HANDOUT #3

Draft Considerations for Determining the Capacity of Isolated Conveyance

This document provides a description of the factors considered in concluding that 15,000 cfs is the appropriate conveyance capacity for the isolated canal. Each factor is presented below as either a pro or con for sizing the canal at 15,000 cfs.

It is important to note that the 15,000 cfs capacity of an isolated canal matches the existing combined physical pumping capacity of the Banks and Jones pumping plants in the south Delta and conveyance capacity in the California Aqueduct and Delta Mendota Canal, although the full capacity of these existing facilities has not been used because of regulatory constraints. A 15, 000 cfs canal would not exceed the export capacity of the existing pumping plants.

Pros

1. A 15,000 cfs capacity could accommodate the more environmentally-benign operational concept of "big gulp/small sip," which would require higher peak capacity during winter/spring. Operational flexibility was a primary factor used in identifying the capacity of the canal that would yield the greatest benefit. A capacity of 15,000 cfs would allow diversion at sufficient rates to accommodate the highly variable inter- and intra-annual hydrology of the Sacramento and San Joaquin River watersheds. This north Delta diversion capacity would allow for a "big gulp/small sip" operation in which water would be diverted from the north Delta facility at a higher rate when there is sufficient water in the Sacramento River and at a lower rate or not at all when there are insufficient flows in the river. Operations of a north Delta facility of this size would allow for both meeting water supply demands and protection of covered fish species. Diversion rates could be dependent on the time of year with respect to flow rates, fish attraction flows, and fish presence near the facilities. This operational approach would also allow variability in river hydrology to be more similar to historical conditions and eliminate the removal of peaks in the hydrograph, as currently occurs. A canal capacity of at least 15,000 cfs could accommodate the highly variable and flexible nature of this operational approach (A. Munevar pers. comm.).

2. A 15,000 cfs capacity could accommodate tidal operations of the new diversion at lower flows, which may require peak capacity at two times the rate of the daily or monthly average. At a smaller temporal scale, sizing the canal at 15,000 cfs could provide for improved water supply reliability and the protection for covered fish species through variable operations with tidal flows. Positive barrier fish screens rely on sufficient flows to be efficient at avoiding impingement of fish on the screens. The sweeping velocity past the screen must exceed the approach velocity to the screen by two to three times for maximum fish protection. Due to tidal action on the Sacramento River, this criterion would not be met at lower flows. With greater capacity, diversions could

take advantage of ebb tides when the sweeping to approach velocity ratio is sufficient, decrease when the ratio is insufficient, and cease diversions during flood tides.

3. A 15,000 cfs capacity could provide flexibility for adapting to climate change (hydrology and sea level rise). Predicted future climate change suggests that a larger canal is needed to maintain water supply reliability. Future climate change is expected to result in increased variability of Delta hydrology (Knowles and Cayan 2002, 2004). A 15,000 cfs canal would provide the operational flexibility to accommodate this increase in variability. Future climate change is also expected to result in sea level rise (Intergovernmental Panel on Climate Change 2007). With sea level rise, dual conveyance would depend more greatly on the north Delta facility as water quality conditions degrade at south Delta facilities.

4. A 15,000 cfs capacity could protect water supply in case of a catastrophic event. A 15,000 cfs capacity of a canal could prevent the loss of water supplies in the face of catastrophic events, such as the failure of a number of levees protecting deeply subsided islands.

5. A 15,000 cfs capacity could minimize cut-and-fill costs associated with digging a canal and building levees around the canal. In an initial DWR analysis, a canal larger than 15,000 cfs would need to import soil to build sufficient levees for the canal, significantly increasing construction costs of the canal (P. Marshall pers. comm.). A canal smaller than 15,000 cfs would require the export of soil associated with digging the canal, also significantly increasing construction costs. However, a 15,000 cfs canal would be able to use the soil removed for digging the canal for building the levees.

6. A 15,000 cfs capacity could reduce adverse effects on covered fish species. There is an important trade-off between the use of a new north Delta diversion facility and existing south Delta facilities. When the ability to divert from the north Delta facility is insufficient, diversions from the south Delta would supplement those from the north Delta facility.

Preliminary modeling was conducted using canal capacities of 5,000, 10,000, and 15,000 cfs while meeting existing export needs of the CVP and SWP (P. Marshall pers. comm.). Modeling results indicate that a north Delta conveyance capacity of 5,000 and 10,000 cfs would require greater south Delta diversions to meet export needs, causing high negative Old and Middle River flows and low QWEST. Therefore, operations at 5,000 and 10,000 cfs at the north Delta are expected to do very little to reduce effects on covered fish species. However, a pumping capacity of 15,000 cfs for a north Delta diversion facility and canal would reduce the dependence on south Delta pumping, and therefore, minimize any effects to fish associated with negative Old and Middle River flows and low QWEST.

A 15,000 cfs canal capacity would establish the north Delta as the primary point of diversion. As a result, in addition to reduced south Delta effects on fish species, the

anticipated state of the art fish screens and operational approach at the north Delta facility are expected to reduce impingement of covered fish species to very low levels.

Cons

1. The full capacity of the canal would not be used a substantial amount of time, yet the facility would be very expensive, resulting in the stranding of assets. Preliminary CalSim and Cal-Lite modeling indicates that use of the full capacity of a 15,000 cfs canal would be infrequent (A. Munevar, pers. comm.). However, these results were based on monthly averages and fail to show daily and hourly flexibility in which the full capacity may be used during short periods to achieve planning goals. For example, intra-day operation of the intakes (e.g., tidal operations) could allow for short periods of higher diversions that could more often utilize a higher canal capacity than is provided in modeling output with a monthly time step.

2. Capacity could cause greater dependence on the north Delta diversion, which could degrade water quality in certain areas of the south Delta. There is concern that north Delta diversions may degrade agricultural and municipal water quality in parts of the south Delta because less Sacramento River water would be conveyed through the Delta to the south Delta facilities. However, preliminary CalSim/Cal-Lite modeling results indicate that dual operations of north and south Delta diversions can meet existing water quality standards over which SWP and CVP project operations in the Delta have control (A. Munevar, pers. comm.).

3. A larger diversion in localized area would have greater local effect on hydraulics and fish screen performance. The intake capacity of 15,000 cfs for the new north Delta diversion and fish screen is unprecedented. As a result, if it were built as a facility with one intake, the effects to local hydraulics are expected to be large. However, early conceptual designs of the facilities have included installing multiple intakes along the river between Sacramento and Walnut Grove to dilute these local effects (Fish Facilities Technical Team 2008).

4. A larger diversion would have added engineering considerations, a larger footprint, and greater associated infrastructure. A 15,000 cfs canal is expected to need more associated engineering work and infrastructure, and create a larger footprint than a smaller canal, particularly if the facility consisted of five separate intakes. As a result, impacts to stakeholders and terrestrial species and construction costs are expected to be higher at this capacity relative to a smaller intake. However, cut and fill costs associated with digging a canal and building a levee are expected to be lower if the canal is 15,000 cfs (see Pro #5 above)

References

Fish Facilities Technical Team. 2008. Preliminary draft: Conceptual proposal for screening water diversion facilities along the Sacramento River. Report to the BDCP, 8/29/2008.

Intergovernmental Panel on Climate Change. 2007. Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, Pachauri, R.K and Reisinger, A.(eds.)]. IPCC, Geneva, Switzerland, 104 pp. Available at: http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf.

Knowles, N. and D. R. Cayan. 2002. Potential effects of global warming on the Sacramento/San Joaquin watershed and the San Francisco estuary. Geophysical Research Letters. 29:38.

Knowles, N. and D. R. Cayan 2004. Elevational dependence of projected hydrologic changes in the San Francisco Estuary and watershed. Climatic Change. 62:319-336.

Personal Communication

Marshall, P. (Engineer, DWR), Discussion of sizing of an isolated canal with BDCP Integration Team, 2/3/2009.

Munevar, A. (Engineer, CH2M Hill), North Delta diversion effects on channel hydrodynamics, particle fate, and water quality. Presentation to the BDCP Integration Team, 1/28/2009.