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USACE Walla Walla District Biological Services: Temperature Monitoring Program at McNary Dam

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		Report Period:	June 24 to 30, 2016
Report No.	MCN TEMP 5-16		

Fish Collection

An estimated 1,153,809 juvenile salmonids were collected, and 1,153,782 juvenile salmonids bypassed the McNary Juvenile Fish Facility (JFF; Table 1), comprising 99.98% subyearling Chinook salmon and 0.02% sockeye salmon. There were total of 27 juvenile system mortalities, comprising 7 sample mortalities and 20 facility mortalities (Figure 1).

River Conditions

Average river flow for this reporting period was 197,300 cubic feet per second (197.3 kcfs), with an average spill of 98.9 kcfs.

Weather Conditions

The weekly average daytime temperature for June 23 to 30 was 76.1 °F. The weekly average nighttime temperature was 69.7 °F. Temperatures ranged from a maximum of 95.4°F from 1930 to 2030 on June 28 to a minimum of 55.0 °F at 0600 on June 25.

Winds averaged 2.9 miles per hour (mph) this week and were predominately from the north (Figure 2). The wind was highest at 1030 on June 24, with winds averaging 16 mph and gusts up to 33 mph.

Probe Operations

The probe positioned at the barge dock was moved to the Unit 1 tailwater at 1330 on June 25. A new probe will be placed at the barge dock when supplies become available next week.

Water Temperatures

Water temperatures trended with air temperatures (Figures 3 and 4). The average gatewell temperature (weekly average of 14 gatewell positions, 66.0 °F) was slightly higher than the average temperatures in the forebay (weekly average of 14 forebay positions, 65.8 °F), collection channel (weekly average of positions at units 1, 8, and 12, 65.3 °F), and JFF (weekly average of the separator, sample tank, and recovery raceway 9W, 65.1 °F). Tailwater 14 had the lowest temperatures.

An increased diurnal pattern in water temperatures was observed on days with little to no wind. The temperature differential was higher on low-wind days within the forebay, gatewells, and, to a lesser extent, the collection channel and JFF (Figure 5). The forebay saw the largest average weekly temperature differential at 6.0 °F. The maximum forebay temperature differential was 12.1 °F at 2130 on June 28 (F7 high; F2 low). Average weekly temperature differential across 14 gatewells was 5.0 °F. The maximum gatewell temperature differential was 10.6 °F at 2100 on June 28 (U10 high; U3 low).

The warmer waters had a smaller effect on differential temperatures through the dam (Figures 6 and 7). The average weekly temperature differential between the gatewells and forebay was 1.8 °F. In eight units, the gatewell was warmer than the forebay on average (Units 2, 4, 5, 9, 10, 11, 12, and 13). In six units, the forebay was warmer than the gatewell on average (Units 1, 3, 6, 7, 8, and 14). The largest temperature differential was 11.8 °F at Unit 3 at 2000 on June 28 (forebay greater than gatewell). The average weekly temperature differential between the gatewell and collection channel was 1.5 °F. The gatewell was warmer than the collection channel at Units 1 and 12. The collection channel was warmer than the gatewell at Unit 8. The largest differential was 6.1 °F at Unit 1 at1430 on June 28.

The spillway temperatures followed the same trends seen in the powerhouse (Figure 8). Spillbay 1 had the highest average weekly temperature, at 67.9 °F. Spillbays 22 and 12 had the lowest weekly temperatures, at 64.4 °F and 64.4 °F, respectively.

Table 1
Bypass, Mortality, and River and Weather Conditions from 0700 June 23 to 0700 June 30

Date	Fish Collected	Fish Bypassed	Mortality		Avg. River Flow	Avg. Turbine Flow	Avg. Spill	Air Temperature		Wind Speed	
			Sample	Facility				Avg.	Max	Avg.	Max
Jun 23 – 24	260,506	260,490	4	12	207.4	98.8	104.0	68.9	80.1	7.0	15.0
Jun 24 – 25					181.7	85.8	91.1	64.0	74.4	7.2	16.0
Jun 25 – 26	333,200	333,196	2	2	194.8	92.6	97.6	67.4	83.0	0.7	3.0
Jun 26 – 27					203.6	96.9	102.0	74.6	89.7	2.1	14.0
Jun 27 – 28	478,503	478,497	1	5	197.4	93.8	99.0	77.6	94.9	2.1	7.0
Jun 28 – 29					205.5	97.8	103.1	79.1	95.4	0.5	4.0
Jun 29 – 30	81,600	81,599	0	1	191.0	90.5	95.7	77.2	93.2	0.5	3.0
Weekly Avg.	**1,153,809**	**1,153,782**	**7**	**20**	**197.3**	**93.7**	**98.9**	**62.4**		**2.9**	

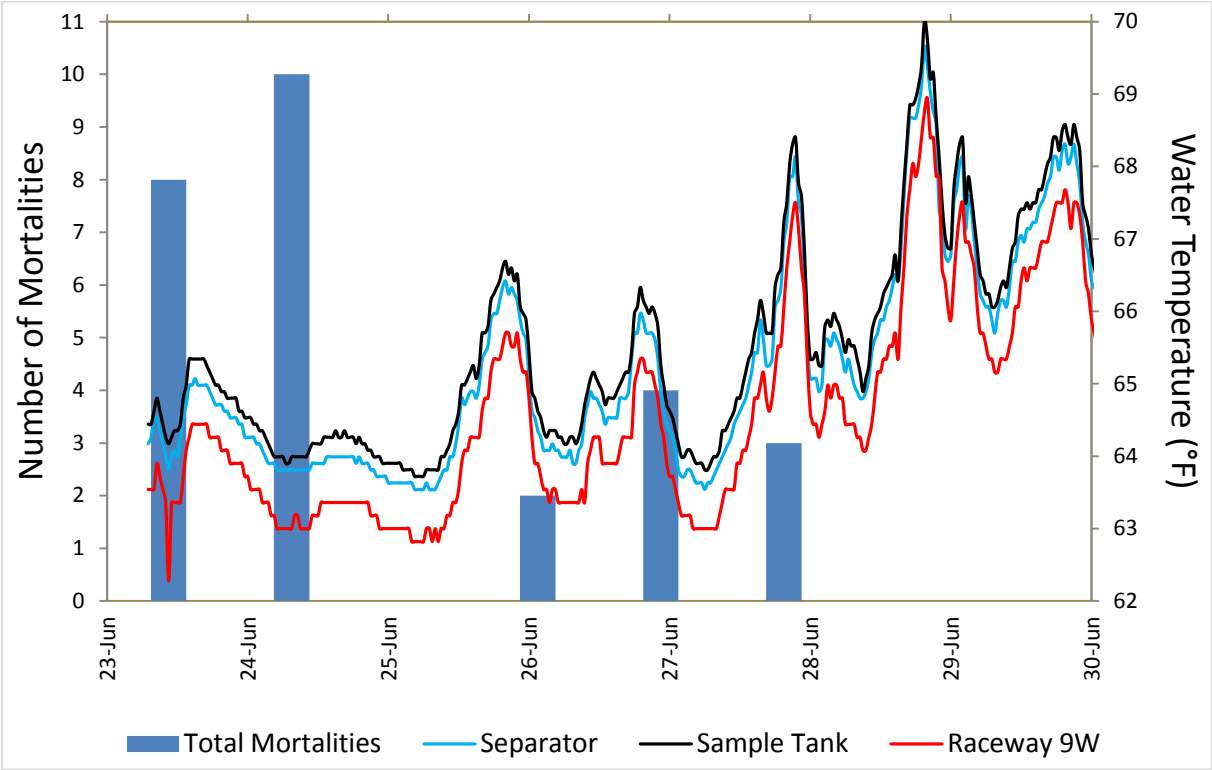

Figure 1
Juvenile Fish Facility Total System Mortalities and Three JFF Water Temperatures from 0700 June 23 to 0700 June 30 (Mortalities Reported as Time when Discovered)

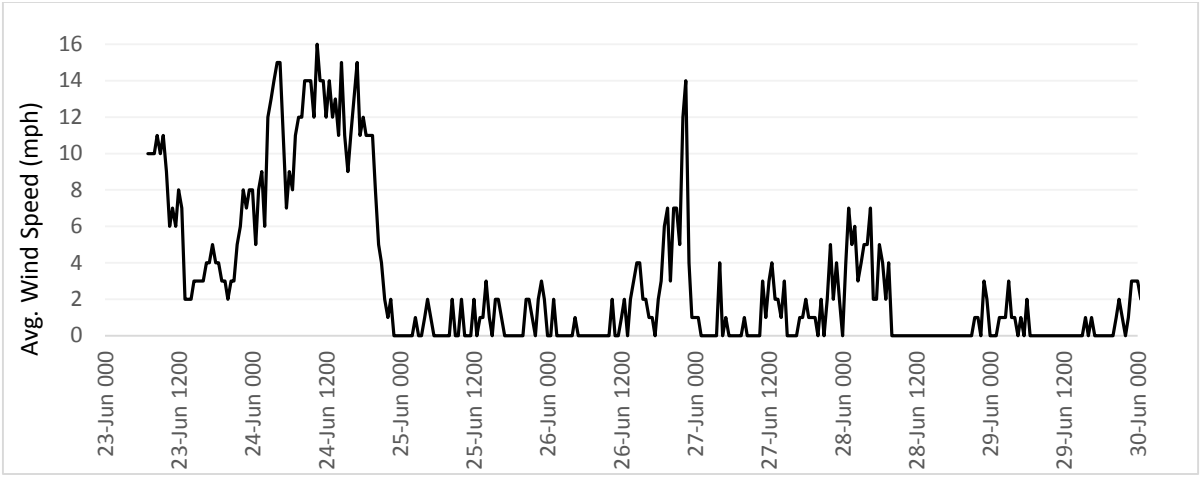

Figure 2

Average Wind Speed from 0700 June 23 to 0700 June 30

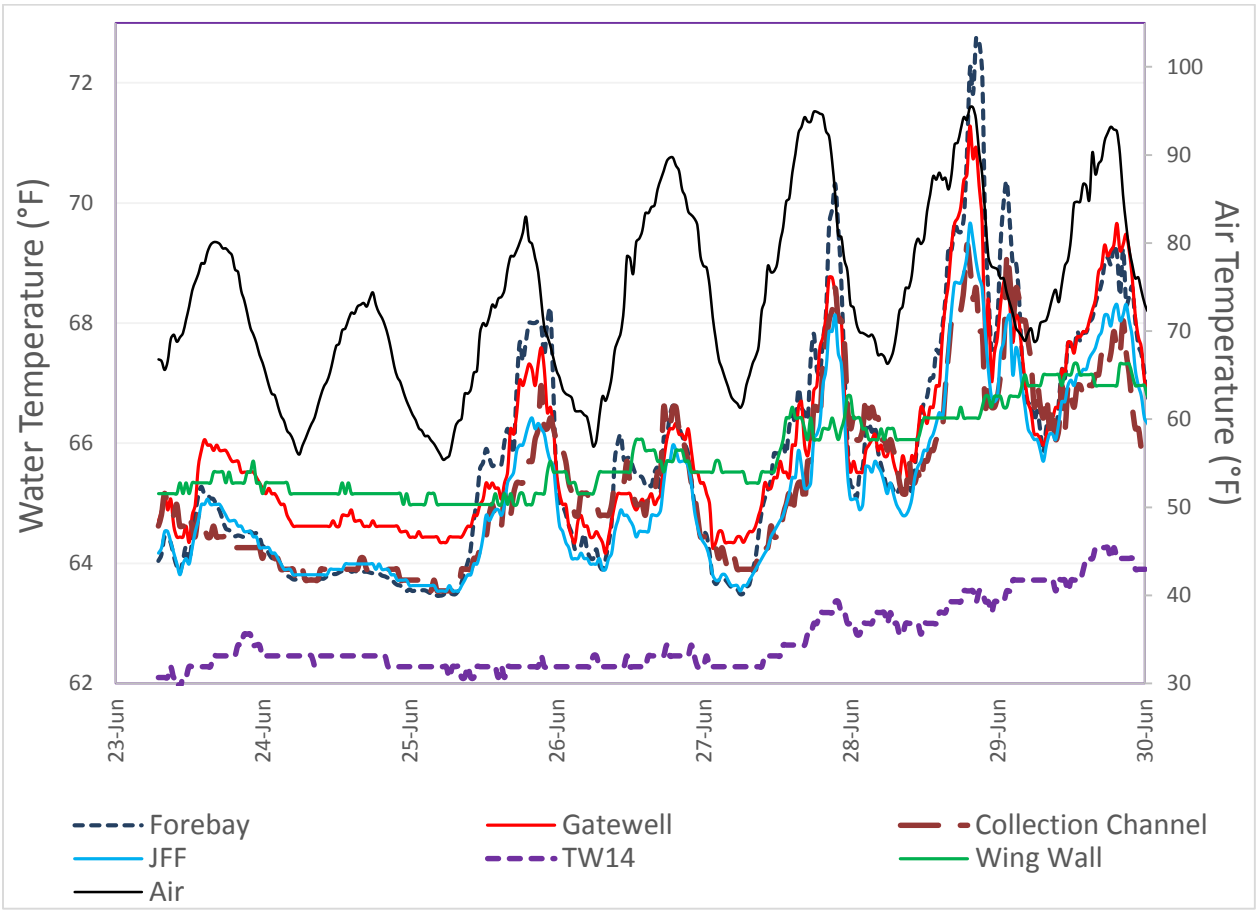

Figure 3

Average Air and Water Temperatures for Six Dam Locations from 0700 June 23 to 0700 June 30

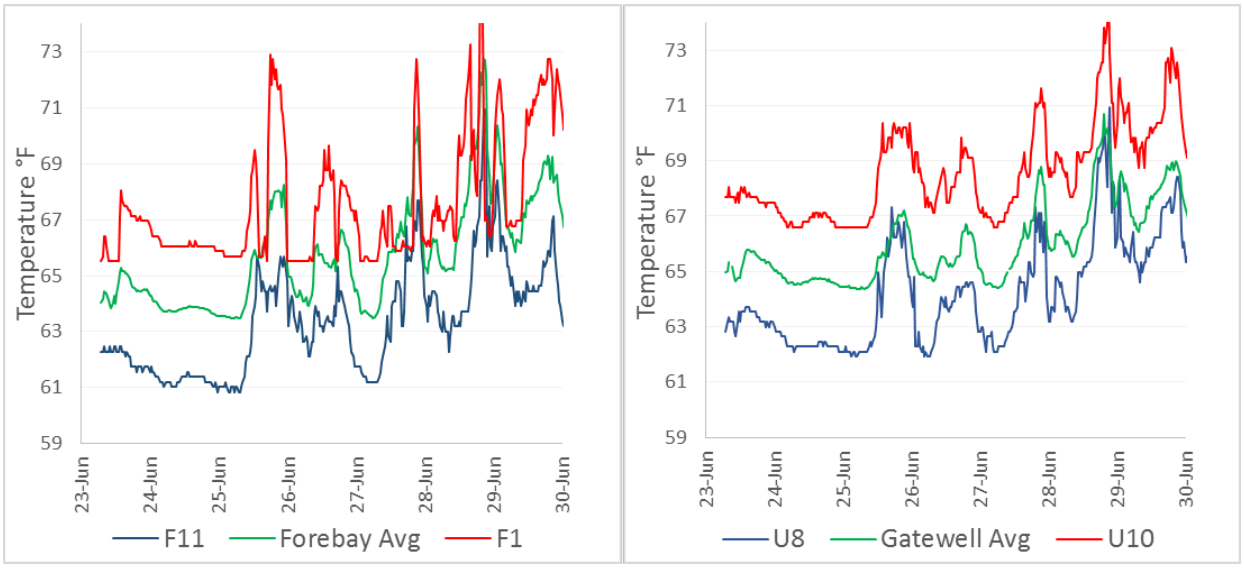

Figure 4

High, Average, and Low Forebay and Gatewell Temperatures from 0700 June 23 to 0700 June 30

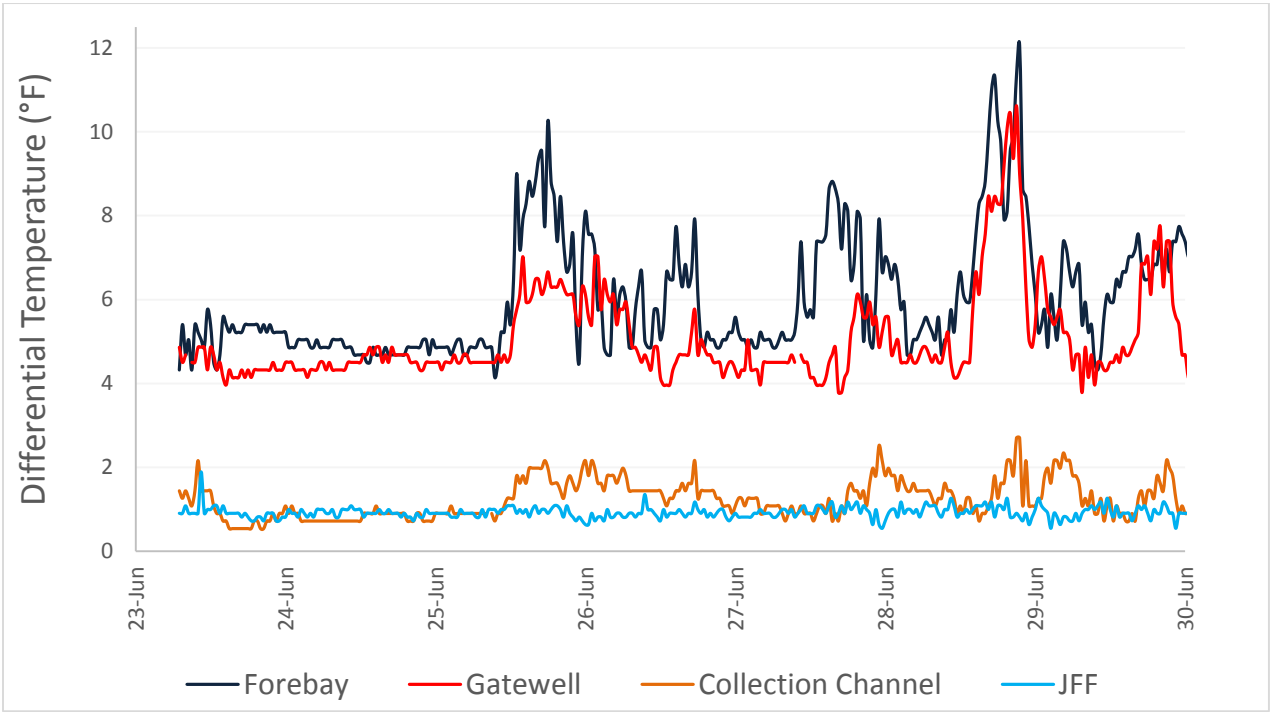

Figure 5

Average Differential Temperatures within Four Dam Locations from 0700 June 23 to 0700 June 30

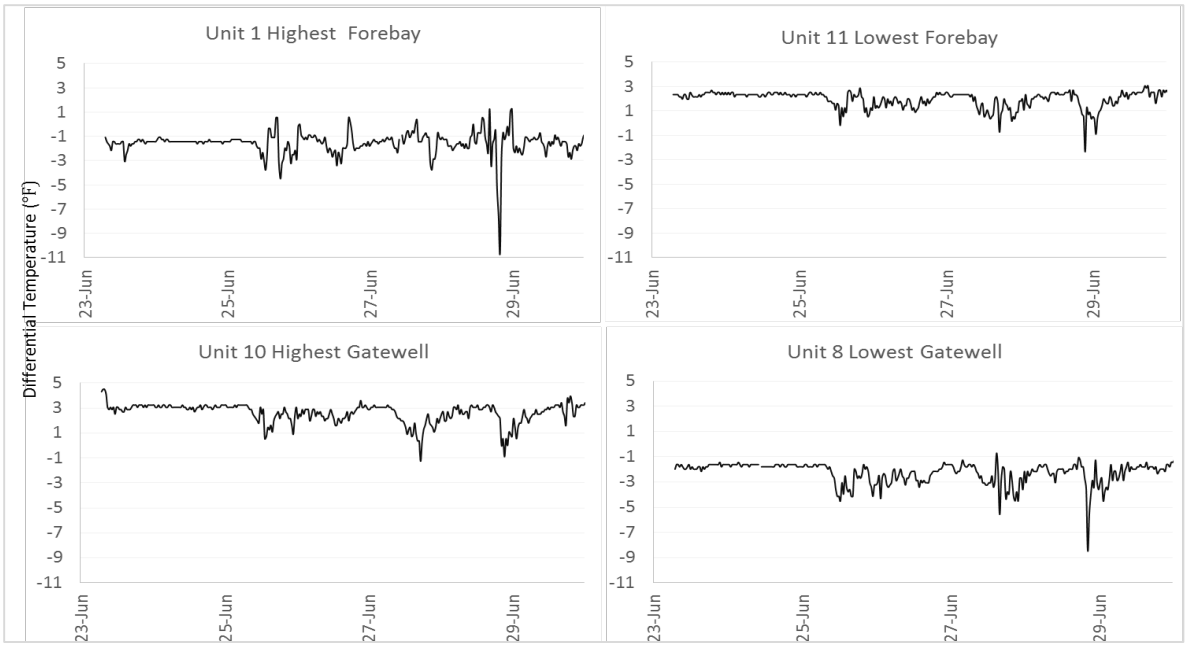

Figure 6

Gatewell and Forebay Differential Temperatures (Gatewell minus Forebay) for Units with the Highest and Lowest Weekly Average Temperature from 0700 June 23 to 0700 June 30

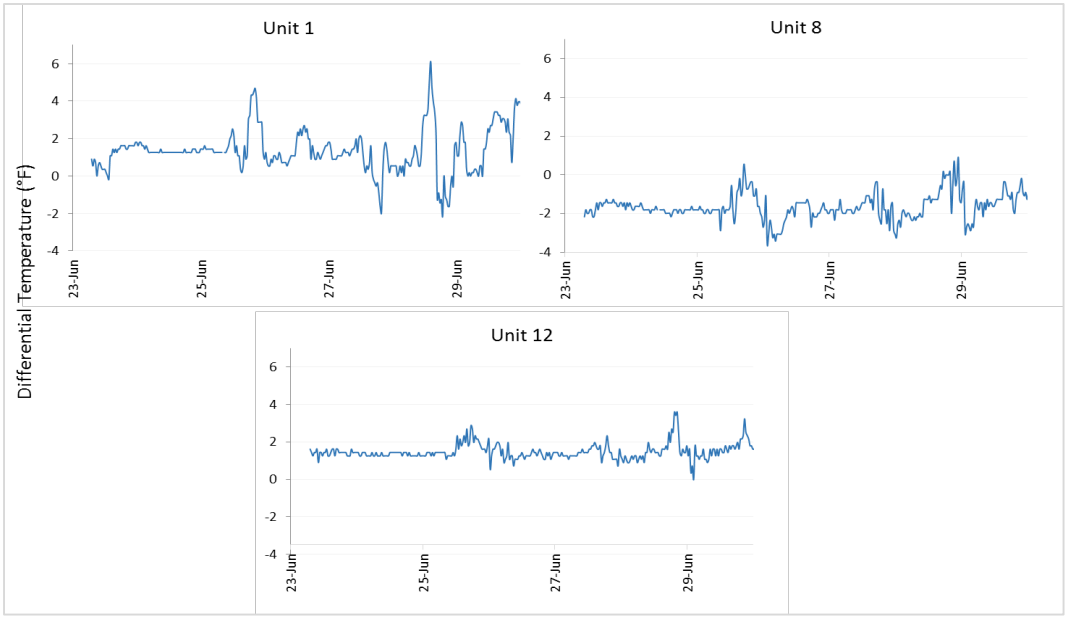

Figure 7

Gatewell and Collection Channel Differential Temperatures (Gatewell minus Collection Channel) for Units 1, 8, and 12 from 0700 June 23 to 0700 June 30

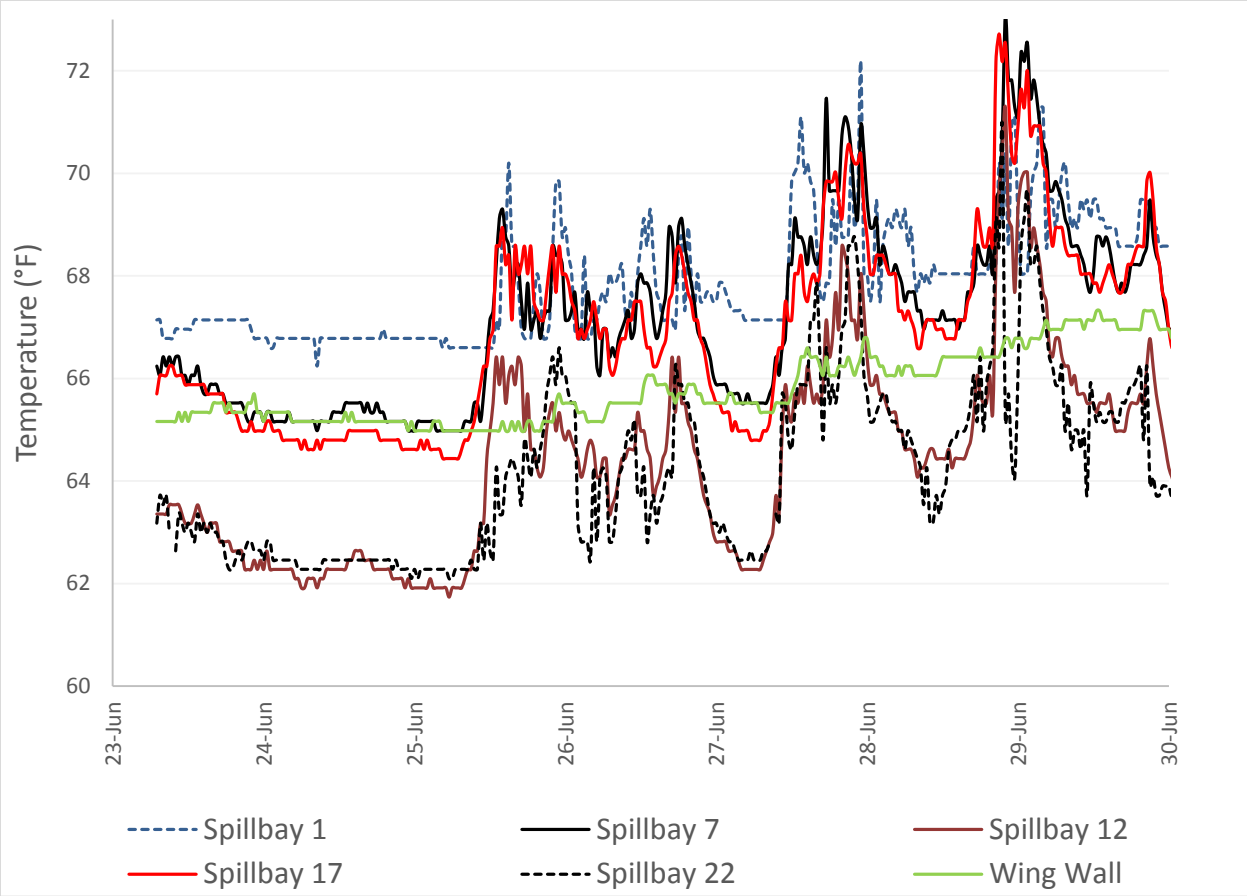

Figure 8

Temperatures for Five Spillbays and the Wing Wall from 0700 June 23 to 0700 June 30