**Figure descriptions**

1. **Predicted annual salvage:** Predicted proportion of the juvenile winter run Chinook salmon cohort salvaged each year (SWP and CVP combined) under the COS and PA. Proportions calculated from a zero-inflated negative binomial model reported in Zeug and Cavallo (2014). Model inputs included Sacramento River flow and combined exports.
2. **Predicted salvage:** Box plots of the predicted proportion of winter run Chinook salmon salvage in each month (October –May) for different water year types. Proportions calculated from a zero-inflated negative binomial model reported in Zeug and Cavallo (2014). Model inputs included Sacramento River flow and combined exports.

**Routing figures**

1. **All:** Proportion of flow entering the interior delta from the Sacramento River (for junctions SS1, SS2, GEO, DCC) or San Joaquin River (for junctions COL, FMN, FRV, HOR, MRV, ORV, TMS, TRN). Routing of water into CCF via West Canal and toward the CVP from Old River. Flow proportions were calculated for COS, PA and WOA.

**Description of salvage methods from Water Fix BA**

5.D.1.1.2.2 Salvage Based on Zeug and Cavallo (2014)

An analysis to evaluate differences in entrainment (salvage) at the south Delta export facilities between NAA and PA was done following the statistical models of salvage of marked (codedwire tags) hatchery-reared Chinook salmon published by Zeug and Cavallo (2014). The analysis focused on winter-run Chinook salmon; spring-run Chinook salmon were not included because very few marked individuals were salvaged and so the statistical models could not be fit successfully (Zeug and Cavallo 2014). Several modifications to the methods of Zeug and Cavallo (2014) were employed to focus on relevant model predictors. First, statistical models of the empirical data were constructed using only releases of winter-run Chinook salmon raised at the Livingston Stone Hatchery. Second, salvage at the CVP and SWP south Delta export facilities was combined and combined exports were used as a predictor rather than modeling each facility separately. This was done because the range of south Delta export flows from the individual facilities during the 82-year CalSim-II period exceeded the range of the observed data. However, when both south Delta export facilities are combined, the ranges of modeled and observed data almost completely overlap. Third, some variables were excluded from the statistical models because they were not significant in the original analysis or they were not relevant in this context. For example, the original analysis used the variable “distance of release from the facilities”. However, winter-run Chinook salmon were only released from a single location, making this predictor irrelevant. Finally, to determine which hydrologic variables were the best predictors of salvage, a model selection exercise was performed using the original data from Zeug and Cavallo (2014). The model selection exercise included five potential hydrologic predictor variables including; Old and Middle River flows (OMR), inflow-export ratio (I-E)2, total south Delta exports, San Joaquin River flow, Sacramento River flow and one biological variable (mean fork length at release). Most of these variables were strongly correlated so models were constructed only with variables that had correlation coefficients 1 million individuals) for each candidate model with standardized predictors for both the count and zero-inflation portion of the models and the log number of fish released as an offset variable in the count portion of the model. To select the best approximating model, Akaike's Information Criterion (AIC) was calculated for each model. The model with the lowest AIC value was identified as the best approximating model. The AIC value of all other models was subtracted from the value of the best approximating model to calculate the ΔAIC. Any model that had a ΔAIC value ≤ 2.0 was considered a competing model with the best approximating model.

A single best model of salvage was selected with no other model having a ΔAIC <2.8. This model had three predictor variables for the count model and zero inflation models including mean fork length of fish at release, Sacramento River flow, and total exports (Table 5.D-32). The final count model indicated that non-zero salvage was greater when fish were released at a larger size, flow in the Sacramento River was higher, and exports were higher (Table 5.D-32). For the zero inflation model, coefficients indicated zero salvage was more likely when fish were released at a smaller size, Sacramento River flow was higher, and exports were lower (Table 5.D-32).

To predict salvage under the NAA and PA, daily flow and export data from DSM2 output was aggregated into 7-day running means and standardized to the same scale as the empirical data. This was done to mimic the way data were aggregated in the original publication (7-day means) and the winter-run specific models described above. A 7-day mean was used because an acoustic tagging study revealed that was the approximate mean time Chinook salmon smolts spent transiting through the Delta (Zeug and Cavallo 2014). The total number of fish entering the Delta in a season was then multiplied by the daily entry proportion defined by the same distribution used in the Delta Passage Model. The log-transformed product of this calculation was used as the offset on each day. The distribution did not weight the result but simply distributed the fish over time.

The values described above (DSM2 data, offset, fish fork length) are used as inputs in the ZINB model to predict the mean salvage for each day. The size of fish entering the delta was set as the midpoint size on the 15th of each month using the Delta length-at-date model (Table 5.D-33). After January, the midpoint value was higher than the observed sizes at release and the model was set to the maximum observed fork length from February–June (95 mm). However, it should be noted that the statistical model uses size at release in the Sacramento River near Redding, CA and fish are assumed to grow between release and the salvage facilities. The mean daily salvage values were then summarized by month and reported as the proportion of total annual salvage observed in each month. Additionally, the annual predicted value of salvage in each of the 82 water years was plotted for the NAA and the PA.

**Routing methodology from Water Fix BA**

Many routes can potentially be used by fish migrating through the Delta and survival through these routes can be significantly different (Newman 2008; Perry et al. 2010). Thus, routing of fish at junctions and how routing could be affected by project operations has the potential to influence through-Delta survival. In general, routes that keep fish in the mainstem Sacramento and San Joaquin Rivers are superior to routes leading into the interior Delta (Hankin et al. 2010;

Perry et al. 2010), although some recent findings for the San Joaquin River have not supported this generality (Buchanan et al. 2013). Perry (2010) found that the routing of fish into the interior delta through the combined junction of Georgiana Slough and the Delta Cross Channel was a function of the total flow entering the interior delta through both of those junctions. This is the function represented in Figure 6.7 within Perry (2010). This function indicated that the slope of the relationship was less than 1.

Cavallo et al. (2015) performed a meta-analysis of routing at 6 Delta junctions and found that the proportion of flow entering a junction explained 70% of the variation in routing. Similar to the Perry (2010) study, the slope of this relationship was less than 1 suggesting fish move into junctions at a rate less than the proportion of flow. Both of these studies present strong evidence that routing at junctions is a function of flow into that junction.

For the present effects analysis of the PA, flow routing into junctions was based on the proportion of flow entering a junction away from the main stem, from DSM2-HYDRO outputs. Fifteen-minute data were used to calculate the daily proportion of flow that enters the junction, following the methods of Cavallo et al. (2015). Similar to the analysis of velocity described previously, the daily value calculated from the 15-minute data will be used to calculate summary statistics (box plots) for each month (December–June) and water year-type. If the median entrainment values under NAA and PA differed by ≥ 5% for any month, greater detail in the description of results was provided, based on a comparison of minimum values, maximum values, 25th quantile, 75th quantile, and median values.

Flow into seven junctions was analyzed using this metric: junctions from the Sacramento River included Sutter-Steamboat Sloughs, Delta Cross Channel, and Georgiana Slough; junctions from the San Joaquin River included head of Old River, Turner Cut, Columbia Cut, Middle River, and the mouth of Old River.

The combined evidence from the literature strongly indicates routing is a function of flow. Thus, it can be assumed routing of fish toward the interior delta will increase as the proportion of flow entering the junction increases. However, the slope of the relationship will be less than 1.