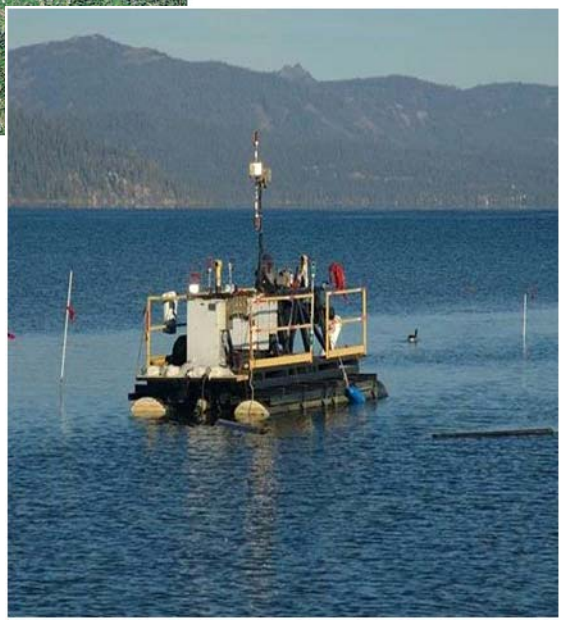
NEVADA IRRIGATION DISTRICT

Combie Reservoir Sediment and Mercury Removal— A Water Supply Maintenance Project

PROJECT DESCRIPTION



July 2009

COMBIE RESERVOIR SEDIMENT AND MERCURY REMOVAL

A WATER SUPPLY MAINTENANCE PROJECT – Project Description

PROJECT OVERVIEW

Most surface waters in the Sierra Nevada have been significantly and adversely impacted by historic gold mining activities, particularly the streams, rivers, and reservoirs in the Cosumnes, American, Bear and Yuba watersheds. As a result, water bodies in these regions contain elevated concentrations of mercury that are remnants of gold processing practices used over a century ago. Mercury is a water quality constituent of national concern; it is listed in California Toxics Rule by the Environmental Protection Agency. Consumption of fish from water bodies contaminated with mercury can lead to developmental delays in fetuses, infants and children.

The Nevada Irrigation District (NID) owns and operates two reservoirs on the Bear River which are 303d listed[1] for mercury: Rollins Reservoir and Combie Reservoir. For more than 30 years, NID has contracted with private aggregate mining companies to remove sediments that naturally migrate toward the reservoirs. At Combie Reservoir, dredging was used to remove sediments for more than 15 years. Dredging operations in Combie Reservoir were halted in 2003 as a result of high mercury levels found in dredge effluents, affecting NID efforts to maintain reservoir storage capacity, and potentially affecting NID's ability to supply drinking water to its customers. With the majority of California's water supply coming from rivers and reservoirs of the Sierra Nevada Mountains, the impact of such mercury contamination, may threaten water quality for many Californians, and the prevention of dredging operations threatens water supply storage over the long-term.

The Combie Reservoir Sediment and Mercury Removal Project (hereafter referred to as the Project) is a water supply maintenance project that removes sediment from Combie Reservoir while introducing an innovative recovery process to reduce elemental mercury concentrations in the Bear River watershed. It will utilize the design, construction, and operation of an innovative mercury extraction process paired with ongoing sediment removal operations to maintain reservoir storage capacity. This project will utilize a proven patented technology, the Knelson Concentrator, in a new application in order to remove elemental mercury from dredged sediments, while monitoring and studying the effects of the operation on water quality and biota. This initial project is estimated to take between three to five 5 years to complete. On-going maintenance dredging to maintain reservoir capacity is estimated to reoccur on 10 year intervals. Project benefits include; water supply reliability, water quality protection and improvement, ecosystem restoration and enhanced recreation. If this project demonstrates that mercury can be

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[1] The 303(d) List of Waters reports prepared by the State Water Resources Control Board identifies streams and lakes as impaired for one or more pollutants because they do not meet one or more water quality standards. Impaired waters are identified through assessment and monitoring programs conducted by local, state and federal agencies.

removed from river sediments the process can be applied at other reservoirs throughout the Sierra Nevada. In time, there could be a beneficial effect toward remediation and reduction of mercury contamination. Such remediation efforts would also be beneficial to the California Bay-Delta.

PROJECT LOCATION

The Project location is in the northeastern section of Combie Reservoir at the Bear River inflow. Combie Reservoir straddles the Nevada-Placer County line east of the Lake of the Pines community in Nevada County and west of the Meadow Vista community in Placer County (Figure 1).

PROJECT PURPOSE

The purpose of the Project is two-fold. First, it will remove sediments accumulated in Combie Reservoir. Sediment removal will restore and maintain water storage capacity and water supply availability for NID customers in portions of Nevada County and Placer County. Secondly, the Project introduces an innovative recovery process to remove elemental mercury from settled or suspended sediments during dredging operations. The Project sponsor is NID, with the United States Geological Survey (USGS) serving as one of the primary project partners responsible for monitoring water quality and ecological parameters of interest.

PROJECT OBJECTIVES

Objective 1: ***To remove sediment in order to restore and maintain reservoir storage capacity on an as-needed basis.*** Combie Reservoir was built over 70 years ago to provide quality drinking water and irrigation supplies to the NID service area in portions of Placer and Nevada counties. NID has maintained the reservoir capacity for more than 20 years by dredging sediments that threatened to fill the reservoir from the Bear River, upstream of Combie Reservoir. Even though dredging has occurred for many years, approximately 200,000 tons of sediment has migrated past the dredging operations, entering the reservoir. The transported sediment (from the river) settled at the northeastern end of the reservoir as water velocities taper off and particulate matter settles out (of suspension) at the upper reaches of the reservoir (Figure 2).

Objective 2: ***To remove mercury associated with sediments deposited in Combie Reservoir.*** In 2003, dredging operations were halted due to elevated concentrations of mercury found in the dredge effluent. Tests confirmed that the unfiltered water sampled in accordance with State regulations exceeded 50 nanograms per liter (ng/L), which is the relevant water quality maximum acceptable contaminant level (criterion), based on the United States Environmental Protection Agency's California Toxics Rule. Since that time, ongoing sedimentation occurs at the northeastern end of Combie Reservoir coupled with elevated mercury concentrations, increasing threats to water supply capabilities and quality, as well as recreational opportunities.

Mercury is a chemical that was widely used to extract gold as part of hydraulic gold mining during the mid-to late 1800s. Mercury exists in multiple forms and high levels

are found in water bodies throughout the Sierra Nevada region. The two primary forms of mercury pertinent to this project are: elemental mercury and methylmercury.

- Elemental mercury, or quicksilver, is a form of mercury that was applied during hydraulic mining to amalgamate, or bind to, gold, making it easier to recover from the slurry.

- Methlymercury is a biologically active form of mercury found in living organisms, such as fish. Mercury is methylated[2] by bacteria in a low oxygen environment, such as at the bottom of a reservoir. Methylmercury moves up the food chain from bacteria to plankton, to macroinveratbrates, to herbivorous fish, to piscivorous (fish eating) fish, and biomagnifies[3] with each step to dangerously high levels in fish, a level that is poisonous to fish eating birds, and humans.

Common remediation techniques for methylmercury removal follow one of two approaches: 1) the reduction of elemental mercury in order to reduce the source for methylation, or 2) the interruption of the methylation process so as to limit the conversion of elemental mercury to methylmercury. The proposed Project will remove elemental mercury that is bound to the dredged sediment thereby removing the source material for methylation. Dredging may also make the northeastern end of the reservoir that is currently shallow and warm and therefore likely conducive to methelyation less conducive, because dredging will create deeper and cooler conditions. In this way the project is expected to reduce not only the source material for methylmercury (elemental mercury in the sediment) but will also change the conditions in which the methylation process currently takes place.

In order to measure the effects of removing elemental mercury and reducing methylation conditions, environmental monitoring will take place before, during, and after the dredging and mercury removal operations. This information will help fill critical data gaps in the currently limited understanding of mercury behavior in a reservoir environment, specifically, downstream transport and bioaccumulation pathways so that watershed wide benefits to mercury removal can be realized. (See project Monitoring and Adaptive Management Section.)

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[2] Methylation is a term used in the chemical sciences to denote the attachment or substitution of a methyl group on various substrates. This term is commonly used in chemistry, biochemistry, soil science and the biological sciences. Methylmercury is composed of a methyl group (CH_3-) bonded to a mercury atom; its chemical formula is CH_3Hg^+ (sometimes written as $MeHg^+$).

[3] Biomagnification, is the increase in concentration of a substance that occurs in a food chain as a consequence of food chain energetics; put simply, big fish eat lots of little fish.

Objective 3: ***To improve reservoir management and maintenance by demonstrating an efficient method of mercury removal paired with dredging operations.*** NID and its project partners propose to introduce a mercury removal component to an existing dredging operation in order to meet USEPA and State water quality standards for mercury found in water bodies. An integral component of this project is to study water quality during the dredging and mercury removal operations as a performance measure so that NID operations can be adjusted to maximize mercury removal efficiency. (See project Monitoring and Adaptive Management Section.) If this project proves successful NID will be able to pursue a proactive mercury removal program as part of a consistent and ongoing maintenance dredging operations at Combie Reservoir. The lessons learned from this project will be useful and possibly transferrable to similarly impacted reservoirs in the Sierra Nevada region.

Objective 4: ***To support local industry by marketing gravel, sand, silt, and clay material removed during dredging.*** Vast quantities of gravels naturally flowed unrestricted into streams which drain into the Bear River. Even with the court-ordered cessation of hydraulic mining in 1884, thousands of tons of hydraulic mining debris continue to be transported downstream during storm events into Rollins Reservoir and Combie Reservoir. This material is a marketable resource for the construction industry (sand and gravel), the ceramic industry (silts and clays), and landscape industry (silts and clays).

In the past, marketable materials harvested from the Combie Reservoir have been sold as road base, construction and landscape fill material from a nearby plant within the Bear River canyon owned by Chevreaux Aggregates, Inc. (Chevreaux's Meadow Vista plant). Some materials have been processed for concrete and asphalt. Recently, a construction tile manufacturer sampled and tested some of the soils for its clay tile product, with satisfactory results.

The by-products from this Project – gravel, sand, silt, and clay– will be used as raw material by local industries.

Objective 5: ***To improve recreational opportunities and boat access within Combie Reservoir.*** Currently, the recreation and boat access at the northeastern end of Combie Reservoir is limited and/or non-existent, at low water levels, due to excessive build-up of sediments that block access to a large portion of the reservoir shoreline, including many private docks. At times, sand-bars prevent boaters from traversing the upper reaches of the reservoir; this also prevents access to portions of Combie Reservoir for beach use, fishing, and other recreational activities. This project will remove sediment barriers that limit such recreational access.

PROJECT BACKGROUND

NID constructed Combie Reservoir in 1926. At full capacity it has 5,555 acre-feet of operational storage. Combie Reservoir is a source of drinking and irrigation water for numerous consumers in Placer and Nevada counties; it also provides recreational opportunities to residents of both counties. Combie Reservoir is also the primary source of water for a 12 million gallon per day (MGD) water treatment plant. Lake water is pumped to an open canal which flows to the Lake of the Pines Water Treatment Plant serving over 2000 homes, businesses and a high school in southwestern Nevada County.

Since the mid 1960s, aggregates have been removed from the upper reaches of Combie Reservoir, within a man made pond (approximately 750 feet wide by 4,000 feet in length). The pond was separated from the Bear River and the rest of Combie Reservoir by a series of dikes and berms. In the mid-1990's, or earlier, aggregates were removed from the pond using suction dredge methods; this was done to eliminate the need to lower water levels and maintain a relatively high water level for recreation purposes and power generation at the Combie North Power House (a small hydro-electric generator located at Combie Dam). In 2003 dredging operations in Combie Reservoir were halted, ultimately leading to the inception of this Project. Elevated total mercury concentrations were detected in the dredge effluent during routine sampling as part of California Regional Water Quality Control Board (CRWQCB) permit requirements. It was determined that mercury was mobilized with sand and finer particulates during dredging activities.

Previously, the USEPA gave final approval to California's 2002 Section 303(d) List of Water Quality Limited Segments. Under Section 303(d) of the 1972 Clean Water Act, states, territories and authorized tribes are required to develop a list of water quality limited segments that includes water bodies that do not meet water quality standards even after minimum required levels of pollution control technology have been installed. This law also required these jurisdictions to establish priority rankings for listed waters, as well as develop action plans known as Total Maximum Daily Loads (TMDL) in order to improve water quality. Combie Reservoir was included on the 2002 list due to the presence of mercury associated with historical gold mining practices.

It has recently been determined by the California Attorney General and the Executive Director of the California State Mining and Geology Board that dredging within a water supply reservoir does not constitute a mining activity. A 1995 California Attorney General Opinion (78 Ops. Cal. Atty. Gen. 343) established that maintaining a flood-control facility is exempt from the State Surface Mining and Reclamation Act (SMARA). In a letter dated July 30, 2008, Stephen M. Testa, Executive Officer of the California State Mining and Geology Board, confirmed that the State Attorney General Opinion applies to all maintenance activities of a water retention and flood-control facility, provided that the original contours of the water facility are not altered. As such, maintenance dredging of Combie Reservoir to be conducted as part of this Project is not subject to SMARA.

An Initial Study has been prepared for this project to meet the requirements of the California Environmental Quality Act (CEQA). The primary purpose of the Initial Study is to describe

existing environmental resources, potential environmental impacts and environmental mitigation measures that may be required for this Project. The Regional Water Quality Control Board, California Department of Fish and Game and US Army Corps of Engineers require environmental documentation in order to issue applicable permits. As such, the Initial Study is focused on providing the environmental documentation required for permitting under CEQA.

All permits for the Project will be requested by and will be issued to NID. Therefore, NID, as the public agency that intends to carry out the Project, will serve as the lead agency pursuant to CEQA. Agencies that require environmental documentation in order to issue their respective authorizations are as follows:

1. Sacramento Regional Water Quality Control Board -Waste Discharge Permit and Section 401 Certification or Waiver
2. California Department of Fish and Game -Section 1603 Stream Alteration Agreement and dredge operations
3. Placer County -Hazardous Materials Business Plan

In addition, the U.S Army Corp of Engineers has jurisdiction, but may not require a Section 404 Permit for Discharge of Dredged or Fill Material into Waters of the US. A jurisdictional determination has been requested of the U.S Army Corp of Engineers.

PROJECT FEATURES

The initial Project will occur over a three- to five- year period, during which an estimated 150,000 to 200,000 tons of material will be removed from Combie Reservoir. Periodic maintenance dredging will occur on an as needed basis on approximate 10 year intervals. Sediments will be removed using an electric dredge and mechanical centrifuge dewatering system (as manufactured by Eveready Marine Service, or equivalent). Mercury will be removed from the dredged sediments using a Knelson Concentrator (Concentrator), a centrifugal technology that is proven to effectively remove mercury and other heavy metals from sediment. The Project includes four major components, as described below and illustrated in Figures 3 and 4:

1) ***Dredging of Combie Reservoir.*** The dredge site is located in the northeastern end of the reservoir. The existing site features at Combie Reservoir provide an ideal location for implementation and demonstration of the mercury removal technology. Existing Project features include:

   a. The former dredge pond (approximately 750’ by 4,000’) where dredging occurred before operations were halted;
   b. The levee road and berms constructed to isolate the pond from the Bear River and the rest of Combie Reservoir; and
   c. Channelized flow of the Bear River around the east side of the pond where the river flows into the northeastern end of Combie Reservoir.

The Project is expected to operate for nine months per year for three- to five- years to remove the estimated 150,000 to 200,000 tons of material from the reservoir. The dredge will have an electrically operated boom with an estimated maximum reach of 20-30 feet in length, and will be capable of pulling up sediment from the bottom of Combie Reservoir at an approximate rate of 250 gallons/minute.

The dredged material will be a slurry of gravel and sand that will be pumped from the dredge through a pipe, either floating on the water or lying on the bottom of the reservoir, and laid along the levee road to the on-site Mobile Separation and Dewatering System (MSDS), located at the northeast end of the pond – refer to Figures 3, 4 and 5. The following equipment will be utilized on-site and will comprise new features of the Project:

- Eveready remote controlled all electric floating dredge with positive displacement pump on pontoons, or equivalent
- Slurry pipeline (8" to 12" diameter) with electric and control cables
- Receiving tanks and primary screens (2 tanks, about 10' dia. x 10' tall)
- Trash bin or dump truck (for large debris and rock)
- Electric pumps (6) and flexible distribution piping
- Secondary separation and agitated conditioning tanks (4 tanks, about 10'dia. x 10' tall)
- Polymer storage and mixing tanks with control booth (2 containers, about 8' x 30'x 10' tall)
- Centrifuge with conveyor belt system (for material delivery to the Concentrator and waiting trucks)
- Two to four dump or transport trucks
- Earth containment berm
- Portable diesel generator "whisper quiet" model Duthie Power Services with an output capacity of 220KVA 480 Volt 300 amp @60 Hz., or equivalent[4]
- 100 gallon above ground diesel fuel storage tank

The above list of equipment describes the Eveready (electric) Mobile Dredge and Dewatering System, 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 Concentrator. 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, cutter head, as well as the dewatering system motors operate 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 Concentrator. The flow will be controlled by the on-board operator using the VFD controls.

[4] In the future, NID may connect to the 3-phase, 480V power source if it extended to the Chevreaux plant

The size of the system dredge module is 10' x 30', and weighs approximately 15,000 lbs. The cutter head boom can be lowered to a measured depth (for dredging sediments and avoid excavating below the original contours of the reservoir). Located just behind the cutter head is a hidrostal sludge pump; this is a positive displacement pump (800- 1,000 gallons per minute) that will not clog. This combination of cutter head and hidrostal pump reduces the risk of suspended sediment or contaminant dispersal into the reservoir due to the powerful suction at the entry to the cutter head. In addition, the positioning of the hidrostal pump below the water surface provides a virtually silent operation.

The dredged materials received through the cutter head are then pumped and conveyed through a floating pipeline to a receptor or shore-based treatment process which can be located up to 4,000' away from the dredge (even further by the use of a booster pump).

The dredged material (slurry) then passes over a vibrating screen assembly to remove large rock and debris. The screened slurry is then pumped to another vibrating screen, separating silts and clay size material from sand and rock size aggregates, if needed, where the segregated material falls into agitated conditioning tanks. The conditioned slurry is then pumped to one of the high "G" centrifuge where primary dewatering occurs and produces a thickened sludge that is conveyed to the Concentrator, for the removal of mercury. Effluent from the Concentrator is later pumped to the second high "G"[5] centrifuge, where optimal separation produces a dry cake and centrate. If required, the separation process is enhanced by injecting flocculating polymers into the conditioned slurry feed prior to entering the centrifuges. The dry cake is discharged to trucks via conveyors and the centrate is returned to the first containment chamber (of the pond).

The dry cake material will then be loaded onto large dump trucks and transported to the Chevreaux Meadow Vista processing plant, which is located on the Bear River approximately one-half mile north of the Project site – refer to Figure 3.

Water and suspended solids that leak or spill from the dewatering equipment are contained by an earthen berm and returned to the primary separating tanks (manually excavated or pumped). A series of containment chambers in the pond will provide additional spill protection – see below.

The pond was the original dredging site at the Project location before operations ceased in 2003. As described in a previous section, the pond is separated from the river by a series of berms and a levee road. As part of this Project, the pond will be divided into a series of containment chambers separated by floating log booms with turbidity curtains; the curtains will extend from the surface of the water to the bottom of the pond. Centrate will be discharged to the first containment chamber to filter the water and allow turbidity to settle, if any, and provides source water for the Concentrator. Secondary containment chambers, and more if needed, will be used to further remove any material in suspension and provide discrete areas for monitoring water quality. Only clean water will be returned to Combie Reservoir (at the south end of the pond) once the slurry/centrate has

[5] 'G' denotes gravitational forces at ~9.8 m/sec^2.

been processed through the Knelson Concentrator, dewatering centrifuges and turbidity curtains.

The dredge will maneuver in small isolated parts of the "Area to be Dredged" using a series of cables, pulleys and anchors– refer to Figure 3. These isolated areas will be cordoned off to boats and swimmers using safety buoys. All cables, pulleys and anchors will be positioned to avoid disturbance of riparian areas along the reservoir shore, Bear River and containment pond. There will be three anchor points for the dredge cable/pulley maneuvering system for the electric dredge. Two points will be on shore with a cable running between them and the other will be submerged. A pulley connected to a cable on the two shore mounted anchors would provide guidance for the dredge path of travel. The shore mounted anchor point(s) will be positioned on shore such that there would be minimal disturbance to riparian vegetation. When the dredge is to be re-positioned, it would be able to move without relocating the shore mounted anchors as it could merely realign its path along the pulley and cable system between the two shore-mounted anchors. In addition, the shoreline location where the slurry pipe will cross the riparian area between the reservoir and the upland levee road will be selected such that disturbance to riparian vegetation is minimized by the placement of the pipe. Given the site conditions at the proposed location, the above-ground placement of this pipe over rock or earthen portions of the levee should be possible without harming any vegetation. The dredge will be shut down periodically in order to set up and relocate the dredge to various staging areas, and to allow inspection, maintenance and water quality monitoring.

A portable diesel generator ("Whisper quiet" Duthie Power Services, 220KVA Generator 480 Volt 300 amp @ 60 Hz, or equivalent), licensed by the Air Resources Board will be brought in to run the dredge and dewatering equipment (a separate smaller generator will provide power to the concentrator and mobile office). The generator will be placed on land above the ordinary high water mark (1,602' MSL) and power cables will be connected to the mobile dredge and shore mounted dewatering system.

Small quantities of diesel fuel (less than 100 gallons) will be stored and dispensed on site, if needed for the portable generator. Storage and handling of diesel fuel will be done in accordance with Placer County Hazardous Material Business Plan requirements.

2) ***Removal of Mercury from Dredged Sediments.*** The concentrator used for this Project will have a 12-inch bowl that spins at 60-80*g* (gravitational force (~9.8 m/sec^2)) to separate mercury from the thickened sludge (from the primary centrifuge). The concentrator is a unique centrifuge that is capable of removing 85 to 95 percent of mercury from the sediments. The concentrator will operate during dredge operations and up to two hours each day after dredge operations are ended in order to process all material remaining in the tanks and centrifuges. At times, the concentrator and centrifuges may operate without the use of the dredge to re-process the dry cake, or centrate, if needed to achieve maximum efficiency. The following equipment comprises the new Project features for this component:

   - Knelson Concentrator (model KC-CD12MR[MS]) or equivalent

- Mobile office and lab (approximately 8' by 65') with separate generator (less than 50 horsepower)

During operations of the dewatering system, a thickened sludge will be transported from the primary centrifuge to the Concentrator by a conveyor belt system. Mercury and other heavy metals will be extracted through the Concentrator as the thickened sludge mixes with water and travels through the machine. The tail water (treated effluent) from the Concentrator will be pumped into the second centrifuge for secondary dewatering.

After final dewatering, the centrate will be discharged to the first containment area, then flow through a series of containment chambers, as needed to further remove suspended particles from the centrate, before it flows into Combie Reservoir – see Water Filtration below. The centrate will be monitored to insure project effectiveness. The extracted mercury and other heavy metals (concentrate) will be collected and transported to a legal offsite disposal area as required by the Placer County Hazardous Materials Business Plan. Any recovered gold or amalgam will be transported to an accredited off-site laboratory for assay, analysis, and separation; the disposal of any separated mercury will be in accordance with county and state regulations appropriate to the location of the laboratory used. All recovered mercury will be retired and will not be resold on the open market.

3) ***Water Filtration.*** Water filtration will take place using a series of containment chambers separated by floating turbidity curtains in the pond. The containment chambers will be designed to allow water to pass through the turbidity curtain while keeping back (retaining and/or serving as a barrier to) suspended solids. Two or more curtains will be used to create three or more areas of containment in the pond. These containment areas will be monitored for effectiveness.

Water will migrate by hydraulic gradient, which will flow in one direction (south) towards the reservoir through the turbidity curtains. Clean water will be returned to Combie Reservoir at the south end of the pond through an over-control structure (such as an overflow pipe with an inverted 90-degree elbow and screened, designed to draw water from mid-depth). The over-control structure will be a monitoring site to insure water quality protection. In this way, the water will be filtered, leaving floating material and suspended material to settle out and/or remain in the pond, returning only clean water to the reservoir.

In addition to the floating turbidity curtains in the pond, a series of shallow groundwater monitoring wells will be installed along the berm separating the pond and the Bear River. This will provide added assurance that water does not filter back into the river without proper treatment and clarification, or filtered through the berm.

New Project features that comprise the water filtration component include:

- Log booms with turbidity curtains
- Overflow pipe
- Shallow groundwater monitoring wells

4) ***Transport of Marketable By-Products to Off-Site Locations.*** The Project site allows for maximum use of the aggregates that will be removed from Combie Reservoir due to its vicinity to the Chevreaux Aggregates, Inc. (Chevreaux) Meadow Vista processing plant. The plant is located only one half of a mile upstream along the Bear River. Sand, silt, clay, and gravel (dry cake) will be transported by truck from the MSDS to the Chevreaux plant for processing. If for any reason, Chevreaux does not take possession of the dry cake, it will be transported (by truck) to another aggregate plant within Placer County or Nevada County. Once processed by Chevreaux or another plant, the marketable materials will be stored on site and trucked to construction sites or other industries in the region. Non-marketable materials will be disposed of in accordance with existing state and federal regulatory permits issued to the plant operator.

5) ***Flood Plain Management***. The entire operation is located within the Bear River floodplain. The following measures will be incorporated as project features to minimize the effects associated with high water flows:
    a. All shore based and equipment processes will be located and operated above the ordinary high water mark of 1,602 feet (msl) (See Figure 4)
    b. All operations will be suspended from the period of December 1 through April 1 each year.
    c. All project features including the mobile office and concentrator, mobile equipment, on-site diesel fuel storage, portable restrooms and dredge will be removed and stored off site, above the flood plain, prior to December 1 of each year. Said features will not be returned on-site until after April 1 or after winter storms have ended, whichever is later.
    d. The MSDS and Concentrator staging areas will be restored to pre-project conditions following completion of the Project.

6) ***Days and Hours of Operation.***
    a. Dredging, dewatering and material transport
        - Monday through Saturday 7:00 a.m. to 7:00 p.m.
        - No work on federal holidays
    b. Mercury processing
        - No limitation

PROJECT MONITORING AND ADAPTIVE MANAGEMENT

The innovative nature of this project requires that monitoring be used to measure the impacts of the project on three separate accounts; 1) To inform environmental permitting specific to the Wastewater Discharge Permit (Anti-Degradation Study) 2) To measure the environmental benefits of ecosystem restoration (Environmental Monitoring) 3) To inform the dredging and mercury removal operation so that adaptive management can be used to optimize mercury removal efficiency (Operational Monitoring).

1) Anti-Degradation Study: A one year long Anti-Degradation study began in February 2009, and includes monthly and storm water sampling above and below Combie Reservoir, at the pond-reservoir interface and at the area to be dredged in the northeastern end of the reservoir. These data will be used to characterize pre project water quality

conditions. The water quality parameters being measured include general mineral and organic constituents, general physical parameters such as turbidity, and total mercury and methylmercury. This study will also include laboratory testing of the Knelson concentrator for total, methyl and reactive mercury. These data are important to be able to describe background water quality conditions and predict the water quality changes that result from the project. These data will be used to write an Anti-degradation study report which will be reviewed by the Central Valley Regional Water Quality Control Board as part of the Waste Discharge Permit.

2) Environmental Monitoring: The USGS California Water Science Center in Sacramento will design and conduct the environmental sampling and will analyze the results. The USGS Study Sampling Plan includes samples of water, sediment, and biota (fish and invertebrates) in Combie Reservoir before, during, and after project operations to determine whether concentrations of mercury and methylmercury in Combie Reservoir are reduced as a result of dredging and mercury removal. The goal of the environmental sampling is to determine the effectiveness of removing elemental mercury as a strategy to reduce methylmercury in the aquatic food chain and to characterize the form of mercury that is transported both into and out of Combie Reservoir. This environmental monitoring should lead to a better understanding of mercury transport, methylation, and bioaccumulation in the Bear River system.

3) Operational Monitoring: Water that enters and exits the dredging and mercury removal equipment will be monitored in order to maximize efficiency. The Central Valley Regional Water Quality Control Board will require water quality monitoring in order to insure that all water quality standards are achieved during operations. The sampling locations and frequency are to be determined by the Central Valley Regional Water Quality Control Board and will be described in detail in the Waste Discharge Permit. The sampling locations likely to be required by the Board include the water entering the MSDS from the dredge, effluent from the centrifuge, or centrate that discharges into the first containment chamber of the pond, and at the pond-reservoir interface. Shallow groundwater wells along the levee road that separates the Bear River from the Pond will also be monitored to determine if groundwater flow occurs between the River and the Pond. These predicted operational monitoring locations are depicted in Figure 6 Process Flow Diagram by the letter ‘M’. The precise water quality parameters and monitoring frequency will be determined by the Central Valley Regional Water Quality Control Board. The goal of the operational monitoring will be to update the dredging and mercury removal equipment use parameters through adaptive management.

A Technical Advisory Committee (TAC) will be formed to evaluate monitoring data that is collected during the life of the project. The TAC will be made up of scientists, key stakeholders, tribes, landowners, and engineering operations experts. Monitoring results will provide the TAC with information needed to optimize the degree and timing of operations and determine the effectiveness of the mercury removal process. The role of the TAC will include:

a. Reviewing monitoring data,

b. Providing quality assurance and quality control (QA/QC) of monitoring data,

c. Providing guidance on operations and engineering, and

d. Making recommendations to equipment operators.

PROJECT BENEFITS

Water Supply Reliability. This project was conceived by the need to restore and maintain water storage capacity in Combie Reservoir. As a water supply reservoir, NID is responsible to its customers to maintain a reliable water supply. Periodic or on-going removal of sediments that enter the reservoir is necessary to maintain this water supply. By developing an action strategy to remove mercury in conjunction with accumulated sediments, NID will be able to maintain the needed water storage capacity in Combie Reservoir.

Removing Mercury Contamination. This project intends to develop Best Management Practices (BMPs) for restoring water storage capacity and removing legacy mercury contamination within the Sierra Nevada region. If proven to be successful in removing mercury, this strategy should provide for more reliable water supply and improved water quality for all beneficial uses within the region, as well as in downstream water bodies such as the California Bay-Delta.

Mercury Fate and Transport Research. While the main intent of the Project is to remove sediments and mercury from Combie Reservoir, because of the controlled operational environment, there are numerous research opportunities within this intent that may serve to fill critical data gaps in our understanding of mercury in and below reservoir environments. The USGS Sampling and Analysis Plan will quantify the effects of removing elemental mercury to the aquatic food chain. Specifically, this research will address the impacts of removing a known amount of elemental mercury on methylmercury levels in young of the year fishes, macroinvertabrates and other biosentinal species. Monitoring below Combie Reservoir will help fill critical data gaps regarding the form and quantity of mercury that is transported to downstream reaches, enabling improved quantification of overall tributary contributions of methylmercury to the Bay Delta. The sampling and analysis plan proposed by USGS has immeasurable benefits to mercury related studies and remediation techniques throughout California.

Recreation and Public Access. Currently, recreation activities at the northeastern end of Combie Reservoir is limited due to excessive build-up of sediments that block access to portions of the reservoir and its shoreline, including private boat docks. This project will work to remove sediment barriers that limit private boat dock access, while improving water quality and aquatic habitat.

Water Quality Protection and Improvement. This project will remove mercury from sediment deposits in Combie Reservoir. Systematic removal of mercury from the reservoir may allow for future removal of Combie Reservoir from the California 303 (d) list under the Clean Water Act.