Appendix F SJRIP RiverWare Historic Model Calculated Local Inflow Results and Validation

The model has been validated through analysis of the calculated local inflows in the historic model configuration. Local inflows account for the presence of ungaged flow gains and losses, including spatial and temporal variations in groundwater movement and losses, return flow distribution, and inflow from ephemeral washes and other ungaged tributaries. The local inflows may also reflect uncertainty associated with modeling assumptions (i.e. reach travel times), missing historic data estimations, and uncertainty within observations and measurements. The goal in the validation process is two-fold:

1. Minimize the variance within the local inflows by using the best available and most accurate historic data and by ensuring our assumptions are as appropriate as possible. The variance within the modeled local inflows should be within an expected and reasonable range of the actual reach gains and losses that occur within the river. Additionally, the temporal and spatial patterns observed in the modeled local inflows should be logical and make fundamental hydrologic sense within the river system.
2. The cumulative local inflows will ideally show relatively constant slopes over time. A constant slope generally shows that the local inflow factors are associated with the hydrology of the physical basin due to the geology, geography and hydrography (something relatively unchanging over time). Major inconsistencies and slope changes within the cumulative local inflows can be natural (i.e. natural disaster, or a flooding event that causes a major change in the channel cross-section, etc.) or can be a sign of anthropogenic factors, such as a project coming online that is not adequately represented in the model. In these cases, every effort was made to ensure that the model is accurately representing projects as accurately as possible.

The cumulative local inflow plots are shown in Figure 1 and Figure 2 below. The San Juan River at Farmington, Shiprock, and Four Corners, and the Animas River all show relatively consistent slopes over time. The San Juan River above Navajo and at Bluff both show relatively consistent slopes with the exception of a small variation in the 1980's. These discrepancies have been investigated thoroughly and do not seem to be indicative of a modeling issue. It is suspected that these discrepancies are related to the above average hydrology of the 1980's, which could have in fact produced the increases in local inflows seen during this period, or also possibly have caused gage and measurement issues in the historic data that are reflected in the calculated local inflows.

The local inflows were also examined on an annual basis in an effort to fundamentally understand what the local inflows specifically represent, as shown in Figure 3 and Figure 4 below. Locations along the San Juan River, for example, show an overall negative average monthly local inflow in the summer, showing a loss to the river that is otherwise unaccounted for in the model. Groundwater losses, riparian phreatophyte uses, reach evaporation, and uncertainty in modeled depletions and return flows are all possible model issues that are addressed with the local inflow.

Conversely, the calculated local inflows are generally higher during the spring months and again in the late summer/early fall. These could indicate ungaged local inflows in washes and other tributaries, in the

lower reaches especially, that occur during spring runoff and the rain events that are typical during the later parts of the year.

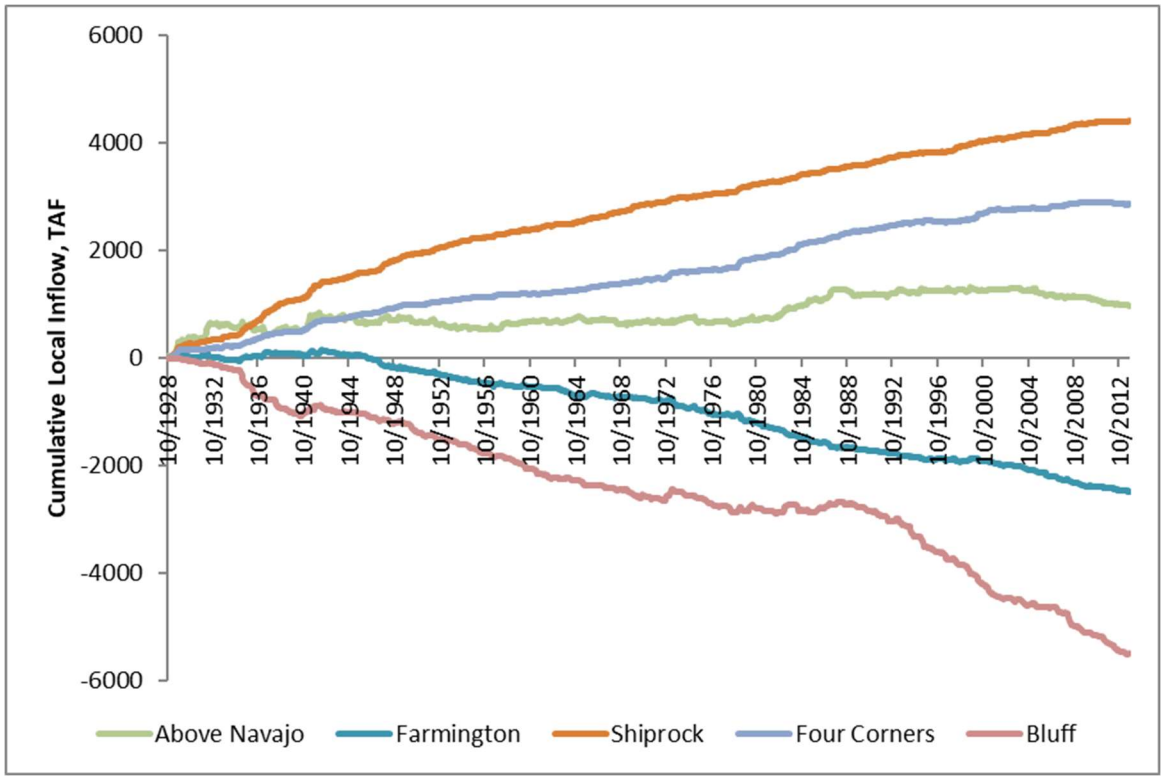

Figure 1: Cumulative Local Inflows at San Juan River Local Inflow Nodes.

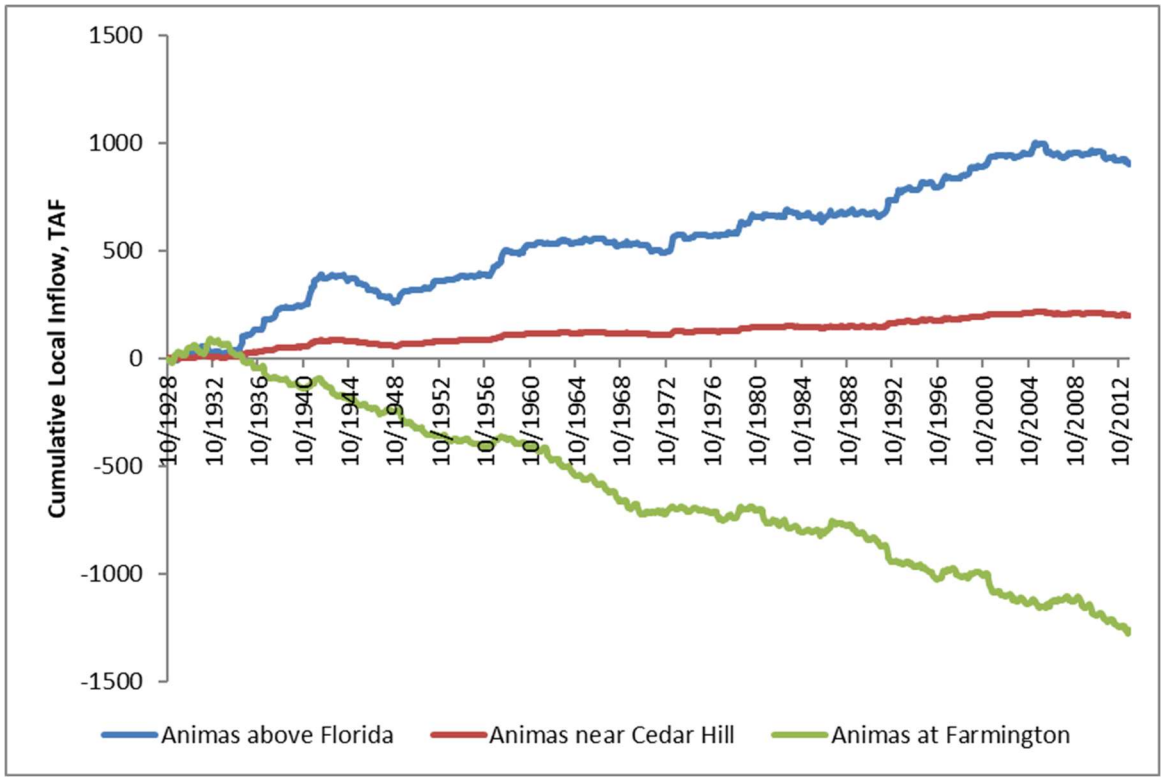

Figure 2: Cumulative Local Inflows at Animas River Local Inflow Nodes.

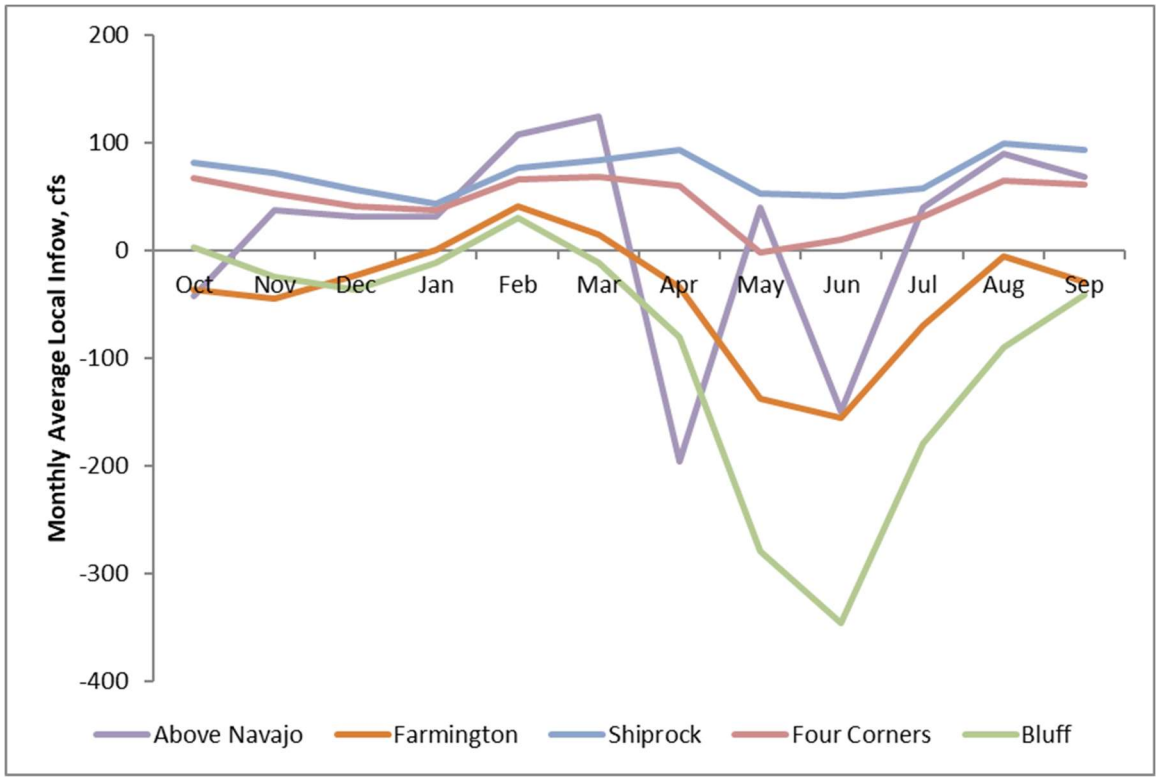

Figure 3: Annual Variations of Average Local Inflows at San Juan River Local Inflow Nodes.

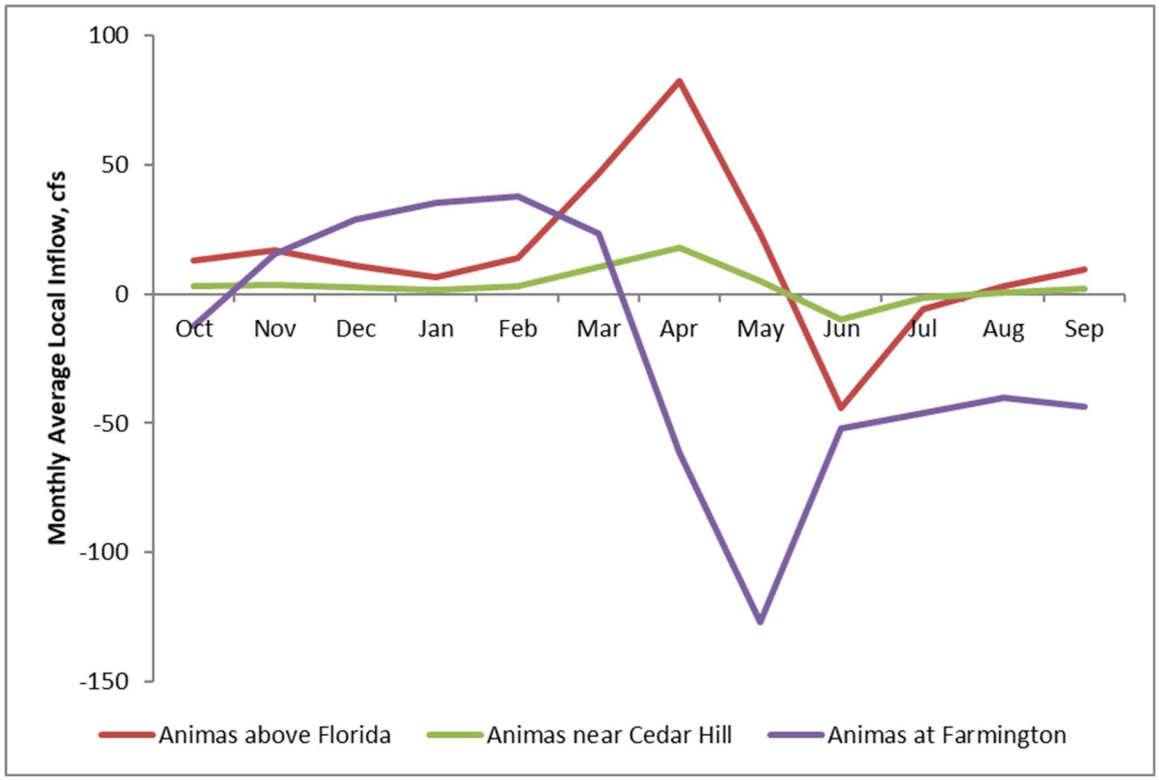

Figure 4: Annual Variations of Average Local Inflows at Animas River Local Inflow Nodes.