TWG 2/18/99 n Henderson
Attach 2

GLEN CANYON DAM ADPATIVE MANAGEMENT PROGRAM
TECHNICAL WORKGROUP - AD HOC LAKE POWELL ADVISORY GROUP
CATEGORIZATION OF MANAGEMENT OBJECTIVES AND INFORMATION NEEDS

January 25, 1999

The AMWG approved a list of MO/INs for the Glen Canyon Dam Adaptive Management Program on July 21, 1998. From this list, two MOs (and associated INs) were adopted for Lake Powell. On January 13, 1999, the AMWG asked the TWG to separate the Lake Powell MOs and INs into two categories: those directly related to downstream resources and those that mostly relate only to the lake itself (gray and black categories). Once approved by the TWG, the GCMRC will develop a monitoring and research program for both the long-term strategic plan and the FY-2000 work plan to address those INs in the downstream category.

Below is a suggested split of MO/INs for Lake Powell based on my understanding of the effects on downstream resources. Please review and be ready to discuss at our meeting on 2/4. Based on the comment received at that time, I'll revise and be ready to present a final list for the 2/18 TWG. (All MOs and INs are written verbatim in order to minimize reader confusion.)

in if affecting downstream →

Gray category - Lake Powell Management Objectives and information needs related to downstream resources

MO 1 relates to resources within Lake Powell that have been shown to directly influence downstream biology and water quality. MO 1 reads as follows:

> **Prevent impacts that adversely affect the water quality (physical, chemical, biological) of Lake Powell due to dam operations and ensure that fully informed AMWG decisions are possible both now and in the future.**

Fu. red by O&M under water quality item. not funded out of Am

MO 1 includes the following Lake Powell INs that directly influence downstream water quality and aquatic ecology:

Physical/Chemical (Limnology)

IN 1.1 Determine the effect of current dam operations (under approved operating criteria) on reservoir water quality, including but not limited to the following:

a. Determine near-dam hydrogen sulfide levels (and other hazardous chemical constituents) within the hypolimnion occurring under current dam operating under current dam operating criteria.

b. Determine the dynamics of lake stratification and advective flows and their effects on chemical constituents.

c. Determine/quantify the dynamics of major cations, anions, and

White areas are funded out of Am.

nitrate/phosphate ratios resulting from dam operations

d. Determine the effects of dam operations (under approved operating criteria) on the physical/chemical dynamics of Lake Powell side channels and embayments.

e. Quantify/model the heat budget for Lake Powell to determine near-term and long-term (monthly/weekly and annual summaries respectively) effects on a selective withdrawal system.

f. Determine the effects of current dam operations on reservoir levels of selenium.

Biological

IN 1.1 Determine the impacts of dam operations and resulting water quality on primary and secondary productivity of Lake Powell, including:

a. algae (phytoplankton)
c. zooplankton

not part of AMP but still information desired (ie. TCD)

Black category - Management Objectives and information needs related mostly to Lake Powell

MO 2 relates mostly to Lake Powell aquatic ecosystem with little or no connection to downstream resources. It reads as follows:

> **Protect Lake Powell aquatic ecosystem (fishery) from adverse impacts due to dam operations and subsequent effects, including but not limited to: temperature, reservoir surface elevations, elevated selenium levels, advective flow patterns, predator/prey relationships, and fish movements.**

The INs associated with MO 2 that are believed to have relevance mostly to the Lake Powell aquatic ecosystem:

IN 2.1 Determine the effects of water temperature caused by dam operations.

IN 2.2 Determine the effects of fluctuations in the reservoir surface elevations caused by dam operations (under approved operating criteria)

IN 2.3 Determine the effects of elevated selenium levels caused by dam operations (under approved operating criteria)

IN 2.4 Determine the effects of advective flow patterns on the Lake Powell aquatic ecosystem caused by dam operations (under approved operating criteria)

IN 2.5 Determine the effects of predator/prey relationships caused by dam

operations (under approved operating criteria)

IN 2.6 Determine the effects of fish movements caused by dam operations

In addition, the following IN associated with MO-1, relates mostly to the Lake Powell aquatic ecosystem with minimal effect downstream are the following:

Biological

IN 1.1 Determine the impacts of dam operations and resulting water quality on primary and secondary productivity of Lake Powell, including:

a. algae (periphyton)
b. macrophytes
d. macroinvertebrates

IN 1.2 Quantify levels of selenium and describe effects of these levels on primary and secondary productivity, fish and waterfowl, and human consumption.

Then goes to (G) to develop Annual Plan to AMWG approval in July. Approved by TWG & out to AMWG by June 21.