Combie Reservoir
Sediment & Mercury Removal Project

Submitted by
the Nevada Irrigation District
to the California Department of Fish & Game
for the CALFED Ecosystem Restoration Program

March 1, 2011

Section 1: Summary Information

1. Project title: Combie Reservoir Sediment and Mercury Removal Project

2. Applicant name: Nevada Irrigation District

3. Contact person: Tim Crough, Assistant General Manager

4. Address: 1036 West Main St.

5. City, State, Zip: Grass Valley, CA 95945

6. Telephone #: (530) 273-6185

7. Fax #: (530) 271-6838

8. Email address: crough@nidwater.com

9. Agency Type: Local Agency

10. Certified nonprofit Organization: No

11. New grantee: Yes

12. Amount requested: $4,786,430

13. Total project cost: $6,881,080

14. Topic Area(s): Primary topic area: Ecosystem water and sediment quality; Secondary topic area: Mine remediation

15. ERP Project type: Pilot/Demonstration

16. Ecosystem Element: Contaminants

17. Water Quality Constituent: Primary: Mercury; Secondary: Turbidity and Sedimentation

18. At-Risk species benefited: The At-Risk species mentioned in the Multi-Species Conservation Strategy document (*Sacramento River winter-run Chinook salmon, Central Valley fall-/late-fall-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley steelhead, and Sacramento splittail*) do not occur in the project area, but have critical habitat starting approximately 10 miles downstream in the lower Bear River. All of these species are likely to benefit from the expected reduction in downstream transport of toxic materials, specifically mercury and methylmercury, as a result of this project.

This project addresses Conservation Measure #11:

11. Implement construction BMPs including stormwater pollution prevention plans, toxic materials control and spill response plans, vegetation protection plans, and restrictions on materials used in channel and on levee embankments:

- *Avoid or minimize the use of such materials that are deleterious to aquatic organisms.*
- *Before implementing CALFED actions that require dredging, dredge materials should be tested to determine the presence of materials deleterious to winter-run Chinook salmon. Only sediment meeting all water quality standards and free from toxic substances in toxic amounts should be accepted for aquatic disposal.*
- *Discharges from controllable sources of pollutants and releases from water supply reservoirs shall be conducted in a manner that attains those water quality objectives designated by the Central Valley Regional Water Quality Control Board for the maintenance of salmon and steelhead in designated habitats. All materials that are used for construction of in-channel structures must meet applicable State and federal water quality criteria.*

19. Project objectives: 1) Remove sediment and mercury (Hg) accumulated in Combie Reservoir, thereby reducing conditions that contribute to Hg methylation in the Bear River; 2) Determine the net environmental benefit to the Bay-Delta of removing Hg from Combie Reservoir.

20. Time frame: The project timeline assumes a start date of January 2012 and an end date of December 2014 (See Table 1 below for further detail). Project administration (Task 1) will take place throughout the life of the project. Environmental sampling (task 2) will take place within a six-month window prior to sediment extraction. Environmental sampling will be repeated after the sediment and mercury extraction is complete during the third year and reports will be completed by the end of the project.

Site construction and utility set up (Task 3) and equipment mobilization and set up (Task 4) will be implemented in the first year. The sediment and mercury removal (tasks 6 and 7) and associated operational monitoring (task 5) will take place during June through November during fair weather conditions for two years. It is estimated that 60,000 to 120,000 cubic yards of sediment will be removed and 50 to 150 pounds of mercury will be removed from the sediment. Education and outreach will be conducted throughout the project implementation (Task 8).

This project is designed to be completed within three years. If the three-year timeframe is not sufficient to remove all of the material (down to the natural contour line of the reservoir), additional dredging will be implemented using other (matching) funds.

Table 1: Project Timeline

Project Timeline	Year 1 (2012)												Year 2 (2013)												Year 3 (2014)											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Task 1: Project Administration																																				
Task 2: Environmental Sampling																																				
Task 3: Site Construction and Untilities																																				
Task 4: Mobilization and Equipment Set up																																				
Task 5: Operational Monitoring																																				
Task 6: Dredging and Dewatering																																				
Task 7: Mercury Extraction																																				
Task 8: Education and Outreach																																				

Section 2: Location Information

1. Township, Range, Section: 7.5 USGS Quad: Lake Combie Quadrangle, Township: T14N, Range: R8E

2. Latitude, Longitude (in decimal degrees, Geographic, NAD83):

Latitude decimal degrees: 39.02020 Latitude geographic: 39°, 1', 13"

Longitude decimal degrees: -121.03626 Longitude geographic: -121°, 2', 11" (NAD83)

3. Location description: Combie Reservoir is located on the Bear River in the Sierra Nevada foothills approximately 50 miles northeast of Sacramento. The reservoir contains lake and stream channel deposits chiefly made up of sand, gravel, and silts that continue to wash down the Bear River from natural erosion and hydraulic mining from the 1880s. Vast quantities of Tertiary-age channel sand and gravels flow unrestricted and continue to accumulate from the upland streams and watershed areas of the Bear River. Even with the court-ordered cessation of hydraulic mining in 1884, millions of tons of the hydraulic mining debris continue to be transported downstream during storm events into Combie Reservoir.

Combie Reservoir was formed as a water storage feature with the construction of the Van Giesen Dam in 1928, creating an impoundment of the Bear River with 5,555 acre-feet of operational storage capacity. Because of the long and narrow shape of the reservoir (0.3 miles wide and 2 miles long), the aggregates are roughly sized by water action along the length of the reservoir. The grain size decreases to the southwest along the reservoir and becomes predominantly clay and silt directly behind the Van Giesen Dam. The grain size distribution is caused by the decrease in energy (velocity) as the Bear River enters the reservoir. Coarse gravels are deposited first, with progressively finer grains settling out as the transport energy diminishes.

The work site occupies a portion of the former dredging staging area used by Chevreaux Aggregates, Inc. – a commercial sand and rock supplier to the local construction industry. This project utilizes the dormant Chevreaux staging area and does not disturb any forested or riparian area.

See Attachment A: Project Location Map, Attachment B: Topographic Map, Attachment C: Project Site Plan, and Attachment D: Parcel Map.

4. County(ies): Placer and Nevada Counties

5. Directions: From I-80 east of Auburn, take Exit 125 (Clipper Gap), then take Placer Hills Road north to Combie Road. Turn left on Combie Road and proceed until road makes sharp curve to the right. Before the curve, go straight (northwest) at 2701 Combie Road.

6. Ecological Management Region: Sacramento Valley

7. Ecological Management Zone(s): Upper Watershed, Feather River Sutter Basin EMZ

8. Ecological Management Unit(s): Upper Watershed, Bear River EMU

9. Watershed Plan(s): The project is included as a high-priority project in the *Cosumnes, American, Bear, Yuba Integrated Regional Watershed Management Plan*. This project is mentioned in the *Amendments to the Water*

Quality Control Plan for the Sacramento River and San Joaquin River Basins for the Control of Methylmercury and Total Mercury in the Sacramento-San Joaquin Delta Estuary Staff Report (Wood et al. 2010) as an approach that "could help address methylmercury impairments in those reservoirs as well as potentially help reduce the amount of inorganic mercury and methylmercury transported to the Delta." The project is mentioned in *A 21st Century Assessment of the Yuba River Watershed*. This project implements certain goals and objectives of the *Nevada Irrigation District Combie Reservoir Shoreline Management Plan*. This project is also in the top five recommended projects in the *Bear River Watershed Management Plan* (2003).

10. Project area: 45 acres (including dredge and construction area)

11. Land use statement: The project is located in the northwest corner of Combie Reservoir, southeast of Lake of the Pines community in Nevada County and west of Meadow Vista community in Placer County. The Nevada Irrigation District ("NID" or "District") owns the land where all project activities will take place.

Combie Reservoir is a source of drinking and irrigation water for numerous consumers in Placer and Nevada Counties. It also provides residents of both counties with recreational opportunities, such as swimming, boating, and fishing. Combie Reservoir is a terminus water supply reservoir providing water (via a canal) to the Lake of the Pines Water Treatment Plant, which serves more than 2,000 homes in southern Nevada County in the Lake of the Pines region.

Beginning in the mid-1960s, Chevreaux Aggregates Inc. (Chevreaux) was retained by NID to seasonally dredge the northeastern portion of Combie Reservoir near the Bear River inflow. For the 30 years preceding 2003, all dredging of the reservoir occurred within a large detention pond (approximately 200 m wide, 1200 m long, and 10 m deep) created by the installation of a series of dikes/berms to isolate the working pond from the Bear River and rest of Combie Reservoir. The site is currently dormant.

Combie Reservoir bestrides both Nevada and Placer Counties and is located within the Bear River canyon. The beneficial uses of the Bear River and Combie Reservoir are for water storage and diversion, hydroelectric power, recreation, riparian uses, and aquatic life. Other land uses surrounding Lake of the Pines include public schools, two (2) small commercial centers, and rural home sites on parcels of five (5) acres and larger. Most of the larger parcels are vacant, or are used for agricultural purposes. The residential rural community of Meadow Vista is south and east of Combie Reservoir. The topography surrounding Combie Reservoir is rolling hills with elevations ranging from 1,600 feet to 2,000 feet above mean sea level (msl).

Land uses around the site include residential, aggregate mining, and undeveloped forestlands, and are not anticipated to change within the next five years. See Table 2 below for more detail on current land use.

General Plan Designation: Placer County, Meadow Vista Community Plan: Water (W)
Zoning: Placer County: Water Influence-Mineral Reserve
General Plan Designation: Nevada County: Water Area (WA)
Zoning: Nevada County: Public-Mineral Extraction (P-ME)

Table 2: Zoning and General Plan/Community Plan Designation

Location	Zoning	General Plan/Community Plan Designation	Existing Conditions & Improvements
Site	Public-Mineral Extraction (P-ME)	Water Area (WA)	Reservoir—water storage and recreation
North	Agriculture with a 30 acre minimum lot size with Mineral Extraction (AG-30-ME) and Open Space (OS)	Rural 30 and Planned Development	Bear River and open space
South	Water Influence-Mineral Reserve (W-MR) (Placer Co)	Water (Placer Co.)	Combie Reservoir
East	Water Influence-Mineral Reserve (W-MR) (Placer Co)	Water (Placer Co.)	Combie Reservoir
West	Agriculture with 10 acre minimum lot size (AG-10) and Open Space (OS)	Rural 10 and Planned Development	Lake Combie Estates (5-acre lots) and open space (Darkhorse)

12. Project area ownership: 100 % owned by the Nevada Irrigation District, an independent public agency governed by an elected board.

13. Project area with landowners support of proposal: Nevada Irrigation District is the sole landowner of the project site. Outreach to landowners in the area surrounding the project site was conducted as part of the CEQA process, so local residents are aware of, and have provided feedback about, the proposed project. As a part of CEQA process, multiple meetings were held in the communities surrounding Combie Reservoir in Nevada and Placer Counties. Feedback from the local stakeholders, specifically on traffic and noise, was incorporated into the project. Project modifications included selection of an electric dredge and an electric shore- mounted dewatering plant. In addition, the project is designed to keep truck trips on Combie Road through the Meadow Vista community to within the level of standards established by Placer County General Plan. In general, landowners saw that this project addresses an environmental problem, mercury, and will result in improved recreation on the reservoir. Because of these watershed-wide benefits, the community is generally supportive of the project.

Section 3: Landowners, Access and Permits

1. Landowners granting access for project: NID owns the land where the project will be implemented, and additional landowner access requests are not required.

2. Owner Interest: See Attachment D: Parcel Map.

3. Permits: CEQA, Mitigated Negative Declaration, Notice of Determination 9-25-2009, has been completed for this project. NID received a Sierra Nevada Conservancy grant to complete all of the environmental permitting associated with this project. The process to acquire the permits listed below began in November 2009. All permits will be obtained by June 1, 2011.

The permits required for the project activities described in this grant application are:

- California Department of Fish and Game, Long-term Stream Alteration Agreement for reservoir maintenance, submitted November 4, 2010
- California Regional Water Quality Control Board, Central Valley Region, Waste Discharge Requirements under Section 402 National Pollution Discharge Elimination System Permit, and Water Quality Certification under Section 401 of the Clean Water Act, submitted October 28, 2010
- U.S. Army Corps of Engineers, Nationwide Permit 16, Return Water from Upland Contained Disposal Areas, received February 10, 2011. *Note: The Army Corps of Engineers has determined that the project qualifies for a Nationwide 16 Permit, subject to satisfying Water Quality Certification under Section 401 of the Clean Water Act and pre-construction authorization requirements that will be fulfilled when pre-construction activities begin.*
- Placer County Environmental Health Department, Hazardous Materials Business Plan

4. Lead CEQA Agency: Nevada Irrigation District

5. Required Mitigation: No. This project is not a mitigation measure required by any regulatory agency.

Section 4: Project Objectives

1. List task information:

Goal 6: Water and Sediment Quality

Objective 1

Reduce the loadings and concentrations of toxic contaminants in all aquatic environments in the Bay-Delta estuary and watershed to levels that do not adversely affect aquatic organisms, wildlife, and human health

This project is directly relevant to ERP Strategic Goal #6 Water and Sediment Quality, and Objective 1 because it will reduce sediment and mercury loading into the Bay-Delta, improving water and sediment quality. The project will reduce the loading of mercury and sediment from abandoned mines through improvements in the watershed by consutructing facilities and equipment to remove contaminants at a resevoir in the the Bear River watershed. Sediment and contaminants from historic mining travel long distances from their source, affect the health of ecosystems, sensitive species, and humans, and have the potential to hinder restoration efforts in the Bay-Delta (ERP Draft Stage 1 Implementation Plan 2001; Bouse et al. 2010).

The transport of mercury and methylmercury through Sierra Nevada reservoirs (via spillways and controlled releases) is a significant contributor to Bay-Delta methylmercury levels. Over a 20-year period (1984-2003) it is estimated that 98% of total mercury loads to the Delta came from upstream tributaries (Wood et al. 2010a). In the Bear River watershed, the study conducted by USGS in Camp Far West Reservoir (downstream of Combie) measured mercury and methylmercury concentrations in water flowing through Camp Far West Resevoir (Alpers, et al. 2008), however additional data on this topic is needed.

The tributaries of the Sacramento River are the source of 80% or more of total mercury flowing into the Bay-Delta, and "the Cache Creek, Feather River, American River, Putah Creek waterhseds in the Sacramento Basin have both relatively large mercury loadings and high mercury concentrations in suspended sediment, which makes these watersheds effective candidates for total mercury load reduction programs" (Wood et al. 2010a). Mercury loads entering the Delta are highest in winter and spring (Foe 2003), which is when the majority of sediment and mercury is transported from the Bear River Watershed, into the Feather River, and finally downstream to the Sacramento River and Bay-Delta. Furthermore, mercury from gold mining in the Sierra Nevada is more biologically available than material from mercury mines in the Coast Range (Wood et al., 2010b). Therefore, this project is perhaps more effective at solving the Bay-Delta methylmercury problem than a similar project in the Coast Range because it removes mercury that is likely to methylate and become biologically available in the Bay-Delta.

This project is also relevant to ERP Stage 2 Actions for Contaminants and Toxics since it will contribute to identifying implementation measures for mecury and sediment in the upper watersheds for the Methylmercury Total Maximum Daily Load (TMDL) in the Delta and upcoming TMDLs in the upper watershed tributaries. According to the Central Valley Regional Water Quality Control Board (CVRWQCB) Clean Water Act Section 303(d) List of Water Quality Limited Segments Requiring TMDLs lists 2011 as the proposed completion date for a TMDL for mercury in Combie Reservoir (CVRWQCB 2007).

2. Additional objectives: Abandoned Mine Remediation through Development of a Best Management Practice: Abandoned mines constitute the oldest and longest neglected environmental problem in the State of California. The California Gold Rush, while it contributed enormously to the prosperity of the state and the nation, devastated the land and people of the Sierra Nevada. The continued presence of mining toxins perpetuates this devastation today. Abandoned mines in the headwaters of the Bear River continue to contaminate downstream reaches. The mercury-contaminated sediment that resulted from mining and processing of placer and lode gold deposits has accumulated behind impoundments, where effective mercury removal can take place if coupled with routine reservoir management, specifically dredging.

Developing an Interdisciplinary and Collaborative Approach to Mercury Control: This project will serve to increase both collaboration and awareness around the ongoing effects of remediating legacy environmental problems from historic mining in California. The project involves various state, federal, and local public agencies, as well as community organizations, in a positive effort to address this complex, multi-faceted problem using a multi-disciplinary approach. Presentations of project results to state and federal scientists and policy makers will raise awareness and help drive action and funding for addressing this long-neglected issue.

A detailed description of the project's goals and objectives is included in Section 6, 1: Project Description, below.

3. Source(s) of above information:

Alpers, C.N., Stewart, A.R., Saiki, M.K., Marvin-DiPasquale, M.C. Topping, B.R., Rider, R.O., Gallanthine, S.K., Kester, C.A., Rye, R.O., Antweilier, R.C. and De Wild, J.F., 2008, Environmental factors affecting mercury in Camp Far West Reservoir, 2001-03. U.S. Geological Survey Scientific Investigations Report 2006-5008, 358 p.

Bouse, R.M., Fuller, C.C., Luoma, S., Hornberger, M.I., Jaffe, B.E., and Smith, R.E., 2010, Mercury-contaminated hydraulic mining debris in San Francisco Bay: San Francisco Estuary and Watershed Science, v. 8, no. 1, p. 1–28. (*http://escholarship.org/uc/item/15j0b0z4).*

Foe, C.G., 2003, *Mercury Mass Balance for the Freshwater Sacramento-San Joaquin Bay-Delta Estuary*. Final report submitted to the CALFED Bay-Delta Program for the project: An
Assessment of the Ecological and Human Health Impacts of Mercury in the Bay-Delta

Watershed (Task 1A). California Regional Water Quality Control Board, Central Valley Region. Sacramento, CA. (http://mercury.mlml.calstate.edu/reports/2003-reports/)

CVRWQCB (Central Valley Regional Water Quality Control Board), 2007, 2006 CWA Section 303(d) List of water quality limited segments requiring TMDLs, USEPA approval date, June 28. 2007, accessed Feb. 27, 2011 at:
http://www.swrcb.ca.gov/water_issues/programs/tmdl/docs/303dlists2006/epa/r5_06_303d_reqtmdls.pdf

TSF (The Sierra Fund), 2008, Mining's Toxic Legacy: An Initiative to Address Legacy Mining Toxins in the Sierra Nevada, 87 p. (http://www.sierrafund.org/images/content/campaigns/pdf/Miningstoxiclegacy.pdf)

Wood, M.L., Morris, P.W., Cooke, J., and Louie, S.J., 2010a, Amendments to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins for the Control of Methylmercury and Total Mercury in the Sacramento-San Joaquin Delta Estuary Staff Report, April 2010, 331 p. plus appendices.

Wood, M.L., Foe, C.G., Cooke, J., Louie, S.J., 2010b, Sacramento – San Joaquin Delta Estuary TMDL for Methylmercury Staff Report, Draft Report for Public Review, February 2010, 233 p.

Section 5: Conflict of Interest

Primary Contact for Proposal: Timothy Crough, PE
Primary Investigator: Charles Alpers, Ph.D., U.S. Geological Survey
Co-Primary Investigator: Carrie Monohan, Ph.D., Headwaters Sciences
Subcontractors: USGS, Pegasus Earth-Sensing Corp., The Sierra Fund, Headwater Sciences, CABY

Last Name	First Name	Organization	Role
Modrall	Keri	Modrall Consulting	Grant Writer
Leach	Kyle	Leach Consulting	Consulting Geologist
Parilo	Tom	Thomas A. Parilo & Associates	Land Use and Environmental Planner

Section 6: Project Tasks and Results Outline

1. Detailed Project Description

Problem statement. If mercury-contaminated sediment continues to accumulate in Combie Reservoir, methylmercury production will likely increase, future water storage capacity, water quality, and recreation opportunities in Combie Reservoir will be threatened, and downstream reaches of the Bear River, Feather River, Sacramento River, and Bay-Delta, including several water bodies that have been identified by the CVRWQCB as mercury impaired (CVRWQCB 2007) will continue to receive water with elevated methylmercury, a neurotoxin that biomagnifies up the food chain.

Located on the Bear River in the Sierra Nevada foothills approximately 50 miles northeast of Sacramento, Combie Reservoir is listed as an impaired water body because of mercury contamination (CVRWQCB 2007). The water quality of Combie Reservoir has been severely compromised by mercury residing in sediments that have been deposited in the upper reaches of the reservoir. The mercury contamination is manifested in elevated fish tissue concentrations documented by the USGS (May et al. 2000), which are the basis of a fish consumption advisory issued by the California Office of Environmental Health Hazard Assessment (Klasing and Brodberg 2003).

Over the past 20 to 30 years, riverbed excavation or dredging has occurred at Combie Reservoir to maintain water storage capacity on an as-needed basis. The California Regional Water Quality Control Board – Central Valley Region (RWQCB-CVR) halted these operations in 2002 because of elevated mercury levels in the dredge pond.

Since 2002, each storm event has filled Combie Reservoir with additional transported sediments, which are contaminated with mercury left behind from historic hydraulic mining in upstream areas.

This project combines innovative mercury removal equipment (remediation technology) with reservoir maintenance dredging to remove mercury from dredged sediments. The result will be a reduction of an extremely hazardous water quality and aquatic ecosystem pollutant, an increase in water storage capacity, and reduced mercury-methylation potential in the reservoir.

Mercury is a water quality constituent of national concern. Consumption of mercury-laden fish leads to developmental delays in fetuses, infants, and children, and can lead to neurological symptoms and other health problems in adult humans as well as ecological problems in wildlife (Weiner et al. 2003a,b). As such, removing mercury from the watershed will have the benefit of removing a serious, public health and environmental hazard. Fish tested in Combie Reservoir (largemouth bass and Sacramento sucker) were among the highest in mercury in a state-wide survey recently completed by the State Water Resources Control Board's Surface Water Ambient Monitoring Program (Davis et al. 2010). Reduced mercury contamination in Combie Reservoir sediments would likely lead to reduced loads of total mercury and methylmercury into the lower Bear River and the Bay-Delta.

The hypotheses that are being tested are: (a) Removing elemental mercury from dredged sediments in Combie Reservoir will result in a less contaminated aquatic food chain; specifically, zooplankton and small fish are expected to have lower methylmercury levels after study completion; (b) Removing elemental mercury from Combie Reservoir will reduce the loads of mercury and methylmercury in the lower Bear River, a tributary to the Bay-Delta; and (c) Removing elemental mercury from dredged sediment as a Best Management Practice during reservoir maintenance dredging activities in mercury-laden reservoirs across the Sierra Nevada would significantly reduce methylmercury exposure to wildlife and loading of mercury and methylmercury in this and other tributaries to the Bay-Delta.

Goals and objectives. The goal of the Combie Reservoir Sediment and Mercury Removal Project is to remove 50 to 150 pounds of mercury from 60,000 to 120,000 cubic yards of sediment that has accumulated in Combie Reservoir. The specific measurable objectives and expected results in support of this goal are: 1) to remove 50 to 150 pounds of mercury and 60,000 to 120,000 cubic yards of sediment; 2) to reduce the conditions that contribute to mercury methylation by removing elemental mercury from shallow, relatively warm waters, and deepening the reservoir back to its original contour; 3) to determine the net environmental benefit to the Bear River watershed and the Bay-Delta of removing elemental mercury from Combie Reservoir; 4) to construct dredging and mercury extraction facilities; and 5) to monitor, refine, and document the dredging and mercury extraction process to develop a Best Management Practice for mercury remediation in reservoirs affected by historical gold mining.

2. Background and Conceptual Models

The 19th century California Gold Rush is considered the primary source of mercury contamination to the Sacramento River and the San Francisco Bay-Delta. Mercury from historic gold mining can still be found in Sierra Nevada waterway (Alpers et al. 2005a,b). Continuous and ongoing erosion, along with each storm event that occurs, washes this toxic element downstream into impoundments such as Combie Reservoir, where it methylates and permeates the aquatic ecosystem, becoming a serious health hazard to the humans and wildlife that rely on this water body and downstream environments. See Attachments A through C for project maps. See the Location Description and Land Use Statement (above) for a description of the project site.

Conceptual Model: Methylmercury enters the aquatic ecosystem. If we remove mercury from the bottom of the reservoir we will reduce the levels of methylmercury in fish.

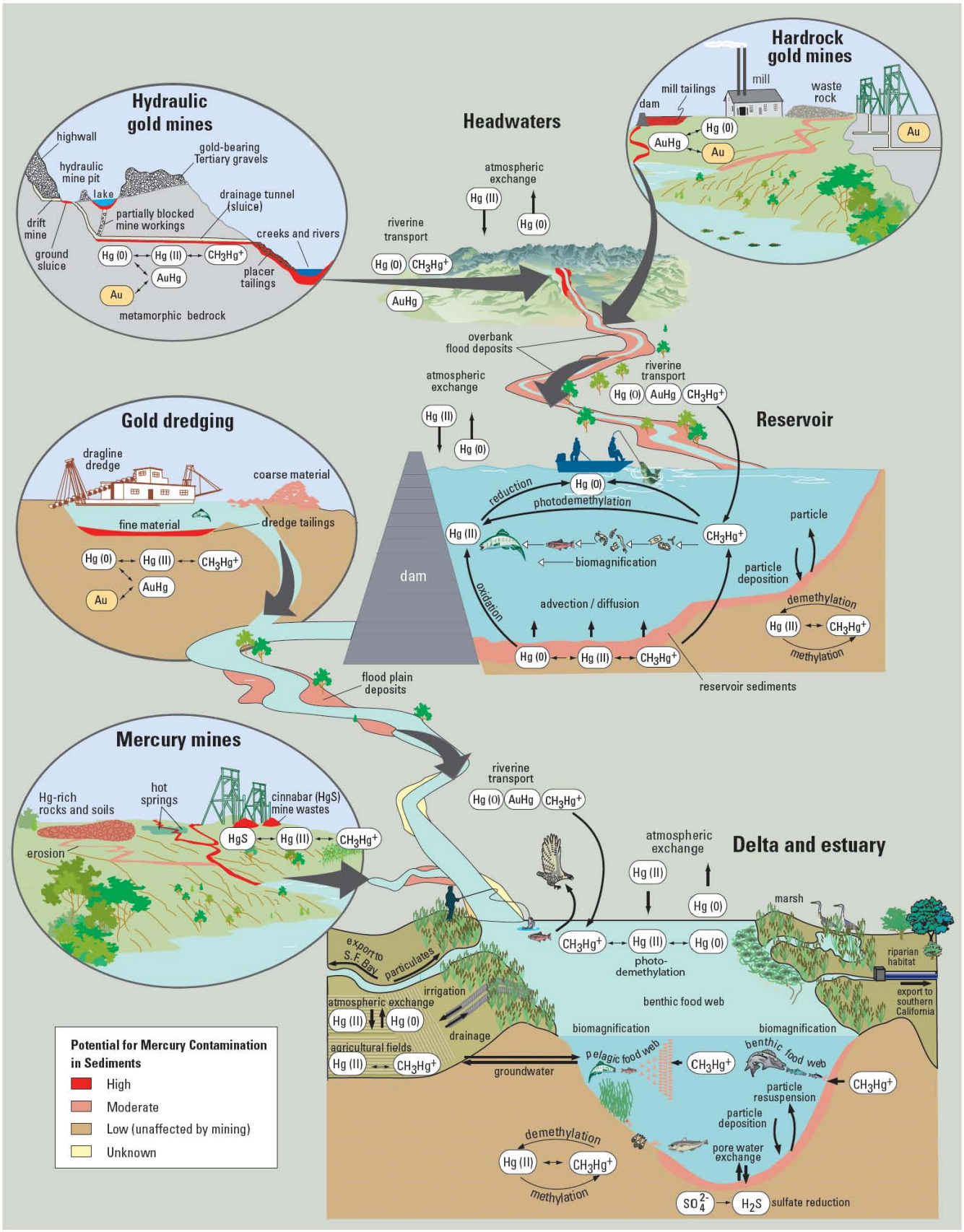
FIGURE 1: Methylmercury in the Aquatic Ecosystem

Each year, the reservoir fills with more mercury-laden sediment, without a way to dredge or remove it. Not only is NID losing water storage capacity, but more importantly, mercury methylation throughout the aquatic ecosystem is likely escalating as temperatures in Combie Reservoir rise as a result of increasing areas of shallow water and reduced water storage volume. The investment of public funds in project activities will lead to long-term economic and environmental benefits for the Sierra Nevada region and the Bay-Delta.

Conceptual Model: Mercury from hydraulic gold mines still contaminates the Bay-Delta.
The conceptual model (Figure 2 below), originally developed by Alpers et al. (2005), clearly depicts the connection of hydraulic gold mines in the headwaters as a mercury source to the Bay-Delta. This project would remove mercury and sediment that has been transported downstream to reservoirs from numerous hydraulic mines upstream in the headwaters of the Bear River watershed, thereby reducing the amount of mercury entering the Bear River, downstream reservoirs and the Bay-Delta. The effectiveness of this strategy will be evaluated in the proposed project as monitoring of mercury loading using best available science (Task 2) will take place through the project to fully characterize pre-project conditions in order to be able to compare post-project conditions and evaluate project effectiveness. Once completed at Combie Reservoir, this mercury remediation technique could be applied to numerous other mercury-contaminated reservoirs. Thus, the implementation of this project will create a Best Management Practice that has long-lasting, direct environmental benefits to the lakes, streams, and rivers of the Sierra Nevada, its watersheds, and the California Bay-Delta.

The information generated as a result of proposed project activities will expand the existing body of knowledge related to mercury contamination and remediation by filling critical gaps in our understanding of mercury fate and transport within and between watersheds. This information is applicable not just in the Bear River Watershed, but throughout the Sierra Nevada, the state of California, and elsewhere.

FIGURE 2: Conceptual Model



3. Approach and Scope of Work

Project Approach: The overall project is expected to remove approximately 50 to 150 pounds of elemental mercury while producing up to 60,000 to 120,000 cubic yards of clean aggregate material for use in the construction industry. The overall project has been carefully designed to include 6 main components: 1) initial analysis, permitting activities, and CEQA (completed); 2) pre-project sampling, site construction, mobilization and startup dredging; 3) production dredging (mercury extraction and sediment removal); 4) operational efficiency and adaptive management monitoring; 5) post-project sampling and report writing and; 6) education and outreach.

The initial analysis and CEQA clearance (first component) were completed with the assistance of a 2008 Sierra Nevada Conservancy grant in the amount of $100,000 and with NID general funds. The current request includes eight tasks: 1) administration; 2) pre-project and post-project environmental sampling and monitoring of fish, water, zooplankton, invertebrates, and sediment; 3) site construction and utilities; 4) mobilization and equipment set-up; 5) operational monitoring; 6) dredging and dewatering; 7) mercury extraction; and 8) education and outreach.

Although NID is contributing significant funds to this project, the overall cost far exceeds the financial capability of the District. In 2010, United States Senator Dianne Feinstein recommended FY 2011 Senate Appropriations funding in the amount of $3,000,000; the U.S Senate Committee on Appropriations recommended partial funding for this project, in the FY2011 Appropriation Omnibus Bill. However, due to congressional economic concerns, in December 2010 the United States Senate deferred all appropriation-funding bills for FY 2011. Therefore, appropriations funding is not expected. If needed, additional funding sources may include the State Water Resources Control Board Cleanup and Abatement Account. These funds are limited to cleanup activities, and could supplement the dredging and mercury extraction activities beyond the first two years, if needed, using other (matching) funds.

State and federal funding is appropriate for the Combie Reservoir Sediment and Mercury Removal Project, as widespread mercury contamination was the result of uncontrolled hydraulic mining in the late 1800s. During that time, an estimated 26 million pounds of mercury were used to extract gold from mine tailings, much of which still remain in Sierra Nevada watersheds (Churchill, 1999, 2000). This project will begin a new era of watershed management in the Sierra Nevada region demonstrating a new method for addressing an otherwise non-point source of pollution in a managed and controlled environment.

Goals and deliverables that will result from the proposed project activities are to determine the net environmental benefit to the Bear River watershed and to the Bay-Delta of removing elemental mercury from Combie Reservoir (Task 2); to prepare the site for dredging and mercury extraction activities (Task 3); to refine the dredging and mercury extraction process so that it can be implemented smoothly and efficiently (Task 5); and to inform the general public about the dangers of mercury contamination, foster understanding of the legacy of Gold Rush mining activities, and provide information concerning the Combie Reservoir Sediment and Mercury Removal project (Task 8).

Scope of Work. The tasks described below, which will be funded by this grant, will serve as the foundation for the overall project to restore the upper Bear River and Combie Reservoir.

Task 1: Project Administration and Management

The project team recognizes that project management and administration are critical to successful project implementation. NID has extensive experience in implementing and managing water-related projects and operations. Additional project partners who will assist with the implementation of this project are: the United States Geological Survey (USGS); Pegasus Earth-Sensing Corp. (Pegasus); The Sierra Fund (TSF) and the Cosumnes, American, Bear, and Yuba River Integrated Regional Water Management Team (CABY). Under this task, NID will take the lead in contract oversight, overall management of work plan schedule and deliverables, fiscal management and invoicing, development of the semi-annual report and the final report, performance

measure reporting, convening project team meetings, development and management of subcontracts, and compliance with all funding requirements.

1.1 Draft and finalize subcontracts
1.2 Fiscal management and invoicing
1.3 Submit semi-annual reports
1.4 Overall project coordination
1.5 Draft and submit final report

Task 1 Deliverables	Timeline
Signed subcontracts with project partners	January 15, 2012
Mid-project report	May 15, 2013
Final report drafted	December 1, 2014
Final report finalized	December 15, 2014

Task 2: Environmental Sampling and Monitoring Pre-and Post-Project
This task will establish pre-and post sediment and mercury removal (dredging) conditions and, ultimately, be the basis for determining the net environmental benefit and load reduction to the lower Bear River (a tributary to the Bay-Delta) of removing elemental mercury from Combie Reservoir. It will include water-quality samples taken both monthly and during storm events. Data from the water-quality samples will be combined with flow information from a gage station to be installed above the dredge site as well as other available flow data downstream of Combie Reservoir to calculate mercury and methylmercury loads moving down the watershed. Headwater Sciences will collect the water samples in the Bear River upstream and downstream of Combie Reservoir that will be used in the load calculations. The USGS will collect water samples within Combie Reservoir as well as sediment, zooplankton, invertebrate, and fish samples pre-and post-dredging to determine any temporal changes in mercury and methylmercury concentrations. The USGS will analyze the data and produce a peer-reviewed report on the pre-dredging baseline conditions in Combie Reservoir and in the Bear River upstream and downstream of the reservoir prior to mercury removal, and will prepare a second peer-reviewed report comparing pre-dredging to post-dredging conditions. These two USGS reports will document the environmental changes that result from removing sediment and mercury from Combie Reservoir.

Fish Tissue: Fish will be sampled from three sites: upstream, downstream and within the reservoir. Fish tissue will be analyzed for total mercury in skin-off axial muscle fillet tissue in larger fish, and whole-body in smaller fish. The goal is to sample 10 largemouth bass (or smallmouth bass, if largemouth are not available), 10 bluegill, and 10 rainbow trout from the Bear River, both upstream and downstream of the reservoir, and 10 largemouth bass and 10 bluegill from the reservoir pre- and post-dredging.

Protocols:
Field Collection: Fish samples will be field frozen with water surrounding on dry ice, using a low-stress protocol developed by USGS research team members in conjunction with UC Davis School of Veterinary Medicine (Protocol #13464).

Preparation of fish samples for analysis: Fish for analysis will be thawed, weighed, and measured. Individuals within the human health relevant size ranges (≥ approx. 150 mm for trout and ≥ 305 mm for bass) will be analyzed for fresh weight muscle mercury and smaller fish will be analyzed by whole-body methods using standard cold vapor atomic absorption (CVAA) spectrophotometry.

Water Quality and Invertebrate Sampling: Five sites in Combie Reservoir will be selected to do integrated water column sampling. Two sites will be located in the pond previously used by Chevreaux Aggregate, Inc in their dredging activities. Three sites will be located within the reservoir, one downstream of the dredging area and two near the dam (one shallow and one deep). The five sites will be sampled four times pre-dredging and again four times post-dredging. Water quality grab samples will be taken monthly (12 samples over 1 year) from a site upstream of Combie Reservoir, a site downstream of Combie Reservoir, and at the dredge site in the reservoir.

Grab samples will be taken from these sites during at least four storm events pre- and post- dredging. Invertebrate samples (caddisfly and/or stonefly larvae) will be taken from the sites upstream and downstream of the reservoir both pre-project and post-project. Zooplankton samples will be taken at the shallow reservoir water-quality sampling sites both pre-project and post-project. Laboratory analysis by USGS of water samples will include total mercury (unfiltered and filtered), methylmercury (unfiltered and filtered), DOC, TSS, nutrients, and chlorophyll-a. Analysis of invertebrates and zooplankton will include total mercury and methylmercury concentrations.

Protocols: Samples will be analyzed in USGS laboratories in Menlo Park, CA for total mercury and methylmercury according to EPA methods 1630 and 1631. Field procedures and laboratory methods will follow an existing Quality Assurance Project Plan (QAPP) approved by the USGS and the State Water Resources Control Board (SWRCB). The QAPP includes blanks, replicate samples, and matrix spikes on selected constituents.

Water Column Vertical Profiles: At the five sites in Combie Reservoir where the water column will be sampled, in situ data will be collected in vertical profiles for temperature, pH, dissolved oxygen (DO), specific conductance, and turbidity. The data will be collected initially at five-foot intervals and more detailed data (one-foot intervals) will be collected where steep gradients are identified. The vertical profiles will be collected approximately monthly throughout the project, to determine the extent of low DO (hypolimnion) zones where Hg methylation may occur.

Protocols: Water column profiles will be done using a multi-parameter water quality sonde such as the YSI 6-series. The manufacturer's instructions will be followed regarding instrument calibration.

Sediment Quality: Sediment samples will be taken from the bottom of the reservoir at the five locations where the water-quality reservoir samples will be taken (two sites in the former dredge pond, one site below the new dredging area and two sites near the dam). Sediment samples will be taken from the top 2 pre- and post- dredging. Five sites, and 4 sampling events both pre- and post-project makes a total 40 sediment samples and includes analysis by USGS of THg, MeHg, RHg(II), grain size, LOI, Fe and S redox species.

Protocols: Samples will be analyzed in USGS laboratories in Menlo Park according to EPA methods 1630 and 1631. Field procedures and laboratory methods will follow an existing Quality Assurance Project Plan (QAPP) approved by the USGS and the State Water Resources Control Board (SWRCB). The QAPP includes blanks, replicate samples, and matrix spikes on selected constituents. Reactive mercury(II) will be determined using the method of Marvin-DiPasquale and Cox (2007).

Flux measurements: Additional sediment samples will be taken from four depths at six sites (48 samples total) for the purpose of determining flux of mercury and methylmercury from the sediment pore water to the reservoir. Pore water will be extracted from the sediment samples by centrifugation, and will be analyzed for total mercury, methylmercury, dissolved organic carbon, and nutrients. Bottom-water samples will be collected at the same locations and analyzed for the same constituents for comparison. The pore-water and bottom-water analyses will be used to calculate diffusion rates from sediment pore water to the water column in the reservoir. Sediment and bottom-water samples will be taken pre- and post- dredging. Sediment samples will be taken from 6 sites during two events at 4 depths for a total of 48 samples pre-dredging and 48 samples post-dredging, plus 24 corresponding bottom water samples. A total of 120 pore-water and bottom-water samples will be analyzed for total mercury (filtered), methylmercury (filtered), DOC, and nutrients. Diffusion rates will be calculated from sediment pore water to the reservoir water column.

Protocols: Samples will be analyzed in USGS laboratories in Menlo Park according to EPA methods 1630 and 1631. Field procedures and laboratory methods will follow an existing Quality Assurance Project Plan (QAPP) approved by the USGS and the State Water Resources Control Board (SWRCB). The QAPP includes blanks, replicate samples, and matrix spikes on selected constituents.

2.1 Fish tissue sampling
2.2 Water Quality Sampling, monthly and storm water, and in-reservoir

2.3 Invertebrate Sampling
2.4 Water quality vertical profiles
2.5 Sediment quality sampling
2.6 Sediment flux sampling
2.7 Data analysis and report production

Task 2 Deliverables	Timeline
Fish tissue samples from 3 sites; 30 bass, 30 bluegill and 20 trout	March–June 2012 and March–June 2014
Sediment and water-quality sampling from 5 sites and 4 events	Jan.–June 2012 and Jan. –June 2014
Sediment flux sampling, 6 sites, 4 depths, 2 events, 48 samples	March–June 2012 and March–June 2014
USGS report on pre-project conditions drafted	December 15, 2012
USGS report finalized on pre- and post- project conditions	December 15, 2014

Task 3: Site Construction and Utilities
The goal of this task is to construct the equipment and systems necessary to begin mercury extraction activities. The tasks necessary to prepare the site for dredging and mercury extraction are: site grading, installation of temporary power connection/power source, creation of parking areas, construction of temporary office/lab and toilet facilities, installation and testing of pipe and pump lines, and construction of log booms and turbidity curtains. In addition, the final setup, assembly, and testing of the extraction equipment and dewatering system will be completed on site.

3.1 Prepare civil site drawings
3.2 Grade site
3.3 Install temporary power
3.4 Install temporary office/lab and toilet facilities
3.5 Construct parking area and safety barriers
3.6 Install overflow pipe
3.7 Install dredge pipes and tanks
3.8 Construct log booms with turbidity curtains

Task 3 Deliverables	Timeline
Civil site drawings	March 1, 2012
Construction contracts	February 15, 2012
Site prepared for mobilization and startup dredging	June 1, 2012

Task 4: Mobilization and Equipment Set up (This Task is dependent on Task 3.)
After the site construction and utilities activities are complete, the specialty equipment will be brought to the site and assembled for operations (i.e., mobilization). The sediment and mercury removal facilities will be assembled on the shores of Combie Reservoir as portable units outside of the ordinary high water mark (1,602' above mean sea level). The sediment and mercury removal facilities includes an electric dredge, dewatering system (with tanks), piping and pumps, centrifuge(s), polymer mixing tanks, conveyors, and mobile concentrator(s). The facilities and equipment will be assembled and tested to ensure proper operation.

4.1 Equipment mobilization
4.2 Equipment assembly

Task 4 Deliverables	Timeline
Dredge and mercury extraction equipment operational	June 1, 2011

Task 5: Equipment Calibration, Operational Monitoring and Adaptive Management (This Task is dependent on Task 3 and 4 being completed. Task 6 and 7 are dependent on this task.)
Once the equipment is assembled it will be tested to ensure proper operation. After this initial testing, calibration and refinement of systems will be ongoing, as necessary, to ensure efficient extraction of mercury and sediments. The effluent from the dewatering system and mercury removal equipment is similar to the effluent from a water treatment plant, in that it is has been altered to remove a contaminant of concern, in this case mercury. The mercury removal equipment was tested by the project team during demonstration tests in September and October of 2009. The result of these tests indicated that the mercury removal equipment was 93% efficient at removing mercury. Total, methyl and reactive mercury were measured going into and coming out of the mercury removal equipment during four replicate tests (Monohan et al. 2011; Monohan et al., in prep).

Monitoring will take place throughout the project because it is possible that forms of mercury associated with dense minerals (elemental mercury and mercury-gold amalgam), will be effectively removed, and other forms, such as reactive mercury(II) or methylmercury adsorbed to clay- and silt-sized particles of normal density, are not removed by the concentrator. This concern is the reason that the mercury removal equipment consists of both a concentrator for physical removal of elemental mercury and chemical removal (polymer and or electromagnetic treatment) of any remaining forms of mercury such as reactive mercury(II) and (or) methylmercury in the effluent. If reactive mercury(II) or flowered elemental mercury is released by the concentrator then the best course of action will be to cease the operations until such time that the project can be modified to eliminate water discharge that exceeds applicable water-quality criteria specified in the 401 certification from RWQCB. The project will include operational water-quality monitoring stations around the dredge activity area, at the location of the centrate (dewatering system and concentrator effluent) in the dredge pond, upstream of the reservoir and downstream of the reservoir.

5.1 Equipment calibration
5.2 Monitoring according to 401 Certification Specification
5.3 Process Refinement

Task 5 Deliverables	**Timeline**
Calibration data to be included in mid project report	May 15, 2013
Adaptive Management and process refinement and production Mid-Project report	January 15, 2013
Adaptive Management and process refinement and production Final Report	December15, 2014

Task 6: Dredging and Dewatering (This Task is dependent on Task 3 and 4.)
An electric suction dredge and dewatering system will be used to remove sediments from the bottom of the reservoir and separate solid from liquid materials. Sediment is removed and transported to the dewatering equipment by an electrically powered submerged cutter head and pump, which is virtually silent. Due to the relative dispersed nature of the sediments to be removed, the floating equipment will move from location to location by a guidance cable system. It is expected that dredging will take place Monday through Saturday, from May to November for two years producing up to 60,000 to 120,000 cubic yards of aggregate material.

All materials harvested will be processed through the Material Separation and Dewatering System (MSDS) and mercury extraction equipment (See Task 7). The electrically powered MSDS is a complete set of portable equipment used to dredge, classify, and dewater aggregate material from the reservoir. This equipment will feed material directly to the mercury-removal equipment within the shore-mounted dewatering system. The dewatered material will produce a liquid effluent, or centrate, resulting in a clean water return to Combie Reservoir and a solid material by-product.

The pumping activity through the pipeline will occur constantly during dredge and mercury removal activities. The dredge pump, cutterhead and dewatering system motors operate remotely through Variable Frequency Drive (VFD) controls. The flow of material will vary based on the pulp density of the slurry material and the capacity of

the mercury removal equipment. The flow will be controlled by the on-board operator using the VFD controls to achieve the best results based on constant operational monitoring and adaptive corrections to flow rates, polymer input, revolutions per minute, etc. (See Task 5 for Adaptive Management Component).

Generally haul trucks will be loaded directly from the dewatering equipment via conveyor belts. Haul trucks will be used to transfer the aggregate material to the Chevreaux facility. Based on an estimate of 32 round trips per work day, with each round trip consisting of two pass-bys (1 arriving empty and 1 departing full), a total of 64 trips could be generated in an 8-hour operating day, or about 8 per hour.

6.1 Equipment assembly and set up
6.2 Dredging

Task 6 Deliverables	**Timeline**
Equipment assembled	June 1, 2012
Dredging Year 1	April-November 2012
Dredging Year 2	April-November 2013

Task 7: Mercury Extraction (This Task is dependent on Task 6.)
The project will involve the recovery, separation and handling of elemental mercury. The mercury removal equipment is composed of a physical separation of mercury from the sediment though centrifuging it in a concentrator and chemical removal of mercury from the effluent using a polymer and or electromagnetic charge separation. The mercury recovery system includes a granulometric separator for separating a feed by particle size; a centrifugal concentrator in flow communication with the granulometric separator for isolating and concentrating an elemental mercury-containing fraction of the feed; and an accumulator tank for collecting elemental mercury from the elemental mercury-containing fraction. The accumulator tank has an inlet in flow communication with the centrifugal concentrator; an outlet; a plurality of baffles defining a serpentine flow path to slow the flow of the elemental mercury-containing fraction from the inlet to the outlet; and a mercury accumulation area for collecting elemental mercury settling from the elemental mercury-containing fraction. The elementary mercury fraction is channeled through a baffled accumulator tank to slow its flow and facilitate gravitational settling and recovery of elementary mercury.

An optional step of magnetically separating material after granulometric separation and only processing the diamagnetic fraction at the centrifuging step may be included (US Patent Application No. 12/887269/Ref: P644 0003/DHT). The mercury concentrator is located within an enclosed machined unit and mounted on portable trailer unit with a fully enclosed laboratory/office. The concentrator equipment could run continuously 24 hours per day, 7 days per week. Demonstration tests of the mercury removal equipment on project material indicated a 93% efficiency rate mercury recovery (Monohan et al. 2011 and in prep.). These demonstration tests were four replicate closed system tests that monitored for total methyl and reactive mercury going into and coming out of the mercury removal equipment. All local and state requirements will be used in handling and transport to avoid accidental spills or other mishaps. All recovered mercury will be transported to a class 1 landfill for disposal. Amalgam will be transported to an independent laboratory for assay and retorting. Regular monitoring of the mercury removal efficiency for total, methyl and reactive mercury will be conducted in accordance with the 401 Certification process and as described in Task 5: Equipment Calibration, Operational Efficiency Monitoring and Adaptive Management.

7.1 Equipment assembly and set up
7.2 Mercury Extraction

Task 7 Deliverables	**Timeline**
Equipment assembled	June 1st, 2012
Mercury Extraction Year 1	April-November 2012
Mercury Extraction Year 2	April-November 2013

Task 8: Education and Outreach
NID will partner with local schools and organizations, including CABY and the Sierra Fund, to implement this task. Education and outreach will be an important element of both the overall mercury removal project, as well as this portion of project activities. This component will include conducting Angler Surveys and working with OEHHA to fill critical data gaps for 303(d)-listed water bodies for mercury impairment that currently do not have fish advisories, posting of fish consumption advisories at mercury contaminated reservoirs where people are known to fish for sustenance, a supplemental K-12 curriculum insert to accompany the California Gold Rush block, field trips for local schools, and a project-specific webpage.

8.1 Angler Surveys
8.2 Fish consumption advisory posting
8.3 4th grade California Gold Rush curriculum inserts
8.4 Field trips for local school children
8.5 Project-specific webpage
8.6 Presentations regarding project activities and outcomes

Task 8 Deliverables	**Timeline**
Angler Survey Report	October 15, 2014
Fish Consumption Advisories Posted at Rollins and Combie	April 1, 2012
Curriculum inserts developed	November 1, 2013
Functional project-specific webpage	June 30, 2012

4. <u>Deliverables</u>. Details regarding task deliverables and due dates are included in the work plan section above.

Mid-Project report: There will be a mid project report submitted May 15, 2013, which will include the results of the pre-project environmental sampling (fish, water, invertebrates, and sediment), the adaptive management and process refinement of the sediment and mercury removal equipment, and progress of the angler surveys, fish consumption advisories, and web page effectiveness.

Final Report: The Final report will include the USGS peer-reviewed publications comparing pre- and post-project environmental conditions, the conclusions from the adaptive management, process refinement and equipment operations results, K-12 curriculum development inserts, and project summary and implications as a Best Management Practice for reservoir maintenance and mercury control programs.

USGS Reports: Two peer-reviewed USGS reports will be prepared, one on pre-project conditions, and the other comparing pre-project and post- project conditions. These reports will address issues that include but are not limited to:

- The effectiveness of removing elemental mercury from the environment on the aquatic ecosystem, specifically the mercury concentration in fish tissue (especially small fish) after the project as compared to before;
- A comparison of pre- and post-project loads of mercury and methylmercury loads from the reservoir to the lower Bear River (a tributary of the Bay-Delta), based on monthly and storm-event samples;
- Analysis of whether chemical and thermal stratification of the reservoir impacts mercury cycling at different times of the year, using mercury and methylmercury concentrations in zooplankton and invertebrates;
- Determination of spatial and temporal variability in sediment (top 2 cm) for total mercury, methylmercury, reactive mercury, grain size, iron and sulfur redox species, and loss on ignition; and
- Determination of diffusion rates for mercury, methylmercury, dissolved organic carbon, and nutrients from sediment pore water to the water column in the reservoir; this will determine the extent to which the mercury that will be removed by the dredging project had been actively cycling from the sediment to the water column, making it available for methylation and oxidation.

5. Feasibility

Management coordination - Feasibility

Combie Reservoir is a managed and maintained water supply reservoir that receives continuous hydraulic mining debris from upstream. Combie Reservoir is an ideal test case, pilot project, in which to utilize controlled and regulated dredging technology coupled with innovative mercury removal technology. The Nevada Irrigation District is aptly suited to take on a project of this caliber because of its hydraulic engineering expertise, institutional knowledge regarding mercury contamination, and because of its experience with managing and operating treatment facilities.

As a local public agency, the Nevada Irrigation District operates under rules and regulations adopted under authority conferred by the California Water Code. Nevada Irrigation District was founded in 1921 and has been operating for almost 90 years. NID is an independent special district operated by and for the people who own land within its 287,000-acre boundaries. NID provides service in an expansive geographic area that makes the district one of the largest in the State of California. The district is organized primarily to supply water for irrigation, municipal, domestic and industrial purposes. NID water is available in wide areas of Nevada and Placer counties; the district also has storage and distribution facilities in Sierra and Yuba counties. NID collects water on 70,000 acres of high mountain watershed, owns and operates an extensive reservoir and canal system with a network of water treatment plants and distribution pipelines. The district produces hydroelectric energy and provides outdoor public recreation. NID operates seven water treatment plants and seven hydroelectric power plants. In addition, the district maintains and manages 10 reservoirs with 280 acre-feet of storage. The district also maintains and manages 400 miles of canals and 300 miles of pipeline.

NID has extensive experience in implementing and managing large-scale projects. Not only has NID proven this expertise through its history of successful management of its own water operations, but it has also proven its expertise through the successful implementation of the first stage of this project (CEQA and pre-planning), partially funded by the Sierra Nevada Conservancy beginning in 2008. NID will make all of the management decisions associated with this project and will manage contractor with individual subcontracts that are overseen and managed by a project manager at NID. NID is well suited to take on a project of this caliber and sees it as a necessary development to 21st century water management in California. A description of the fiscal partners of this project is included in the Qualifications section below.

Environmental Compliance and Permitting

As discussed in Section 3: Landowners, Access, and Permits, CEQA has been completed for this project. The process to acquire all other required permits began in November 2009. All permits will be obtained by June 1, 2011. These are listed in Section 3.

Operational Conditions - Feasibility

This project is designed to take place within 3 years. If this time frame is not sufficient to remove all of the material (down to the natural contour line of the reservoir), additional dredging may be done using other (matching) funds; in this case, post-project conditions would take pace the following spring (March-June 2015) if approved by the ERP. If this additional sediment and mercury removal is warranted, additional funding will be sought to cover these expenses, for example, from the State Water Resources Control Board's Clean Up and Abatement Account or from Congressional Appropriations.

Sediment and mercury removal at Combie Reservoir will likely need to be repeated every 10 to 15 years in order to treat sediment that accumulates in the reservoir during that time. Under this scenario, the mercury extraction component becomes a Best Management Practice coupled with routine dredging to maintain storage capacity. This project will be sustainable over the long term and will have far-reaching benefits as it improves water quality, habitat, and public health in the Bear River watershed and beyond. The activities that will be undertaken in this project will be utilized in the management of other reservoirs, including Rollins Reservoir, which is also owned and operated by NID.

6. Relevance to the CALFED ERP

Relevance to this PSP. The 2010-2011 PSP includes the following priority: "Projects using constructed facilities to control mercury or other mine drainage in the Bay-Delta or dissolved oxygen and other water quality problems in the lower San Joaquin River and South Delta." This project is directly relevant to this priority, as it will construct an innovative mercury-removal facility, which will not only reduce mobilization of mercury into the foodweb but will also lead to a Best Management Practice for mercury removal in reservoirs upstream of the Delta.

The project will reduce the loading of mercury and sediment from abandoned mines through improvements in the watershed by consutructing facilities and equipment to remove contaminants at a resevoir in the the Bear River watershed. Sediment and contaminants from historic mining travel long distances from their source, affect the health of ecosystems, sensitive species, and humans, and have the potential to hinder restoration efforts in the Bay-Delta (ERP Draft Stage 1 Implementation Plan 2001; Bouse et al. 2010). The transport of mercury and methylmercury through Sierra Nevada reservoirs (via spillways and controlled releases) is a significant contributor to Bay-Delta methylmercury levels. Over a 20-year period (1984-2003) it is estimated that 98% of total mercury loads to the Delta came from upstream tributaries (Wood et al. 2010a). In the Bear River watershed, the study conducted by USGS in Camp Far West Reservoir (downstream ofCombie) measured mercury and methylmercury concentrations in water flowing through Camp Far West Resevoir (Alpers, et al. 2008), however additional data on this topic is needed.

The tributaries of the Sacramento River are the source of 80% or more of total mercury flowing into the Bay-Delta, and "the Cache Creek, Feather River, American River, Putah Creek waterhseds in the Sacramento Basin have both relatively large mercury loadings and high mercury concentrations in suspended sediment, which makes these watersheds effective candidates for total mercury load reduction programs" (Wood et al. 2010a). Mercury loads entering the Delta are highest in winter and spring (Foe 2003), which is when the majority of sediment and mercury is transported from the Bear River Watershed, into the Feather River, and finally downstream to the Sacramento River and Bay-Delta. Furthermore, mercury from gold mining in the Sierra Nevada is more biologically available than material from mercury mines in the Coast Range (Sacramento – San Joaquin Delta Estuary TMDL for Methylmercury,Draft Report, Feb. 2010; Wood et al., 2010b). Therefore, this project is perhaps more effective at solving the Bay-Delta methylmercury problem than a similar project in the Coast Range because it removes mercury that is likely to methylate and become biologically available in the Bay-Delta.

In addition, the project will also significantly augment the existing data regarding the fate and transport of mercury in the ecosystem through environmental monitoring activities (Task 2) and through operational monitoring activities (Task 5).

Priority 3 of the 2010-2011 Ecosystem Restoration Project PSP identifies: *Projects using constructed facilities to control mercury or other mine drainage in the Bay-Delta or dissolved oxygen and other water quality problems in the lower San Joaquin River and South Delta.*

This project is directly relevant to Priority 3, as it constructs facilities and equipment that will prevent mercury and sediment from being transported from abandoned mine sites downstream to the Bay-Delta. This project will not only reduce mobilization of mercury into the foodweb of the Bay-Delta ecosystem, but will also lead to a best management practice for mercury sources in watersheds upstream of the Delta.

The DRERIP Evaluation Summary Report, Draft 2009 includes a recommendation (32) to "focus efforts on controlling ongoing mercury lading into the Delta...to reduce mercury supply over the long term available for methylation." This project is directly relevant to recommendation 32. Additionally, this project will address a need that same report identifies for monitoring studies to contribute to the development of a numerical mercury transport and fate model.

This project will indirectly contribute to ERP's habitat and sensitive-species restoration goals. The ongoing

mobilization of mercury from watersheds with abandoned mines has the potential to hinder restoration efforts. The ERP Conservation Strategy for Stage 2 Implementation 2010 specifically mentions the impcat mercury may have on wetlands restoration projects.

The Combie Reservoir Sediment and Mercury Removal project meets several overarching priorities listed in the PSP:

- **Interdisciplinary Project –** This project brings together knowledge of the mining industry with innovative engineering and cutting edge environmental scientist, geochemists and hydrologic sciences.
- **Collaborative Project –** This project is greatly enhanced by the Integrated Regional Watershed Management Planning Group CABY and local environmental partners, The Sierra Fund. In addition, world renown scientist from USGS have been technical advisors to this project since its inception and have contributed significantly to the projects continues success and adaptive management components.
- **Matching Funds –** This project used matching funds from The Sierra Nevada Conservancy to complete its environmental permitting and if necessary will utilize Congressional Appropriation funding, and/or Clean up and Abatement Funding from the State Water Resources Control Board.

7. Expected quantitative results (Project Summary)

Habitat Description

- Combie Reservoir in the Bear River, a Tributary to the Sacramento Bay-Delta

Activity

- Enhancement: improving the ecological value of the site without changing the habitat type
- Flow enhancement: improving water quality
- Restoration/Conversion (to new habitat): Improving the ecological value of the site by returning the habitat to its original type
- Sediment Reduction: Will help to reduce stream sedimentation

Measurements

- Gravel (cubic yards): 60,000-120,000 cubic yards of gravel and sand aggregate will be treated
- Mercury (pounds): 50-150 lbs of mercury will be removed from the treated gravel
- Stream length (miles): At least 10 miles of stream length below Combie Reservoir to the Bay-Delta will be protected from mercury and sediment contamination.
- Reservoir area (acres): At least 20 acres of reservoir habitat will be enhanced and restored through the removal of sediment and mercury.

8. Other Products and Results: The USGS reports on pre-dredge and post-project conditions will help fill critical data gaps in our current understanding of mercury fate and transport in watersheds contaminated by historical gold mining. Specifically, the project will quantify the rates at which mercury and methylmercury diffuse from sediment to bottom water, how mercury is methylated in shallow reservoir sediment and the water column, how methylmercury is bioaccumulated in the aquatic food chain, and how and when mercury and methylmercury are transported downstream. Below are some additional quantitative results expected from this project:

Fish Mercury data:

- Inform fish consumption advisories for Combie Reservoir, and the Bear River upstream and downstream, for bass (largemouth and/or smallmouth, bluegill, and rainbow trout;
- Show the effects of removing elemental mercury from the environment translated to an improved aquatic ecosystem;
- Document changes in concentrations of mercury (which occurs predominantly as methylmercury) concentration in fish tissue after the project as compared to before

Water Quality data:

- Mercury data in the water from sites upstream and downstream of the dredge area at different times of the year will inform how mercury is being transported from the reservoir to downstream environments
- Water quality grab samples will inform regarding mercury transport during storm events, specifically the extent to which mercury is transported downstream with suspended sediment
- Mercury concentrations in zooplankton, and invertebrates will inform how mercury is entering the food web through the pelagic food chain

Water Column Vertical Profiles:

- Physical (temperature) and chemical (dissolved oxygen) stratification of the reservoir will be documented so that potential impact on mercury cycling can be evaluated

Sediment Quality:

- Sediment samples from the bottom of the reservoir (specifically from the top 2 centimeters) at different locations will be analyzed for total mercury, methylmercury, reactive mercury(II), grain size, iron and sulfur redox species, and loss on ignition; these data will provide information about mercury methylation conditions in the reservoir pre-and post-dredging.

Sediment Flux:

- Sediment pore-water samples and bottom water taken from four depths at six sites will be analyzed for total mercury, methylmercury, dissolved organic carbon, and nutrients. These data combined with data from bottom water will be used to calculate the diffusion rates from sediment pore water to the water column in the reservoir, which will provide information regarding the benthic exchange and how mercury and methylmercury may move from the sediment to the aquatic foodchain.

9. <u>Qualifications</u>

The Nevada Irrigation District (NID). NID has the expertise and the experience necessary to function as the fiscal lead, the project manager, with equipment and manpower to construct and operate the equipment.

NID was founded in 1921 and has been operating for almost 90 years. NID is an independent special district operated by and for the people who own land within its 287,000-acre boundaries. NID provides service in an expansive geographic area that makes the district one of the largest in the State of California. The district is organized primarily to supply water for irrigation, municipal, domestic and industrial purposes. NID water is available in wide areas of Nevada and Placer counties; the district also has storage and distribution facilities in Sierra and Yuba counties. NID collects water on 70,000 acres of high mountain watershed, owns and operates an extensive reservoir and canal system and network of water treatment plants and distribution pipelines. The district produces hydroelectric energy and provides outdoor public recreation. As a local public agency, NID operates under the California Water Code. NID board meetings are conducted in public and the district's records are open to public inspection during normal business hours.

Current tenure of capital improvement programs includes $250 million dollars, with an average of $12 million per year. NID has 175 employees, and 22,000 agriculture and treated water customers. NID operates seven water treatment plants and seven hydroelectric power plants. In addition, the district maintains and manages 10 reservoirs with 280 acre-feet of storage. The district also maintains and manages 400 miles of canals and 300 miles of pipelines.

The United States Geological Survey (USGS), Dr. Charles Alpers. The USGS will complete the sampling and monitoring activities described in Task 2. Dr. Alpers has more than 20 years of experience performing research on trace metals in the environment, with emphasis on the impacts of historical mining. He has authored or co-authored more than 95 peer-reviewed reports and journal articles, including the most definitive reports available on the fate and transport of contaminant mercury in the Sierra Nevada from historical gold mining operations. Dr. Alpers is lead author of the CALFED DRERIP Mercury Conceptual Model, and served on a CALFED advisory panel that evaluated potential effects on mercury of possible Bay Delta Conservation Plan (BDCP)

implementation measures. Dr. Alpers has served as an advisor to the Combie Reservoir Sediment and Mercury extraction project for several years and has participated in pilot tests on mercury removal.

Pegasus Earth-Sensing Corp. (Pegasus), Ted Reimchen and Ryan Jones. NID and Pegasus will complete the site construction, mobilization, and startup dredging activities described in Tasks 3 and 4. Pegasus developed the first mercury extraction equipment for the Combie Reservoir project, which was tested in the fall of 2009. Their role is to develop the second generation of mercury extraction equipment to be used during the first year of mercury extraction. Ted Reimchen is the founder of Pegasus Earth-Sensing Corporation. Mr. Reimchen has 40 years of global experience (57 countries) in managing financial risk, mineral exploration and recovery, and mine development in remote areas. Ryan Jones is a geologist who has worked closely with Ted Reimchen since 1980. He provides consulting services including gravity recovery of precious metals, wash plant design, mining machinery procurement, gravity and magnetic separation techniques and gold room design.

The Cosumnes, American, Bear, Yuba Integrated Regional Water Management Team (CABY). NID will be the lead in the education and outreach task, with assistance by the CABY and the Sierra Fund (as described in Task 8) in specific activities. CABY was first convened in 2006 and adopted its finalized Integrated Regional Water Management Plan (IRWMP) in 2007. CABY comprises a diverse membership of stakeholders from across the four watersheds. CABY's primary activities are collaborative project development and coordination across a wide range of water-related issues, including mercury contamination in our waterways. The group and its uniquely collaborative process have been essential to the development of this project since its inception. CABY will develop the project specific web site with the aim of sharing information related to the project, as well as mercury contamination in the region.

The Sierra Fund, Dr. Carrie Monohan. The Sierra Fund first began their initiative to address mining's toxic legacy in 2005. Dr. Carrie Monohan began working on mercury issues in the Deer Creek watershed and produced a Mercury Survey for the Deer Creek watershed. Dr. Monohan was the project manager for the Brownfield's City of Nevada City Community Wide Assessment from 2006 to 2009. The Sierra Fund has developed a mining toxins workgroup that meets regularly to discuss water quality and human health aspects of mining toxins, including mercury. The Sierra Fund has become a resource to the public on mercury contamination in fish, including through its active involvement in developing fish advisories with the Department of Health and the Office of Environmental Health Hazard Assessment. The Sierra Fund will assist NID with Task 5.

10. Literature Cited

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Foe, C.G., 2003, *Mercury Mass Balance for the Freshwater Sacramento-San Joaquin Bay-Delta Estuary*. Final report submitted to the CALFED Bay-Delta Program for the project: An Assessment of the Ecological and Human Health Impacts of Mercury in the Bay-Delta Watershed (Task 1A). California Regional Water Quality Control Board, Central Valley Region. Sacramento, CA. (<http://mercury.mlml.calstate.edu/reports/2003-reports/>)

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Section 7: Project Budget

1. Detailed Project Budget

Budget			
Combie Sediment and Mercury Removal Project			
By: Nevada Irrigation District (NID)			**Totals**
PERSONNEL SERVICES			
Staff Level	**Number of Hours**	**Hourly Rate**	
Survey Crew 3-man crew (const. staking)	80	$140	$11,200
Engineer (site design)	200	$45	$9,000
Sr. Engineer (process design)	640	$50	$32,000
Equipment Operator (Hg extraction)	11,350	$35	$397,250
Utility Worker (misc)	200	$25	$5,000
Mechanic (service equip.)	120	$30	$3,600
Construction Inspector (site work)	360	$28	$10,080
Sr. Engineer (adaptive mgmt)	1,280	$50	$64,000
Administrative Assistant (clerical)	1,500	$25	$37,500
Assist. GM /Sr. Engineer (Proj Mgmt)	1,500	$54	$81,000
Subtotal			$650,630
Staff Benefits @ 43.45% (rounded)			$282,700
TOTAL PERSONNEL SERVICES			**$933,330**
OPERATING EXPENSES			
Description			
Subcontractor Costs:			
Task	**Subcontractor**		**Cost**
Process Design & Fabrication	PES		$40,000
Equipment Mobilization, Setup & Tests	PES		$68,000
Aggregate Removal	by other funding sources		$0
Site Clearing & Grading	TBD		$28,000
Site Construction	TBD		$148,000
Outlet & Control Structure Construction	TBD		$120,000
Log Booms and Filter Fabric Installation	TBD		$120,000
Safety Bouy & Barrier Installation	TBD		$60,000
Solid Waste Removal & Disposal	TBD		$13,500
Mercury Disposal	TBD		$45,000
Pumps, Piping & Misc Equip Rental	TBD		$115,000

Gauge Station Installation, Operation & Maintenance	USGS	$75,000
Sample Collection and Scientific Analysis	USGS	$551,400
Compliance Monitoring & Analysis	HS	$152,000
Data Management / Website Info	CABY	$35,000
Education Curriculum Development	SF	$50,000
Sign Posting	SF	$20,000
Worker's Compensation Insurance		$34,900
Materials (Fuel)		$85,000
Photographic Supplies		$200
Printing and Duplicating		$3,000
Office Supplies		$2,000
General Expense (Site Utilities)		$4,500
Travel and Per Diem		$2,000
Training		$0
Total Operating Expenses		**$1,772,500**
Equipment		
Equipment Rental:		
Hg Extraction Equip Rental	PES	$450,000
Add'l Hg Extraction Equip Rental	by other funding sources	$0
Dredge & Dewatering System Rental	TBD	$2,000,000
Add'l Dredge & Dewatering Sys Rental	by other funding sources	$0
SUBTOTAL		$5,155,830
LESS OFFSETTING REVENUE *		($640,000)
OVERHEAD @ 10% (Less Equipment)		$270,600
GRAND TOTAL (Amount Requested)		**$4,786,430**

Acronyms, Abbreviations & Symbols:

PES = Pegasus Earth-Sensing Corp.

USGS = United States Geological Survey

CABY = Cosumnes, American, Bear & Yuba Rivers Integrated Water Management Planning Group

HS = Headwater Sciences

SF = The Sierra Fund

Hg = Mercury

tbd = To be determined

* = Estimated Value of Precious Metal Recovery (Gold)

OTHER PROJECT ELEMENTS /FUNDING:	Amount	Funded by:
Initial Testing, Analysis, Permits and CEQA (done)	$160,550	Nevada Irrigation District
Grant Preparation & Other Admin Costs (done)	$60,000	Nevada Irrigation District
CEQA Initial Study and Reports (done)	$100,000	Sierra Nevada Conservancy
Add'l Hg Extraction, if warranted	$747,700	To be determined
Add'l Dredge & Dewatering, if warranted	$1,000,000	To be determined
Add'l Compliance Monitoring, if warranted	$101,400	To be determined
Aggregate Removal	$245,000	Chevreaux/Teichert Aggregates
Less add'l Offsetting Revenue *	($320,000)	
TOTAL PROJECT COST =	**$6,881,080**	

2. Budget Justification

Within Task 2, the report on pre-dredging conditions is expected to cost $48,000, and the final report comparing pre- and post-project conditions is expected to cost $61,262, for a total of $109,262.

- Fish Tissue: A total of 60 bass, 60 bluegill and 40 trout total at $238 per sample (including cost of collection and analysis by USGS), leads to a cost of $38,080 for fish tissue sampling.
- Water Quality and Invertebrates Sampling: Five sites for four sampling events pre- and post-dredging leads to 40 water quality samples, at $2,530 per sample (including cost of collection and analysis by USGS of total mercury (unfiltered and filtered), methylmercury (unfiltered and filtered), DOC, TSS, nutrients, and chlorophyll-a in water and total mercury, methylmercury and C:N in zooplankton) for a total cost of $101,200 for water quality and zooplankton sampling within the reservoir.
- Water Quality Vertical Profiles and Invertebrates: Water quality vertical profiles at several locations within Combie Reservoir will be measured monthly during the course of the project at a total cost of $48,000. Two taxa of invertebrates, three samples of each will be collected in the Bear River, both upstream and downstream of Combie Reservoir pre-project and post-project, for a total of 24 samples, at a cost of $867 per sample (including cost of collection and analysis by USGS of total mercury, methylmercury, and water content), for a total of $20,804.
- Sediment Sampling: Sediment sampling at five sites for 4 sampling events for 40 samples at a cost of $1,940 per sample (including cost of collection and analysis by USGS of total mercury, methylmercury, reactive mercury (II), grain size distribution, loss on ignition (organic content), and iron and sulfur redox species) for a total of $77,600. Sediment Flux: A total of 104 flux measurement samples will be analyzed at a cost of $1,450 per sample (including collection and analysis by USGS of total mercury (filtered), methylmercury (filtered), DOC, and nutrients in pore water and bottom water) and diffusion rates will be calculated from sediment pore water to reservoir water column at a total cost of $151,268.
- Miscellaneous: Miscellaneous supplies and labor for USGS to write quarterly reports will cost $5,186, bringing the USGS subtotal (exclusive of the gaging station) to $551,400. Installation by USGS of a gaging station on the Bear River upstream of Combie Reservoir plus operation and maintenance for three years is estimated to cost an additional $75,000.

Rental of specific equipment is necessary to implement this project. The electric dredge and dewatering equipment used for this project must meet specific noise and production requirements to be effective. The dredge and dewatering equipment must be equivalent to the mobile process that was designed and fabricated by Everready Marine Services, Inc. and modified to coordinate with the mercury extraction equipment.

The mercury extraction equipment is a one-of-a-kind mobile rig, specifically designed and tested for this project by Pegasus Earth-Sensing Corporation. The project budget includes estimated rental costs for use of these two unique items. The dredge and dewatering system is unique, but NID is not prohibited from renting or fabricating a similar system. On the other hand, there is no known alternative for the mercury extraction equipment other

than the system designed and patented by Pegasus Earth-Sensing Corp. for this project. ERP funds will not be used to purchase any equipment. ERP funds will be used to rent the equipment for the duration of this project.

All other materials, construction, and equipment used for this project will be the result of competitive bid by local contractors and suppliers.

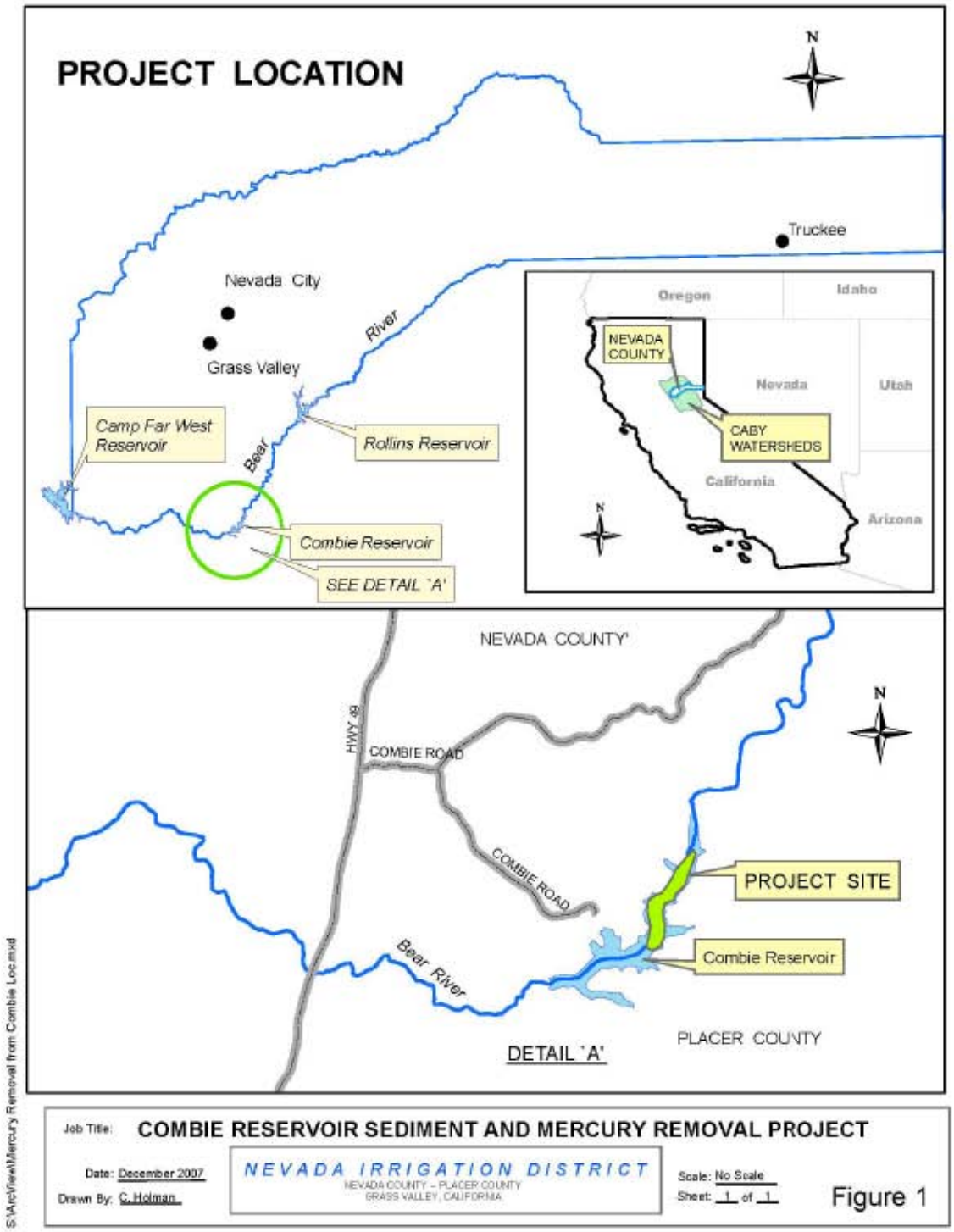
The ERP budget will not be used to pay for a Stream Bed Alteration Permit. A Stream Bed Alteration Permit fees will be paid for by funds secured priviously by the Sierra Nevada Conservancy. The Stream Bed Alteration Agreement for resevoir maintenance was submitted November 4, 2010.

3. Administrative Overhead

Administrative overhead costs are not greater than 10% of the budget (less the equipment rental costs). Subcontractor overhead costs are also not anticipated to be over 10% of their contracts, with the exception of the USGS, which has an overhead rate of 35% mandated by federal regulations. The subcontractor budgets are considered part of operating expenses in this ERP budget.

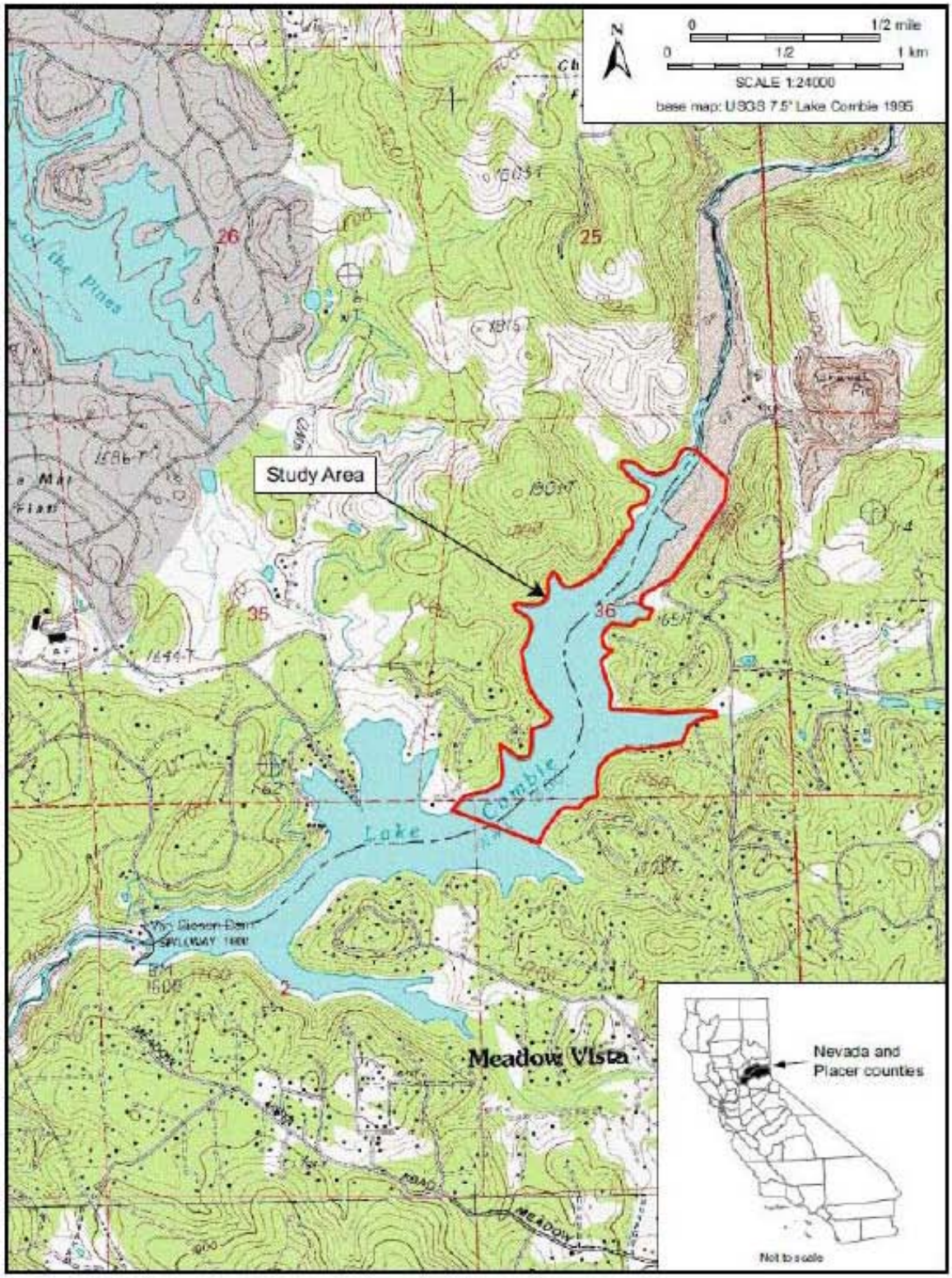
ATTACHMENT A

Project Location Map



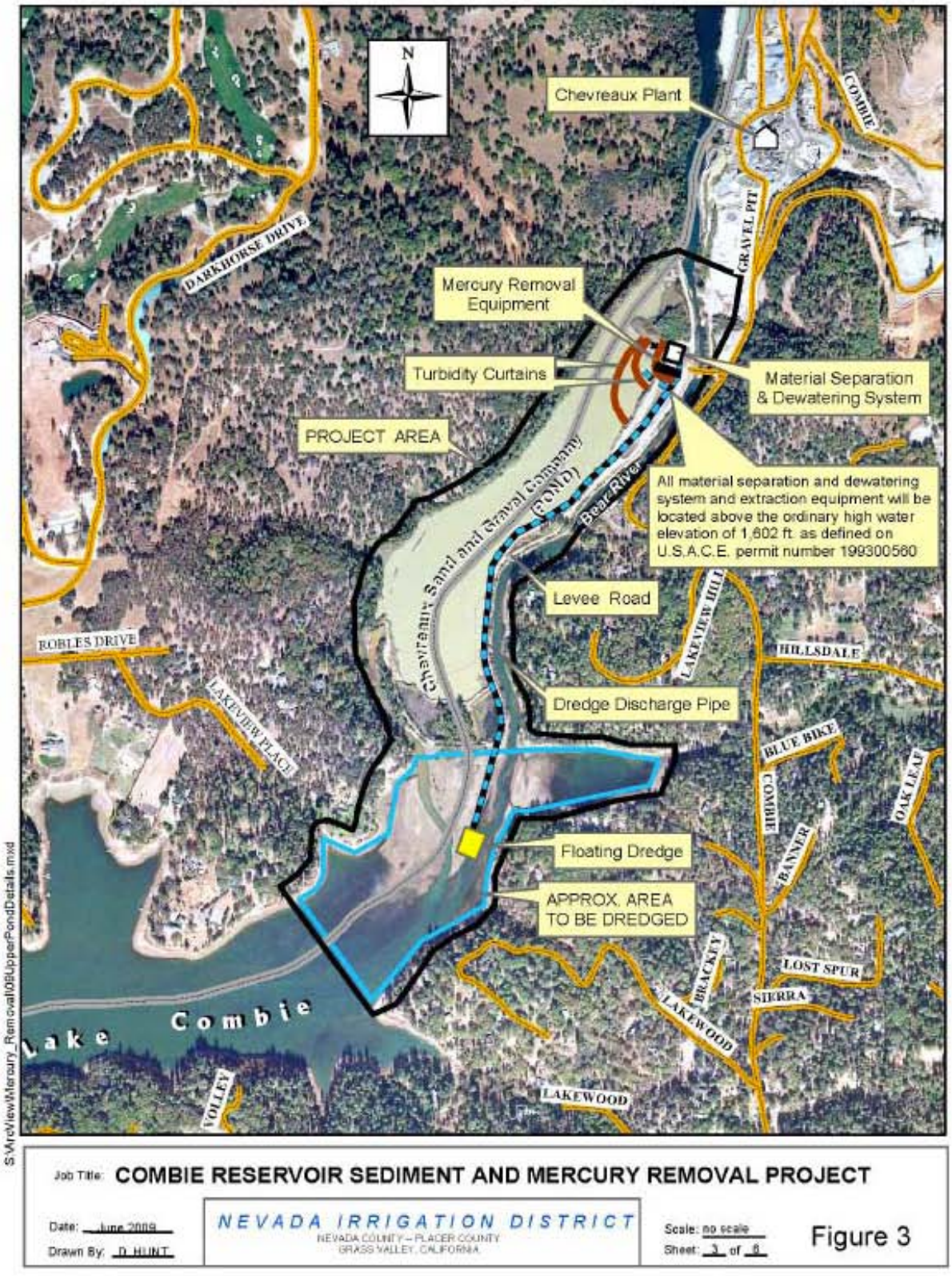
ATTACHMENT B

Topographic Map



ATTACHMENT C

Site Plan



ATTACHMENT D
Parcel Map

ParcelQuest by CD-DATA

Property Detail

Placer, CA KRISTEN SPEARS, ASSESSOR

Parcel # (APN):	**074-220-022-000**	Use Description:	**WELL/WATER**
Parcel Status:	**ACTIVE**		
Owner Name:	**NEVADA IRRIGATION DIST**		
Mailing Address:			
Situs Address:	**95722**		
Legal Description:	**47.92 A FR SEC 36 14 8**		

ASSESSMENT

Total Value:		Use Code:	**87**	Zoning:	
Land Value:		Tax Rate Area:	**083032**	Census Tract:	
Impr Value:		Year Assd:	**2010**	Improve Type:	
Other Value:		Property Tax:		Price/SqFt:	
% Improved		Delinquent Yr			
Exempt Amt:		HO Exempt?:	**N**		

SALES HISTORY

	Sale 1	Sale 2	Sale 3	Transfer
Recording Date:	**12/30/1929**			**12/30/1929**
Recorded Doc #:	**1929R0280320**			**1929R0280320**
Recorded Doc Type:				
Transfer Amount:				
Sale 1 Seller (Grantor):				
1st Trst Dd Amt:	Code1:		2nd Trst Dd Amt:	Code2:

PROPERTY CHARACTERISTICS

Lot Acres:	**47.920**	Year Built:		Fireplace:	
Lot SqFt:	**2,087,395**	Effective Yr:		A/C:	
Bldg/Liv Area:				Heating:	
Units:		Total Rooms:		Pool:	
Buildings:		Bedrooms:			
Stories:		Baths (Full):		Park Type:	
Style:		Baths (Half):		Spaces:	
Construct:				Site Inflnce:	
Quality:		Garage SqFt:			
Building Class:				Timber Preserve:	
Condition:				Ag Preserve:	
Other Rooms:					

*** The information provided here is deemed reliable, but is not guaranteed.

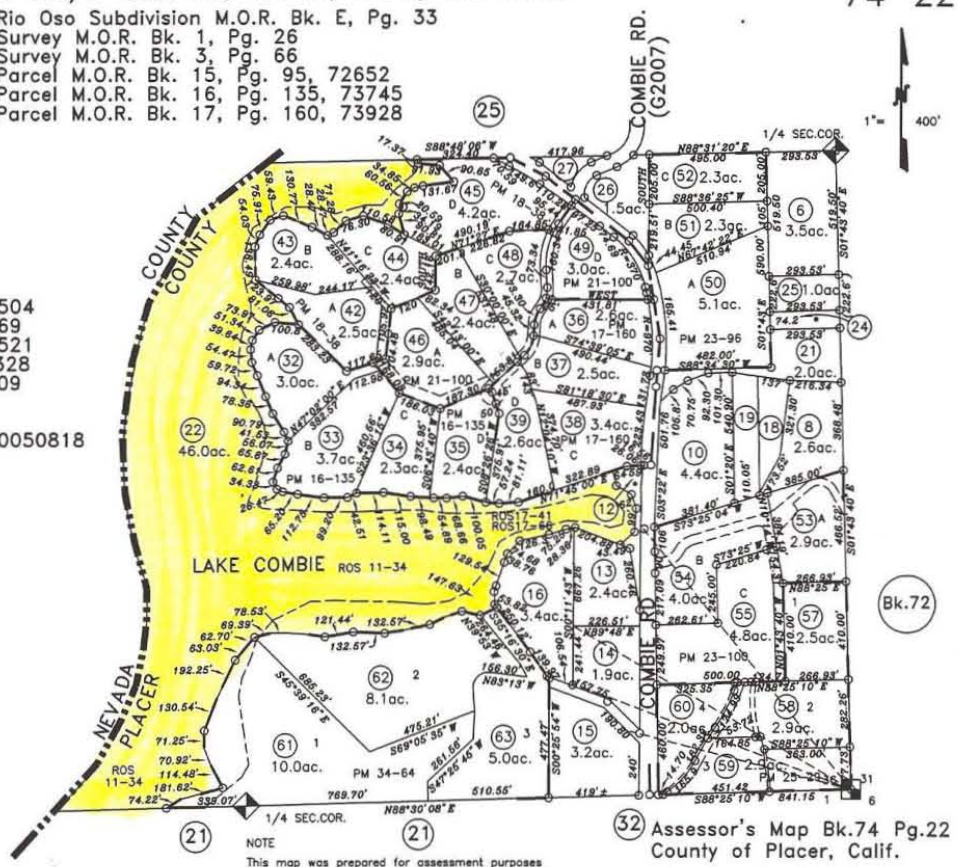
Area to be dredged in Placer County

POR. S.1/2 SEC. 36, T.14N., R.8E., M.D.B.&M.

Rio Oso Subdivision M.O.R. Bk. E, Pg. 33
Survey M.O.R. Bk. 1, Pg. 26
Survey M.O.R. Bk. 3, Pg. 66
Parcel M.O.R. Bk. 15, Pg. 95, 72652
Parcel M.O.R. Bk. 16, Pg. 135, 73745
Parcel M.O.R. Bk. 17, Pg. 160, 73928

74-22

Parcel M.O.R. Bk. 18, Pg. 38, 73952
Parcel M.O.R. Bk. 21, Pg. 100, P-74504
Parcel M.O.R. Bk. 23, Pg. 96, P-74769
Parcel M.O.R. Bk. 23, Pg. 100, P-74521
Survey M.O.R. Bk. 11, Pg. 34, No. 1328
Parcel M.O.R. Bk. 25, Pg. 29, P-75009
Survey M.O.R. Bk.17, Pg.41 No.2393
Survey M.O.R. Bk.17, Pg.66 No.2431
Parcel M.O.R. Bk. 34, Pg. 64, DPM 20050818



32 Assessor's Map Bk.74 Pg.22
County of Placer, Calif.

06-02-2008
01-09-2003 GHM/BMJ
Page Drawn Per Basemap Information

NOTE
All distances on curved lines are chord measurements.

NOTE
This map was prepared for assessment purposes only, and is not intended to illustrate legal building sites or establish precedence over local ordinances. Official information concerning size or use of any parcel should be obtained from recorded documents and local governing agencies.

NOTE
Assessor's Block Numbers Shown in Ellipses.
Assessor's Parcel Numbers Shown in Circles.

Property Detail

Placer, CA KRISTEN SPEARS, ASSESSOR

Parcel # (APN): **074-250-008-000** Use Description: **MISCELLANEOUS**
Parcel Status: **ACTIVE**
Owner Name: **NEVADA IRRIGATION DIST**

Mailing Address:
Situs Address: **95722**
Legal Description: **28.92 A FR SEC 36 14 8**

ASSESSMENT

Total Value:		Use Code:	**82**	Zoning:	
Land Value:		Tax Rate Area:	**083032**	Census Tract:	**219.02/2**
Impr Value:		Year Assd:	**2010**	Improve Type:	
Other Value:		Property Tax:		Price/SqFt:	
% Improved		Delinquent Yr			
Exempt Amt:		HO Exempt?:	**N**		

SALES HISTORY

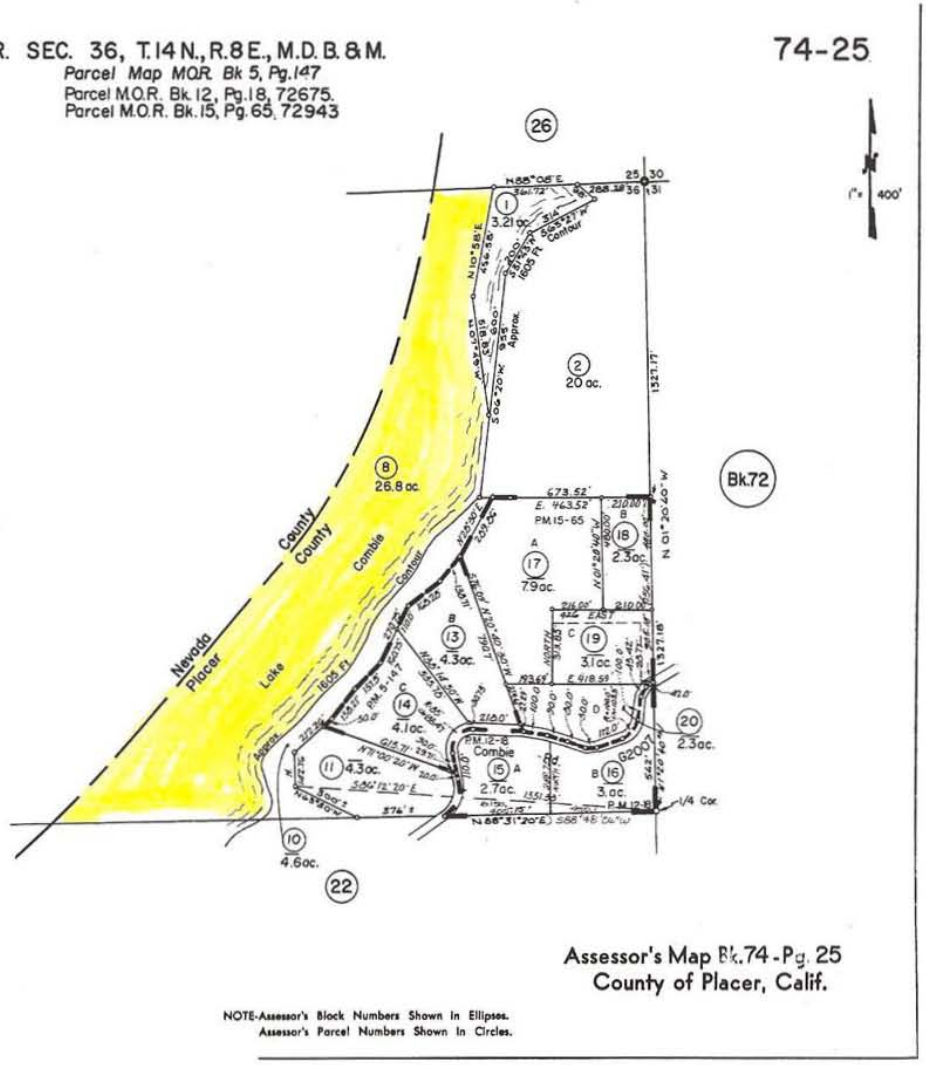
	Sale 1	Sale 2	Sale 3	Transfer
Recording Date:	**04/25/1928**			**04/25/1928**
Recorded Doc #:	**1928R0280303**			**1928R0280303**
Recorded Doc Type:				
Transfer Amount:				
Sale 1 Seller (Grantor):				
1st Trst Dd Amt:		Code1:	2nd Trst Dd Amt:	Code2:

PROPERTY CHARACTERISTICS

Lot Acres:	**28.920**	Year Built:		Fireplace:	
Lot SqFt:	**1,259,755**	Effective Yr:		A/C:	
Bldg/Liv Area:				Heating:	
Units:		Total Rooms:		Pool:	
Buildings:		Bedrooms:			
Stories:		Baths (Full):		Park Type:	
Style:		Baths (Half):		Spaces:	
Construct:				Site Inflnce:	
Quality:		Garage SqFt:			
Building Class:				Timber Preserve:	
Condition:				Ag Preserve:	
Other Rooms:					

*** The information provided here is deemed reliable, but is not guaranteed.

Area of site construction and extraction operations in Placer County



10-79
4-78
6-74
7-71

Property Detail

Nevada, CA JIM DAL BON, ASSESSOR

Parcel # (APN): **11-181-13-000** Use Description: **GOVERNMENT**
Parcel Status: **OTHER**
Owner Name: **NEVADA IRRIGATION DISTRICT**

Mailing Address:
Situs Address:
Legal Description: **PTN N 1/2 OF NE 1/4 36-14-8**

ASSESSMENT

Total Value:		Use Code:	**GO075**	Zoning:	
Land Value:		Tax Rate Area:	**072036**	Census Tract:	**1.03/6**
Impr Value:		Year Assd:	**2010**	Improve Type:	
Other Value:		Property Tax:		Price/SqFt:	
% Improved		Delinquent Yr			
Exempt Amt:		HO Exempt?:	**N**		

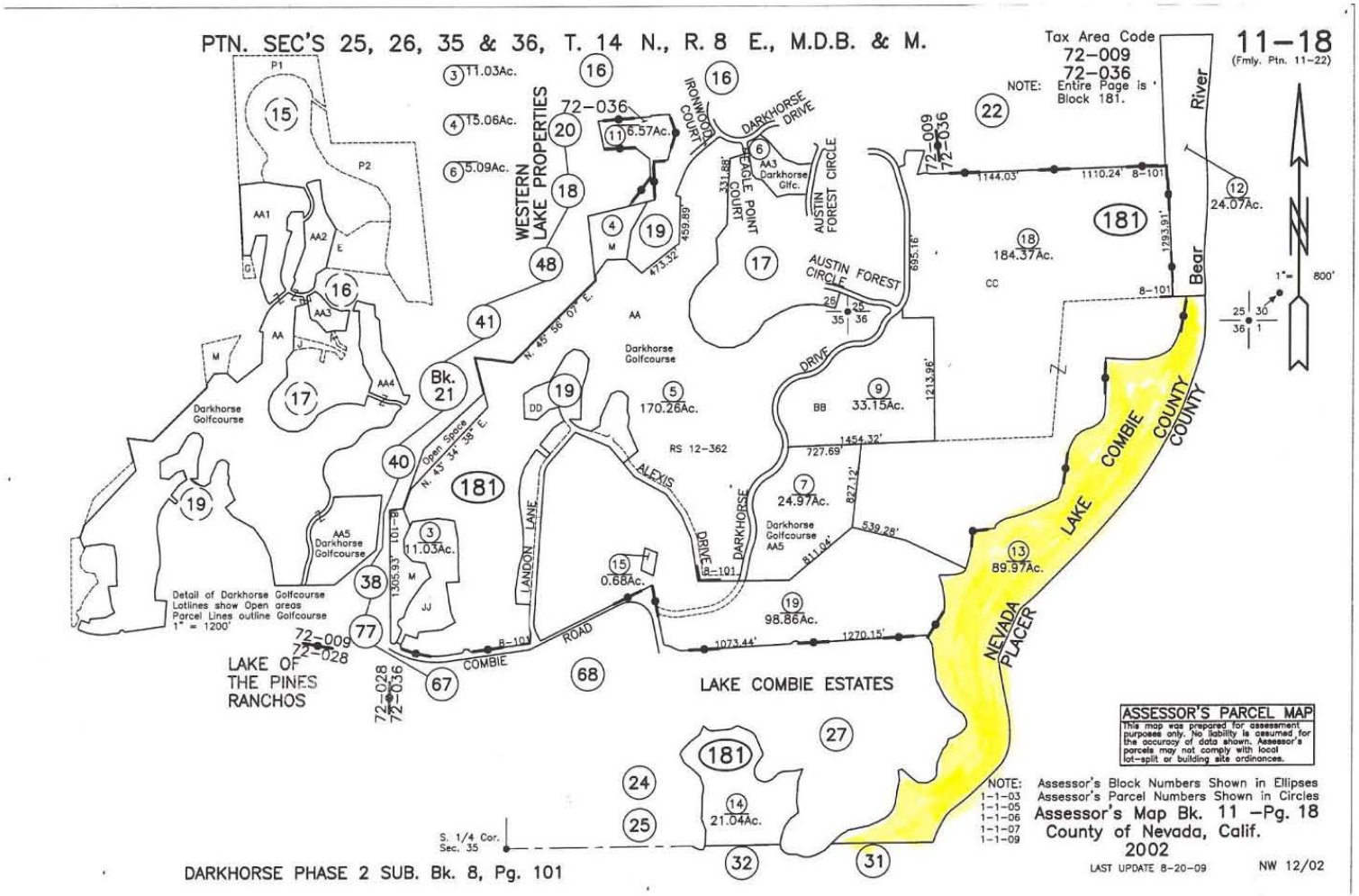
SALES HISTORY

	Sale 1	Sale 2	Sale 3	Transfer
Recording Date:				
Recorded Doc #:				
Recorded Doc Type:				
Transfer Amount:				
Sale 1 Seller (Grantor):				
1st Trst Dd Amt:	Code1:	2nd Trst Dd Amt:	Code2:	

PROPERTY CHARACTERISTICS

Lot Acres:	**89.970**	Year Built:		Fireplace:	
Lot SqFt:	**3,919,093**	Effective Yr:		A/C:	
Bldg/Liv Area:				Heating:	
Units:		Total Rooms:		Pool:	
Buildings:		Bedrooms:			
Stories:		Baths (Full):		Park Type:	
Style:		Baths (Half):		Spaces:	
Construct:				Site Inflnce:	
Quality:		Garage SqFt:			
Building Class:				Timber Preserve:	
Condition:				Ag Preserve:	
Other Rooms:					

*** The information provided here is deemed reliable, but is not guaranteed.



Area of dredging, construction, and extraction in Nevada