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PLUMAS COUNTY ENVIRONMENTAL HEALTH DEPARTMENT GROUNDWATER MONITORING PLAN; CALIFORNIA DEPARTMENT OF HEALTH SERVICES SURFACE WATER AND SEDIMENT MONITORING PLAN, AND; DEPARTMENT OF WATER RESOURCES GROUNDWATER LEVEL AND FLOW MONITORING PLAN FOR THE LAKE DAVIS PIKE ERADICATION PROJECT

February 1, 2007

The California Department of Fish and Game (DFG) is conducting an extensive water quality monitoring program for the Lake Davis pike eradication project. Surface and groundwater monitoring as required and recommended by the California Department of Health Services (DHS), Plumas County Environmental Health Department (PCEH), and Lawrence Livermore National Laboratory (LLNL) is addressed in this program. DFG will continue to work closely with the local community regarding water quality and supply concerns. Groundwater monitoring is a component of the Lake Davis Northern Pike Eradication Project 2007 Draft Environmental Monitoring Plan.

Although information to date implies that groundwater will not be negatively impacted by the project and that surface water quality will return to background levels, surface and groundwater quality, groundwater levels and flow will be monitored to determine possible impacts from the pike eradication project. This plan also addresses the requirements of California Health and Safety Code Section 116751 and requirements and concerns of other agencies and the local community.

DHS SURFACE WATER QUALITY AND SEDIMENT MONITORING

Water and sediment monitoring for rotenone, rotenone breakdown products and rotenone formulation chemicals will occur in the reservoir before and after the treatment of Lake Davis according to the Lake Davis Northern Pike Eradication Project 2007 Draft Environmental Monitoring Plan. DFG will collect samples of water and sediment for DHS and may be accompanied by observers such as PCEH staff. Baseline and post-treatment samples will be transported by DFG to the DHS Sanitation and Radiation Laboratory in Richmond, CA. DHS requires baseline analyses for Volatile Organic Compounds (VOCs), Semi-VOCs, N-methyl pyrrolidone (MP), Diethylene Glycol Monomethyl Ether (DEGME). Additionally, DFG will collect DHS required samples and analyze for biochemical oxygen demand (BOD), dissolved oxygen and general water quality parameters including pH, EC, alkalinity, and hardness, and DFG may analyze a number of split samples according to DHS required methods and protocol to confirm DHS' results.

Baseline Sampling: DHS/DFG baseline reservoir water samples will be collected approximately one week prior to treatment of Lake Davis. Five representative sampling transects will be selected for water and sediment sampling in the reservoir. Each transect has two sites, yielding a total of 10 sites on the reservoir. Each transect will have one littoral (shallow) site and one limnetic (deeper) site. Water samples will be collected at three depths at each limnetic site (surface, mid-depth, and bottom) and two depths at each littoral site (surface, bottom). VOC and Semi-VOC samples for DHS will be transported by DFG to the DHS Richmond laboratory. BOD, dissolved oxygen and general parameters including pH, EC, alkalinity, and hardness samples required by

DHS will be collected by DFG and analyzed on site and/or by the DFG Water Pollution Control Laboratory (WPCL) in Rancho Cordova, CA.

Post-treatment sampling: DHS post-treatment reservoir water quality sampling will begin approximately 48 hours after rotenone treatment of the reservoir is completed. Sampling will continue weekly thereafter at 10 locations throughout the reservoir (including baseline sample locations) until 3 consecutive sample results indicate non-detectable levels for rotenone, rotenone breakdown products and rotenone formulation chemicals in the water column and sediment. After 3 consecutive water and sediment samples in all baseline locations result in non-detectable levels of the treatment formulation constituents, and DHS makes a determination that the lake water is safe for use as a drinking water source, additional water quality samples will again be collected and analyzed by the WPCL for BOD, dissolved oxygen and general parameters including pH, EC, pH, alkalinity, and hardness for comparison to baseline water quality.

Note: It is possible that baseline monitoring may detect existing chemicals in the reservoir prior to treatment that are unrelated to rotenone and rotenone formulation chemicals. Chemicals not related to the pike eradication treatment are not subject to the pike project water quality monitoring activity.

PCEH GROUNDWATER QUALITY MONITORING:

DFG will support continued groundwater quality monitoring conducted by PCEH in the Lake Davis area. Additional monitoring will occur before, during, and after the pike project as required by DHS, the RWQCB, and as recommended by PCEH and LLNL.

PCEH current 10-year well water quality monitoring program: PCEH has been monitoring groundwater quality in approximately 80 wells (currently 78 wells; two wells are tested semi-annually) in the area as part of a 10-year monitoring agreement resulting from the 1997 Lake Davis rotenone application. The wells in this monitoring network or *grid* are currently tested yearly for rotenone formulation constituents that were part of the 1997 Lake Davis rotenone treatment. No test results to date indicate any spatial or temporal pattern that might suggest chemicals from the 1997 application entered any well. However, monitoring will continue. And as stated in DFG's California Environmental Quality Act Findings for the Lake Davis Pike Eradication Project, DFG will provide alternative water supply should pike project activities impact groundwater in the area. This is the ninth year of the PCEH 10-year well water quality testing program in the 1997 well grid, to be completed in 2008. PCEH well water samples are currently analyzed by North Coast Laboratory, in Arcata, California.

Isotopic Testing and future well water quality monitoring: In addition to the annual testing for the 1997 Lake Davis treatment chemicals and as recommended by LLNL, DFG will support isotopic groundwater analysis. Isotopic analysis will include the collection of groundwater samples from wells in the current 78 well-grid (and additional wells if appropriate--see "Well Owner Sampling Inquiries" heading below) prior to the 2007 Lake Davis treatment. Isotopic testing will help to determine if wells in the current monitoring grid may contain water that is connected with surface water, such as Lake Davis or Grizzly Creek; likewise, the testing will identify wells that do not have evidence of surface water connection, which could therefore potentially be removed from the current monitoring grid. PCEH will collect the water samples for isotopic analysis and transport them to LLNL for testing.

PCEH staff will collect background surface water samples in Lake Davis, Grizzly Creek, and specific tributaries. These samples will be analyzed for isotopes by LLNL. Later they will be

compared to well water isotope samples. The well water samples will be collected by PCEH approximately July 2007 when the annual 1997-related monitoring occurs, and transported to LLNL for the isotopic analysis prior to the 2007 Lake Davis treatment. Isotopic analytical results will then be evaluated by LLNL in the context of other groundwater monitoring information to determine potential vulnerability of groundwater quality from pike eradication activities. Other groundwater evaluation criteria includes historical groundwater quality monitoring data, past and current DWR groundwater level monitoring, well location and geology, casing depth, screen intervals, and well log information if available. Based on the LLNL isotopic evaluation, the current 78-well monitoring grid will be revised to include a specific set of wells in a new monitoring grid that is representative of groundwater resources related to surface water connectivity.

Wells in the revised grid will be monitored by PCEH for the 2007 rotenone treatment chemicals as follows: once during the treatment, then every two or three weeks thereafter until 3 consecutive samples result in no detection of the 2007 rotenone and rotenone formulation chemicals. After 3 non-detectable sample results are confirmed, PCEH will begin annual testing for formulation chemicals in the new well grid for up to 10 more years.

If rotenone formulation chemicals are present in groundwater, and/or persist, DFG is prepared to provide drinking water to well owners. Chemicals not related to the pike eradication treatment are not subject to the pike project water quality monitoring activity.

Well water samples will be collected by PCEH according to the Henrici Method and as recommended by LLNL (Ridley 2006), and transported to the appropriate laboratories via chain-of-custody. Isotope samples will be transported to LLNL and well water samples to be analyzed for rotenone, rotenone breakdown products and rotenone formulation chemicals will be analyzed for PCEH by North Coast Laboratories.

WELL OWNER SAMPLING INQUIRIES:

Individual well owners interested in having their well included in either the groundwater level or groundwater quality monitoring program should contact PCEH. The following criteria will be used to determine the validity of adding the well to the 2007 well monitoring grid.

- Well owner concern
- Well location and elevation (proximity to Lake Davis, Grizzly Creek, etc.)
- Location geology and current DWR and PCEH monitoring data
- Isotopic analysis
- Baseline (historical) water quality analysis of well water (pre-existing chemicals in water?)
- Historical supply information (i.e., has well experienced seasonal supply shortages?)
- Well log (if available) (age and type of casing, screen intervals, condition)
- Well pumping capacity

DFG will make the decision to extend the well sampling grid based on DWR Engineering Geologist, PCEH, LLNL, and DHS consultation.

DWR GROUNDWATER LEVEL AND FLOW MONITORING:

DFG contracted the DWR to monitor groundwater levels and flow direction in the Lake Davis project area before, during and after the 2007 Lake Davis treatment. Specific wells (approximately 30 representative wells) south of Lake Davis and along Grizzly Creek will be identified and mapped. Water levels in the wells will be measured and data compiled, plotted, and analyzed to determine potential influences on groundwater supply and flow in the area. This program will also establish a groundwater level monitoring grid in the project area as well as regular collection of water level data, mapping of wells in the watershed, characterization of groundwater movement, and identification of influences on groundwater levels and flow in the area.

DWR groundwater level monitoring began in November 2005 and will continue throughout the 2007 pike eradication project until February 2008.