Project 184 Geomorphology Monitoring Plan

Sensitive Site Investigation and Mitigation Plan Development

Revised Agency Review Draft

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Version 6.0

This monitoring plan is a collaborative effort and has been developed to satisfy the geomorphology requirements set forth in the Project 184 Settlement Agreement (EID 2003), U.S Forest Service (FS) 4(e) License Condition No. 37.6 (FS(a) 2003), and California State Water Resources Control Board Section 401 Clean Water Act Water Quality Certification Condition No. 13 (SWRCB 2006). The investigation at the Caples Creek and Caples Dam spillway channel also appears as a protection, mitigation, and enhancement (PM&E) measure in the Federal Energy Regulatory Commission (FERC) Final Environmental Impact Statement (EIS) issued for Project 184 (FERC 2003). Chapter 1 of this Geomorphology Monitoring Plan is needed to determine the fluvial geomorphic properties of Caples Creek, and the Caples Dam Spillway Channel, which will be used to determine the most effective method for stabilizing the spillway channel and providing adequate sediment transport in Caples Creek. Chapter 2 of this Plan is to conduct geomorphic investigations that will lead to the development of a mitigation plan to address instability in Oyster Creek.

The scope of this plan has been defined by the geomorphology requirements set forth in this document and has been agreed to by El Dorado Irrigation District (EID).

Chapter 1: Caples Creek & Dam Spillway Channel

1.0 Background

Fluvial geomorphology study results (1998-2002) indicated potential problems with channel stability in Caples Creek and along the Caples Dam Spillway Channel that is associated with an imbalance in bedload and stream flow, and a potential impact on fluvial processes downstream. Operation of Caples Lake Dam affects flow in both Caples Creek and the auxiliary Dam Spillway Channel. Flow regulation for purposes of water supply and power generation has altered the natural streamflow hydrograph of Caples Creek. Of most concern to this study plan is that natural large peak flows from spring snowmelt runoff now occur less frequently and at a lower magnitude since most runoff is stored in the reservoir during the spring and summer, and because the dam outlet works can only release a maximum of 350 cubic feet per second (cfs). Discharges exceeding this level are released through the auxiliary dam spillway. This Monitoring Plan describes the issues and study approach for the natural Caples Creek channel and Caples Dam Spillway Channel.

Caples Creek Channel

Peak flows required for performing geomorphic channel maintenance (maintenance of a stable channel form and fluvial processes by transporting the sediment load recruited to the channel) have been altered by flow regulation. Attenuation of the natural Caples Creek spring runoff has resulted in "a high level of fine stream bed material, little movement of the material with spring runoff events, and affected the channel profile with a suggestion of aggradation of stream bed material " (FS(b), 2003). A lack of willow recruitment has also been identified on the Caples Creek channel in a FS 4(e) riparian analysis report (FS(b), 2003). Furthermore, the FS rationale for 4(e) Conditions report (FS(c), 2003) states that initiating bedload transport is important for improving aquatic habitat. Managed pulse flow events that mimic the magnitude and timing of a natural hydrograph may be needed to ensure sediment transport and channel maintenance.

Caples Dam Spillway Channel
When inflow to Caples Lake exceeds the capacity of the Caples Lake outlet structure, water is released into a spillway at the auxiliary dam. The spillway was likely a small natural drainage pathway prior to the construction of Caples Dam. Spill flows have over time resulted in incision and bank erosion of the Dam Spillway Channel (ENTRIX, 2002).

1.1 Study Plan Approach and Objectives

The study plan is organized to collect the necessary field data and perform appropriate analyses required to address stated concerns related to stream channel instability and channel maintenance pulse flow requirements.

Caples Creek Channel
To date, no detailed quantitative studies have been performed on Caples Creek to determine the discharge magnitude and frequency required to meet channel maintenance goals. This study will analyze Caples Creek hydraulics and sediment transport to determine an appropriate pulse flow magnitude specific to channel and riparian maintenance needs for Caples Creek. The overall approach includes:

- Conduct a field assessment of geomorphic conditions between the confluence with the spillway channel downstream to Jake Schneider Meadow to document channel stability/instability;
- Perform hydraulic and sediment transport modeling to evaluate pulse flow requirements for channel and riparian maintenance;
- Provide controlled test flow releases to calibrate hydraulic modeling and to conduct in-situ field studies to demonstrate flow magnitude needed to transport sediments; and
- Identify mitigation measures to meet channel geomorphological objectives.

Pulse flow magnitude and frequency should be dimensioned so as to provide for the following resource objectives as listed in Appendix B of the Settlement Agreement (EID 2003):

Fluvial Geomorphology Objectives
- Maintain or restore channel integrity
- Maintain, improve, or restore fluvial processes to provide for balanced sediment transport, channel bed material mobilization and distribution, and channel structural stability that contribute to diverse aquatic habitat and healthy riparian habitat

Riparian Habitat Objectives
- Maintain or restore riparian resources
- Maintain and restore instream flows sufficient to sustain desired conditions of riparian, aquatic, wetland, and meadow habitats

Connectivity Objective
Maintain and restore spatial and temporal connectivity for aquatic and riparian species within and between watersheds to provide physically, chemically, and biologically unobstructed movement for the survival, migration, and reproduction

Conversely, pulse flows should not be too high as to cause excessive transport, particularly de-stabilizing spawning gravels so that they are depleted from the channel reach and the bed is coarsened.

Caples Dam Spillway Channel

Historic spills from Caples Lake Auxiliary Dam down the Dam Spillway Channel have resulted in channel incision and channel widening, particularly in the downstream reach near Caples Meadow where the Dam Spillway Channel is formed in finer grained alluvium and more easily eroded compared to the steeper boulder-dominated reach upstream. The Dam Spillway Channel was likely a much smaller natural drainage prior to project development that has been incised and enlarged by historic spill flows. It is not known the extent to which the channel may be currently stable at flows of 60 to 250 cfs. Field data will be collected to develop channel and bank stabilization plans for the Dam Spillway Channel. Major tasks will include:

- Field assessment to identify areas in need of stabilization;
- Hydraulic modeling to evaluate the stability of the channel bed and banks;
- Calibrate hydraulic model, observations of bank/bed stability, and estimated sediment load transported using empirical field data collection methods during test flow release; and
- Consider and develop mitigation measures to be addressed in Stabilization Plans (prepared separately to address license conditions).

1.2 Site Investigation Locations

The following locations were identified by the Ecological Resources Committee (ERC), FS, and SWRCB to be included in the geomorphology monitoring plan:

- Caples Creek below the confluence of the Caples Lake Dam Spillway Channel to the Jake Schneider Meadow
- Caples Lake Dam Spillway Channel

1.3 Study Details

The following proposed study details of the Caples Creek portion of the Geomorphology Monitoring Plan have been developed to provide a means for quantitatively identifying channel maintenance pulse flow requirements and the need for and location of stabilization measures as a result of Project 184 operations.

Caples Creek Channel

Field Assessment of Geomorphic Conditions

EID will conduct a detailed geomorphic field assessment of Caples Creek in the entire 6.5-mile long reach from the confluence with the Dam Spillway Channel downstream to Jake Schneider Meadow. The field assessment will include GPS mapping and photo documentation of problematic areas (e.g., headcuts indicative of vertical channel instability, bank erosion hot spots, evidence of channel degradation/aggradation), description of channel patterns (single thread,

braided, and the types of depositional features present), planform (sinuosity), presence and function of large wood jams, and assessment of the general channel stability and its expected trajectory based on comparison with previously observed conditions (ENTRIX 2002). These observations provide insight into sediment transport conditions.

Hydraulic and Sediment Transport Modeling

Two detailed modeling reaches will be established on Caples Creek. The purpose of the two modeling reaches will be to collect field data that can be input into a hydraulic model to evaluate the appropriate magnitude of pulse flow needed to meet channel maintenance and riparian resource objectives. The first modeling reach will be located in Caples Meadow (confluence with the Dam Spillway Channel), and the second study reach will be located in Jake Schneider Meadow. Both of these locations were relicensing study sites, representing low-gradient, poorly entrenched, alluvial reaches that are most sensitive and responsive to changes in flow or sediment regimes.

A topographic survey of the longitudinal bed profile and cross-sections through the channel and floodplain will be performed in each study reach. The topographic survey data will provide the necessary input to represent the channel geometry for modeling purposes. If possible, the cross-sections previously surveyed for the relicensing studies in both reaches will be re-surveyed and compared with new cross-section surveys to evaluate stability and trends in the evolution of the channel morphology over the past several years. The position of riparian vegetation in relation to the low-flow channel and top of banks will also be surveyed. This information will be helpful to determine what magnitude of pulse flow might be necessary for purposes of inundating riparian vegetation to prescribed depths on a reach-scale basis.

The sediment composition of the bed will be characterized at the surveyed cross-sections for input into sediment transport modeling (described below) to determine the discharge required to mobilize given bed particle sizes. At cross-sections where the bed material is coarse enough, surface particle counts using the Wolman method will be conducted to analyze particle size gradations. If the bed material is too fine for the Wolman method, bulk samples of the bed will be collected and analyzed to determine particle size gradations.

Bedload transport will be analyzed to approximate the magnitude of a pulse flow needed to flush fine sediment and mobilize spawning gravel. Furthermore, the study will investigate whether the volume of sediment potentially mobilized and transported out of the meadow is in balance with the volume of sediment recruited into the meadow from upstream sources. The topographic survey data will be input into the U.S. Army Corps of Engineers' HEC-RAS hydraulic modeling software to calculate channel hydraulics for a range of streamflows. The HEC-RAS shear stress output will be utilized in sediment transport calculations to model the discharge magnitude needed to initiate bedload transport for a variety of particle sizes over a range of high flows. The HEC-RAS model will also be used to determine stage-discharge relationships, thus predicting the magnitude of flow needed to inundate riparian zones.

Model Calibration and Empirical Sediment Balance/Sediment Transport Studies

The HEC-RAS modeling results are most accurate and predictive capabilities are most reliable when calibrated to a known flow(s). Therefore, as feasible, a test flow release of moderate

magnitude (100-300 cfs) will be provided during spring 2009, based on water availability, and the pulse flow requirements outlined in the license requirements (the pulse flow magnitude is determined based on water year type)[1]. Additionally, safe access to the modeling sites must be available for field crews to record water surface elevations during the controlled flow release. Safe access will depend upon the snowpack and the controlled flow release magnitude. Staff gages will be installed in the modeling reaches from which multiple observations of stage will be recorded at various discharges for the surveyed transects and used for model calibration.

Empirical sediment balance and sediment transport data will also be collected. Sediment balance and sediment transport is defined here as the collection of field data during a test flow release (or required pulse flow release) to determine the amount, rate, and particle size characteristics of sediment transported in Caples Creek for a given flow range. Ideally, a combination of empirical field studies and computer modeling will be used to analyze bedload transport. Empirical field methods would include one or more of the following:

- Tracer gravels to track transport of bed material during controlled flow release;
- Real-time sampling using a Helly-Smith or other suitable instream bedload sampler to determine sediment load, sediment transport rate, and particle size characteristics;
- Scour chains to estimate depth of scour and bed mobilization during a high flow;
- Pit traps to collect bedload sediments in transport during a controlled flow event to determine sediment load, sediment transport rate, and particle size characteristics;
- Bank erosion pins to track bank retreat associated with higher flow events; and
- Survey post-flow release cross-sections in the modeling reaches to determine if the pulse flow resulted in net loss, net gain, or no change in the volume of sediment stored in the channel.

The ability to collect empirical data will depend upon the availability of high flows capable of transporting bedload. Since there are 2006 FERC license restrictions on discretionary releases from Caples Lake, EID water supply obligations, and physical limitations on the range of flows that can be released through the existing outlet works, EID will not depend only on empirical studies to obtain the bedload transport data. EID will provide a controlled flow releases in spring 2008, if water is available[1].

An additional in-situ field study is the installation of bank erosion pins to track bank retreat. The Settlement Agreement section 8.4(a) and (b), FS 4(e) condition 37.6, and SWRCB 401 condition No. 13(g) identifies the use of bank erosion pins as a study method, in addition to the other methods already described in the field assessment of geomorphic conditions section, above. Bank erosion pins are proposed to be installed at the two modeling sites in fall 2007 and tracked through the 2008 spring runoff period. However, bank erosion pins yield data only if there are flows of sufficient magnitude to potentially cause some erosion. Multiple flow seasons are typically needed for useful information to be derived from bank erosion pins. This will substantially limit opportunities for obtaining useful information from the bank erosion pins.

[1] Test flows are an essential element of the study. If, due to water supply limitations, test flows can not occur during 2009, EID will coordinate with the ERC, State Board, and the FS to request an extension of time from FERC until water supply conditions allow for test flows.

Based on the data collection and modeling analyses described above, EID will report on the extent to which a given flow magnitude is capable of performing geomorphic channel maintenance and reducing the likelihood of impairing riparian vegetation recruitment. From this quantitative data, an evaluation of the existing pulse flow requirements and potential adjustments up to a maximum of 600 cfs magnitude will be made.

Caples Dam Spillway Channel

Under the 2006 FERC license, EID is prohibited from releasing greater than 60 cfs into the Dam Spillway Channel, with exceptions for public safety reasons. However, up to 250 cfs could be released into the spillway channel to meet potential pulse flow requirements following approval and implementation of an adequate stabilization methodology by the ERC, FS, and SWRCB. The focus of the Dam Spillway Channel work will be to develop restoration/stabilization plans for the Dam Spillway Channel for design flows ranging from 60 cfs, up to a maximum of 250 cfs (the additional flow needed to create a combined total 600 cfs pulse flow with a 350 cfs release from the Caples Dam outlet works). The goal of the stabilization plan is to convey the portion of the pulse flow above 345-350 cfs (should higher flows be determined necessary) through the spillway without destabilizing the spillway channel, that could cause accelerated bank erosion, and result in excess sediment load delivery to Caples Creek at Caples Meadow.

Field Assessment of Caples Dam Spillway Channel Stability

EID will conduct a detailed field assessment of existing Dam Spillway Channel conditions. The field assessment will include GPS mapping and photo documentation of problematic areas (e.g., headcuts, bank erosion hot spots), assessment of the general channel stability and its expected trajectory based on comparison with conditions observed by ENTRIX in 2002. EID will survey the longitudinal bed profile and selected channel cross-sections, focusing on the lowermost eroding sections of the spillway. If possible, the three cross-sections surveyed for previous relicensing studies will be relocated and re-surveyed to evaluate trends in the evolution of the channel morphology over the past several years.

The sediment composition of the bed and banks will be characterized at the surveyed cross-sections to determine the discharges required to mobilize given bed particle sizes, and thus, the stability of the bed and banks under a specified flow. At cross-sections where the bed material is coarse enough, surface particle counts using the Wolman method will be conducted to analyze particle size gradations. If the bed material is too fine for the Wolman method, bulk samples of the bed will be collected and analyzed to determine particle size gradations.

Woody debris can influence channel stability both vertically and laterally, and moderate sediment transport. Field observations show that fallen trees accumulated in log jams in the Dam Spillway Channel are potentially effective at reducing channel slope and dissipating flow velocities, reducing bank erosion. Given the design flows under consideration and the quantities of wood debris observed in the Dam Spillway Channel, EID will evaluate the mobility of existing wood and whether destabilizing existing debris jams will have negative consequences to channel stability. Furthermore, the potential for enhancing existing debris jams, or designing and constructing new log jams in the channel to provide additional bank protection, and identification of other suitable techniques to reduce bank erosion and ensure a stable channel will be considered.

Each piece of large wood debris forming a log jam that is obstructing flow will be characterized and mapped (GPS), noting its mean diameter, length, orientation relative to channel streamline, and inclination measurements to determine blockage coefficient or percent of wetted cross-section obstructed at particular flows. Field measurements will also include whether wood is embedded in the channel bed or banks and whether it was locally recruited or delivered from upstream.

Hydraulic Modeling

The topographic survey data representing channel geometry and bed particle size will be used to build a hydraulic model to determine flow stage, velocity, and near-bank shear stress for the range of design discharges, 60-250 cfs. Results from the HEC-RAS model will be used to predict the size of bed sediment that would be transported at selected flows and to determine stability of the channel bed and banks under existing, and potentially restored conditions. From the measurements taken of the existing logjams in the channel, the potential for these woody structures to remain stable if larger flows are more frequently routed down the channel will be determined.

Hydraulic Model Calibration, Observation of Bed/Bank Stability, and Empirical Sediment Balance/Sediment Transport Studies

The ability to accurately release a controlled flow down the Dam Spillway Channel is substantially constrained by the flashboard design at the spillway, and by the reservoir water surface elevation which has to be high enough to create the necessary head to force flow over the spillway. Assuming that there is sufficient water to fill Caples Lake to above the spillway invert elevation during the period when flashboards may be seasonally installed (April 1 to October 1 as required by DSOD), then a controlled flow release can be provided. The flashboards will be installed by April 1 allowing the reservoir to fill above the spillway invert, and then subsequently a board(s) will be removed when there is sufficient water stored in the lake to provide a spillway flow release, possibly by spring 2009. The discretionary spillway flow release can allow up to 60 cfs for a calibration flow, but no more, as required by the license conditions. Given these considerations and constraints, EID will provide a controlled flow release, if water is available, to enable direct observation of channel processes, allow hydraulic model calibration, provide insight on the existing level of channel stability at flows ranging up to 60 cfs, and collection of sediment balance/sediment transport data[2].

Prior to any controlled flow release, bank erosion pins will be installed at select locations and examined following the release to gage the extent of bank erosion. In addition, the cross-sections and bed profile adjacent to the cross-sections will be re-surveyed to provide information on any channel morphologic response. Flow velocities will be measured with a current meter and staff gages will be installed at the surveyed cross-sections to record stage during the flow release. These data will help to dimension the extent of bed and bank erosion likely to occur under existing conditions without any stabilization efforts, and will provide information to help address the type of erosion control methods that are suitable over the range of design flows.

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[2] Test flows are an essential element of the study. If, due to water supply limitations, test flows can not occur during 2009, EID will coordinate with the ERC, SWRCB, and the FS to request an extension of time from FERC until water supply conditions allow for test flows.

Empirical sediment balance and sediment transport data will also be collected during the controlled flow release. Sediment balance and sediment transport is defined here as described above for the Caples Creek channel, for purposes of determining the amount, rate, and particle size characteristics of sediment transported in the spillway channel. Empirical field methods would include one or more of the following:

- Tracer gravels to track transport of bed material during controlled flow release;
- Real-time sampling using a Helly-Smith or other suitable instream bedload sampler to determine sediment load, sediment transport rate, and particle size characteristics
- Scour chains to estimate depth of scour and bed mobilization during a high flow; and
- Pit traps to collect bedload sediments in transport during a controlled flow event to determine sediment load, sediment transport rate, and particle size characteristics.

1.4 Mitigation Plan Development

The results of these investigations will be utilized to support development of stabilization plans and to address pulse flow requirements as required by the Project 184 Settlement Agreement (EID 2003), U.S Forest Service 4(e) License Conditions (FS 2003), and the California State Water Resources Control Board Section 401 Clean Water Act Water Quality Certification Conditions (SWRCB 2006), and identified as a PM&E measure by the FERC Final EIS. In these documents, within two years of license issuance (October 2008) EID is required to develop plans for stabilizing the Caples Dam Spillway Channel and determine the feasibility and cost of facility modification to convey pulse flows. These plans will be developed under separate cover and will be based directly upon the results collected from the field studies, hydraulic modeling, and observation of bed/bank stability if test flow releases are provided, as described herein.

The mitigation plans will contain a write-up, tables, and graphics describing the results, analyses, and information obtained from the site investigations and will include clearly stated goals, objectives, and performance standards. For the Caples Creek pulse flow, the mitigation plan will identify the magnitude and frequency of pulse flow necessary for channel and riparian maintenance purposes. For the Caples Dam Spillway Channel the existing channel stability under the design flows will be defined. As needed, stability measures will be identified and described that may range from hard engineered bank protection (e.g., rip-rap) to softer approaches such as riparian revegetation, bank shaping to a stable angle of repose, and use of large woody debris jams to moderate bed and bank shear forces and provide bank protection and channel stability. The advantages and disadvantages of the identified stability measures will be described and compared, and a preferred set of Stabilization Plan alternatives will be recommended for consideration by ERC, FS, and SWRCB.

1.5 Reporting

EID shall provide annual site investigation reports to the FS, ERC, and SWRCB and shall include any recommended measures proposed by EID to correct channel stability problems (FS 2003; SWRCB, 2006). This plan will be executed with the first year of monitoring to be conducted in 2009 and will continue with the second year of monitoring in 2010.

The data collected under the study methods identified in this Plan will be electronically compiled and distributed by January 31, to the FS, ERC, and SWRCB. The report will be circulated to the ERC for review and consideration at least two weeks prior to the annual meeting, which will occur by April 1. The report will summarize the results of the site investigations and consideration and development of mitigation measures.

1.6 Literature Cited

ENTRIX, Inc. 2002. EID Project 184 Geomorphic Sites Assessment. December 2002.

El Dorado Irrigation District. 2003. El Dorado Relicensing Settlement Agreement. El Dorado Project FERC Project 184.

Federal Energy Regulatory Commission. 2003. Final Environmental Impact Statement for El Dorado Hydroelectric Project (FERC No. 184-065). Office of Energy Projects. August 2003.

State Water Resources Control Board of California. 2006. Clean Water Act Section 401 Technically-Conditioned Water Quality Certification for Federal Energy Regulatory Commission El Dorado Hydroelectric Project (FERC No. 184).

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FS (c), 2003. Rationale Report for Final Section 4(e) Conditions. Prepared for relicensing of the El Dorado Hydroelectric Project (FERC Project No. 184).

Chapter 2: Oyster Creek Channel

2.0 Background

Oyster Creek is a small tributary to the Silver Fork American River, and is fed, in part, by leakage from Silver Lake. Typically, stream flow in Oyster Creek is correlated with stage (i.e., water surface elevation) in Silver Lake (FERC 2003), but climatic events may also influence the magnitude of discharge. Previous fluvial geomorphic investigations have documented instability in the Oyster Creek channel downstream of State Route (SR) 88 (ENTRIX, 2002). Channel incision is evident through portions of a low gradient meadow reach, and some banks have only fair stability (ENTRIX, 2002). Channel instability may be attributed to several historic and ongoing land uses that may have modified the hydrologic and sediment transport regimes of the Oyster Creek. These potential land use impacts include (1) grazing, (2) a straightening or realignment of the creek by natural or possibly human intervention, (3) the influence of the SR 88 roadway and culverts, and/or (4) increased base flow due to Silver Lake leakage.

Grazing in the riparian meadow downstream of SR 88 likely began in the late 1800s and continues to be a permissible land use practice up to the present day (FS, 2007). Livestock grazing in High Sierra streams has the potential to destabilize these systems through removal of riparian vegetation that provides bank erosion protection and hydraulic roughness. Soils in the Oyster Creek riparian meadow are partially derived of former lake bed sediments. These sandy soils have limited particle cohesion, and even moderate disturbance appears to induce instability and erosion.

In addition, the contemporary Oyster Creek channel follows the margin of the riparian meadow within a relatively narrow meander belt, an alignment and planform morphology typical of High Sierra meadows channelized for drainage and irrigation. Channelization concentrates hydraulic forces and often induces instability. It is possible that reclamation of the channel or grazing alone could have induced the instability of this portion of Oyster Creek. Alternatively, there are distinct and quite dominant joint patterns in the local bedrock that could be controlling the channel alignment. Such bedrock patterns would become more influential on the stream as the creek incised and there was less and less of a soil buffer between the creek underlying bedrock.

Construction of SR 88 in the early 20th century obstructed the Oyster Creek channel and drainage from tributary area (steep hillslopes and alluvial fans to the south), which disrupted bedload supply and transport continuity in the meadow reach. The roadway fill collects drainage and sediment from the steep hillslopes above the meadow and routes it to the culvert crossing under SR 88. The concentration of drainage, which historically spread over the entire meadow surface, increases the discharge and hydraulic forces within the channel, which may induce instability. Perhaps more critical is the discontinuity in sediment transport created by the roadway and culverts. Before construction of the SR 88, the steep hillslopes contributed sediment directly to the upper portion of the riparian meadow and the channel, as evidenced by alluvial fan lobes at the head of the meadow. It is evident that the roadway and culverts now limit the conveyance of hillslope-derived and alluvial sediments to the meadow reach. The SR 88 culverts are also undersized for large flood events. During the large rain-on-snow floods of 1997 flood waters reportedly over-topped the SR88 roadway. In fact, local residents have noted that the 1997 flood

event caused significant local erosion and denuded the Oyster Creek channel of woody debris and vegetation.

It has also been suggested that increased in base flow due to Silver Lake leakage has contributed to the instability of the Oyster Creek channel. Leakage flow from Silver Lake may increase stream power and stage during small and moderate flood events, and extend the duration of these floods. Therefore, increased discharge due to seepage may extend the amount and time that work is being done on the bed and banks, theoretically contributing to channel instability.

The purpose of License Condition No. 37.6 is to conduct geomorphic investigations that will clarify the mechanisms of channel degradation and lead to development of a mitigation plan to address instability in the Oyster Creek channel. The field investigations and characterization of Oyster Creek will begin in fall 2007.

2.1 Study Plan Objectives

The study plan is organized to collect the necessary field data and perform appropriate analyses required to address channel instability concerns (FS, 2003(b)). The objectives include:

- Determine the causes of instability in the channel;
- Determine channel reaches in need of restoration/stabilization;
- Determine the sediment transport dynamics and hydraulic forces affecting formation of the present channel and use this information as a basis of design for stabilization measures; and
- Consider and develop mitigation measures to be addressed in Stabilization Plans (prepared separately to address license conditions).

2.2 Site Investigation Locations

The site investigation will include Oyster Creek and its associated riparian habitat from Silver Lake to the confluence with the Silver Fork American River. Tributaries to Oyster Creek in this reach will also be evaluated. Detailed investigations and the mitigation plan development will focus on unstable reaches of the Oyster Creek channel from Silver Lake to the tributary that comes from Highway 88 (Silver Fork American River), as stated in the Settlement Agreement (EID, 2003).

2.3 Study Details

The following proposed study details have been developed to characterize the geomorphic conditions in Oyster Creek, identify the most appropriate means to stabilize the channel, and quantify the responsibility of the Project 184 operations. Safe access to the sites must be available for field crews and, will depend upon snowpack levels and streamflow levels.

Site Investigation

The site investigation will include acquisition of aerial photos and topographic survey; a geomorphic assessment; a hydrologic assessment; and habitat evaluation.

Aerial Photos and Topographic Survey

An aerial topographic survey will be conducted to develop a 2-foot contour map and provide current aerial photos. The aerial survey will be supplemented with ground-based topographic survey of channel features to define the longitudinal profile (thalweg), cross-section detail and other important attributes for identifying channel forming flow. The contemporary aerial photos will be compared to historic aerials to analyze the effects of land use practices and changes in channel hydrology or morphology.

Geomorphic Assessment.

The geomorphic assessment consists of two elements: data collection to analyze past and present conditions, and characterization of current geomorphic process as driven by sediment transport dynamics and stream hydraulics.

The geomorphic survey will include reach delineation, longitudinal profile, planform analysis, detailed cross-sections, bankfull measurements, pebble count grain-size analysis and bank stability assessment. Reaches will be delineated based on physical parameters such as slope, bed material, vegetation structure, etc. Geomorphic descriptions of each of the reaches will be provided and their locations will be shown on a map.

Aerial photography and topographic survey of the study area will be used for determining the channel planform (e.g., sinuosity) and profile over its entire length. The aerial survey will be supplemented with more detailed ground-based survey of cross-sections. Cross-sections will be surveyed at approximately 250-foot intervals along the channel in the project area. Cross-sections will be established in locations that are representative of the overall channel reach, as well as above and below significant changes in profile (e.g., knickpoints). Water surface, bankfull indicators and channel thalweg will be noted along the cross-sections. Previous cross-sections conducted in the licensing study will be re-occupied. Tributaries to Oyster Creek will be evaluated for erosion, sedimentation and runoff contribution. Bed grain-size distribution will be quantified by performing pebble counts using the procedure defined by Wolman (1954) at cross sections where the bed material is coarse enough. If the bed material is too fine for the Wolman method, bulk samples of the bed will be collected and analyzed to determine particle size gradations. Bedload mobility will be evaluated using data from pebble counts or bulk samples in conjunction with the HEC-RAS hydraulic model of the channel.

The bank stability assessment will determine bank erosion potential for the bankfull and flood prone channel. Erosion potential will be determined using an approach adapted from Rosgen's (1996) Level III Bank Erosion Hazard Index. The method is based on the assumption that the ability of a stream bank to resist erosion is primarily determined by:

- The ratio of stream bank height to bankfull stage,
- The ratio of riparian vegetation rooting depth to stream bank height,
- The degree of rooting density,
- Stream bank angle,
- Bank surface protection afforded by debris, vegetation, or resistant material such as
- boulders or bedrock, and
- The composition of stream bank materials.

These components will be evaluated in the field by estimating or measuring bank height, bankfull depth, bank angle, percent bank face protected (by vegetation), percent root density, rooting depth from top of bank, and bank composition (e.g., particle size). Each parameter is determined for a relatively uniform bank segment. Bank erosion potential will be evaluated independently for the left and right channel banks. Data will be recorded using a Trimble GeoXT Global Positioning System (GPS). The bank erosion potential for each bank segment is determined based on the rating table developed by Rosgen. Adjustments are made based on bank material to produce a final score for each segment. The final score is then assigned an erosion potential rating of very low, low, moderate, high, very high, and extreme.

The data collected above will be used to interpret the historic evolution of Oyster Creek and the present geomorphic processes forming the channel. The present conditions data and historical information will be used to characterize the pre-disturbance, channel/landform development processes from a watershed-scale perspective of sediment supply and transport. The effects of important land use modification such as SR 88 roadfill and culverts, Silver Lake seepage and other activities or influences (e.g., grazing, or channel realignment due to reclamation or bedrock control) will be estimated to develop a cause and effect analysis that explains the degradation and apparent instability of the Oyster Creek channel downstream of SR 88. Components of the cause and effect analysis will include: a qualitative and quantitative assessment of sediment supply (bedload and suspended load) as it relates to channel forming processes and ecological function; estimated peak flood frequency, flow duration, and annual hydrograph characterization; and channel hydraulic characteristics over a range of floods.

Hydrology and Hydraulics

The hydrologic assessment will generate flood frequency curves for the project reach using a variety of methods including correlation of Oyster Creek flows to other stream gages, correlation of Silver Lake levels to leakage discharge, and/or rainfall-runoff modeling. This assessment will attempt to characterize and quantify runoff for various climatic events including rain-on-snow, spring snowmelt, and summer thunderstorms.

A hydraulic model (HEC-RAS) will be developed to predict flow and hydraulic conditions (e.g., stage, velocity, shear stress) that affect sediment transport over a range of discharges. Model input parameters such as hydraulic roughness and channel topography will be developed at the time of field cross-section survey. The Manning's equation will be used to estimate a discharge associated with bankfull flow indicators, such as point bars and scour lines. The bankfull discharge value will be compared to hydrologic estimates of flood frequency and available streamflow data.

Streambed sediment mobility (competence) and potential transport capacity will be estimated using predictive formulae (e.g., Meyer- Peter Mueller; Wilcock) and bed surface grain-size distribution calculated from pebble count or bulk sample data. A modeling-based approach will help provide insights for the design of stabilization measures and sediment transport dynamics given the apparent imbalance between discharge and coarse bedload supply (i.e., coarse sediment supply is limited).

In addition to the modeling approach, a field-based bedload sampling study will be implemented. The objective of the bedload sampling study will be to evaluate whether there is sufficient sediment moving to the reaches downstream of SR 88 to maintain habitat, which is important for ecological function.

Empirical field methods would include one or more of the following:

- USFS Portable Bedload Traps;
- Tracer gravels;
- Helly-Smith sampler;
- Scour chains;
- Pit traps;
- Bank erosion pins; and
- Survey of post-flow release cross-sections.

Streamflow measurements will be conducted throughout the sampling period.

The ability to collect empirical data will depend upon the availability of naturally-occurring high flows capable of transporting bedload. If hydrologic conditions do not provide naturally-occurring high flows during 2009, EID will coordinate with the ERC, SWRCB, and the FS to request an extension of time from FERC until hydrologic conditions favor naturally-occurring high flows.

Habitat Assessment

This assessment will include characterization and mapping of the riparian vegetation communities, and in-channel habitat features (e.g., woody debris). The assessment will be used to analyze changes in vegetation community composition that may result from instability in the channel.

Develop Restoration/Stabilization Measures

The data generated from the site investigation will be used to characterize the geomorphic setting and develop mitigation measures to address channel instability. The interrelationship between habitat, hydrology and geomorphology (including sediment transport) will be considered in identifying appropriate restoration/stabilization measures. For example, a hydraulic model may be developed to determine the flow velocity and shear stress along the existing channel over a range of flow conditions. This model would be used to select bioengineering methods suitable for channel stabilization.

2.4 Mitigation Plan Development

The Mitigation Plan will contain the findings of the site investigation including the geomorphic, hydrologic and habitat assessment. Areas of the Oyster Creek channel in need of mitigation (i.e., bank stabilization or restoration) will be delineated, and goals and objectives for the mitigation measures will be defined. The Mitigation Plan will identify various stabilization measures that would meet the goals and objectives, and a preferred alternative will be recommended. The plan

will also include a schedule for implementing the corrective actions and monitoring the success of the mitigation measures.

The result of these investigations will also be utilized to support development of a stabilization plan required by the Project 184 Settlement Agreement (EID, 2003), FS 4(e) License Conditions (FS, 2003), and the SWRCB section 401 Conditions. In these documents, EID is required to develop plans for stabilizing and restoring Oyster Creek. This plan will be developed under separate cover and will be based directly upon the results of the site investigations, hydraulic modeling, and other pertinent observations.

2.5 Reporting

EID shall provide annual site investigation reports to the FS, ERC, and SWRCB and shall include any recommended measures proposed by EID to correct stability problems (FS 2003; SWRCB, 2006). This plan will be executed with the first year of monitoring to be conducted in 2009 and will continue with the second year of monitoring in 2010.

The data collected under the study methods identified in this Plan will be electronically compiled and distributed by January 31 to the FS, ERC, and SWRCB. The report will be circulated to the ERC for review and consideration at least two weeks prior to the annual meeting, which will occur by April 1. The report will summarize the results of the site investigation and consideration and development of mitigation measures.

2.6 Literature Cited

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Federal Energy Regulatory Commission (FERC). 2003. Final Environmental Impact Statement for Hydropower License, El Dorado Project No. 184-065. July.

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FS, 2007. Preliminary Environmental Assessment for Cody Meadow and Sherman Grazing Allotment Management Plans. Eldorado National Forest.

Reid, Leslie M.: Rapid evaluation of sediment budgets / Leslie M. Reid & Thomas Dunne. – Reiskirchen : Catena Verl., 1996

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126 FERC ¶ 62,226

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

El Dorado Irrigation District — Project No. 184-162

ORDER APPROVING GEOMORPHOLOGY SENSITIVE SITE INVESTIGATION AND MITIGATION PLAN

(Issued March 24, 2009)

1. On August 1, 2008, El Dorado Irrigation District, licensee, filed a geomorphology sensitive site investigation and mitigation plan (plan) pursuant to article 401(a) of the license for the El Dorado Project (FERC No. 184), U.S. Forest Service (FS) 4(e) condition no. 37.8, and condition no. 13 of the water quality certificate (WQC) issued by the California State Water Resources Control Board (SWRCB).[1] The project is located on the South Fork of the American River and its tributaries in El Dorado, Amador, and Alpine Counties, California, and occupies Federal lands administered by the FS.

BACKGROUND

2. Among other requirements listed under article 401(a), the licensee is required to file for Commission approval monitoring and study plans pursuant to 4(e) condition 37.8 and WQC condition 13. These conditions require that the licensee conduct a detailed investigation of fluvial geomorphic properties for Caples Creek, below the confluence of the Caples Lake spillway channel to the Jake Schneider Meadow; Caples Lake spillway channel; and Oyster Creek, from Silver Lake to below the confluence with the tributary stream that comes from Highway 88.

3. Final study plans for 4(e) condition 37 are to be approved by the FS, SWRCB, and Ecological Resources Committee (ERC). Final study plans for WQC condition 13 are to be approved by the chief of the Division of Water Rights in SWRCB in consultation with the FS, ERC, and California Department of Fish and Game (CDFG).[2] The licensee is also to file with the Commission, by June 30 of each year, an annual report fully describing the monitoring efforts of the previous calendar year. The licensee is to

[1] See 117 FERC ¶ 62, 044 (2006)

[2] The CDFG also participates in project requirements as part of the ERC.

provide copies of the annual report to the FS, ERC, CDFG and the SWRCB. The requirement is for two years of monitoring and reporting.

LICENSEE'S PLAN

4. The fluvial geomorphology study conducted from 1998-2002 produced evidence of a problem with channel stability in the Caples Dam spillway channel and Oyster Creek channel, with an apparent imbalance in bedload and streamflow in these reaches, and a potential impact on fluvial processes downstream. The plan filed by the licensee addresses the study findings for further investigation of the sites to determine the most effective method of stabilizing the spillway channel and providing adequate sediment transport in Caples Creek, and the development of a mitigation plan to address instability in Oyster Creek.

Caples Creek Channel

The study plan for the Caples Creek channel is organized to collect field data and perform analyses required to address concerns related to stream channel instability and channel-maintenance, pulse-flow requirements. Hydraulics and sediment transport would be analyzed to determine an appropriate pulse-flow magnitude specific to channel and riparian maintenance needs. The licensee states that the following actions would be taken for the Caples Creek channel:

- Field assessments of geomorphic conditions between the confluence with the spillway channel downstream to Jake Schneider Meadow to document the overall stability of the channel;
- Hydraulic and sediment-transport modeling to evaluate pulse-flow requirements for channel and riparian maintenance;
- Controlled test-flow releases to calibrate hydraulic modeling and to conduct in-situ field studies to demonstrate the flow magnitude needed to transport sediments; and
- Identification of mitigation measures.

The licensee states that pulse-flow magnitude and frequency should be calculated to specifications that allow for successful use of the fluvial-geomorphology, riparian-habitat, and connectivity objectives listed in appendix B of the project relicensing settlement agreement (Settlement).[3]

[3] The Settlement, which was filed with the Commission by the licensee on April 29, 2003, contains recommended protection, mitigation, and enhancement measures proposed by the parties to the Settlement. The Settlement addresses the following issues: (continued)

Caples Dam Spillway Channel

The study plan for the Caples Dam spillway channel is organized for field data collection to develop channel and bank stabilization plans for the channel. The licensee states that the following actions would be taken for the Caples Dam spillway channel:

- Field assessment to identify areas in need of stabilization;
- Hydraulic modeling evaluation of stability of the channel bed and banks;
- Calibration of the hydraulic model, observations of bank and bed stability, and estimated sediment load transported using empirical field data collection methods during test flow release; and
- Consideration and development of mitigation measure.[4]

Oyster Creek Channel

The study plan for the Oyster Creek channel is organized to collect necessary field data and to perform appropriate analyses to address channel instability concerns. The licensee states that the following actions would be taken for the Oyster Creek channel:

- Determination of causes of instability in the channel;
- Determination of channel reaches in need of restoration and stabilization;
- Determination of sediment transport dynamics and hydraulic forces affecting formation of the present channel for use as a basis of design for stabilization measures; and
- Consideration and development of mitigation measures.

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flow regimes and lake levels for project development, channel stabilization, monitoring measures, fish protective measures, wildlife and sensitive-plant protective measures, noxious weed control, public information services, recreational enhancements, visual resource protection, road and trail access, and facility management. There was no opposition to the Settlement.

[4] Mitigation measures developed for the channels would be utilized to support the development of stabilization plans and to address pulse-flow requirements as required by the Settlement, and 4(e) and WQC conditions.

5. Site investigations for all three channel study plans would include the use of aerial photographs, topographic surveys, geomorphic assessments, hydrologic assessments, and habitat evaluations. Model calibration and empirical sediment balance and transport studies would include a test-flow release of moderate magnitude (100-300 cfs), to be provided during spring 2009, based on water availability, and the pulse-flow requirements outlined in the license. Due to the essential nature of test flows to the study, the licensee states that if test flows cannot occur due to water supply limitations, it would coordinate with the ERC, SWRCB, and FS to request an extension of time from the Commission until water supply conditions allow for test flows.

6. The licensee states that for each channel site, it would provide an annual site investigation report summarizing the results of site investigations, considerations, and development of mitigation measures to the FS, ERC, and SWRCB, and would include recommended measures proposed by the licensee to correct channel stability problems. The reports would be developed for the first year of monitoring, to be conducted in 2009, and would continue with the second year of monitoring in 2010. The reports would be distributed by January 31 of each year for review by the FS, SWRCB, ERC, and the CDFG. The reports would be delivered to the ERC for review at least two weeks prior to an annual meeting with the licensee, which would occur by April 1. Each agency is required to be provided with a 30-day comment period prior to the June 30 deadline for filing the annual report with the Commission.

CONSULTATION

7. The licensee included copies of consultation correspondence in the August 1 filing. By letter dated July 18, 2008, the FS approved the plan. By letter dated July 30, 2008, the chief of the Division of Water Rights in SWRCB approved the plan and stated that it meets all requirements of Condition 13. On August 9, 2007, the ERC approved the plan subject to resource agency approval. No other comments on the plan had been received at the time of the August 1 filing.

DISCUSSION AND CONCLUSION

8. The licensee's filing includes a plan for a detailed investigation of fluvial geomorphic properties for Caples Creek, below the confluence of the Caples Lake spillway channel to the Jake Schneider Meadow; Caples Lake spillway channel; and Oyster Creek, from Silver Lake to below the confluence with the tributary stream that comes from Highway 88. The plan details specific actions to address individual site study needs, and how the data collected would be used to address the problems evidenced in the fluvial geomorphology study conducted from 1998-2002. The geomorphic site investigations described in the plan satisfactorily address the requirements set out in 4(e) condition 37.8, and WQC condition 13. The licensee is to provide a copy of the annual report to the FS, SWRCB, ERC, and the CDFG no later than 30 days prior to the June 30 deadline for filing the final annual report with the Commission, to allow for agency

comments. The licensee's geomorphology sensitive site investigation and mitigation plan, filed on August 1, 2008, should be approved.

The Director orders:

(A) El Dorado Irrigation District's geomorphology sensitive site investigation and mitigation plan, filed August 1, 2008, pursuant to U.S. Forest Service 4(e) condition no. 37.8, water quality certificate condition no. 13, and license article 401(a), is approved.

(B) This order constitutes final agency action. Requests for rehearing by the Commission may be filed within 30 days of the date of issuance of this order, pursuant to 18 CFR § 385.713.

Robert J. Fletcher
Chief, Land Resources Branch
Division of Hydropower
Administration and Compliance

USDA United States Department of Agriculture | Forest Service | Eldorado National Forest | 100 Forni Road
Placerville, CA 95667
(530) 622-5061 (Voice)
(530) 642-5122 (TTY)

File Code: 2770
Date: July 18, 2008

Mr. Brian Deason
Project 184 Coordinator
El Dorado Irrigation District
2890 Mosquito Road
Placerville, CA 95667

SUBJECT: Approval of Geomorphology Monitoring Plan
El Dorado Hydroelectric Project, FERC No. 184

Dear Mr. Deason:

The Forest Service has reviewed the Project 184 Geomorphology Monitoring Plan for the El Dorado Hydroelectric Project, FERC No. 184. The plan has been developed to address a part of 4(e) Condition No. 37, Monitoring Plan, of the El Dorado Hydroelectric Project license, issued October 18, 2006. The plan may be considered approved by the Forest Service. If you have questions, please call Beth Paulson at 530-642-5174.

Sincerely,

/s/Ramiro Villalvazo
RAMIRO VILLALVAZO
Forest Supervisor

cc: Beth A Paulson
Jann O Williams
Kimberly A Morales
bdeason
Duane Nelson
Douglas K Barber

State Water Resources Control Board

Division of Water Rights
1001 I Street, 14th Floor ♦ Sacramento, California 95814 ♦ 916.341.5300
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Linda S. Adams
Secretary for
Environmental Protection

Arnold Schwarzenegger
Governor

JUL 30 2008

Brian Deason
El Dorado Irrigation District
2890 Mosquito Road
Placerville, CA 95667

Dear Mr. Deason:

APPROVAL OF THE GEOMORPHOLOGY MONITORING PLAN SENSITIVE SITE INVESTIGATION AND MITIGATION PLAN DEVELOPMENT FOR EL DORADO IRRIGATION DISTRICT (EID) HYDROELECTRIC PROJECT (FERC NO. 184)

The State Water Resources Control Board (State Water Board) has reviewed the Project 184 Geomorphology Monitoring Plan Sensitive Site Investigation and Mitigation Plan Development (Plan) for the EID Hydroelectric Project, FERC No. 184. The Plan has been developed to provide a detailed investigation of fluvial geomorphic properties of specific river reaches in the project area pursuant to State Water Board Section 401 Clean Water Act Water Quality Certification Condition No. 13(g). The Plan meets the requirements of Condition 13(g) and can be considered approved by the State Water Board.

If you have any questions, please contact Jennifer Watts at (916) 341-5397 or by email at jwatts@waterboards.ca.gov.

Sincerely,

Victoria A. Whitney

Victoria A. Whitney
Division Chief

cc: Mr. Philip Scordelis
Federal Energy Regulatory Commission
Division of Hydropower Administration
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901 Market Street, Suite 350
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Mr. Bradley Powell
U.S. Forest Service
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Mr. Wayne White
U.S. Fish & Wildlife Service
2800 Cottage Way, Room W-2605
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Mr. Stafford Lehr
California Department of Fish and Game
Environmental Services
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Rancho Cordova, CA 95670-4503

FERC Project 184
Ecological Resources Committee (ERC)
Document Approval Log

Description	Draft Versions			Deadline	Vote (check one)		
Document(s) for Review and Approval	**Working Draft Distribution Date**	**Review Draft Distribution Date**	**Final Draft Distribution Date**	**Approval Deadline**	**Approve**	**Abstain**	**Disapprove**
Canal Drainage and Release Points Plan	6/29/07	7/12/07	7/30/07	8/9/07	X		
subject to Resource Agency approval							
Geomorphology Sensitive Site Plan	6/11/07	6/14/07	8/2/07	8/9/07			
Streamflow and Lake Level Information Plan	6/29/07	7/12/07	7/30/07	8/9/07	X		
as amended August 9							

Ecological Resources Committee (ERC) Approval:

I have reviewed the documents listed in the above table and indicated my vote to approve, abstain, or disapprove by checking the appropriate box. Per the ERC Document Approval Protocol, specific suggestions are attached hereto for all documents receiving a "disapprove" vote.

Signature: Chris Shutes Representing: _____

Name: Chris Shutes Date: August 9, 2007

FERC Project 184
Ecological Resources Committee (ERC)
Document Approval Log

Description	Draft Versions			Deadline	Vote (check one)		
Document(s) for Review and Approval	**Working Draft Distribution Date**	**Review Draft Distribution Date**	**Final Draft Distribution Date**	**Approval Deadline**	**Approve**	**Abstain**	**Disapprove**
Cabal Drainage and Release Points Plan	6/29/07	7/12/07	7/30/07	8/9/07	✓		
Geomorphology Sensitive Site Plan	6/11/07	6/14/07	8/2/07	8/9/07	✓		
Streamflow and Lake Level Information Plan	6/29/07	7/12/07	7/30/07	8/9/07	✓		

Ecological Resources Committee (ERC) Approval:

I have reviewed the documents listed in the above table and indicated my vote to approve, abstain, or disapprove by checking the appropriate box. Per the ERC Document Approval Protocol, specific suggestions are attached hereto for all documents receiving a "disapprove" vote.

Signature: Tom Henie Representing: KIRKWOOD MEADOWS PUBLIC UTILITY DISTRICT

Name: TOM HENIE Date: 8/9/07

FERC Project 184
Ecological Resources Committee (ERC)
Document Approval Log

Description	Draft Versions			Deadline	Vote (check one)		
Document(s) for Review and Approval	Working Draft Distribution Date	Review Draft Distribution Date	Final Draft Distribution Date	Approval Deadline	Approve	Abstain	Disapprove
Canal Drainage and Release Points Plan	6/29/07	7/12/07	7/30/07	8/9/07	✓		
Geomorphology Sensitive Site Plan	6/11/07	6/14/07	8/2/07	8/9/07	✓		
Streamflow and Lake Level Information Plan	6/29/07	7/12/07	7/30/07	8/9/07	✓		

Ecological Resources Committee (ERC) Approval:

I have reviewed the documents listed in the above table and indicated my vote to approve, abstain, or disapprove by checking the appropriate box. Per the ERC Document Approval Protocol, specific suggestions are attached hereto for all documents receiving a "disapprove" vote.

Signature: Richard D. Wentzel Representing: East Silver Lake

Name: Richard D. Wentzel Date: 08/09/07

FERC Project 184
Ecological Resources Committee (ERC)
Document Approval Log

Description	Draft Versions			Deadline	Vote (check one)		
Document(s) for Review and Approval	Working Draft Distribution Date	Review Draft Distribution Date	Final Draft Distribution Date	Approval Deadline	Approve	Abstain	Disapprove
Canal Drainage and Release Points Plan	6/29/07	7/12/07	7/30/07	8/9/07	✓*		
Geomorphology Sensitive Site Plan	6/11/07	6/14/07	8/2/07	8/9/07	✓□		
Streamflow and Lake Level Information Plan	6/29/07	7/12/07	7/30/07	8/9/07	✓‡		

* Subject to resource agency approval
□ Subject to resource agency approval
‡ as amended

Ecological Resources Committee (ERC) Approval:

I have reviewed the documents listed in the above table and indicated my vote to approve, abstain, or disapprove by checking the appropriate box. Per the ERC Document Approval Protocol, specific suggestions are attached hereto for all documents receiving a "disapprove" vote.

Signature: Alice Q. Howard Representing: self

Name: ALICE Q. HOWARD Date: 8/18/2007