds of mercury.

In 1901 the cyanide leaching process was implemented in Six Mile Canyon. The cyanide process was able to recover more gold and silver from low-grade ore deposits than was possible using the mercury amalgamation process. The cyanide process eventually replaced the Washoe Process and continues to be utilized by modern mining operations in Nevada today.

It is estimated that 186 mills were operating during the Comstock Era that utilized the mercury amalgamation process. The release of mercury-laden tailings from these mills represents the primary source of mercury in the Carson River Basin. Today these mill tailings have been eroded and redistributed onto soils and drainages or river sediments below the mills throughout the Carson River Basin below New Empire.

The EPA effort to characterize and assess the level of mercury in the environment resulted in the identification and mapping of 113 mill sites as depicted on Figure 2. The figure illustrates that a majority of the mills were located in Gold Canyon and Six Mile Canyon below Virginia City. Approximately 13 mills were located along the Carson River between New Empire and Dayton.

The EPA assumed the highest mercury concentrations would be found around mill sites and focused soil sampling around these sites. Elevated mercury concentrations in soils were found in tailings in Six Mile Canyon and soils adjacent to the Carson River between New Empire

and Dayton. Table 1 provides sample data on Carson River Basin mill sites between New Empire and Dayton sampled by the EPA. Figure 3 depicts the mill sites and areas sampled.

Table 1.
Carson River Historic Mill Sites
Summary of Mercury Concentrations in Soils
(From the surface to a depth of six inches)

Mill Name	Location # Figure 2	Sample Area ID	Sample Size	Max. Conc. mg/kg	Min. Conc. mg/kg	Average mg/kg
Morgan	42	MSO12	19	1,730.91	4.0	225.22
Brunswick	43	MSO13	20	967.55	4.0	90.19
Unidentified	Na	MSO14	10	9.90	4.0	4.59
Merrimac	44	MSO15	14	1,791.67	4.0	383.38
Santiago	45	MSO16	10	267.04	4.0	62.30
Eureka	46	MSO17	10	2,551.06	4.0	515.63

EPA also found elevated mercury concentrations in historic mill tailing deposits. The areas included:

- The alluvial fan below Six Mile Canyon;
- Flood plain of the Carson River below New Empire;
- Carson River channel below New Empire; and
- The sediments in Lahontan Reservoir, Carson Lake, Stillwater Wildlife Refuge and Washoe Lake.

Elevated mercury concentrations were found at six locations, which required immediate corrective action in Dayton and Silver City. These six sites were significant concerns due to the direct access of local residents to the contaminated soils. EPA remediated five of the sites, four in Dayton and one in Silver City, by excavating the contaminated soil to a maximum depth of two (2) feet below ground surface and then backfilled the areas with clean fill. The sixth site was a ditch conveying surface water from Gold Canyon through the center of Dayton. Access to the ditch and contaminated sediment was reduced by installation of a chain link fence along both sides of the ditch. Implementation of these two corrective actions eliminated human access to the contaminated soils or sediment under normal activities.

Health Risk Assessment

As noted above, the EPA determined that mercury maybe located in alluvial fan soils and sediments in the Carson River Basin below New Empire. The mercury concentrations detected in the various areas, toxicology data, and human exposure assessment conducted by EPA found that health risks are limited to the following:

- Consumption of fish or waterfowl from the Carson River system below New Empire; and
- Exposure to high mercury concentrations in soils via incidental ingestion.

Bioaccumulation is when a chemical has the ability to enter the food supply and become concentrated at higher levels as it advances up the food chain. Mercury has this capability. Mercury, which has been deposited in sediments in the Carson River system, is taken up by algae and other small organisms, which are then consumed by fish. Rather than excrete the mercury, the mercury is accumulated in the fish tissue and passed on to other fish and/or birds at the next level of the food chain. Thus fish, birds and animals linked to this food chain tend to have elevated mercury concentrations in their bodies.

As a result of the elevated mercury concentrations in fish and waterfowl in the Carson River system, there is a health risk related to individuals who consume fish or waterfowl taken from the system. The level of health risk is proportional to the quantity and type of fish or waterfowl consumed. The State of Nevada has issued advisories recommending that nursing mothers and children less than six (6) years old not consume fish or waterfowl from the Carson River system.

Elevated mercury concentrations in soils also present a significant human health risk to children less than six (6) years old. The EPA assumes that if young children ingest approximately two teaspoons of soil contaminated with mercury concentrations greater than 80 mg/kg per day, then the soil poises a significant health risk. This assessment was only considered feasible for residential land use; therefore the 80 mg/kg action standard is only applicable to residential developments. A similar health risk assessment has determined that mercury concentrations in soil of 300 mg/kg or less are appropriate for recreational land use.

Exposure pathways that were found not to be of concern were:

- Ingestion of surface water and sediment while swimming;
- Ingestion of groundwater from affected areas;
- Consumption of vegetables grown in contaminated soils; and
- Inhalation of mercury vapors and dust (indoors and outdoors).

Nevada of Environmental Protection Administration

Although EPA has direct control over the Carson River Mercury Site, the NDEP has assumed administration of the EPA approved residential and recreational land use action standard for mercury contaminated soils. The following information outlines the corrective actions that must be addressed for current and new developments within the Carson River Mercury Site.

Residential Land Use: The NDEP reviews and approves all tentative and final land division maps (residential, commercial) in the state. New residential developments that fall with in the Carson River Mercury Site are advised of the mercury risk, residential clean-up standard (80mg/kg mercury in soil). There are two options available to address the mercury risk:

- Option A requires the subdivisions finish grade to provide two (2) feet of clean fill over any mercury contaminated soils which exceed the 80mg/kg standard. Also a durable notification mechanism (deed restriction) to all current and future landowners and

leaseholders of the potential risk associated with the mercury contamination is required. A component of the durable notification is an ongoing Soil Management Plan that ensures that no direct contact with the potentially contaminated soil occurs.

- Option B requires the subdivision finish grade to provide eight feet of clean fill over any mercury contaminated soils which exceed the 80mg/kg residential land use standard. No durable notification or Soil Management Plan is required under this option.

Whether Option A or B is chosen, a statically derived soil sampling plan for finished grade soils from the surface to a depth of two feet (Option A) or eight feet (Option B) must be submitted to the NDEP for approval prior to sampling by a Nevada Certified Environmental Manager. The sampling data results must be submitted to the NDEP for consideration and approval for the final land division map.

Recreational Land Use: The NDEP has advised that land disturbing activities for recreation developments would require the implementation of a soils sampling plan of the finished grade of any disturbed area. The soil sampling plan must demonstrate that two feet of clean fill have been placed over any mercury contaminated soils which exceed the 300 mg/kg recreational land use standard. Clean fill in this case is defined as any soil containing less than 300 mg/kg mercury. The soil sampling plan requires the prior approval of the NDEP.

Summary: The Carson River Mercury Site Superfund Study Area critical regulatory concerns applicable to the Carson River Canyon in Carson City are summarized below:

1. The US EPA designated the Carson River Mercury Site Superfund Study Area in 1990.
2. The primary source of mercury was from Comstock Lode mines and related ore processing which used mercury to amalgamate and recover gold and silver. It is estimated that 14,000,000 pounds of mercury was discharged with mill tailings into ditches and drainages at the ore processing mills.
3. It is estimated that 186 mills used the mercury amalgamation process. Approximately 13 mills were located along the Carson River below New Empire.
4. Elevated mercury concentrations in soils were found in tailings in Six-Mile Canyon and soils adjacent to the Carson River between New Empire and Dayton
5. The EPA human health risk assessment evaluated the
   - Mercury concentrations in soils;
   - Mercury toxicology; and
   - Degree of human exposure to mercury in soils.

   Mercury is toxic to humans and other organisms. It affects the central nervous, kidneys and developing fetus. Mercury bioaccumulates or increases in concentration as it progresses up the food chain. In the Carson River System mercury contaminated sediments are taken up by algae and other small organisms, which are then consumed by fish. Mercury is accumulated in the fish tissue and passed on to other fish and/or

birds. Fish, birds and animals linked to this food chain tend to have elevated mercury concentrations in their bodies.

1. The EPA risk assessment found that human health risks are limited to:
   - Consumption of fish or waterfowl from the Carson river system below New Empire and
   - Exposure to high mercury concentrations in soils via ingestion by children less than six (6) years old.

2. EPA established mercury contaminated soil standards based on land uses:
   - Residential Land Use was established at 80mg/kg
   - Recreation Land use was established at 300 mg/kg

3. Exposure pathways found not to be a concern were:
   - Ingestion of surface water and sediment while swimming
   - Ingestion of groundwater from affected areas
   - Consumption of vegetables grown in contaminated soils and
   - Inhalation of mercury vapors and dust (indoors and outdoors)

4. The NDEP is implementing the mercury soils standards for EPA as follows:
   - New residential developments within the Carson River Mercury Site
     - Option A: requires the finished grade to provide 2.0 feet of clean fill over mercury contaminated soils (<80mg/kg) and establish a durable notification mechanism (deed restriction) for current and future landowners or lease holders and provide a Soil Management Plan.
     - Option B: requires the finish grade to provide 8.0 feet of clean fill over mercury-contaminated soils (<80 mg/kg). No deed restrictions or Soil Management Plan are required.
   - Recreational development: the final grade must provide 2.0 feet of clean fill over mercury-contaminated soils <300mg/kg. Clean fill is defined as soils containing mercury concentration >300mg/kg.

Reference:

EPA, 1994. Preliminary Draft Human Health Risk Assessment/Remedial Investigation Report Carson River Mercury Superfund Site. US EPA, Region IX, San Francisco. April 1994, 120 pages.

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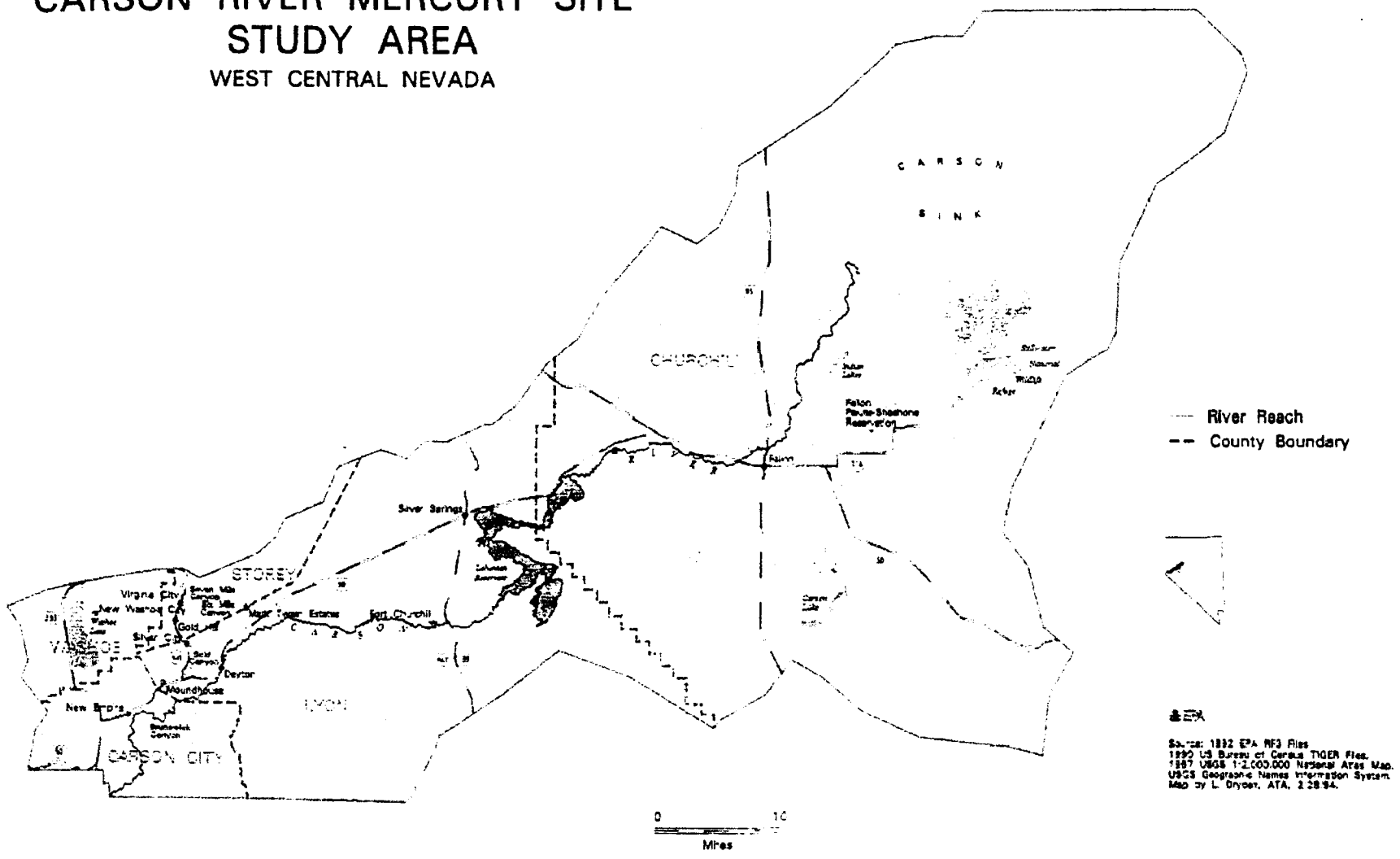
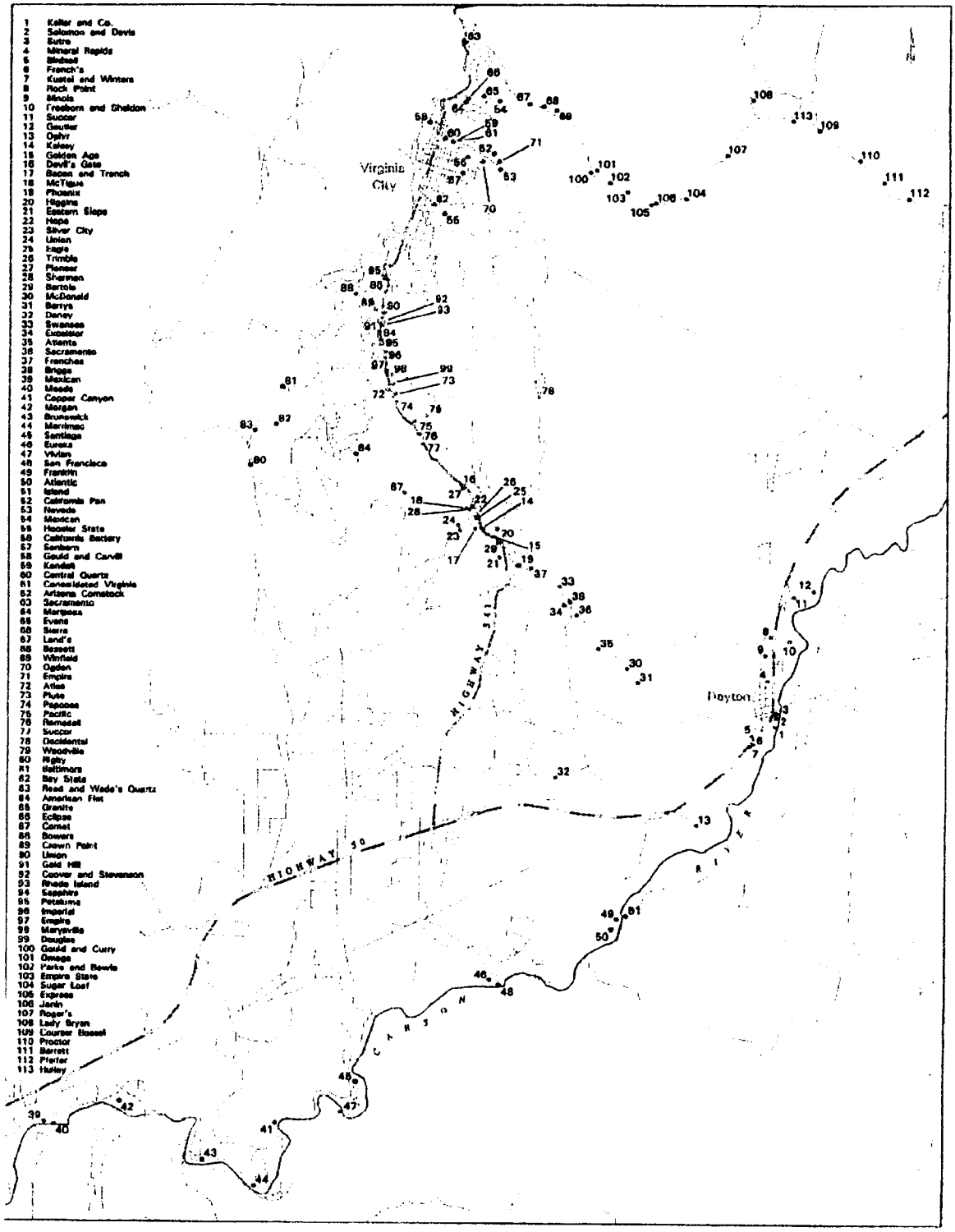
CARSON RIVER MERCURY SITE
STUDY AREA
WEST CENTRAL NEVADA



Source: EPA. 1994

FIGURE 1



HISTORIC COMSTOCK MILL LOCATIONS

STOREY - LYON COUNTY, NEVADA

FIGURE 2

General Area
- Dayton
- Silver City
- Gold Canyon
- Carson River
- Virginia City
- Gold Hill
- American Flat
- Sixmile Canyon

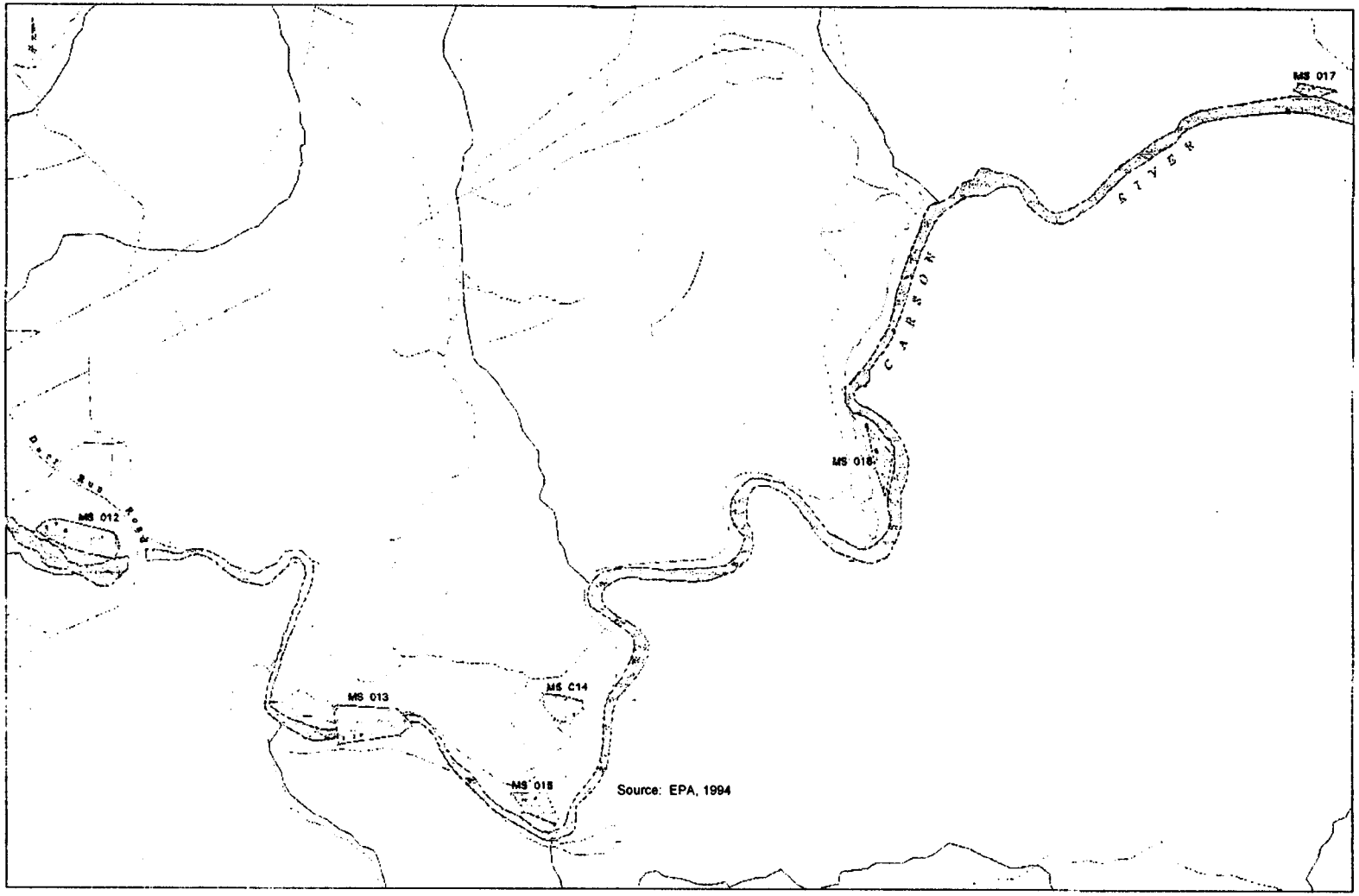
0 2

Miles

Source: Piedmont Engineering, 1993; 1990 US Bureau of Census TIGER Files. Map by L. Dryden, ATA, 3/15/94.

Source: EPA. 1994

FIGURE 2



SURFACE SOIL SAMPLING LOCATIONS

FLOOD PLAIN BETWEEN NEW EMPIRE - DAYTON

FIGURE 3

Total Mercury Concentration in mg/kg (0 - 6 inches)

- Less than 25
- 25 - 79
- 80 and Higher
- Sample ID Area
- River Reach

Sources: 1992 USEPA Art3 Files; Ecology & Environment, 1994; Pedmont Engineering, 1993; 1992 US Bureau of Census TIGER Files. Map by L. Dryden, ATA, 3/18/94.

0 2500

Feet

Source: EPA, 1994

FIGURE 22