Appendix B-5

Management Indicator Species Report – Aquatic Species

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MANAGEMENT INDICATOR SPECIES REPORT

AQUATIC SPECIES

Pit 3, 4, and 5 Hydroelectric Project
(FERC No. 233-081)

U.S. Forest Service
Shasta-Trinity and Lassen National Forests

May 2003

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SUMMARY

Pacific Gas and Electric Company has submitted an application to the Federal Energy Regulatory Commission to relicense the Pit 3, 4, and 5 Hydroelectric Project (FERC No. 233-081, Project) situated along the Pit River in northeastern Shasta County, California.

This report addresses the projected impacts to the only aquatic Management Indicator Species (MIS) applicable to, and affected by the proposed action, an MIS species common to both Forests: the rainbow trout. The analysis is conducted in the context of the preliminary 4(e) license conditions submitted by the Forest Service.

The Forest Service has submitted a preliminary license condition to increase the controlled flow release into the Pit 3 Project bypass reach from the present discharge of 150 cubic feet per second (cfs) to a flow rate of 400 cfs. The Forest Service preliminary conditional release for the Pit 4 Project bypass reach is 450 cfs, up from the current 150 cfs. Both Project bypass flow releases will be variably shaped to best fit seasonal and water-year-type annual runoff fluctuations bounded by instantaneous releases of from 300 cfs to 1,000 cfs. The Federal Energy Regulatory Commission (FERC) has proposed to honor the desires of the licensee by continuing the flow release occurring presently in the Pit 3 reach, and by increasing the release to the Pit 4 bypass reach to 200 cfs (FERC, DEIS 2003).

The present and/or FERC-licensee proposed flow discharges into Project bypass reaches do not adequately move the existing project toward acceptable environmental standards. These standards are described in the Shasta-Trinity and Lassen National Forests Land and Resource Management Plans (Plans), coupled with the Northwest Forest Plan (particularly the Aquatic Conservation Strategy). Current flow releases into Project bypass reaches accumulate to only 7-10% of the summer flow levels that would occur naturally in the bypass reaches. The preliminary conditional flow releases are the only conceivable way that the Forests can foresee the Project approaching acceptable ranges of natural variability mandated by the Forest Service Plans.

The preliminary conditional flow releases will accommodate a significantly greater number of adult rainbow trout in both Project bypass reaches resulting from the creation of substantial adult trout habitat. Adult trout already provide for a desirable recreational angler experience; the opportunity for successful angling may therefore improve significantly. This outcome will be particularly assured when angler access and wadeability is input to the flow shaping model, and the existing riparian habitat has had sufficient time to respond to the flow increases. Trout fry and juvenile production, which may remain constant or decrease somewhat in response to the greater flow volumes, will most certainly be adequate to fully seed the substantially greater adult trout habitat.

Projected water temperatures may increase somewhat in the upper Pit 3 bypass reach, but remain near or within the range of optimal trout habitat. Water quality may increase in the Pit 3 bypass reach due to less resident time for water flowing into Britton Reservoir. Water temperature is projected to decrease significantly in the Pit 4 bypass reach, which will provide greater quantities of optimal trout habitat much more often. There will also be less daily and seasonal variations in water temperature experienced in both bypass reaches, as well as a more uniform temperature profile along the entire length of either bypass reach at any given point in time.

The preliminary license condition to shape flow releases, imitating more closely the seasonal and water-year-type natural runoff conditions, will also move the Project toward obligatory natural ranges of variability. Conditional spawning gravel placement will also help ensure maximal trout fry production. This fry production is expected from the greater number of adult trout certain to materialize in the bypass reaches.

The proposed action will neither adversely impact the Inland Coldwater Fish Assemblage occurring in the Project bypass reaches nor the rainbow trout MIS representing this assemblage. Viable populations of rainbow trout will not only be maintained in response to the proposed Project and accompanying preliminary license conditions, but will be partially restored toward the naturally greater ranges of variability that once existed along this portion of the Pit River. The preliminary conditions, on the other hand, allow for more than 75% of the naturally available summer low flows to be utilized for Project power generation, and about 85% of the naturally occurring flows annually. The preliminary conditional flows prescribe a Project bypass flow regime that is significantly less than the levels recommended by the other Federal and State natural resource agencies.

INTRODUCTION

Pacific Gas and Electric Company (licensee) has submitted an application to the Federal Energy Regulatory Commission to relicense the Pit 3, 4, and 5 Hydroelectric Project (FERC No. 233-081, Project) situated along the Pit River in northeastern Shasta County, California.

The application and the preliminary 4(e) license conditions submitted by the Forest Service comprise the proposed action. The proposed action may affect habitat

components and landscape habitat patterns related to Forest Service Sensitive, Survey and Manage, and Management Indicator Species (MIS). Effects of the proposed action to aquatic Sensitive and Survey and Manage Species are analyzed in the Biological Evaluation prepared for this project.

The effects of the proposed relicensing to aquatic Forest Service MIS are evaluated in this report in the context of the relevant preliminary license conditions. The Forest Service has submitted these conditions to move the existing aquatic habitat found in the Pit River Project bypass reaches toward that which will experience a more natural range of variability.

The Forest Service manages fish habitats to maintain viable populations of wild, native fish such as rainbow trout, or to enhance populations of wild or desirable introduced species. To ensure that viable populations are maintained, management indicators were selected to act as 'barometers' for aquatic communities. The intention is to use these indicators to determine the needs of species and for predicting habitat capability responses to management activities. It was believed at the time that management of these indicator species would ensure that viable population levels of other associated species would also be maintained.

The Shasta-Trinity Land and Resource Management Plan (LRMP 1994) selected five fish species as indicators for three aquatic fish assemblages. The Shasta-Trinity and Lassen National Forests each selected rainbow trout as a management indicator for the inland coldwater fish assemblage, the assemblage that best fits the habitat occurring in the Pit 3 and Pit 4 Project bypass reaches. As stated in the Shasta-Trinity National Forest Land and Resource Management Plan Final Environmental Impact Statement (1994): 'The rainbow trout…. was selected because it has the greatest distribution of any salmonid fish species on the Forests. As such, it can be the species most directly impacted by hydroelectric developments…'. Similarly, from the Shasta-Trinity National Forest LRMP: '…these management indicators are used to guide and monitor forest management activities in a manner that will maintain biological diversity in addition to producing enough fish to meet recreational and commercial needs'.

It is also a goal of the Forest Service, during a hydropower project relicensing that occurs on Forest Service lands, to bring such projects up to current environmental standards and to move them toward consistency with the Northwest Forest Plan Record of Decision (NFP ROD 1994). Central to the NFP ROD is the Aquatic Conservation Strategy (ACS) that 1) seeks to prevent further degradation of aquatic ecosystem health while restoring such integrity, and 2) maintains natural disturbance regimes.

Rainbow Trout Life History and Behavior Patterns

Rainbow trout are the most abundant and widespread native salmonid in western North America (Moyle 2002). The rainbow trout found in the Pit River Project bypass reaches may possibly originate from either/both native coastal rainbow trout, having once access

to the sea prior to construction of Shasta Dam, and the Pit River headwater redband trout (Behnke 2002).

Trout appear to favor water temperatures from 15-18 degrees C (Moyle 2002). Pit River trout have been observed favoring a plume of tributary water that ranged from 16-18 degrees C (Pister 1990 as cited by Moyle 2002). More than 100 cold-water springs and seeps augment Project bypass release flows, with most occurring in the Pit 3 bypass reach (Spring Rivers 2001). Springs contribute about 50 cfs of cold water to the Pit 3 bypass reach (FERC, DEIS 2003).

Rainbow trout interact successfully with other fish species, rarely competing with non-salmonids. Juvenile rainbow trout have been observed following Sacramento suckers around to eat invertebrates exposed during sucker feeding (Moyle 2002).

Project Aquatic Habitat Description

The Pit 3 and Pit 4 Project bypass reaches support a significant population of, and fishery for, rainbow trout. Biomass estimates indicate that rainbow trout dominate the fish resource of the Pit 3 bypass reach, providing a sampling quantity significantly greater than the second most dominant fish, the hardhead (8.13 Kg/hectare, vs. 5.01 Kg/hectare; Stillwater 2002). Rainbow trout biomass estimates decrease by about half in the Pit 4 reach, where Sacramento sucker dominated (Stillwater 2002). Both reaches support relatively high angler catch rates, however, particularly for larger trout (FERC, DEIS 2003).

The Pit 3 bypass reach supports the most 'highly-touted' trout fishery of the two reaches and is acclaimed throughout northern California. Maximum water temperatures can range from 16-19 degrees C in the summer months (FERC, DEIS 2003) but do not exceed 16.6 degrees C on average even in a warm/dry seasonal environment (PG&E 2001). Turbidity is detectable in at least the upper portion of the reach, largely originating from planktonic algae forming in Britton Reservoir (FERC, DEIS 2003). The turbidity and accompanying nutrients found in the upper Pit 3 bypass reach commenced in 1987 when the current 150 cfs Project bypass controlled flow discharge was initiated. A baseline situation of zero release flow had been occurring prior to this date.

The Pit 4 bypass reach possesses slightly warmer average summer water temperatures than the Pit 3 bypass reach of 19-20 degrees C, until the confluences of Canyon and Deep Creeks about three-quarters of the reach length downstream. From this area downriver, average water temperatures drop by about 1-2 degrees C (FERC, DEIS 2003).

1. Pit 3 Project Bypass Reach

The licensee and the Federal Energy Regulatory Commission (FERC) both support the existing 'status quo' release of 150 cfs for the Pit 3 bypass reach to continue through the timeframe of the new license (FERC, DEIS 2003). Rationale for not increasing this discharge include 1) maintaining the existing trout fishery, 2) maintaining, vs. increasing

the water temperature released into the Pit 3 reach from Britton Reservoir that may occur with greater flows, 3) maintaining existing aquatic mollusk habitat dependent upon cold water springs and seeps that enter the river channel, and 4) continuing with the adequate water quality improvements observed in Britton Reservoir that commenced with the 150 cfs release discharge in 1987 (FERC, DEIS 2003).

The Forest Service has submitted a preliminary 4(e) Terms and Condition, however, which prescribes an initial discharge of 400 cfs into the Pit 3 Project bypass reach. This greater but steady base flow discharge will continue only until discharge variations ranging from 300 cfs up to 1,000 cfs can be collaboratively shaped depending upon seasonal, water-year-type, and other modeling inputs.

Aquatic conditions in the Pit 3 Project bypass reach are currently determined by a release of approximately 7.5% of the summer season discharge that would naturally occur. A flow release of this magnitude does not meet the aquatic management objectives of the Lassen and Shasta-Trinity National Forest LRMP's or the NFP ROD ACS. Natural disturbance regimes, natural ranges of variability, and natural hydrograph imitation cannot be substantively achieved under the current discharge levels. Insufficient levels of trout and other fish and aquatic habitats currently exist under the present flow regime. The Forest Service is obligated to bring this existing Project 'up to current environmental standards' and move the Project towards consistency with these management objectives.

Sampling for rainbow trout and/or their habitat has spanned the past 18 years in Project waters. Work performed in 1984 utilized the Instream Flow Incremental Methodology (IFIM-'1D'; Bovee 1982). Trout habitat was divided into the following three life stage categories: adult, juvenile, and fry. Adult trout weighted usable area (WUA) habitat increased at four sampling locations in the Pit 3 bypass reach, comparing 400 cfs to 150 cfs, by 4%, 12%, 39%, and 60%. Fry habitat increased at three sites by 21%, 31%, and 35%, but decreased at another by 18%. Juvenile trout habitat decreased at three of the four sample sites by 13%, 18%, and 30%, increasing at one site by 14%.

A reanalysis of the 1984 work was recently conducted because hydraulic modeling techniques have changed since completion of the earlier sampling. The reanalysis duplicated the <u>direction</u> in the trout habitat flow-related trend change for the three life stages at all four sites that had occurred in the earlier work. What was significantly different between the two results is the much greater estimate in WUA habitat for each life stage with the reanalysis vs. 1984. The WUA available for each life stage of trout ranged from being greater by a significant percentage <u>up to several hundred percent</u> when comparing the recent reanalysis to the work done in 1984.

Trout microhabitat mapping also took place in the summer of 2002 at the present and conditional flows (R2 2003). Trout fry habitat (shallow/slow mapping guild) decreased at the two sample sites. Conversely, trout juvenile habitat increased at the same two sites. Note how this differs from the consensus trend direction from the IFIM-1D results. Adult trout habitat (deep/fast mapping guild) increased significantly at one site but decreased slightly at the other. Empirical trout habitat mapping conducted in 2002

correlated trend increases in adult trout habitat with the 1984 IFIM estimates. They also produced estimates of trout usable area similar to the much greater levels estimated after the reanalysis (R2 2003).

As stated by R2: '…faster water microhabitats are abundant over the lower flow range and their areas level off at lower magnitudes when flows range between 400 cfs and 600 cfs in more confined sites, or increase with discharge as expansive bars become inundated' (R2 2003). Additionally, trout fry (shallow/slow) habitat '...tracks the water's edge with increasing discharge at all sites' (R2 2003). Juvenile trout microhabitat also occurs mostly near channel margins and in shallower boulder gardens. Adult trout (deep/fast) microhabitat 'is well represented spatially in the Pit River' (R2 2003), persisting across the channel up to the level of the Forest Service conditional flow release.

It is projected that water temperature in the Pit 3 bypass reach may increase by a maximum of one degree C in the upper portion of the channel directly determined by Britton Reservoir releases (FERC, DEIS 2003). This projected increase is insufficient to impact the quality of overall trout habitat in the reach, however. The water temperature of the upper Pit 3 bypass reach will still provide thermal habitat well below the current average temperature of the Pit 4 bypass reach (FERC DEIS 2003) which contains a healthy trout biomass and excellent trout fishery. Trout are plentiful enough to provide a successful recreational fishery in the Pit 4 reach despite trout biomass being less than the quantities sampled in the Pit 3 bypass reach (FERC DEIS 2003).

There is no indication that the significantly increased adult trout habitat estimated with the conditional discharge in the Pit 3 bypass reach will not be fully seeded despite the projected minor increase in water temperature. Behnke (2002) notes that trout begin to lose their competitive advantage to other warmer water fish species when water temperatures reach 21 degrees C. The Pit 3 bypass reach summer flow averages will remain several degrees C cooler than this threshold after implementation of the conditional flow release, and remain more uniform throughout the reach length as well (PG&E 2001).

Present fly-fish angling will be affected by the increased discharge. A small number of 'test' anglers sampled various discharges in the summer of 2002 and preferred flows less than the conditional 400 cfs discharge. The Forest Service contends that changes required in angling 'approach' and wadeability may not adversely affect angler success once the greater adult trout population fully seeds the newly created habitat. Near-shore wadeability will persist, and eventually, changes in riparian habitat (providing for a general widening of the open channel) may improve the initial fishing experience and catch success rate during the timeframe of the relicense. Additionally, the seasonal flow-shaping model(s), to be collaboratively determined, will at least partially accommodate desires of anglers.

A Conditional requirement to increase the existing quantity of trout spawning gravels via artificial introduction will assuredly be beneficial. R2 located few, if any gravel

depositional areas incidental to their snorkeling observations (R2 2003). More gravel will be required to accommodate the significantly greater population of adult trout after flows are increased. Project dams reduce the estimated volume of gravel that would otherwise reach the Pit 3 reach by 90%. FERC suggests that the limited gravel quantities currently found may actually limit trout recruitment (FERC DEIS 2003).

2. Pit 4 Project Bypass Reach

The licensee and the Federal Energy Regulatory Commission both support increasing the current release of 150 cfs into the Pit 4 bypass reach to 200 cfs through the timeframe of the new license (FERC, DEIS 2003). The Forest Service has submitted a preliminary 4(e) Terms and Condition, however, which prescribes an initial discharge of 450 cfs into the Pit 4 Project bypass reach. This greater but steady base flow discharge will continue only until discharge variations ranging from 300 cfs up to 1,000 cfs can be collaboratively shaped depending upon seasonal, water-year-type, and other modeling inputs.

IFIM '1D' weighted usable area (WUA) estimates for rainbow trout were conducted in this project reach in 1984. Comparing the Conditional 450 cfs to the present 150 cfs discharge, adult trout WUA estimates increased 66%, 64%, 38%, and 17% at four sampling sites (PG&E 2001, Cheslak, PG&E 2003). Trout fry habitat, conversely, decreased 36%, 61%, and 1% at three sample sites, but increased 2% at one location when flows increased to 450 cfs. Trout juvenile habitat decreased 9%, 42%, 19%, and 8% at the four sampling sites.

The sampling results were recalculated recently because modeling techniques have changed over the past 18 years. Adult trout habitat increased 81%, 63%, 58%, and 48% when sampling near 450 cfs. Trout fry habitat increased at one site by 11%, but decreased by 26%, 36%, and 46% at the other three locations. Trout juvenile habitat increased 11% at one site, but decreased by 19%, 23%, and 9% at the other three sites. Total rainbow trout WUA, not originally estimated in 1984, increased 9%, 10%, and 22% while decreasing by only 2% at one site when increasing the flow from 150cfs to 450cfs (Cheslak, PG&E 2003). The Forest Service believes that these figures have significant value particularly if the parameters defining the three lifestages are inaccurately delimited. Similarly discussed above for the Pit 3 bypass reach, the WUA estimates for all rainbow trout life stages upon reanalysis were dramatically greater than the 1984 estimates at most sampling locations, indicating a flaw in the previous sampling methodology.

Habitat mapping for rainbow trout life stage 'guilds' was done in the Pit 4 bypass reach in 2002 and again provided results similar to those described under the Pit 3 bypass reach discussion, above (R2 2003). Empirical mapping also provided results very similar to the adult rainbow trout WUA estimates generated from the 2002 IFIM sampling at one of the two locations. Likely the most valuable observation resulting from the mapping was revealed in the discussion section of the research work (R2 2003): 'The microhabitat mapping results indicate that habitat is available for each guild at all flows, and that it

responds to changes in flow by shifting location in intuitive ways. Of the four microhabitat guilds, deep/fast (adult trout) is generally present in greatest quantities… and also exhibits the greatest change with flow… Shallow/slow and juvenile trout microhabitat areas generally do not vary as much with flow'.

The Forest Service contends that these conclusions support the projected benefit that will result from the Conditional release flows. Adult trout habitat will surely increase. The increased habitat will be fully seeded because resulting trout fry and juvenile habitat will almost surely be able to provide for sufficient production to support the greater adult trout habitat. As stated by FERC (DEIS, 2003), when discussing the option of increasing Pit 4 releases from 150 to 200 cfs: 'Although WUA available to fry and juvenile trout would decrease by about 10%, the amount of habitat available to these earlier lifestages should still be adequate to support recruitment to the adult lifestage'.

Water temperatures will decrease significantly in the Pit 4 bypass reaches at 450 cfs by, on average, a couple of degrees C (FERC, DEIS 2003). This change could promote elaboration of rainbow trout biomass averages that approach or exceed those currently estimated for the Pit 3 bypass reach. Pit 4 bypass reach temperatures would become more uniform throughout the reach length as well.

Artificially increasing the existing quantities of rainbow trout spawning gravel in the Pit 4 reach is also supported by FERC (DEIS 2003) and will help ensure maximum production of trout fry.

The seasonal and annual water-year-type flow shaping changes will ultimately affect the Project bypass reach and will be tempered in a manner that accommodates various trout life stages. Such changes will achieve a more natural disturbance regime and create ranges of variability similar to what these trout adapted to naturally in the Pit River.

Impacts of the Proposed Action to Aquatic MIS

The proposed action will neither adversely impact the Inland Coldwater Fish Assemblage occurring in the Project bypass reaches nor the rainbow trout MIS representing this assemblage. Viable populations of rainbow trout will not only be maintained in response to the proposed Project and accompanying preliminary license conditions, but will be partially restored toward the naturally greater ranges of variability that once existed along this portion of the Pit River. The preliminary conditions, on the other hand, allow for more than 75% of the naturally available summer low flows to be utilized for Project power generation, and about 85% of the naturally occurring flows annually. The preliminary conditional flows prescribe a Project bypass flow regime that is significantly less than the levels recommended by the other Federal and State natural resource agencies.

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