Five-Year Review Report

First Five-Year Review Report

for the

Carson River Mercury Site

Dayton and Silver City, Nevada

Lyon County, Nevada

September 2003

PREPARED BY:

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Approved by: Date:

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List of Acronyms

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
EPA	United States Environmental Protection Agency
NCP	National Contingency Plan
NDEP	Nevada Division of Environmental Protection
NPL	National Priorities List
RA	Remedial Action
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
TCLP	Toxicity Characteristic Leaching Potential

Executive Summary

The remedy at OU 01 of the Carson River Mercury site currently protects human health and the environment because the excavation and fill work completed as part of the remedial action remains intact and effective in preventing direct contact with mercury-contaminated soils, protecting human health and the environment in the short term. However, in order for the remedy to be protective in the long-term, efforts to review proposed developments in mercury-contaminated areas must continue.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name ***(from WasteLAN)*****:** Carson River Mercury Site		
EPA ID ***(from WasteLAN)*****:** NVD980813646		
Region: 9	**State: NV**	**City/County:** Dayton and Silver City, NV

SITE STATUS	
NPL status: ■ Final ☐ Deleted ☐ Other (specify)	
Remediation status (choose all that apply): ☐ Under Construction ☐ Operating ■ Complete	
Multiple OUs?* ■ YES ☐ NO	**Construction completion date:** ___ / ___ / _____
Has site been put into reuse? ■ YES ☐ NO	

REVIEW STATUS	
Lead agency: ■ EPA ☐ State ☐ Tribe ☐ Other Federal Agency _____	
Author name: Wayne Praskins	
Author title: Remedial Project Manager	**Author affiliation:** USEPA Region 9
Review period:** 09 /01 / 2003 to 09 /30 /2003	
Date(s) of site inspection: 09 /17 / 03 and 09 /18 /03	
Type of review: ■ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only ☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead ☐ Regional Discretion	
Review number: ■ 1 (first) ☐ 2 (second) ☐ 3 (third) ☐ Other (specify) _____	
Triggering action: ■ Actual RA Onsite Construction at OU #1 ☐ Actual RA Start at OU#____ ☐ Construction Completion ☐ Previous Five-Year Review Report ☐ Other (specify) _____	
Triggering action date ***(from WasteLAN)*****:** 07 /28 /1998	
Due date ***(five years after triggering action date)*****:** 07 / 28 / 2003	

Five-Year Review Report

I. Introduction

The Purpose of the Review

The purpose of five-year reviews is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in Five-Year Review reports. In addition, Five-Year Review reports identify issues found during the review, if any, and recommendations to address them.

Authority for Conducting the Five-Year Review

The Agency is preparing this five-year review pursuant to CERCLA §121 and the National Contingency Plan (NCP). CERCLA §121 states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The agency interpreted this requirement further in the National Contingency Plan (NCP); 40 CFR §300.430(f)(4)(ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

Who Conducted the Five-Year Review

The United States Environmental Protection Agency (EPA) Region 9 has conducted a five-year review of the remedial action for operable unit #1 implemented at the Carson River Mercury Site. This review was conducted in September 2003. This report documents the results of the review.

Other Review Characteristics

This is the first five-year review for the Carson River Mercury site. The triggering action for this review is the start date of the actual RA on-site construction as shown in EPA's WasteLAN database: 07/28/1998. The review was triggered by the presence of hazardous substances, pollutants, or contaminants on site above levels that allow for unlimited use and

unrestricted exposure.

The five-year review is being conducted only for the areas addressed by operable unit #1.

II. Site Chronology

Table 1: Chronology of Site Events

Event	Date
Discharge of mercury-contaminated mill tailings to the environment	late 1800s
Initial discovery of elevated levels of mercury in the Carson River	early 1970s
NPL listing (final)	August 30, 1990
Removal actions	1990, 1992
Human Health Assessment and Remedial Investigation Report	December 1994
Feasibility Study (date of report)	December 20, 1994
ROD signature	March 30, 1995
Remedial design start	April 5, 1995
Remedial design complete	September 30, 1996
Superfund State Contract signature	July 1997
Remedial action start	September 30, 1996
Start of onsite construction	July 1998
Construction dates	August 1998 through January 1999 August 1999 through December 1999

III. Background

<u>The Carson River Site</u>

The Carson River Mercury Site (CRMS) is located east of Carson City, Nevada and includes more than 50 miles of contaminated river, reservoir, and wetland sediments in the middle and lower portions of the Carson River system, and more than 50 millsites where mercury was used to process gold and silver ore mined from the "Comstock Lode." More than 10 million pounds of mercury are believed to have been released to the environment between about 1859 and 1900.

Most of the mercury was probably released to the environment mixed in with mill tailings (i.e., waste rock) leftover from the ore milling process.

A U.S. Geological Survey (USGS) study first documented elevated levels of mercury in sediment and surface water in the Carson River system in the early 1970s. Subsequent studies further delineated the extent of mercury contamination at historical millsites, in river and lake sediment, in the adjacent floodplain, and in fish and wildlife. The site was added to the National Priorities List (NPL) in August 1990. State advisories recommend limited or no consumption of fish and ducks at the site due to high levels of mercury.

EPA has identified two operable units at the site. Operable unit 01, the subject of this five year review, addresses risks posed by the contaminated upland soils at the site. Operable unit 02, which is in the RI/FS stage, addresses mercury contamination in the Carson River system, which includes contaminated sediments in the Carson River, Lahontan Reservoir, Carson Lake, and Stillwater National Wildlife Refuge. EPA-sponsored RI/FS work at OU #2 began in approximately 1992 with the initiation of an ecological assessment of mercury-related impacts in Lahontan Reservoir and upstream portions of the Carson River. More recently, RI/FS work has continued largely though interagency agreements with the USGS and USFWS to examine i) ecological effects in Lahontan Reservoir and downstream areas; ii) the formation and degradation of methylmercury in contaminated sediments; iii) whether contaminated sediments in Lahontan Reservoir are a source or sink for mercury; and iv) the transport of mercury in Stillwater National Wildlife Refuge

Operable Unit 01 and the 80 Part Per Million Cleanup Goal

A remedial investigation report for the Carson River site was completed in 1994. During the RI, a site-specific cleanup level of 80 parts per million (ppm) was established for contamination in residential surface soil. Two existing residential communities (Dayton and Silver City, Nevada) were found to contain areas of concern which exceeded 80 ppm. Operable Unit 01 was designated to address the risks posed by direct contact with contaminated soils. A focused feasibility study was completed and proposed plan announced in December 1994.

As noted in Table 2, the site-specific cleanup level of 80 parts per million (ppm) total mercury is based on the reference dose for mercuric chloride, standard exposure assumptions, site-specific assumptions about the species of inorganic mercury present in the soil, and assumptions about the relative bioavailability of different forms of inorganic mercury. The cleanup level applies only to soil contamination in residential areas.

Table 2. Derivation of 80 ppm Cleanup Goal	
Reference dose for mercuric chloride	0.3 µg/kg-day
Inorganic mercury speciation	10% mercuric chloride (or other relatively soluble species) and 90% mercuric sulfide (or other relatively insoluble species)
Oral Absorption ratio of mercury species	(Oral absorption of mercuric sulfide)/(oral absorption mercuric chloride) = 0.20
Body weight of a 1 to 6 year old child	15 kg
Oral intake rate	200 mg/day
Exposure frequency	350 days/year

IV. Remedial Actions

The Record of Decision for OU 01 was signed March 30, 1995. The selected remedy includes the following components:

* excavation of contaminated soils exceeding 80 parts per million (ppm) in a limited number of residential areas in Dayton and Silver City, Nevada, offsite disposal of excavated soil, and backfilling with clean soil (or placement of up to two feet of clean soil on top of the contaminated soil in lieu of excavation and backfilling);

* disposal of soils that do not exceed Toxicity Characteristic Leaching Potential (TCLP) standards at a Resource Conservation and Recovery Act (RCRA) municipal landfill;

* disposal of any soils that exceed TCLP standards at a RCRA municipal landfill after treatment, or at a RCRA hazardous waste landfill;

* restoration and landscaping after excavation and backfilling;

* implementation of institutional controls to ensure that residential development in areas known or suspected to be impacted by mercury, including characterization of mercury levels in surface soils and, if necessary, remediation of impacted soils.

The four areas of concern where remediation occurred are residential properties designated MS001, MS002, MS004, and MS030. Their locations, shown in Figures 2-1 through 2-3, are as follows:

C *MS001*. This area, located in Dayton, Nevada, is bounded by Main Street to

the north, Railroad Street to the west, the Carson River to the east, and Pradere Road to the south. The approximate size of the remediated area was 92,344 $ft.^2$

- *MS002.* Located in Dayton, this area is within a mobile home park on the west side of Highway 50, north of Ziller Way. The approximate size of the remediated area was 988 ft^2.

- *MS004.* The third area in Dayton, this area lies along River Street between Douglas Street to the north and Highway 50 to the south. The approximate size of the remediated area was 36,603 ft^2.

- *MS030.* Located in Silver City, this area is located west of Highway 342, along American Flat Road. The approximate size of the remediated area was 4,416 ft^2.

The remedial design was completed between 1995 and 1997. During the remedial design process, additional soil sampling was completed to more precisely identify the areal and vertical extent of soils requiring cleanup; the soils requiring excavation were tested further to determine the proper disposal location (and whether any treatment was needed before disposal); permission was obtained from the property owners to proceed with the cleanup; the decision was made to demolish five homes to allow a more complete and effective cleanup; the decision was made to temporarily relocate a trailer (along with its tenants) to provide access to contaminated soils; activities were completed to comply with historic preservation requirements; an appraisal of homes to be demolished was completed; arrangements were made for temporary relocation of residents at MS002; arrangements were made for permanent relocation of residents at MS004; agreements were reached for compensation of property owners for demolition of five residences; and the State-Superfund contract was negotiated.

The remedial action was implemented from August 1998 through December 1999, with temporary demobilization between January 1999 and August 1999.

The remedial action at MS030 was completed in August 1998. It included the excavation of 810 cubic yards of contaminated soil, which were transported to the Lockwood landfill in Sparks, NV for disposal. Following excavation, the site was graded and soil samples collected and analyzed to determine if any soils exceeded the 80 ppm cleanup goal. None of the 12 samples exceeded the cleanup goal. The site was reseeded and covered with a straw erosion control mat in October 1998. In August 2000, EPA sent letters to the two property owners summarizing the remediation efforts and stating that EPA believes that human health risks associated with mercury contaminated soils at the property have been eliminated.

The remedial action at MS001 occurred between August 1998 and October 1998. It

included the removal of 46 truckloads of brush and debris, and excavation of 5,022 cubic yards of contaminated soil, which were transported to the Lockwood landfill in Sparks, NV for disposal. The excavation depth over most of the site was two feet, except for a small area which was excavated to a depth of one foot and then sodded. The majority of the site was composted, reseeded and covered with a straw erosion control mat in October 1998. A temporary irrigation system was installed to promote revegetation. In August 2000, EPA sent letters to the three property owners summarizing the remediation efforts and recommending that any soils excavated from depths greater than the depth of remediation be reburied or covered.

The remedial action at MS002 occurred between September 1998 and October 1998. It included the excavation of 36 cubic yards of contaminated soil located beneath and adjacent to two mobile homes. One of the mobile homes was temporarily relocated during cleanup. The excavation depth was one-half to one foot. The contaminated soils were transported to the Lockwood landfill in Sparks, NV. After remediation, sod was placed over a portion of the area. In August 2000, EPA sent a letters to the property owner summarizing the remediation efforts and providing recommendations that any soils excavated from depths greater than the depth of remediation be reburied or covered.

The remedial action at MS004 occurred between September 1998 and November 1999. It included demolition of five homes, and the excavation of 3,219 cubic yards of contaminated soil. The majority of the excavated soil (2,700 cubic yards) was transported to the Lockwood landfill in Sparks, NV for disposal, but 519 cubic yards of contaminated soil (which had failed the TCLP test for mercury or contained visible droplets of mercury) were transported to Bethlehem Apparatus Co. in Hellertown, PA for treatment and disposal. The excavation depth over most of the site was two feet, except for areas where visible mercury was present which were excavated to a depths of two and one-half to three feet. After excavation activities were complete, various restoration and landscaping activities were completed. Activities included placing sod adjacent to the residence at 225 River Street, reseeding the hillside, installation of a new water supply well, construction of a soil barrier wall (by the property owners), replacement of irrigation lines, installation of a drainage system, and replacement of trees and shrubs. A portion of MS004, at 150 Douglas Street, was not excavated. Instead, the property was covered with one-half foot of clean fill to accommodate the owners' development plans. In August 2000, EPA sent letters to the three property owners summarizing the remediation efforts and providing recommendations that any soils excavated from depths greater than the depth of remediation be reburied or covered.

To address mercury-related risks in areas where residential development is planned, the Nevada Division of Environmental Protection has instituted a review process for proposed subdivisions consisting of five or more units. The process is for the NDEP Bureau of Water Pollution Control to request that NDEP's Bureau of Corrective Actions review a proposed subdivision for mercury-related risks, and require sampling and/or mitigation requirements when necessary. The review generally includes a comparison of

the location of the proposed subdivision to EPA and University of Nevada studies identifying areas where elevated levels of mercury are likely, and consultation with developers, property owners, and their consultants. Subdivision plans ("tentative maps") require review and approval of their sewerage plans from NDEP's Bureau of Water Pollution Control. EPA has provided assistance to NDEP and affected property owners and developers when requested. Table 3 summarizes review letters from the Nevada Division of Environmental Protection regarding land acquisition or development in potentially mercury-contaminated areas.

There was no operation, maintenance, or monitoring required as part of the selected remedy.

V. Progress Since the Last Review

This is the first five-year review for the site.

VI. Five-Year Review Process

Administrative Components of the Five-Year Review Process

The review was prepared by Wayne Praskins. Quint Aninao, with the Nevada Division of Environmental Protection, was notified of the five-year review, participated in the site visit and interviews, and reviewed a draft of this report.

Community Notification and Involvement

Two community members were interviewed during the site inspection, as noted below

Document Review

The following documents were reviewed:

Revised Draft, Human Health Assessment and Remedial Investigation Report, prepared by EPA, December 1994

Carson River Mercury Site Feasibility Study, prepared by Ecology and Environment, December 20, 1994

Record of Decision, Carson River Mercury Site, Operable Unit 1: Surface Soil, March 30, 1995

Remedial Action Report, Carson River Mercury Site, Operable Unit 1: Surface Soil, September 27, 2000

Letters from the NDEP regarding land acquisition or development in potentially mercury-contaminated areas (summarized in Table 3).

Table 3. NDEP Review of Proposed Developments or Land Acquisition in Potentially Contaminated Areas

Property/ Development	Date of NDEP letter	Location	NDEP Action/ Recommendation
Hidden Meadow Subdivision, 62 Lots, 30 Lots	July 5, 1994, February 27, 1996	"Brunswick Canyon" area	Subdivision not in area where elevated levels of mercury expected.
Dayton Village, Phase 1 & 2 Subdivision, 28 and 27 lots	November 17, 1994, September 26, 2003	Dayton	Sampling completed; results indicated that mitigation was not necessary.
Darling Ranch Golf Course and Subdivision.	January 19, 1995	Carson River Flood Plan Above Lahontan Dam	Sampling completed
Mallard Estates Subdivision, 43 lots,	February 13, 1995	Churchill County, Carson River Flood Plan Above Lahontan Dam	Subdivision not in area where elevated levels of mercury expected.
Desert Winds, Phase II (Formerly Pony Express) Subdivision, 94 lots	March 28, 1995, May 14, 1998	Lyon Count	Soil sampling required; results indicated that mitigation was not necessary.
Dubois 8 Lots, Stagecoach	May 22, 1995	Lyon County, Carson River Flood Plan Above Lahontan Dam	Subdivision not in area where elevated levels of mercury expected.
Dayton Valley Country Club	May 24, 1995, September 19, 1995, November 20, 1995, September 19, 1995, October 20, 2003	Dayton	Soil sampling required; results indicated mitigation not needed

Canyon Estates Subdivision	August 4, 1995, September 25, 2003	Alluvial Fan/ Carson River Flood Plan Above Lahontan Dam	Sampling initially required, but requirement subsequently rescinded after finding that subdivision not in area where elevated levels of mercury expected.
River Ridge Estates Subdivision, 12 lots	August 7, 1995,	Carson City	Sampling required.
Indian Hills Subdivision	September 18, 1995	Stagecoach, Carson River Flood Plan Above Lahontan Dam	Property not in area where elevated levels of mercury expected.
Walmsley Estates Subdivision	November 20, 1995, February 1, 1996, March 25, 1996, April 12, 1996, May 2, 1996, April 24, 1997	Dayton	Sampling and analysis for mercury; mitigation implemented.
River View Estates, 43 lots	February 8, 1995, November 20, 1995	Dayton	Soil sampling required; results indicated mitigation not needed
Rose Peak Highlands-Phase 2 Subdivision, 32 lots	August 4, 1995	Carson River Flood Plan Above Lahontan Dam	Sampling required.
Churchill Downs Estates Subdivision, 51 lots	February 23, 1996	Lyon County, Carson River Flood Plan Above Lahontan Dam	Subdivision not in area where elevated levels of mercury expected
Project Area No.1, Proposed Dayton Industrial Park	April 1, 1996	Dayton, Six Mile Canyon Alluvial Fan	Soil sampling completed; results indicated mitigation not needed
Dayton Terrace Estates Subdivision, 84 Lots	April 1, 1996	Dayton	Sampling required.

Six Mile Ranchos Subdivision, 38 lots	June 18, 1996	Lyon County, Carson River Flood Plan Above Lahontan Dam	Recommendation that developer test imported fill for mercury levels
Sutro West Phase 1 and 2 Subdivision	August 3, 1995, August 28, 1996	Lyon County, Carson River Flood Plan Above Lahontan Dam	Sampling required; recommendation that developer test imported fill for mercury levels
Glen Vista Subdivision, 155 lots	August 4, 1995, October 15, 1996	Lyon County, Carson River Flood Plan Above Lahontan Dam	Soil sampling required; results indicated that mitigation was not necessary. Recommendation made to developer to test imported fill for mercury levels
Main Post Office	August 3, 1995	Dayton	Mitigation measures recommended
Skyline Subdivision (34 lots)	December 23, 1999	Lyon County, Carson River Flood Plan Above Lahontan Dam	Subdivision not in area where elevated levels of mercury expected.
Planned shopping center (14.414 acres)	September 25, 2003	Alluvial Fan/ Carson River Flood Plan Above Lahontan Dam	Non-residential development. Recommendations made to developer to cover excavated surface soils by pavement, minimize dust from construction, and insure that imported fill is not contaminated with mercury.

Data Review

The remedy required no operation, maintenance, or monitoring. Accordingly, no data have been generated or reviewed.

Site Inspection

A site inspection was conducted on September 17 and 18, 2003 by Wayne Praskins of EPA. Quint Aninao and Bill Story of the Nevada DEP joined for most of the inspection. During the inspection, the remediated areas were inspected on foot, and discussions were held with two of the property owners. Our observations are as follows:

- ***MS001 South and North.*** The remediated area appeared largely as it did in 1999 at the completion of the remedial action. No recent excavation activity was apparent in the remediated areas, and the fill material was intact and in place. The vegetative cover was uneven and varied in the extent of cover. In much of the area, vegetation was growing in parallel rows, with the areas between rows largely bare (see photo). This pattern may result from vegetation growing in remediated areas where the soil was ripped or loosened, and not in other areas due to compaction. The vegetation consisted of a mix of sagebrush and grasses.

  The southern portion of MS001 appeared to have been grazed by cattle. A For Sale sign was also apparent on the property, as has been the case for several years.

  The middle portion of MS001 had areas with no vegetative cover, several mounds of what appeared to be recently imported soil, and tracks apparently from vehicular traffic.

  The northern portion of MS001 included an area of sod which appeared to be in good condition. The property owner said that he watered and fertilized the lawn area regularly. The property owner at the north end of MS001 also raised concerns about two dead cottonwood trees and the death of spruce trees he had planted, as discussed in the interview summary.

- ***MS002.*** The remediated area appeared largely as it did in December 1999 at the completion of the remedial action. No excavation activity was apparent in the remediated area, and the fill material was intact and in place.

- ***MS004.*** The remediated area appeared largely as it did in December 1999 at the completion of the remedial action. No excavation activity was apparent in the remediated areas, the fill material was intact and in place, the drainage system appeared intact and functional, and the soil retaining wall (constructed by the property owner) appeared intact and in good condition. The hillside to the west of the remediated area appeared stable. A minor amount of soil and rock had sloughed off the hillside and been deposited behind the wall, as designed.

- ***MS030.*** No contaminated materials were left onsite at this location.

Selected areas where elevated levels of mercury were found but were not residentially developed at the time of the ROD were also examined.

Six Mile Canyon: The entire length of Six Mile Canyon was viewed. No residential development was apparent, but several parcels had for sale signs (as has been the case for years).

Alluvial Fan (at the mouth of Six Mile Canyon): Various commercial and

residential development has occurred over the last several years.

"Brunswick Canyon" (the Carson River floodplain between New Empire and Dayton): The area along the Carson River was not inspected for this review, but several development proposals were reviewed by Nevada DEP for mercury-related risks.

Carson River Flood Plan Above Lahontan Dam: The area along the Carson River was not inspected for this review. As noted in Table 3, several development proposals were reviewed by Nevada DEP for mercury-related risks.

Carson River Flood Plan Below Lahontan Dam: The area along the Carson River was not inspected for this review

Interviews

Discussions were held with two of the property owners/residents on September 17, 2003 at their properties. The MS004 property owner had no complaints. The property owner at the north end of MS001 raised concerns about two items: 1) whether the remedial action resulted in increasing the final grade adjacent to two Cottonwood trees, killing the trees; and 2) whether the fill material caused the death of some Spruce trees he planted in his yard. These concerns are discussed in the "issues" section below.

VII. Technical Assessment

- *Question A: Is the remedy functioning as intended by the decision documents?*

  Yes, the remedy is functioning as intended. The excavation and fill work completed as part of the remedial action remains intact and effective in preventing direct contact with mercury-contaminated soils.

- *Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of remedy selection still valid?*

  Yes. The exposure and toxicity assumptions made to derive the 80 ppm cleanup level are still valid. One of the assumptions made in deriving the 80 ppm cleanup level was the relative amounts of various species of inorganic mercury in site soils. If future improvements occur in methods for determining the species of inorganic mercury, additional analyses should be considered and any new results used to reevaluate the appropriateness of the 80 ppm cleanup goal. There have been no changes in the ARARs identified in the ROD.

- *Question C: Has any other information come to light that could call into question the protectiveness of the remedy?*

No, although several issues which may affect the future protectiveness of the remedy are discussed in the recommendations and issues sections.

VIII. Issues

Several issues are noted below. None of the issues currently prevent the remedy from being protective.

Issues Applicable to Specific Areas

MS004 - Access Denied: There is a parcel at the north end of MS004 that was not sampled during remedial design due to the property owner's refusal to provide access (180 River Street). Elevated levels of mercury were present in parcels immediately to the south, making it likely that elevated levels of mercury are present at the 180 River Street property. Because access was not provided, the property was not addressed as part of the remedial action. EPA will contact the owner and continue to request permission to sample the property and conduct any necessary remedial action.

MS001 - Flood Protection: During the remedial action, the property owner at the north end of MS001 expressed concern about the effect of the remedial action on the level of flood protection provided to his property. The eastern edge of the remediated area is approx 100 feet from the active channel of the Carson River and the Carson River is prone to periodic floods due to the lack of significant upstream storage. In response to his concern, additional fill was added to a portion of the property during the remedial action. No flooding has occurred since completion of the remedial action. When the next flood occurs, if significant erosion occurs, the property owner may assert that the remedial action contributed to the erosion.

MS001 - Culvert Maintenance: The remedy included the construction of a culvert to direct runoff away from the hillside adjoining the remediated area. The culvert was constructed on property owned by Lyon County. The drainage improvements were approved in concept by the Lyon County Commissioners at their regularly-scheduled meeting on November, 5, 1998, and were reviewed and approved by the Lyon County Engineer as described in a letter from EPA to the County Engineer dated March 30, 1999. No maintenance was needed during the site visit, but maintenance may be needed at some time in the future.

Issues Applicable to All Areas

Future Construction Activities in Remediated Areas . In most areas, soils were excavated to a depth of two feet. It was expected that future construction activities would be unlikely to disturb soil below this depth. Property owners at MS001 and MS004 are contemplating development of their properties. In letters sent after completion of the

remedial action, the property owners were advised to properly handle and dispose of any soils excavated from depths exceeding the depth of remediation.

Areas Not Remediated as Part of the OU:

Future Development in Areas with Elevated Levels of Mercury. Since the mid 1990s, the State has reviewed proposals for new developments with five or more residential units. The continued effectiveness of this procedure depends on the State of Nevada's willingness to review development, and possibly on EPA financial support to the State to support the review. There is no mechanism in place to review smaller developments for mercury-related risks.

Mercury Speciation. As noted above, the 80 ppm cleanup goal is based on several assumptions, including an assumption regarding inorganic mercury speciation. The speciation assumption was based on a limited number of laboratory analyses that attempted to determine the relative amounts of various inorganic mercury species based on their relative solubility. There may be improvements in analytical capability to speciate inorganic mercury which would allow more accurate determination of the speciation, which could change the cleanup goal for future remediation efforts. One possibility is a research group at Stanford University using a method known as EXAFS to speciate mercury.

IX. Recommendations and Follow-up Actions

Table 4: Recommendations and Follow-up Actions

Issue	Recommendations and Follow-up Actions	Party Responsible	Affects Protectiveness? (Y/N)	
			Current	Future
MS004 - Access Denied	Contact property owner to request permission to sample	EPA/ State	Unknown	
MS001 - Flood Protection	Monitor Carson River for major flooding and erosion	EPA/ State	No	Yes
MS001 - Culvert Maintenance	Inspect culvert during next review	Lyon County	No	Yes
Future Construction Activities in Remediated Areas	Inspect during next review	Property Owners with EPA/State oversight	No	Yes
Future Development in Areas with Elevated Levels of Mercury	Continue efforts of support NV DEP review process	State	No	Yes
Mercury Speciation	Evaluate during next review	EPA	No	Yes

X. Protectiveness Statement(s)

Protective in the short-term:

The remedy at OU 01 currently protects human health and the environment because the excavation and fill work completed as part of the remedial action remains intact and effecting in preventing direct contact with mercury-contaminated soils, protecting human health and the environment in the short term. However, in order for the remedy to be protective in the long-term, efforts to review proposed developments in mercury-contaminated areas must continue.

XI. Next Review

The next five-year review for the Carson River Mercury Site is required by September 30, 2008, five years from the date of this review.

Attachment 1: Site Maps

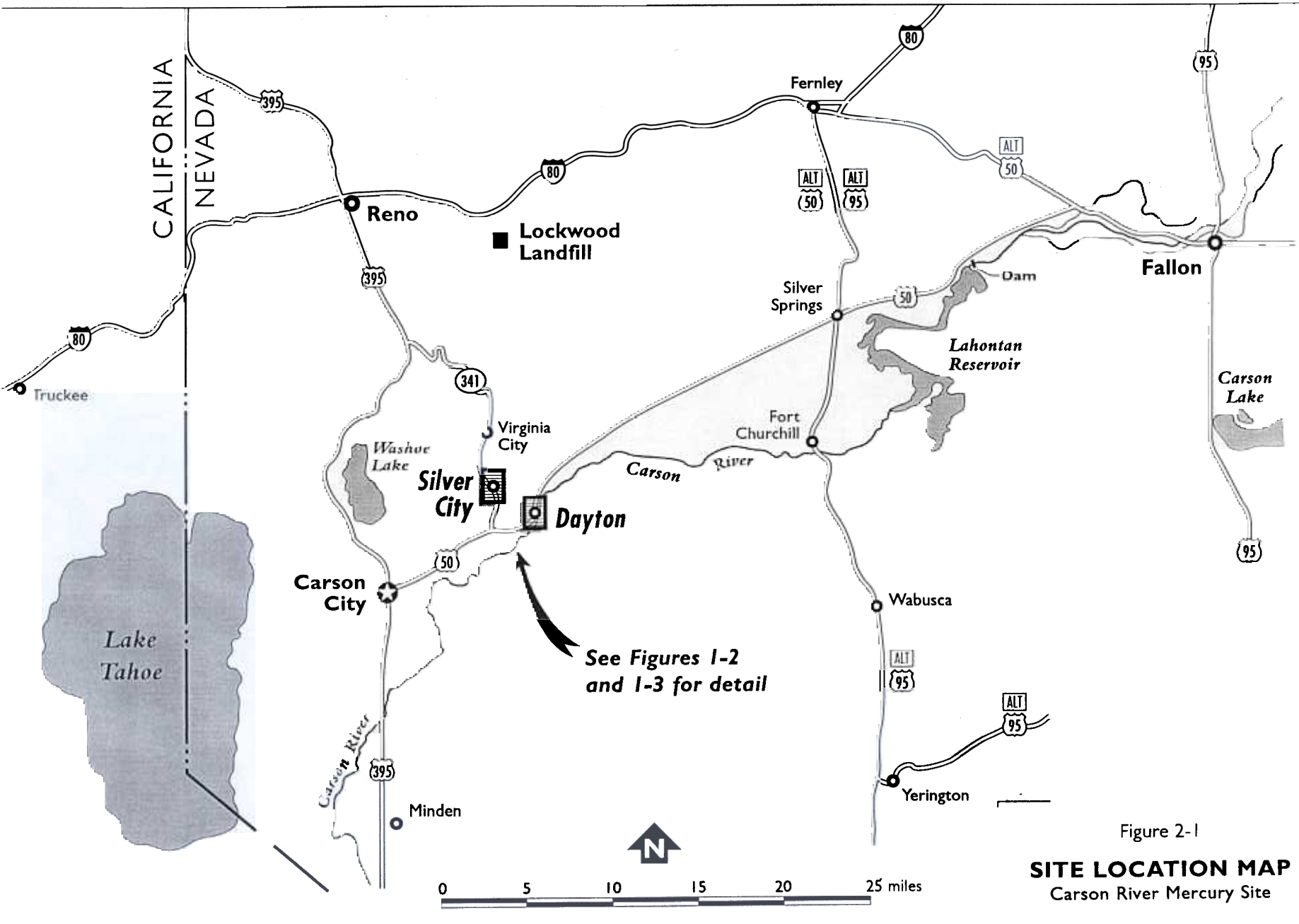


Figure 2-1

SITE LOCATION MAP

Carson River Mercury Site

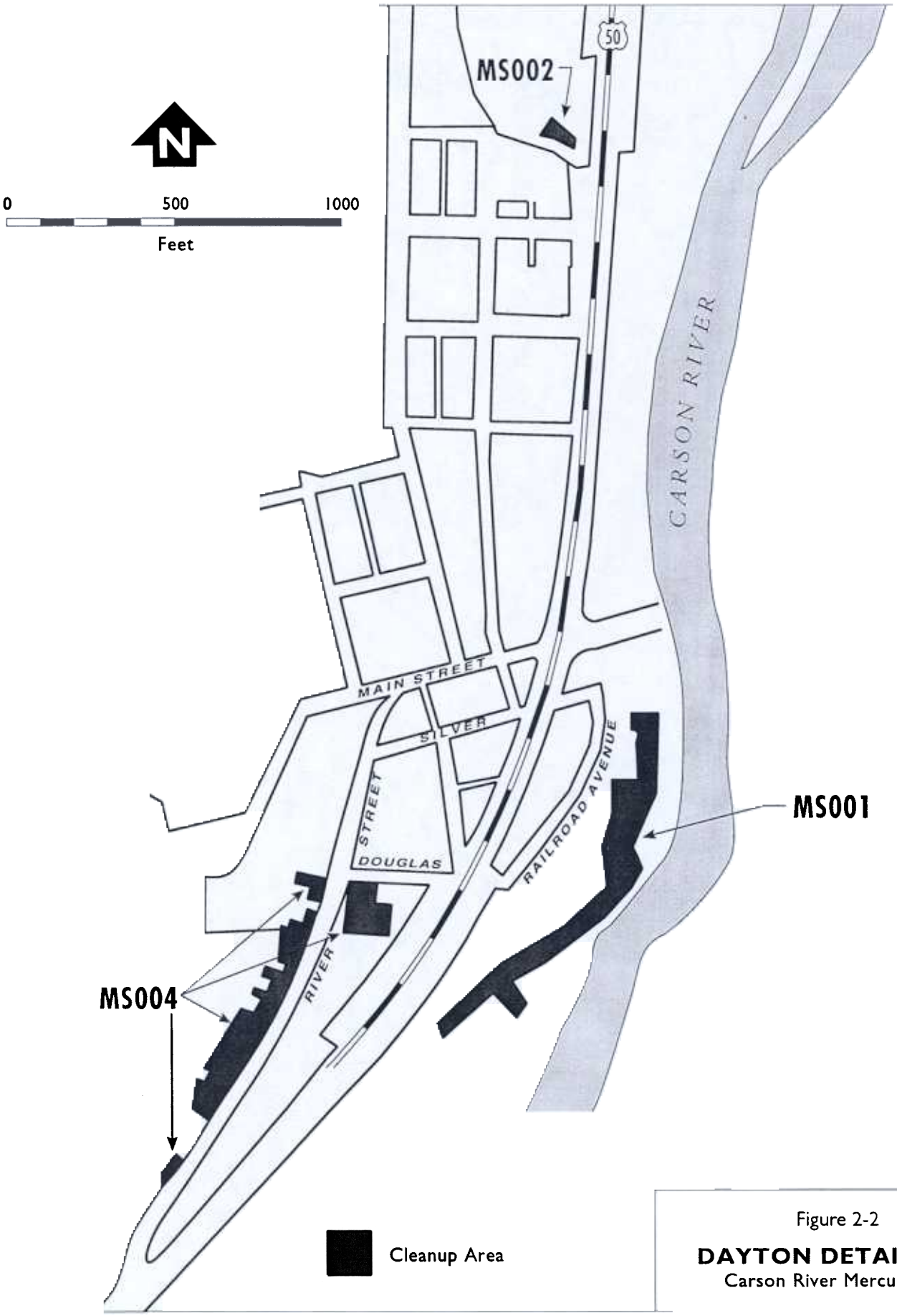
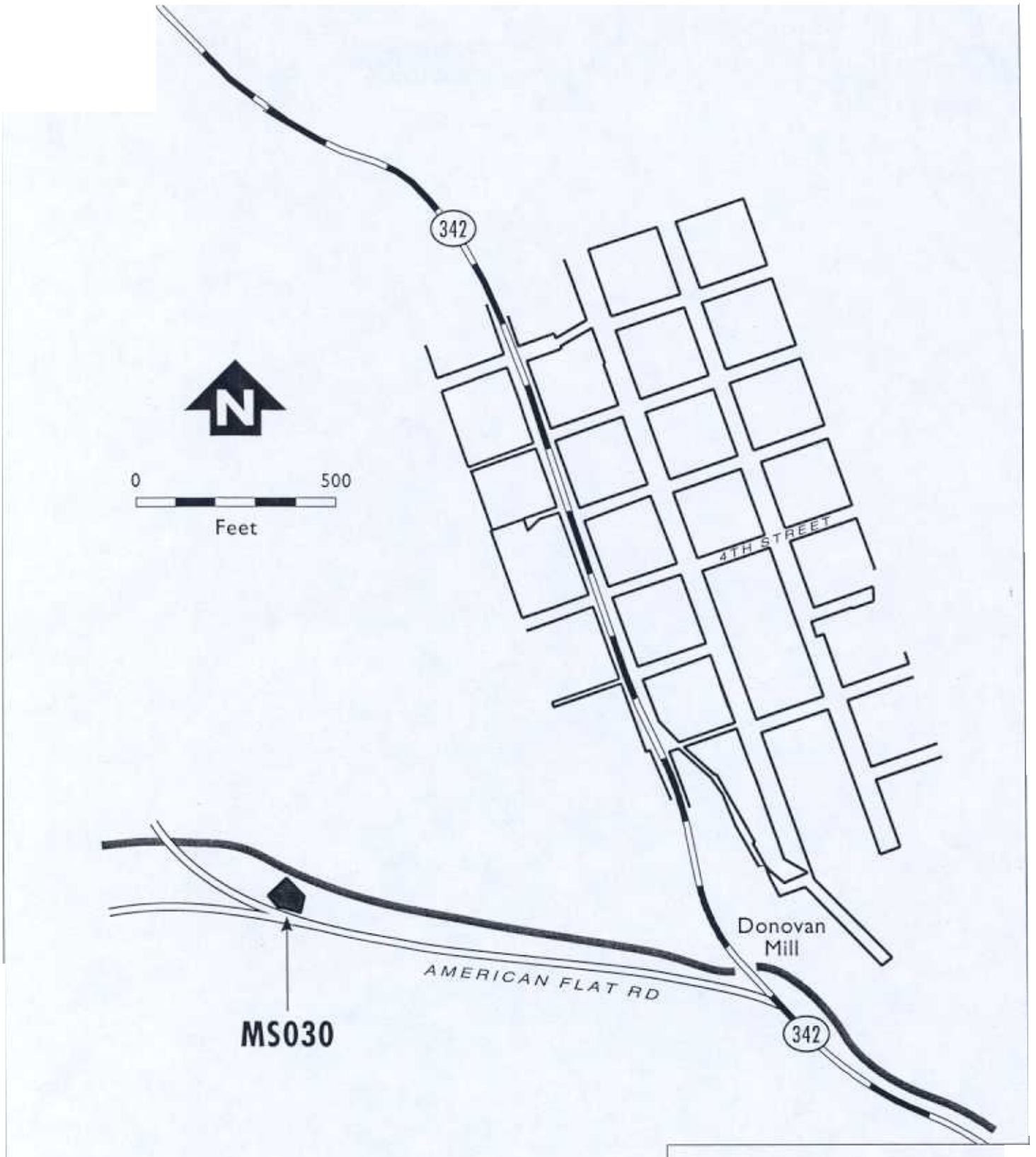


Figure 2-2

DAYTON DETAIL MAP

Carson River Mercury Site



Cleanup Area

Figure 2-3

SILVER CITY DETAIL MAP

Carson River Mercury Site

Attachment 2: Site Visit and Interview Report
September 17, 2003

Property Owner and Resident, MS004

On September 17, 2003, Wayne Praskins (EPA), Quint Aninao (NDEP), and Bill Story (NDEP) met with the owner and resident of the majority of the area designated as MS004 at her home. She had no complaints about the remedial action, and expressed appreciation for our visit. We inspected the property and observed that the remediation work remained intact. No excavation activity was apparent in the remediated areas, the fill material was intact and in place, the drainage system appeared intact and functional, and the soil retaining wall (constructed by the property owner) appeared intact and functional.

Property Owner and Resident, North End of MS001

On September 17, 2003, Wayne Praskins (EPA), Quint Aninao (NDEP), and Bill Story (NDEP) met with the owner and resident of property at the north end of MS001 at his home. The property owner at the north end of MS001 raised concerns about two items: 1) whether the remedial action resulted in increasing the final grade adjacent to two Cottonwood trees, killing the trees; and 2) whether the fill material caused the death of some Spruce trees he planted in his yard. In response to item #1, we noted that any change in the final grade resulting from the remedial action appeared to be minimal, and that the 1997 Carson River flood and year-to-year variability in surface and subsurface flow in and adjacent to the Carson River is also a possible cause of the trees' demise. In response to item #2, Mr. Story of NDEP noted that Spruce trees are relatively difficult to grow in the area, and recommended that the owner try a species of pine instead.

Attachment 3: Photos #1 - #4 Documenting Site Conditions

Photo #1: remediated area at MS001, showing pattern of re-vegetation

Photo #2: remediated area at MS002

Photos #3-4: remediated area at MS004, showing hillside, soil barrier wall, remediated area adjacent to wall