

MEMORANDUM

FROM: Jennifer Sukow, IDWR

TO: Rick Raymondi, IDWR

CC: Sean Vincent, IDWR
Allan Wylie, IDWR

DATE: October 31, 2012

RE: Mud Lake perched seepage, pumping, and diversion data for ESPAM2.1

While reviewing the cell-by-cell recharge for the Eastern Snake Plain Aquifer Model Version 2.0 (ESPAM2.0) final report, I noticed that the average annual recharge from Mud Lake seepage was much greater than in ESPAM1.1, but written documentation indicated that the Mud Lake seepage had been calculated using the same method for both models. I obtained the spreadsheet IWRRRI used to calculate the Mud Lake seepage and initially found a unit conversion error in the calculation used for the ESPAM2.0 input data. After further review and comparison with Water District 31 records, I also found errors in the Mud Lake fixed point pumping data, and found additional monthly data available to improve the data sets used for IESW029 (Mud Lake) diversions, Camas Wildlife refuge seepage, and B31 flood control seepage. This memorandum provides recommendations for improving the perched seepage, fixed point, and diversion data sets. Proposed data sets (E1210125A) are compared to ESPAM2.0 E120116A data sets in Figures 1 through 6. Average annual values for the May 1980 through October 2008 simulation period prior to and after the revisions are summarized in Table 1.

The following errors were found in the Mud Lake area data sets.

1. Mud Lake seepage was calculated using inconsistent units. IESW029 diversions and change in Mud Lake contents were in units of AF/month, while all other values were in ft³/month.
2. B31 flood control diversions were added to, rather than subtracted from the seepage.
3. The volume of well water pumped into Mud Lake was about twice the volume recorded by the Water District 31 Watermaster for most years between 1980 and 2000. This is likely the result of assuming that values reported by the Watermaster were in 24-hr cfs when they were actually reported in AF.

The following monthly data were found to be available to replace estimated monthly values.

1. Monthly values for IESW029 diversions, Camas Wildlife Refuge seepage, and B31 flood control seepage are not consistent with Water District 31 Watermaster records for 1980 through 2000. The values for these years were based on annual diversions shaped by average monthly distributions, rather than monthly data recorded by the Watermaster. Monthly values for Camas Wildlife Refuge seepage are also not consistent with Watermaster records for 2005 and 2008.
2. Monthly values for IESW051 (Dubois) diversions are not consistent with Water District 31 Watermaster records for 1993 through 2010. The values for 1980-2000 were based on annual diversions shaped by average monthly distributions, rather than monthly data recorded by the Watermaster, which are available for 1993-2010. The values for 2001-2010 included Camas Wildlife Refuge diversions, which are input into ESPAM as perched seepage at Camas Wildlife Refuge and should be excluded from IESW051 diversions.

The following improvements to the input data are recommended. Data sets have been revised and reviewed by IDWR and IWRRI staff, and are available for recalibration of the ESPAM model.

1. Perform calculations using consistent units.
2. B31 flood control diversions should be subtracted during calculation of Mud Lake seepage.
3. Replace 1980 through 2000 data for Mud Lake well pumping, IESW029 diversions, Camas Wildlife Refuge seepage, and B31 flood control seepage with monthly data obtained from Watermaster records.
4. Replace 1993 through 2010 data for IESW051 diversions with monthly data obtained from Watermaster records. Exclude Camas Wildlife Refuge diversions for all years.
5. Exclude Camas Wildlife diversions from IESW051 diversions for all years.
6. For 2002 through 2010 Mud Lake well pumping data, assume that 20% of pre-May 1 pumping occurs in March and 80% occurs in April, rather than $\frac{1}{2}$ in March and $\frac{1}{2}$ in April. The revised apportionment is based on seven years with recorded pumping volumes for March and April.
7. Replace perched seepage data sets in PCH file with corrected data for Mud Lake, Camas Wildlife Refuge, and B31 Flood Control sites.
8. Replace diversion data sets for IESW029 (Mud Lake) and IESW051 (Dubois) in DIV file.
9. Replace Mud Lake well pumping data set in FPT file.
10. Revise data sets for which minor discrepancies were found by IWRRI after calibration of ESPAM2.0 was completed (Figures 7 through 14).
 - a. Replace average values used for 1980-2001 diversion data for IESW051 and 2002 diversion data for IESW008 with actual data from Water District 33 records (DIV file).

- b. Revise perched seepage data in PCH file for Beaver Creek Reach 2, Birch Creek Hydropower, and Little Lost.
- c. Revise Goose Creek tributary underflow values and replace all tributary underflow values for stress periods 337-342 with new values based on final USGS gage data for Silver Creek.
- d. Revise exchange well pumping data for E6 in FPT file.

Recharge Component	Average Annual Volume in ESPAM2.0 pre-PEST input data set (AF/yr)	Average Annual Volume in revised pre-PEST input data set (AF/yr)
Mud Lake seepage	140,474	8,505
Camas Wildlife Refuge seepage	5,051	7,593
B31 Flood Control seepage	2,998	3,354
IESW029 (Mud Lake) diversions	82,745	83,805
Mud Lake well pumping	-111,422	-70,673
IESW051 (Dubois) diversions	29,738	28,191
Subtotal (Mud Lake area)¹	149,593	60,775
Net change (Mud Lake area)	-88,818	
IESW008 (Blaine) diversions	10,127	10,167
IESW053 (Howe) diversions	16,733	22,753
Exchange wells	-16,475	-16,812
Beaver Creek reach 2 seepage	17,328	17,123
Birch Creek Hydropower seepage	7,735	9,449
Little Lost seepage	22,929	23,300
Goose Creek tributary underflow	22,794	24,237
Other tributary underflow	877,950	878,791
Subtotal (other areas)	959,122	969,009
Net change (other areas)	+9,887	
Net change to model recharge	-78,931	

Table 1. Average annual values for the May 1980 through October 2008 simulation period.

¹ Wetlands evapotranspiration and recharge on non-irrigated lands also contribute to the model water budget in the Mud Lake area. These components were not reviewed or revised, and are not included in Table 1.

Mud Lake Seepage

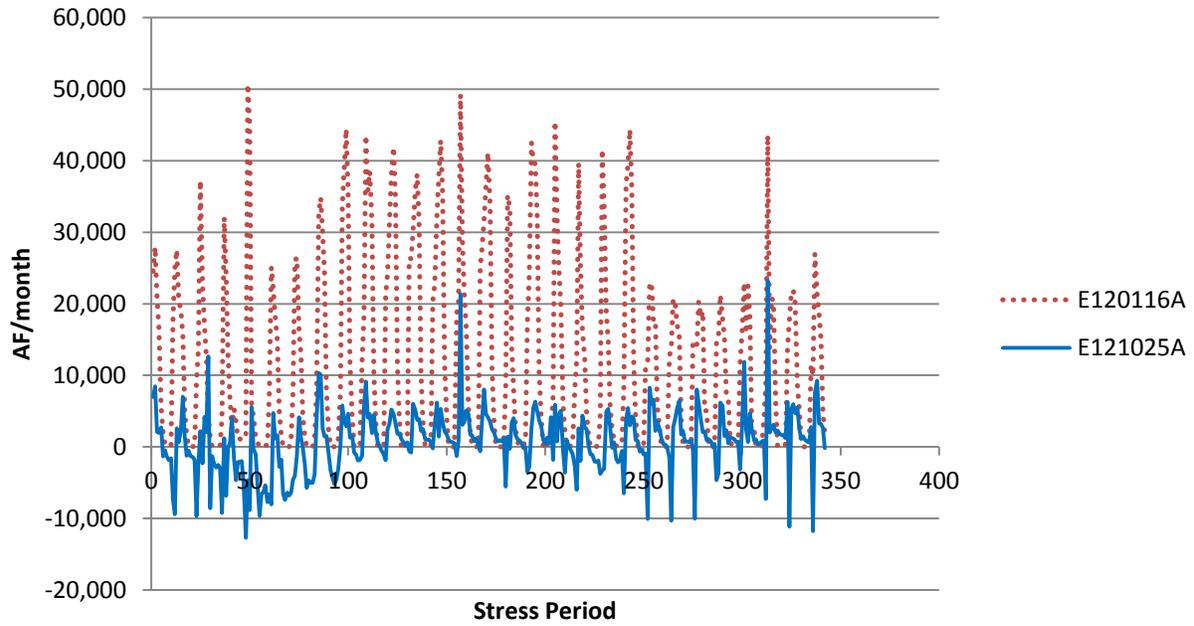


Figure 1.

Camas Wildlife Refuge Seepage

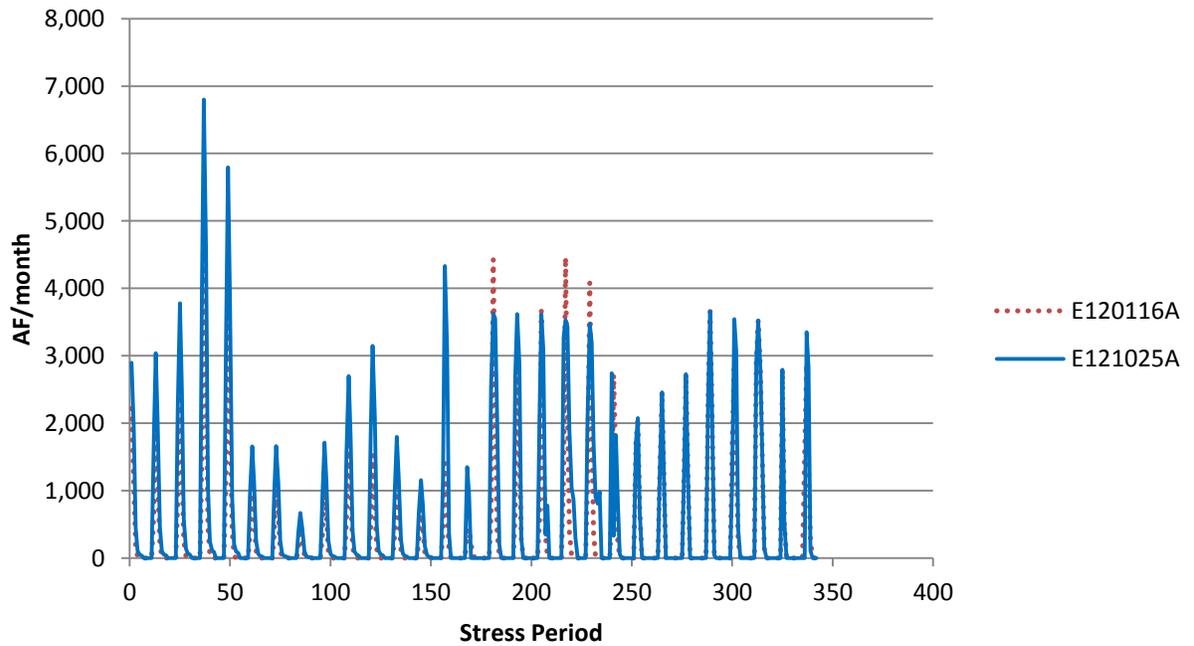


Figure 2.

B31 Flood Seepage

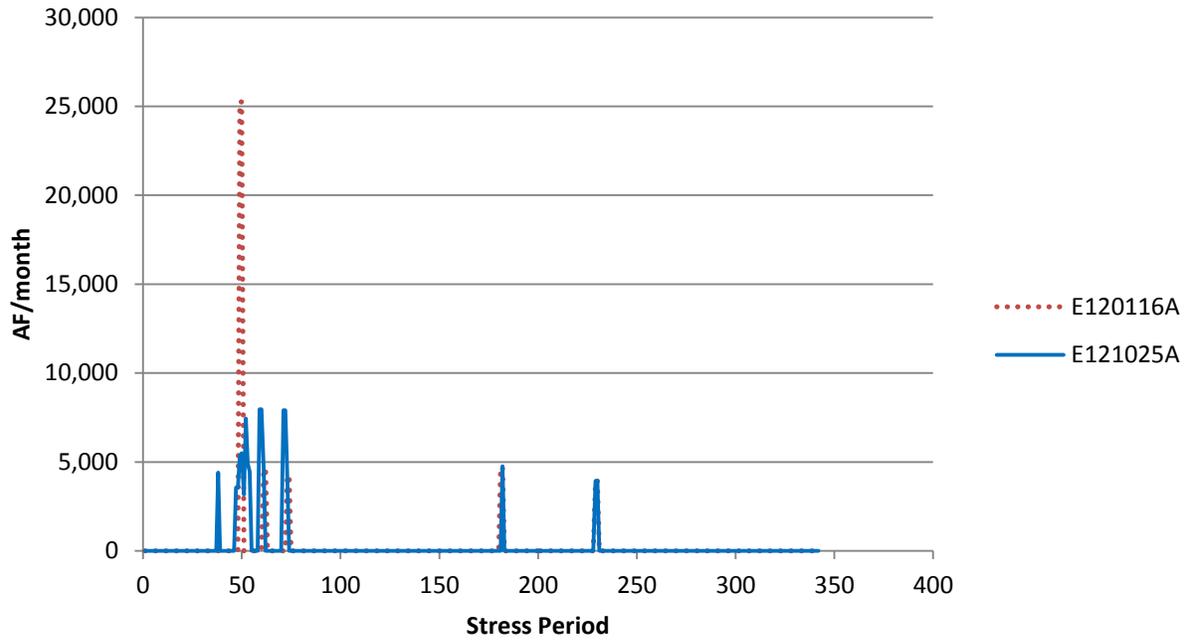


Figure 3.

Mud Lake Diversions

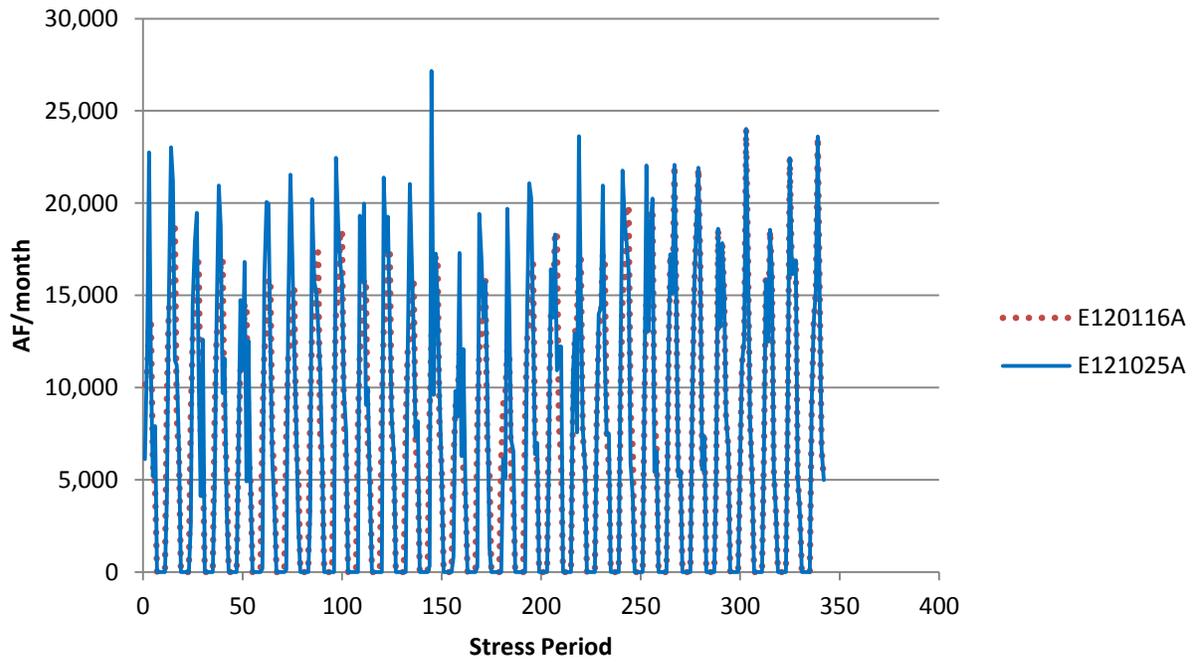


Figure 4.

Mud Lake Pumping

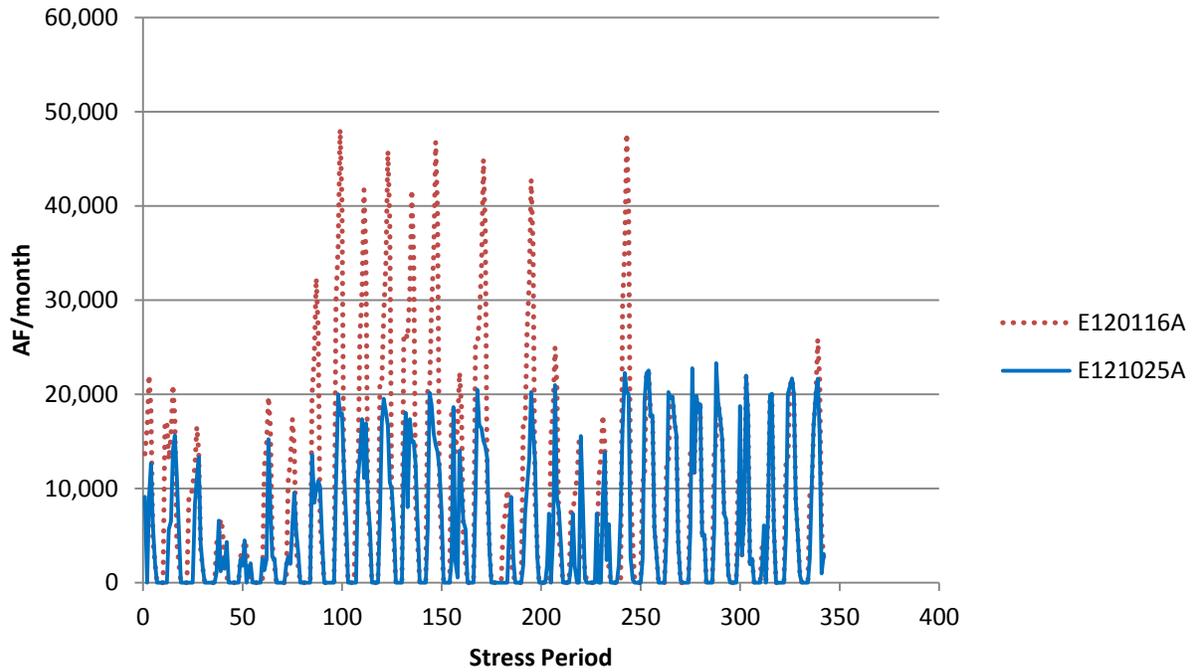


Figure 5.

IESW051 Diversions

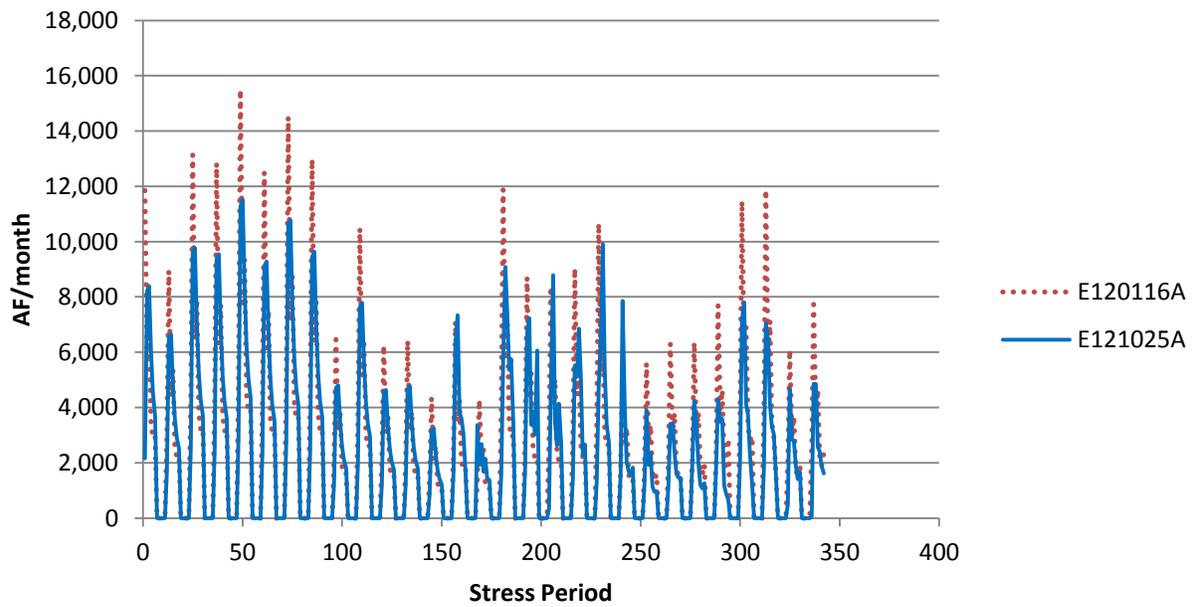


Figure 6.

IESW008 Diversions

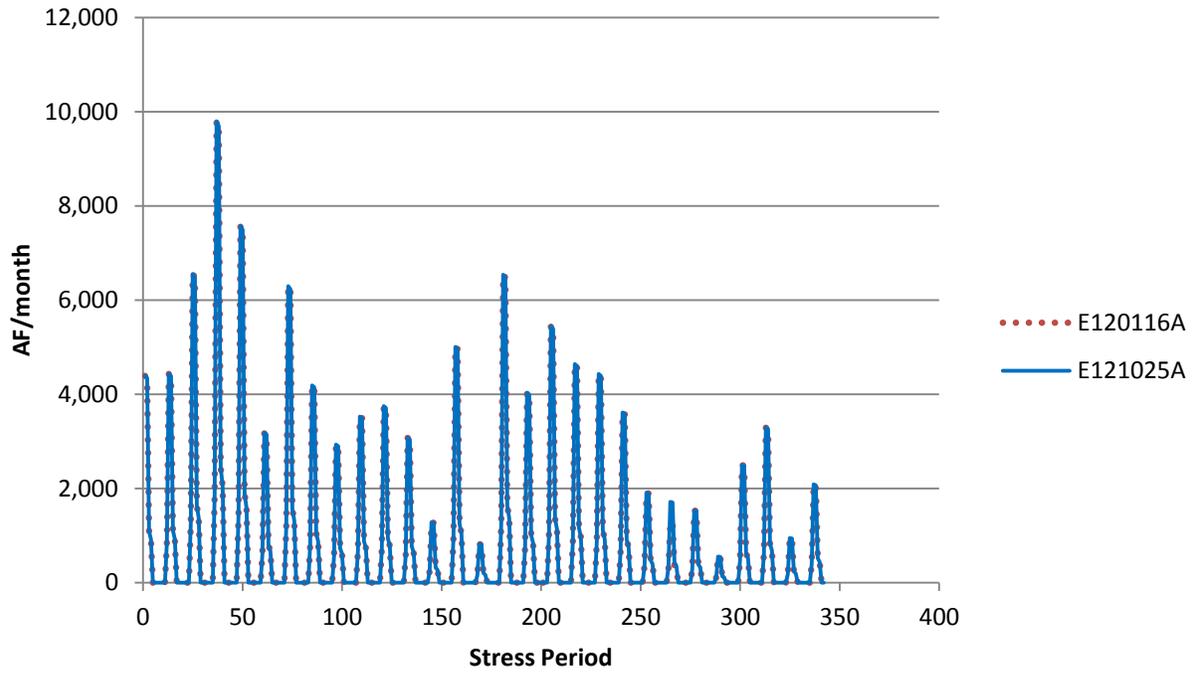


Figure 7.

IESW053 Diversions

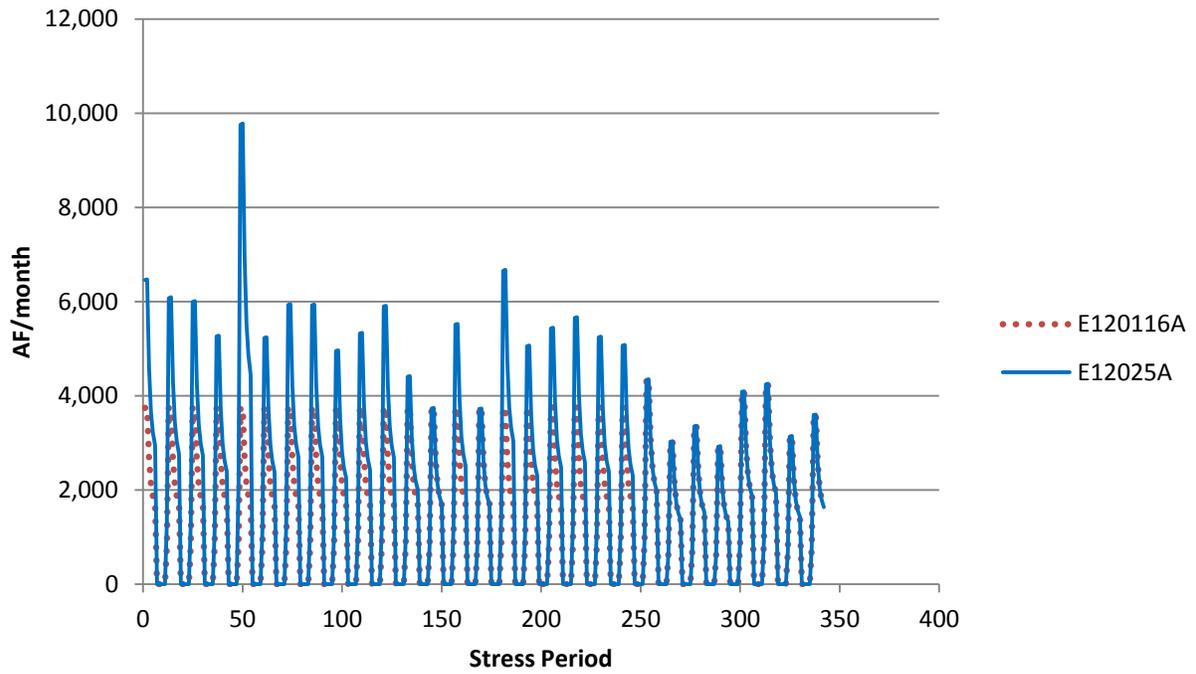


Figure 8.

Exchange Well Pumping

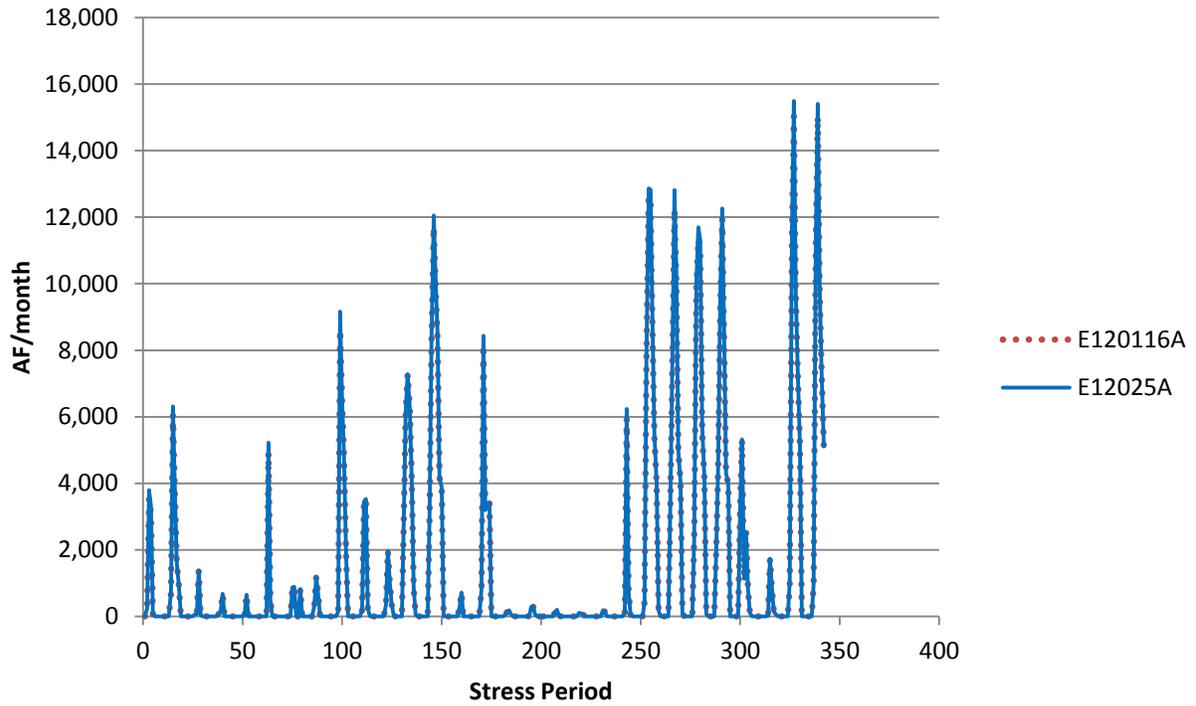


Figure 9.

Beaver Creek Reach 2 Seepage

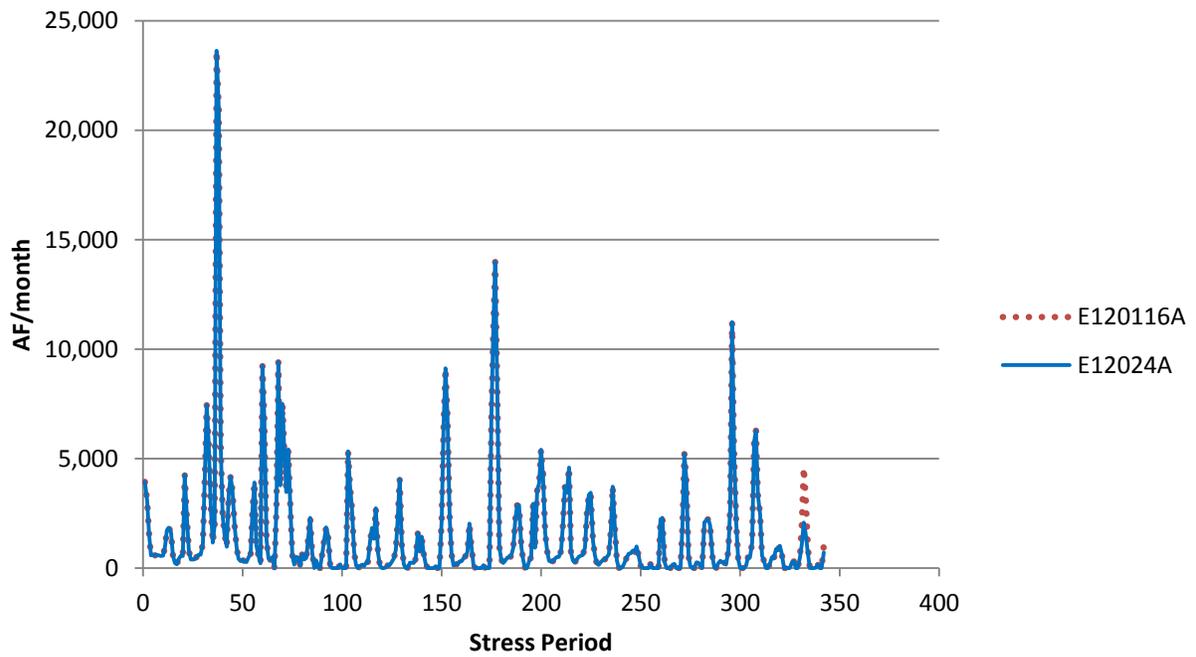


Figure 10.

Birch Creek Hydropower Seepage

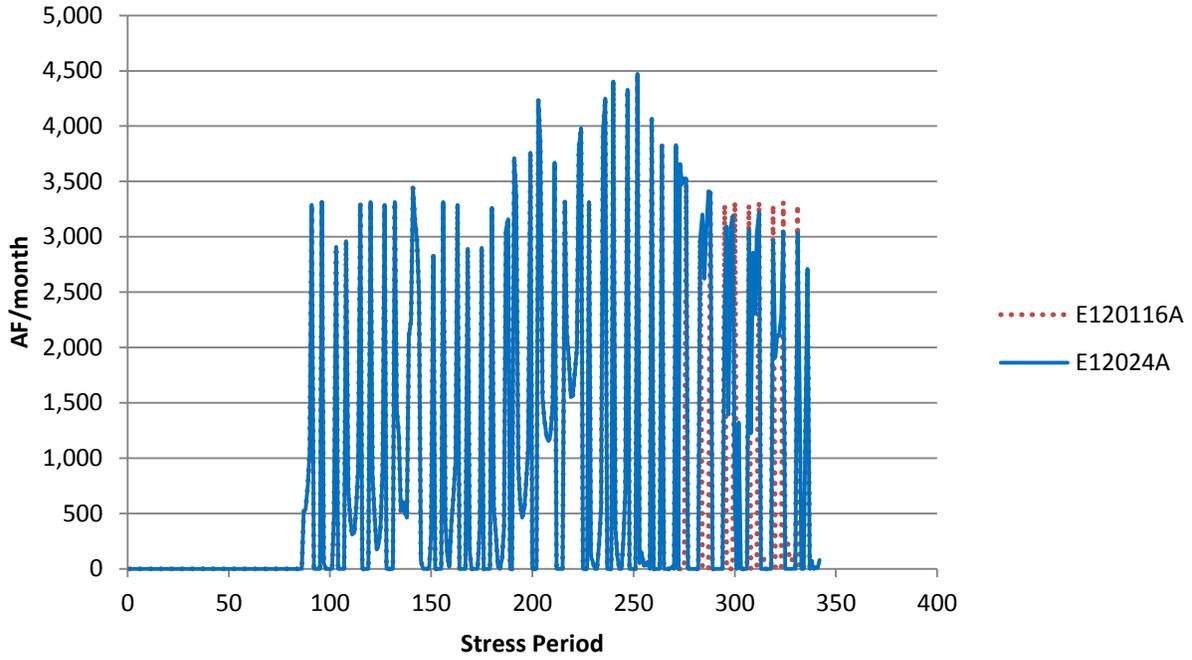


Figure 11.

Little Lost Seepage

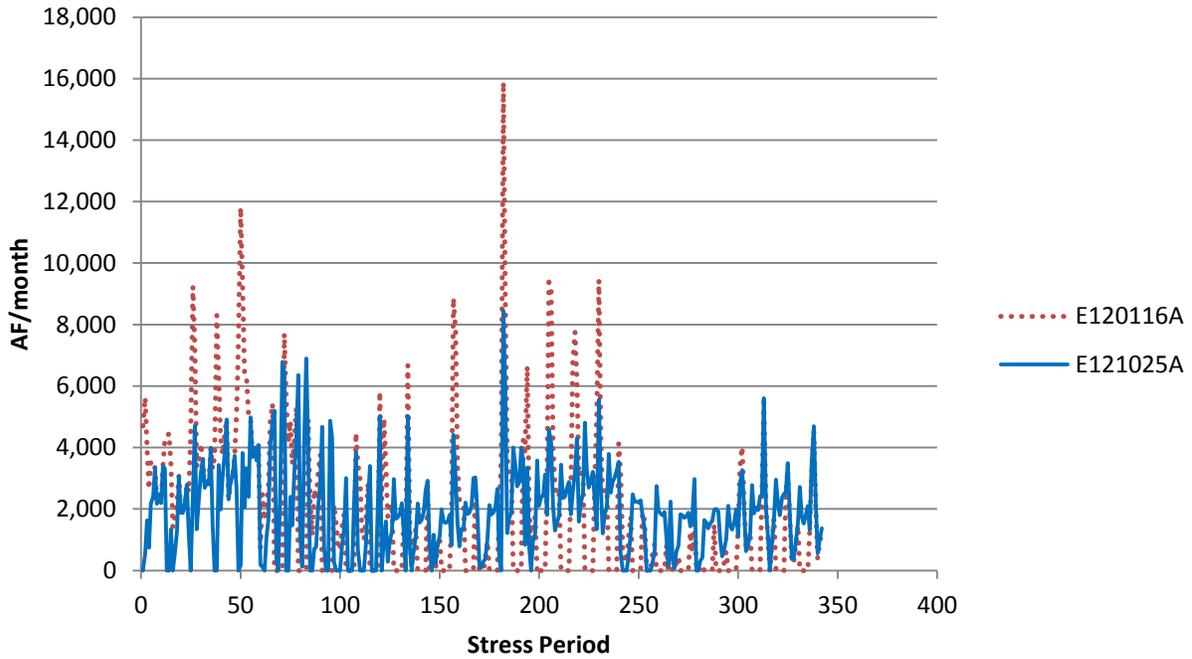


Figure 12.

Goose Creek Tributary Underflow

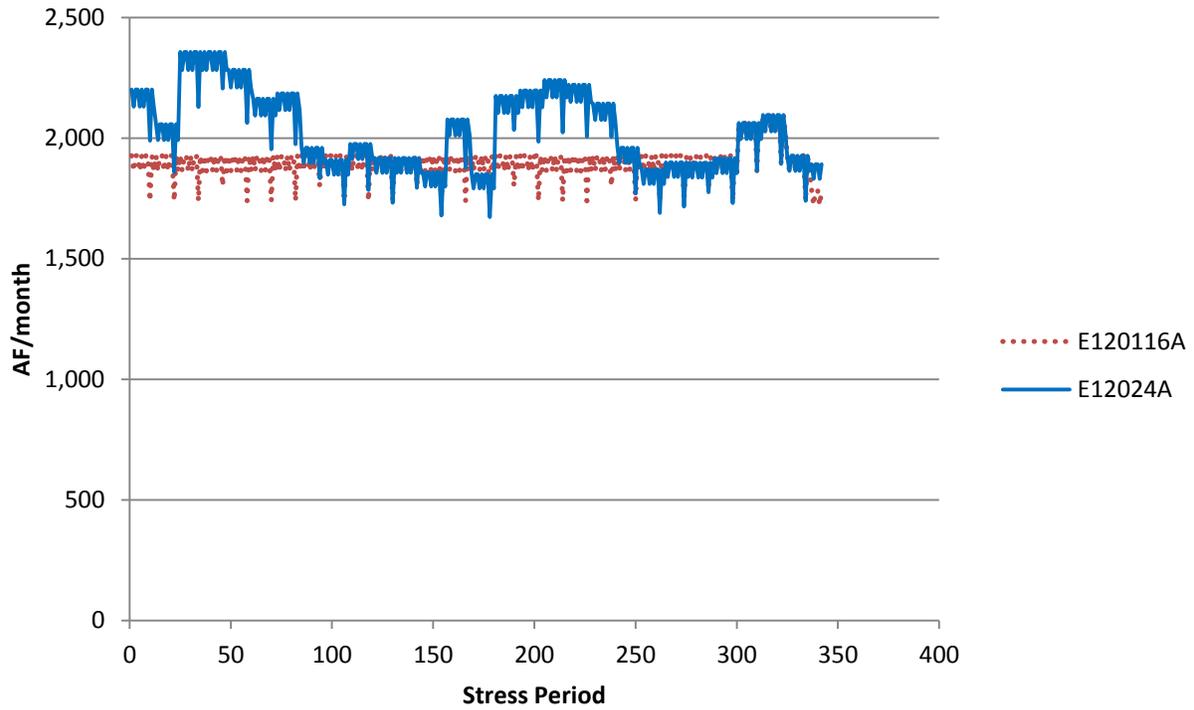


Figure 13.

Tributary Underflow (all basins)

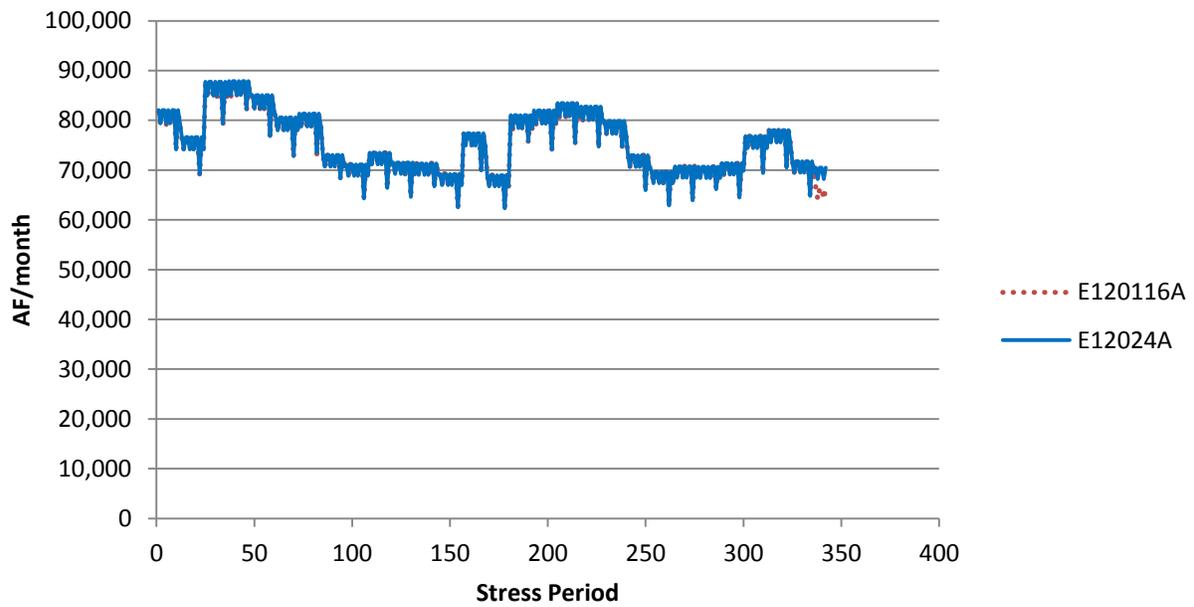


Figure 14.