



# United States Department of the Interior

BUREAU OF RECLAMATION  
Central Valley Operations Office  
3310 El Camino Avenue, Suite 300  
Sacramento, California 95821

IN REPLY  
REFER TO:

CVO-100  
ENV-7.00

FEB 20 2014

Ms. Maria Rea  
Assistant Regional Administrator  
California Central Valley Area Office  
National Marine Fisheries Service  
650 Capitol Mall, Suite 5-100  
Sacramento, CA 95814

Subject: Implementation of Old and Middle River Index Demonstration Project

Dear Ms. Rea:

Management of flows in Old and Middle Rivers (OMR) is required under the Reasonable and Prudent Alternatives (RPAs) of the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (Service) Biological Opinions on the Coordinated Long-term Operation of the Central Valley Project (CVP) and State Water Project (SWP). Currently, compliance with OMR flow requirements is determined through 5-day and 14-day running averages of tidally filtered daily OMR flow (see footnote 13 on page 75 in the 2009 RPA with 2011 amendments, [http://www.westcoast.fisheries.noaa.gov/publications/Central\\_Valley/Water%20Operations/Operations,%20Criteria%20and%20Plan/040711\\_ocap\\_opinion\\_2011\\_amendments.pdf](http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/Water%20Operations/Operations,%20Criteria%20and%20Plan/040711_ocap_opinion_2011_amendments.pdf)).

OMR flow is measured using tidally filtered gage data, which the U.S. Geological Survey (USGS) directly measures with acoustic velocity meters located in OMR near Bacon Island. OMR flow integrates a complex set of hydraulic conditions, including CVP and SWP exports, flows from the large and small tributaries to the Delta, daily and neap-spring tidal variation, atmospheric pressure, local agricultural diversions, and wind.

Over the last several months, the Bureau of Reclamation and the Department of Water Resources have developed a demonstration project specific to the management of OMR flow criteria through an index (estimate) using numerical model output or using data-based regression relationships. Since 2009, CVP and SWP operators have calculated OMR from an index to schedule daily exports and to assist in CVP and SWP operation planning. The OMR Index Demonstration Project, as more fully described in the enclosure, allows for CVP and SWP operators to operate using an OMR index rather than the USGS tidally filtered gage data. Elimination of the 5-day running average requirement will allow operators to “ride out” daily OMR flow fluctuations without having to continuously adjust exports. Although there will be relatively short periods of time when the volume of water exported could either increase or decrease, there is no expected overall significant net gain or loss of water exported by the CVP and SWP. Implementing the Demonstration Project will allow the CVP and SWP to operate

using the OMR index, improving operational stability and simplifying accounting for the many factors affecting OMR flow and resulting in more efficient CVP and SWP water and power operations.

Reclamation anticipates that the Demonstration Project will remain in place indefinitely or until further information emerges as a result of project implementation. Implementation of the Demonstration Project will include close monitoring and reporting of both the USGS tidally filtered gage data and the OMR index values to ensure compliance with the NMFS and Service Biological Opinion requirements during ongoing weekly coordination meetings (i.e., Delta Operations for Salmon and Sturgeon, Water Operations Management Team). NMFS and the Service have the discretion to provide direct guidance or suspend implementation of the OMR Index Demonstration Project if it appears that the 14-day running average compliance as calculated by the index method is varying too much from the measured data.

The proposed OMR Index Demonstration Project is intended to provide stability to coordinated operation of the CVP and SWP while maintaining protection of fishery resources. The Demonstration Project has been designed to ensure that the OMR flow requirements from the NMFS RPA are fully met. Therefore, Reclamation is requesting NMFS' concurrence that the proposed OMR Index Demonstration Project can be used in lieu of the USGS tidally filtered gage data specified in the NMFS Biological Opinion. We also request concurrence with our determination that implementation of the Demonstration Project will have no additional adverse effects on Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, California Central Valley steelhead, the southern distinct population segment of North American green sturgeon, or their critical habitats, beyond what was previously analyzed in our 2008 biological assessment and your subsequent Biological Opinion issued on June 4, 2009.

Sincerely,



Paul Fujitani  
Acting Operations Manager

Enclosure

# Old and Middle River Index Demonstration Project

## I. Introduction

Management of flows in Old and Middle Rivers (OMR) is required under the Reasonable and Prudent Alternatives (RPAs) of the NMFS and FWS Biological Opinions. Currently, compliance with the OMR flow requirements is determined through 5-day and 14-day running averages of tidally-filtered daily OMR flow, which is directly measured with acoustic velocity meters located in Old and Middle Rivers near Bacon Island. OMR flow integrates a complex set of hydraulic conditions, including CVP and SWP exports, flows from the large and small tributaries to the Delta, daily and neap-spring tidal variation, atmospheric pressure, local agricultural diversions, and wind. OMR flow is measured, but can also be indexed (estimated) using numerical model output or using data-based regression relationships. CVP and SWP operators currently calculate an OMR index originally developed by Metropolitan Water District (MWD; Hutton 2008) to schedule daily exports and to assist operational planning.

## II. Proposed OMR Index Demonstration Project

- A. 14-day running average requirement achieved by fully operating to the OMR index
- B. 5-day running average requirement eliminated

Rationale: Operating to the OMR index instead of measured OMR flow is intended to achieve substantial benefits in operational stability. Specifically, focusing operations on the OMR index will improve operational stability and simplify accounting for the many factors affecting OMR flow, resulting in more efficient CVP and SWP water and power operations. Elimination of the 5-day running average requirement will allow operators to “ride out” daily OMR flow fluctuations without having to continuously adjust exports. The proposed OMR Demonstration Project is not expected to result in meaningful changes in the volume of water exported by the CVP and SWP over a tidal cycle. There will be relatively short periods of time when the volume of water exported could either increase or decrease, but there is no expected overall net gain or loss of water exported by the CVP and SWP. Thus, the proposed Demonstration Project is intended to provide benefits to operational stability while maintaining protection of fishery resources with minimal overall effects on the volume of exported water.

Benchmarks: Implementation of the Demonstration Project will include close monitoring and reporting of both the USGS tidally-filtered gauge data and the OMR index values to ensure compliance with the USFWS and NMFS Biological Opinion requirements. Fishery agencies have the discretion to provide direct guidance or suspend implementation of the Demonstration Project if it appears that the 14-day running average compliance as calculated by the index method is varying too much from the measured data.

### III. OMR Index

The equation underlying the OMR index, as it is currently implemented (using daily time series of data) by project operators, is defined as follows:

$$\text{OMR Index (cfs)} = A * [\text{Prior day flows on San Joaquin River @ Vernalis}] - B * [\text{South Delta Diversions and Exports}] + C,$$

where the term South Delta Diversions and Exports is specified as follows:

South Delta Diversions and Exports (cfs) = Clifton Court Forebay Intake + Jones Pumping Plant Exports + Total CCWD Diversions - CCWD Contra Costa Canal Diversions + (¼\* Delta Net Channel Depletions)

The coefficients A, B and C used in the equation are the original coefficients developed for the OMR Index (Hutton 2008). The coefficients are implemented based upon San Joaquin River inflow and on the configuration of the Grant Line Canal (GLC) temporary barrier and the Head of Old River (HOR) barrier as shown in the following table.

HOR Barrier	GLC Barrier	Vernalis (cfs)	A	B	C
Out	Out	< 16,000	0.471	-0.911	83
Out	Out	16,000-28,000	0.681	-0.94	-3008
Out	Out	> 28,000	0.633	-0.94	-1644
Out	In	All	0.419	-0.924	-26
In (Spring)	Out/In	All	0.079	-0.94	69
In (Fall)	Out/In	All	0.238	-0.93	-51

The original equation developed by (Hutton 2008) has two differences from the equation as implemented in this report and as currently used by project operators. The original equation did not include the Contra Costa Water District (CCWD) export location in Victoria Canal and the flows on the San Joaquin River were not lagged by one day.

### IV. OMR Index compared to measured OMR flows

A detailed analysis comparing the OMR index to measured OMR flows for 5-day and 14-day running averages has been completed for the period of January to June for water years 2009-2013 (Guerin 2014). Overall, the two time series exhibited similar characteristics and were highly correlated. The magnitude of difference between the OMR index and measured OMR flow varied by water year and was generally in the range of +/- 1000 cfs. In general, the analysis suggests that the OMR Index Demonstration Project would provide an accurate representation of measured OMR flows, albeit with sometimes considerable differences

occurring during periods when San Joaquin River inflow and/or CVP/SWP exports were rapidly increasing or decreasing.

## **V. References**

Guerin, M. 2014. OMR flow analysis WY2009 to WY2013: Comparison of CDEC/USGS and Hutton/MWD index methods. Resource Management Associates. Final Report prepared for the San Luis and Delta Mendota Water Authority.

Hutton, P. 2008. A model to estimate combined Old and Middle River Flows. Metropolitan Water District. Final Report.