



SUSITNA-WATANA
HYDROELECTRIC PROJECT

Fish Passage Study Data Request
Physical, Hydrologic & Engineering Information
(Items P3 – P5)
Operating Scenarios OS-1b and ILF-1

Prepared by  **MWH**

September 9-11 2014

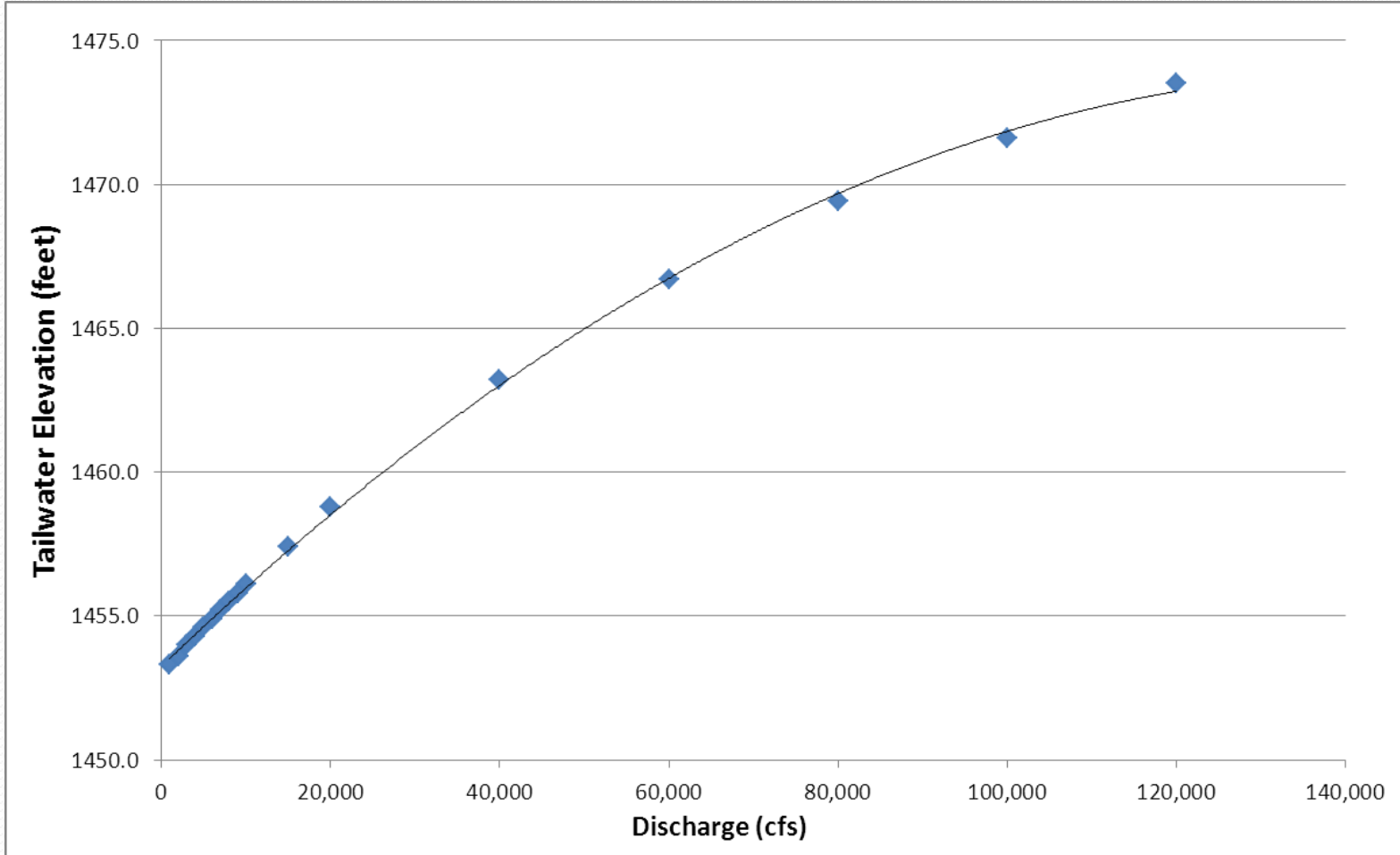


P3 – Tailwater Rating Curve

<u>Discharge</u> <u>(cfs)</u>	<u>Tailwater Elevation</u> <u>(feet)</u>
1,000	1453.3
2,000	1453.6
3,000	1454.0
4,000	1454.3
5,000	1454.6
6,000	1454.9
7,000	1455.2
8,000	1455.5
9,000	1455.8
10,000	1456.1
15,000	1457.4
20,000	1458.8
40,000	1463.2
60,000	1466.7
80,000	1469.4
100,000	1471.6
120,000	1473.5

Note:
The tailwater rating curve used for operations modeling is a preliminary estimate and was based on Figure B.4.2.3 from the 1985 FERC License App., Vol. 2, Exhibit B.

P3 – Tailwater Rating Curve Chart



Brief Summary of Operating Scenarios

- OS-1
 - October 2012 - pre-dates the USGS record extension study
 - Maximum load following case
 - HEC-ResSim.
- Initial fish passage study flow and reservoir elevation data
 - March 2013
 - 61-year flow data set in HEC-ResSim
 - Maximum load following case
 - Allowed the reservoir to reach minimum pool level in a few dry years
- OS-1b
 - March 2014
 - Maximum load following case
 - Includes dry water year rule curve in MWH-ROM
- ILF-1
 - September 2014
 - Intermediate load following case
 - Includes preliminary forecasting in MWH-ROM
- All operating scenarios are preliminary and do not represent a final proposed operation.

OS-1b Maximum Load Following

- Operating scenario OS-1b assumes that the load fluctuation of the entire Railbelt would be provided by the Susitna-Watana Project for the entire year, and that all other sources of electrical power in the Railbelt would be running at base load.
- Includes a dry water year rule curve for the purposes of preventing the reservoir from emptying in dry year sequences. Watana generation would be reduced depending on the distance of the reservoir level below the dry water year rule curve.
- Does not include spring inflow forecasting.
- Normal operating pool is EI 1850 to EI 2050.
- 600 MW at EI 1950.
- 32,000 cfs valve capability; spillway operations begins at EI 2057.6.
- Environmental minimum flows at Gold Creek based on the 1980's Case E-VI, modified to be not less than 3,000 cfs.
- Emergency conditions are excluded

P4 - Monthly Flow Durations – Turbines (1 of 3)

Percentile	Month												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0%	14,531	15,278	11,770	11,105	10,487	18,135	18,135	18,135	18,135	18,135	12,578	14,282	18,135
1%	12,030	12,859	9,736	9,237	9,155	9,565	18,135	18,135	18,135	18,135	10,287	11,976	18,135
2%	11,647	12,432	9,442	9,019	8,854	8,911	18,135	18,135	18,135	16,282	10,001	11,501	18,135
3%	11,424	12,189	9,289	8,867	8,646	8,388	18,135	18,135	18,135	13,081	9,843	11,259	18,135
4%	11,256	12,012	9,168	8,761	8,487	8,096	18,135	18,135	18,135	11,697	9,748	11,094	18,135
5%	11,120	11,872	9,082	8,661	8,346	7,887	18,135	18,135	18,135	10,694	9,654	10,972	18,135
6%	11,009	11,754	9,012	8,588	8,227	7,740	18,135	18,135	18,135	10,155	9,580	10,859	18,135
7%	10,912	11,643	8,952	8,518	8,124	7,587	18,135	18,135	18,135	9,736	9,500	10,764	18,135
8%	10,825	11,548	8,895	8,443	8,035	7,450	18,135	18,135	18,135	9,424	9,416	10,681	16,062
9%	10,743	11,455	8,841	8,387	7,961	7,348	18,135	18,135	18,135	9,257	9,332	10,593	13,210
10%	10,665	11,364	8,794	8,323	7,888	7,230	18,135	18,135	18,135	9,101	9,255	10,520	12,009
11%	10,589	11,281	8,751	8,271	7,813	7,159	18,135	18,135	18,135	8,978	9,184	10,445	11,433
12%	10,524	11,199	8,709	8,218	7,739	7,068	18,135	18,135	18,135	8,859	9,124	10,376	11,041
13%	10,458	11,117	8,671	8,166	7,674	7,010	18,135	18,135	18,135	8,752	9,068	10,308	10,751
14%	10,394	11,040	8,637	8,120	7,605	6,940	18,135	18,135	18,135	8,672	9,012	10,249	10,513
15%	10,334	10,963	8,602	8,078	7,542	6,860	18,135	18,135	18,135	8,577	8,961	10,189	10,306
16%	10,274	10,892	8,567	8,031	7,470	6,800	15,469	18,135	18,135	8,501	8,909	10,132	10,134
17%	10,221	10,824	8,532	7,985	7,406	6,736	10,781	18,135	18,135	8,435	8,849	10,071	9,979
18%	10,167	10,751	8,500	7,944	7,346	6,670	8,856	18,135	18,135	8,354	8,797	10,017	9,834
19%	10,114	10,685	8,465	7,903	7,281	6,620	8,378	18,135	18,135	8,289	8,748	9,956	9,700
20%	10,066	10,616	8,433	7,861	7,221	6,570	8,180	18,135	18,135	8,234	8,704	9,902	9,566
21%	10,019	10,558	8,403	7,818	7,168	6,530	7,923	18,135	18,135	8,176	8,661	9,850	9,436
22%	9,976	10,501	8,372	7,779	7,105	6,470	7,708	18,135	18,135	8,111	8,619	9,804	9,313
23%	9,931	10,447	8,340	7,743	7,046	6,415	7,500	18,135	17,518	8,046	8,579	9,746	9,198
24%	9,886	10,393	8,307	7,709	6,984	6,370	7,300	18,135	16,857	7,987	8,544	9,697	9,091
25%	9,839	10,338	8,272	7,670	6,919	6,330	7,160	18,135	16,209	7,927	8,508	9,640	8,990
26%	9,797	10,288	8,240	7,628	6,858	6,280	7,047	18,135	15,583	7,879	8,476	9,583	8,892
27%	9,751	10,243	8,208	7,592	6,800	6,250	6,916	18,135	15,029	7,836	8,439	9,527	8,796
28%	9,705	10,200	8,177	7,558	6,738	6,190	6,805	18,135	14,469	7,790	8,397	9,468	8,706
29%	9,660	10,154	8,148	7,520	6,676	6,140	6,720	18,135	13,951	7,746	8,354	9,413	8,620
30%	9,615	10,111	8,119	7,484	6,635	6,104	6,647	18,135	13,517	7,710	8,314	9,357	8,538
31%	9,569	10,068	8,088	7,447	6,576	6,090	6,568	18,135	13,137	7,670	8,280	9,305	8,460
32%	9,523	10,028	8,057	7,409	6,519	6,040	6,480	18,135	12,788	7,631	8,246	9,248	8,382
33%	9,480	9,988	8,026	7,374	6,469	5,990	6,422	18,135	12,508	7,598	8,214	9,192	8,305

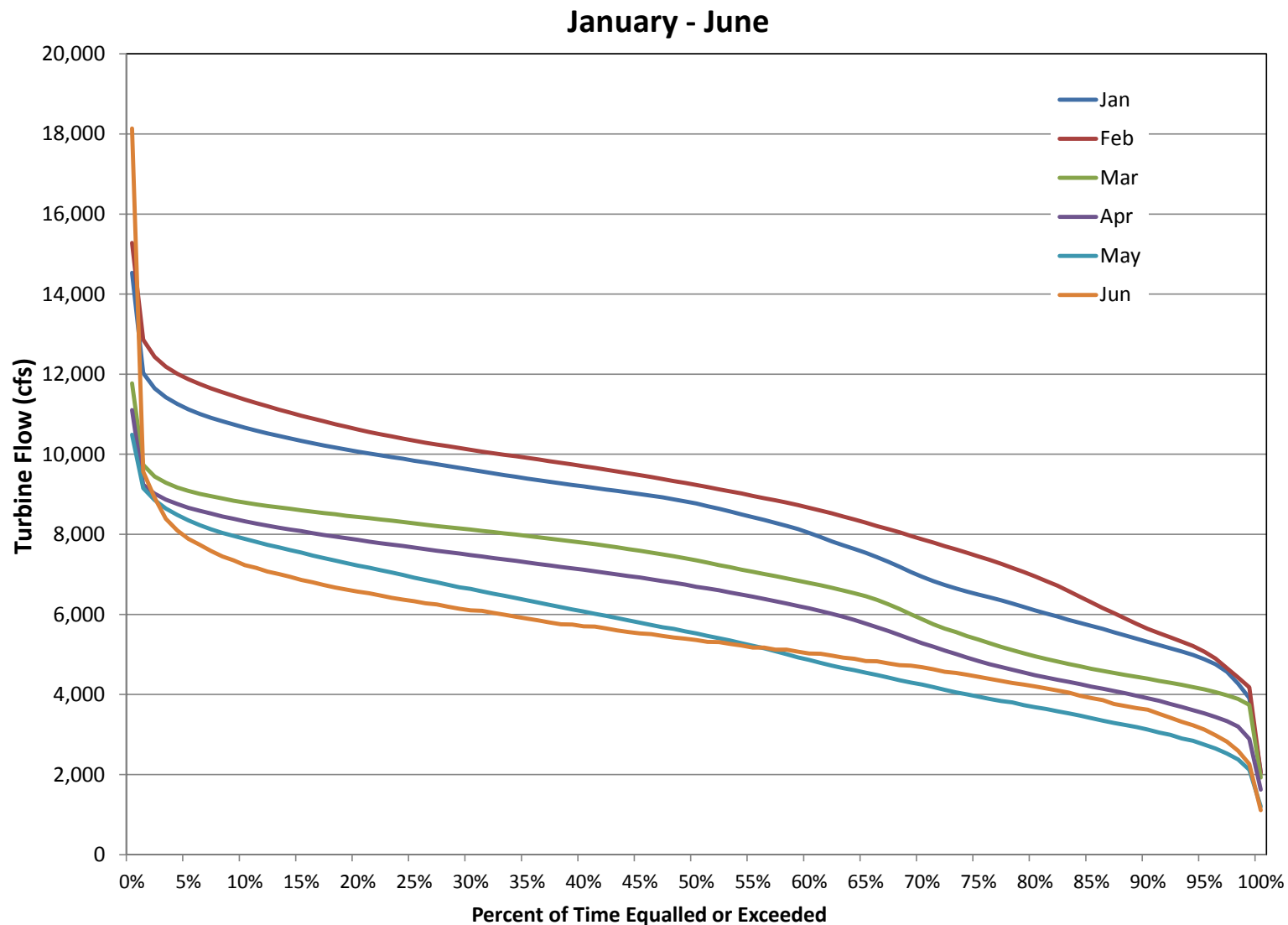
P4 - Monthly Flow Durations – Turbines (2 of 3)

Percentile	Month												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
34%	9,438	9,950	7,994	7,336	6,411	5,940	6,380	18,135	12,215	7,565	8,187	9,131	8,233
35%	9,394	9,910	7,962	7,300	6,355	5,894	6,330	18,135	11,945	7,512	8,161	9,074	8,166
36%	9,353	9,869	7,929	7,261	6,297	5,850	6,285	18,135	11,657	7,470	8,135	9,014	8,098
37%	9,313	9,826	7,892	7,222	6,239	5,800	6,260	18,135	11,398	7,438	8,110	8,959	8,028
38%	9,274	9,784	7,859	7,188	6,179	5,752	6,213	18,135	11,128	7,404	8,085	8,907	7,957
39%	9,233	9,746	7,826	7,153	6,123	5,750	6,147	18,135	10,869	7,361	8,062	8,855	7,884
40%	9,198	9,701	7,791	7,115	6,072	5,700	6,096	18,135	10,623	7,328	8,034	8,800	7,811
41%	9,159	9,659	7,753	7,078	6,017	5,694	6,049	18,135	10,381	7,296	8,007	8,750	7,737
42%	9,121	9,616	7,715	7,038	5,962	5,650	6,010	18,135	10,157	7,267	7,977	8,696	7,661
43%	9,084	9,572	7,675	6,997	5,908	5,600	5,990	18,135	9,978	7,242	7,946	8,645	7,585
44%	9,044	9,525	7,632	6,957	5,848	5,560	5,940	18,135	9,797	7,214	7,917	8,592	7,504
45%	9,003	9,479	7,589	6,921	5,792	5,523	5,900	18,135	9,619	7,181	7,878	8,545	7,428
46%	8,964	9,431	7,545	6,875	5,736	5,510	5,883	18,135	9,448	7,139	7,838	8,497	7,352
47%	8,922	9,383	7,501	6,833	5,680	5,460	5,850	18,135	9,269	7,096	7,787	8,449	7,282
48%	8,872	9,329	7,451	6,790	5,638	5,420	5,824	18,135	9,074	7,048	7,729	8,404	7,212
49%	8,823	9,284	7,399	6,743	5,578	5,392	5,772	17,598	8,870	6,989	7,645	8,355	7,144
50%	8,768	9,230	7,348	6,691	5,524	5,360	5,750	17,097	8,663	6,940	7,556	8,306	7,072
51%	8,703	9,179	7,291	6,646	5,464	5,316	5,700	16,365	8,471	6,895	7,466	8,253	7,000
52%	8,638	9,125	7,233	6,601	5,403	5,308	5,650	15,624	8,290	6,851	7,387	8,209	6,925
53%	8,569	9,071	7,178	6,546	5,346	5,260	5,650	14,873	8,137	6,798	7,320	8,146	6,854
54%	8,498	9,019	7,118	6,495	5,278	5,220	5,650	14,194	7,999	6,739	7,263	8,082	6,781
55%	8,429	8,959	7,064	6,441	5,220	5,170	5,600	13,538	7,848	6,681	7,200	7,997	6,712
56%	8,358	8,904	7,011	6,385	5,157	5,170	5,590	12,887	7,704	6,612	7,149	7,894	6,638
57%	8,287	8,850	6,955	6,327	5,082	5,120	5,560	12,251	7,555	6,555	7,102	7,782	6,566
58%	8,213	8,791	6,901	6,271	5,008	5,120	5,510	11,687	7,421	6,489	7,048	7,667	6,491
59%	8,134	8,729	6,845	6,212	4,927	5,070	5,510	11,134	7,297	6,430	6,980	7,563	6,421
60%	8,035	8,663	6,786	6,150	4,865	5,021	5,460	10,533	7,187	6,370	6,911	7,460	6,350
61%	7,933	8,595	6,728	6,086	4,790	5,020	5,455	9,901	7,079	6,310	6,842	7,357	6,280
62%	7,826	8,524	6,668	6,018	4,720	4,970	5,410	9,115	6,983	6,250	6,776	7,269	6,209
63%	7,727	8,444	6,600	5,942	4,659	4,920	5,360	8,389	6,886	6,177	6,715	7,180	6,140
64%	7,636	8,371	6,532	5,859	4,604	4,893	5,360	7,931	6,804	6,110	6,640	7,094	6,058
65%	7,540	8,289	6,454	5,771	4,545	4,836	5,310	7,572	6,731	6,017	6,542	7,002	5,989
66%	7,433	8,206	6,365	5,678	4,486	4,830	5,310	7,330	6,655	5,894	6,437	6,906	5,902

P4 - Monthly Flow Duration - Turbines (3 of 3)

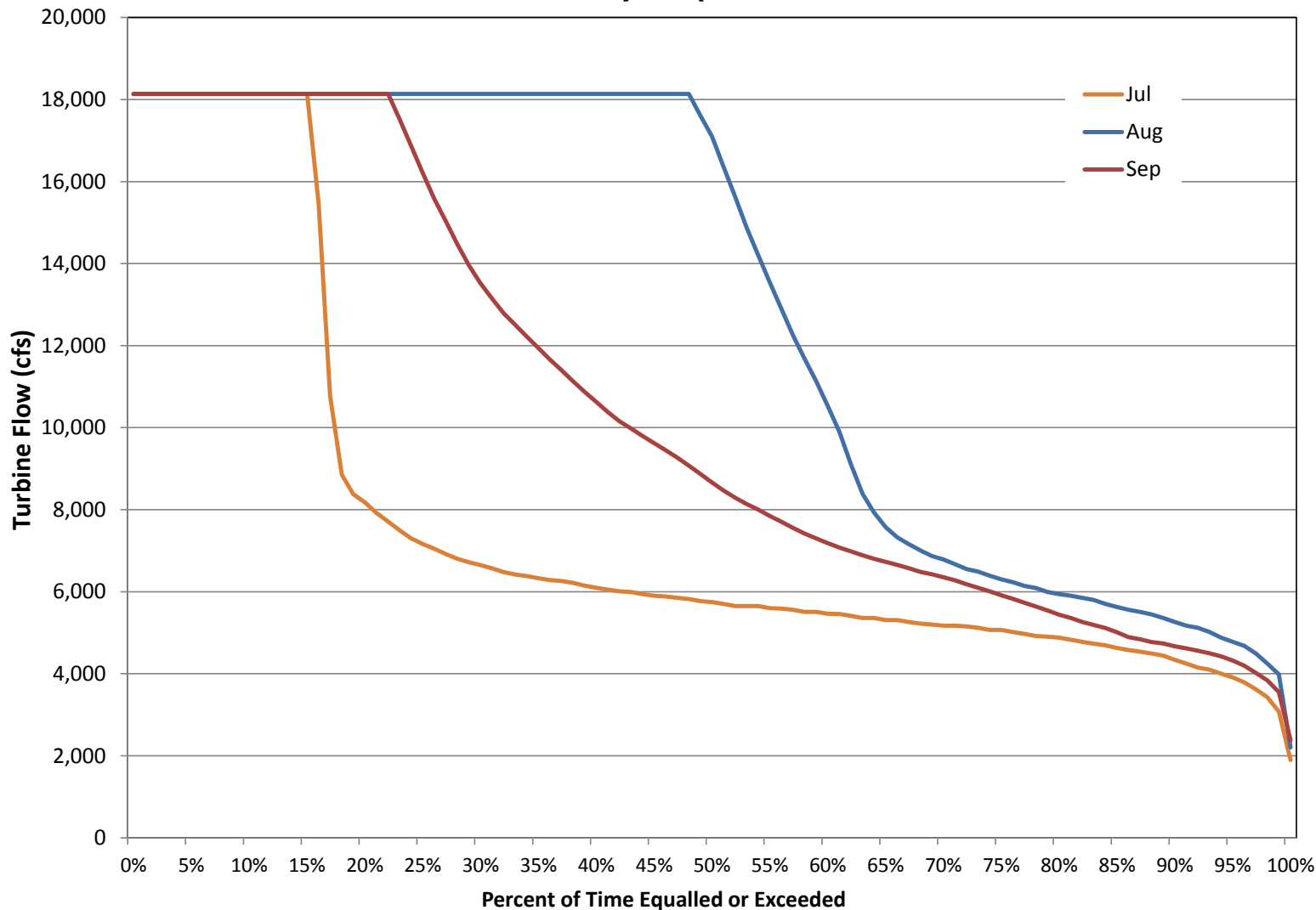
Percentile	Month												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67%	7,318	8,130	6,255	5,586	4,426	4,780	5,260	7,160	6,573	5,790	6,312	6,806	5,847
68%	7,191	8,049	6,136	5,485	4,357	4,730	5,220	7,010	6,486	5,614	6,106	6,706	5,762
69%	7,059	7,959	6,007	5,382	4,299	4,718	5,199	6,870	6,424	5,488	5,905	6,602	5,700
70%	6,940	7,873	5,879	5,280	4,247	4,680	5,170	6,784	6,350	5,362	5,797	6,506	5,639
71%	6,829	7,794	5,752	5,193	4,184	4,630	5,170	6,670	6,278	5,255	5,669	6,411	5,562
72%	6,735	7,704	5,647	5,098	4,115	4,565	5,157	6,552	6,181	5,185	5,580	6,317	5,510
73%	6,649	7,623	5,557	5,013	4,054	4,540	5,120	6,489	6,097	5,092	5,509	6,236	5,442
74%	6,569	7,536	5,458	4,918	4,000	4,490	5,070	6,394	6,011	5,005	5,418	6,148	5,366
75%	6,497	7,446	5,369	4,834	3,943	4,440	5,070	6,300	5,914	4,926	5,328	6,059	5,310
76%	6,428	7,364	5,278	4,757	3,890	4,390	5,020	6,230	5,827	4,861	5,233	5,957	5,237
77%	6,353	7,266	5,191	4,687	3,836	4,340	4,970	6,143	5,730	4,809	5,147	5,857	5,170
78%	6,274	7,164	5,107	4,617	3,800	4,290	4,920	6,090	5,642	4,787	5,079	5,778	5,120
79%	6,189	7,059	5,026	4,548	3,733	4,250	4,901	5,990	5,540	4,743	5,012	5,700	5,064
80%	6,103	6,951	4,956	4,484	3,684	4,200	4,880	5,940	5,438	4,701	4,941	5,628	4,986
81%	6,023	6,831	4,888	4,426	3,639	4,150	4,830	5,900	5,360	4,666	4,873	5,564	4,913
82%	5,946	6,716	4,823	4,369	3,578	4,100	4,780	5,850	5,263	4,634	4,804	5,497	4,831
83%	5,863	6,579	4,764	4,313	3,529	4,050	4,730	5,800	5,189	4,585	4,747	5,432	4,780
84%	5,788	6,437	4,701	4,257	3,470	3,967	4,690	5,700	5,113	4,537	4,700	5,373	4,715
85%	5,712	6,302	4,642	4,197	3,407	3,910	4,630	5,629	5,011	4,491	4,658	5,312	4,647
86%	5,638	6,161	4,589	4,143	3,345	3,860	4,580	5,560	4,890	4,444	4,617	5,254	4,580
87%	5,554	6,033	4,536	4,088	3,292	3,760	4,540	5,510	4,840	4,398	4,576	5,195	4,516
88%	5,473	5,896	4,489	4,030	3,240	3,710	4,490	5,448	4,773	4,350	4,538	5,129	4,440
89%	5,396	5,766	4,441	3,969	3,186	3,660	4,440	5,360	4,740	4,296	4,496	5,053	4,375
90%	5,312	5,640	4,395	3,906	3,126	3,620	4,340	5,260	4,671	4,235	4,456	4,935	4,296
91%	5,232	5,531	4,341	3,840	3,052	3,520	4,250	5,170	4,619	4,180	4,420	4,811	4,216
92%	5,152	5,430	4,293	3,765	2,990	3,420	4,150	5,120	4,564	4,111	4,381	4,696	4,137
93%	5,074	5,319	4,244	3,690	2,904	3,320	4,100	5,020	4,500	4,041	4,340	4,595	4,032
94%	4,988	5,210	4,185	3,610	2,843	3,230	4,000	4,880	4,423	3,976	4,300	4,483	3,916
95%	4,883	5,070	4,126	3,526	2,750	3,122	3,910	4,780	4,321	3,904	4,253	4,345	3,805
96%	4,757	4,897	4,058	3,440	2,650	2,980	3,789	4,680	4,196	3,836	4,204	4,183	3,660
97%	4,568	4,657	3,979	3,337	2,524	2,823	3,620	4,490	4,021	3,756	4,138	3,923	3,457
98%	4,268	4,425	3,890	3,195	2,375	2,591	3,423	4,250	3,836	3,673	4,056	3,709	3,180
99%	3,908	4,177	3,740	2,889	2,120	2,260	3,080	3,983	3,554	3,494	3,906	3,094	2,792
100%	2,056	2,039	1,925	1,622	1,200	1,112	1,897	2,203	2,377	1,971	1,936	1,723	1,112

P4 – Monthly Flow Duration Curves – Turbines



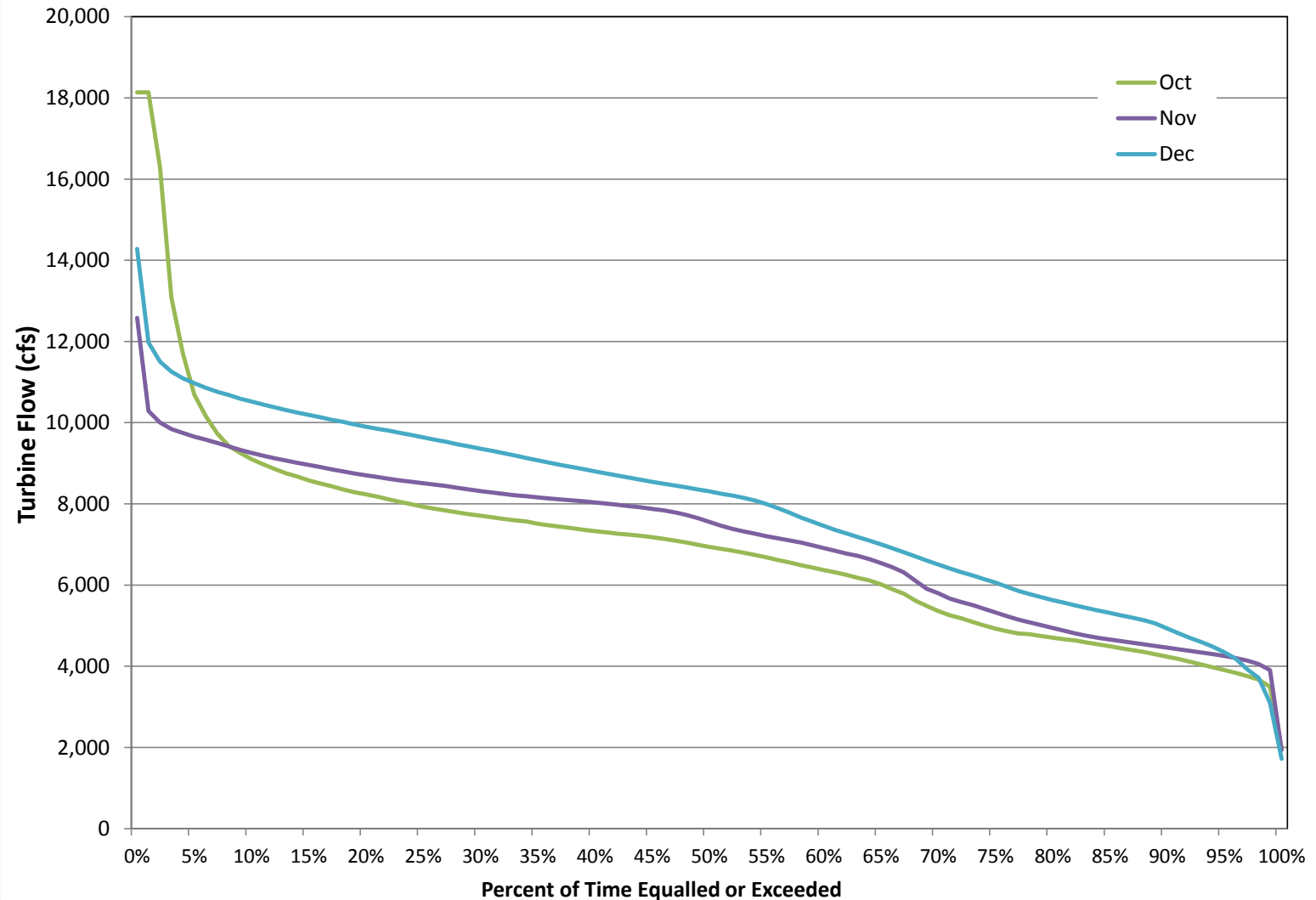
P4 – Monthly Flow Duration Curves – Turbines

July - September

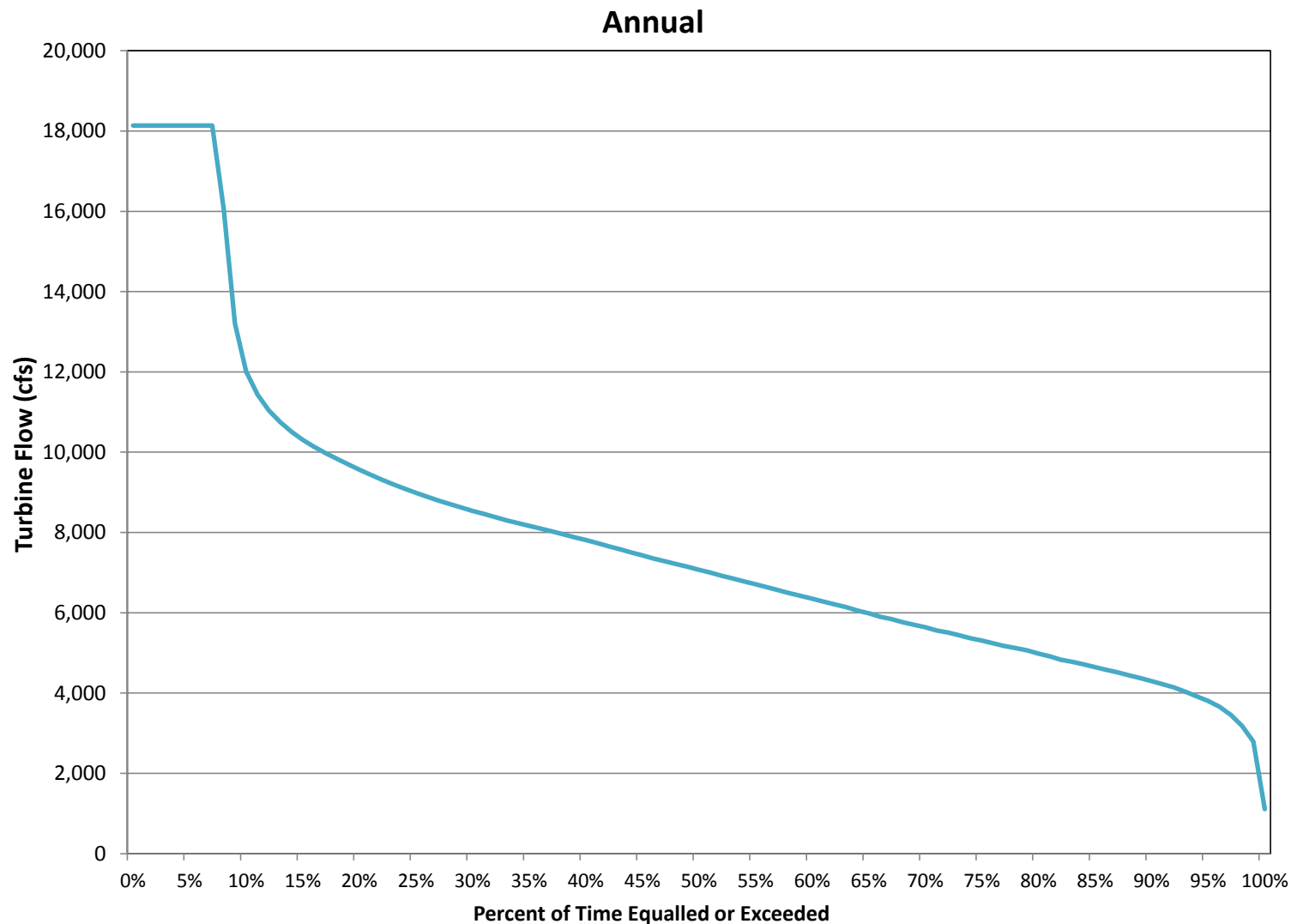


P4 – Monthly Flow Duration Curves – Turbines

October - December



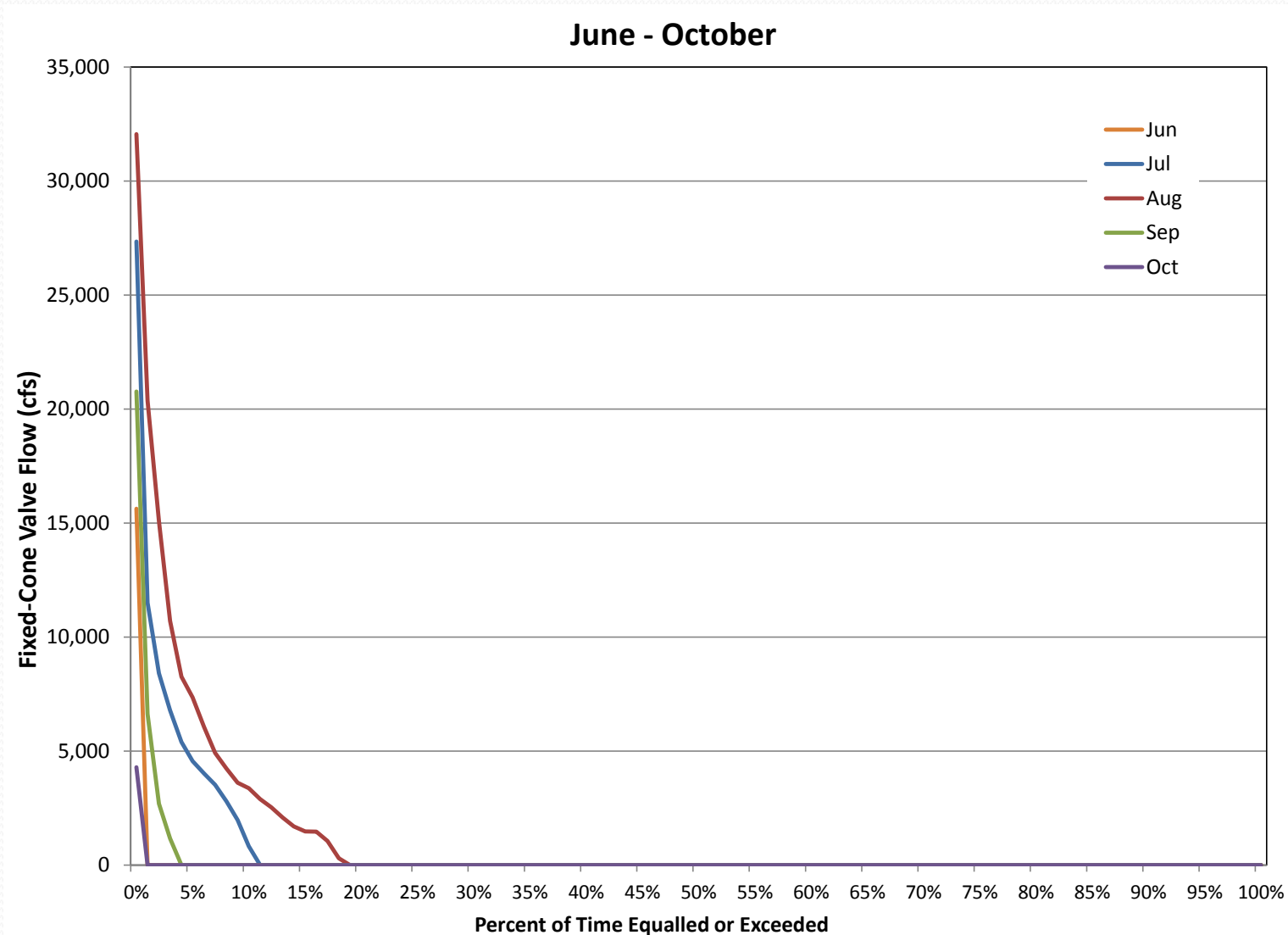
P4 – Annual Flow Duration Curve - Turbines



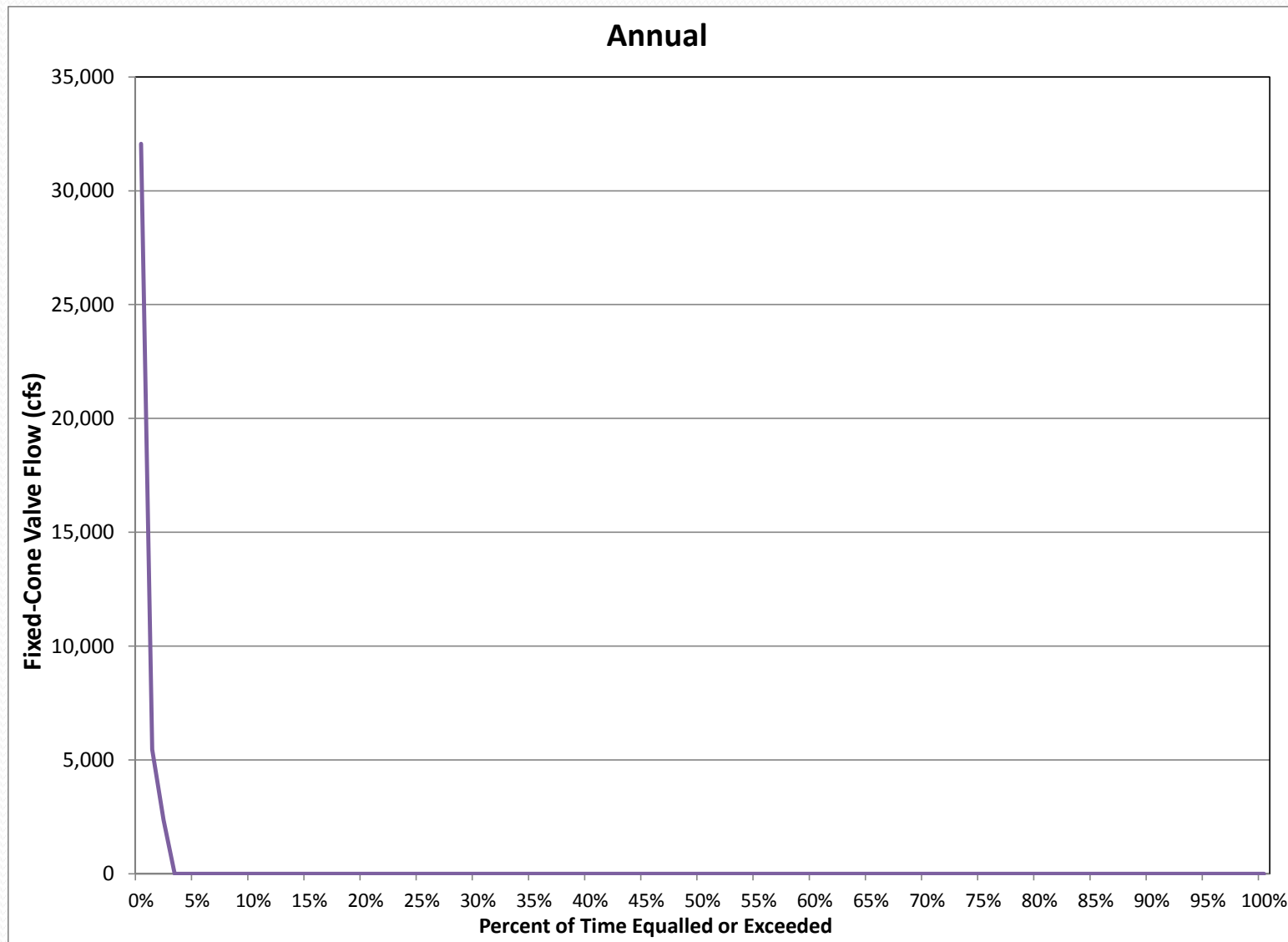
P4 - Monthly Flow Duration – Fixed-Cone Valves

Percentile	Month												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0%	0	0	0	0	0	15,633	27,344	32,061	20,773	4,289	0	0	32,061
1%	0	0	0	0	0	0	11,509	20,369	6,625	0	0	0	5,461
2%	0	0	0	0	0	0	8,406	15,094	2,688	0	0	0	2,367
3%	0	0	0	0	0	0	6,781	10,703	1,160	0	0	0	0
4%	0	0	0	0	0	0	5,396	8,263	0	0	0	0	0
5%	0	0	0	0	0	0	4,555	7,352	0	0	0	0	0
6%	0	0	0	0	0	0	4,023	6,070	0	0	0	0	0
7%	0	0	0	0	0	0	3,516	4,916	0	0	0	0	0
8%	0	0	0	0	0	0	2,789	4,229	0	0	0	0	0
9%	0	0	0	0	0	0	1,977	3,606	0	0	0	0	0
10%	0	0	0	0	0	0	820	3,373	0	0	0	0	0
11%	0	0	0	0	0	0	0	2,891	0	0	0	0	0
12%	0	0	0	0	0	0	0	2,531	0	0	0	0	0
13%	0	0	0	0	0	0	0	2,086	0	0	0	0	0
14%	0	0	0	0	0	0	0	1,695	0	0	0	0	0
15%	0	0	0	0	0	0	0	1,477	0	0	0	0	0
16%	0	0	0	0	0	0	0	1,461	0	0	0	0	0
17%	0	0	0	0	0	0	0	1,055	0	0	0	0	0
18%	0	0	0	0	0	0	0	297	0	0	0	0	0
19%	0	0	0	0	0	0	0	0	0	0	0	0	0
20%	0	0	0	0	0	0	0	0	0	0	0	0	0
30%	0	0	0	0	0	0	0	0	0	0	0	0	0
40%	0	0	0	0	0	0	0	0	0	0	0	0	0
50%	0	0	0	0	0	0	0	0	0	0	0	0	0
60%	0	0	0	0	0	0	0	0	0	0	0	0	0
70%	0	0	0	0	0	0	0	0	0	0	0	0	0
80%	0	0	0	0	0	0	0	0	0	0	0	0	0
90%	0	0	0	0	0	0	0	0	0	0	0	0	0
100%	0	0	0	0	0	0	0	0	0	0	0	0	0

P4 – Monthly Flow Duration Curves – Fixed-Cone Valves



P4 – Annual Flow Duration Curve – Fixed-Cone Valves



P4 - Monthly Flow Duration – Spillway

There was no spillway flow during any hour of the 61-year period of hourly simulation.

P5 – Monthly Elevation Duration (1 of 3)

Percentile	Month												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0%	2,027	2,008	1,989	1,972	2,001	2,052	2,052	2,053	2,052	2,052	2,050	2,043	2,053
1%	2,021	2,001	1,981	1,963	1,976	2,041	2,052	2,052	2,052	2,050	2,048	2,037	2,052
2%	2,019	1,999	1,979	1,961	1,972	2,033	2,052	2,052	2,052	2,050	2,047	2,036	2,052
3%	2,017	1,997	1,977	1,959	1,968	2,028	2,052	2,052	2,052	2,050	2,047	2,035	2,051
4%	2,017	1,996	1,976	1,958	1,966	2,023	2,052	2,052	2,051	2,050	2,047	2,034	2,051
5%	2,016	1,995	1,974	1,957	1,964	2,020	2,052	2,052	2,051	2,050	2,046	2,034	2,051
6%	2,015	1,994	1,973	1,955	1,963	2,017	2,052	2,052	2,051	2,050	2,046	2,034	2,050
7%	2,015	1,993	1,973	1,954	1,961	2,015	2,052	2,052	2,051	2,050	2,046	2,033	2,050
8%	2,014	1,993	1,972	1,953	1,960	2,014	2,052	2,052	2,051	2,050	2,046	2,033	2,050
9%	2,014	1,992	1,971	1,953	1,958	2,012	2,051	2,052	2,051	2,050	2,045	2,032	2,050
10%	2,013	1,992	1,971	1,952	1,958	2,011	2,051	2,052	2,051	2,050	2,045	2,032	2,050
11%	2,013	1,991	1,970	1,951	1,957	2,010	2,051	2,052	2,050	2,050	2,045	2,032	2,050
12%	2,012	1,991	1,970	1,951	1,956	2,008	2,051	2,052	2,050	2,050	2,045	2,031	2,050
13%	2,012	1,990	1,969	1,950	1,955	2,007	2,051	2,052	2,050	2,050	2,045	2,031	2,050
14%	2,012	1,990	1,969	1,950	1,954	2,006	2,051	2,052	2,050	2,050	2,044	2,031	2,050
15%	2,011	1,989	1,968	1,949	1,953	2,005	2,051	2,052	2,050	2,050	2,044	2,031	2,050
16%	2,011	1,989	1,968	1,949	1,952	2,004	2,050	2,052	2,050	2,050	2,044	2,030	2,050
17%	2,011	1,988	1,967	1,948	1,951	2,003	2,050	2,051	2,050	2,050	2,044	2,030	2,049
18%	2,010	1,988	1,967	1,948	1,950	2,002	2,050	2,051	2,050	2,050	2,044	2,030	2,049
19%	2,010	1,988	1,967	1,947	1,949	2,001	2,049	2,051	2,050	2,050	2,044	2,030	2,049
20%	2,010	1,987	1,966	1,947	1,949	1,999	2,048	2,051	2,050	2,050	2,043	2,029	2,048
21%	2,009	1,987	1,966	1,947	1,948	1,998	2,047	2,051	2,050	2,050	2,043	2,029	2,047
22%	2,009	1,987	1,965	1,946	1,947	1,997	2,046	2,051	2,050	2,050	2,043	2,029	2,046
23%	2,009	1,986	1,965	1,946	1,947	1,996	2,045	2,051	2,050	2,050	2,043	2,029	2,045
24%	2,009	1,986	1,965	1,945	1,946	1,995	2,044	2,051	2,050	2,050	2,043	2,028	2,044
25%	2,008	1,986	1,964	1,945	1,945	1,994	2,044	2,051	2,050	2,050	2,043	2,028	2,043
26%	2,008	1,985	1,964	1,944	1,945	1,993	2,043	2,051	2,050	2,050	2,042	2,028	2,041
27%	2,008	1,985	1,964	1,944	1,944	1,992	2,042	2,051	2,050	2,050	2,042	2,028	2,040
28%	2,007	1,985	1,963	1,944	1,944	1,991	2,041	2,051	2,050	2,050	2,042	2,028	2,039
29%	2,007	1,984	1,963	1,943	1,943	1,991	2,040	2,051	2,050	2,050	2,042	2,027	2,038
30%	2,007	1,984	1,963	1,943	1,942	1,990	2,040	2,051	2,050	2,050	2,042	2,027	2,036
31%	2,007	1,984	1,962	1,942	1,941	1,989	2,039	2,051	2,050	2,050	2,042	2,027	2,035
32%	2,006	1,983	1,962	1,942	1,940	1,988	2,038	2,051	2,050	2,050	2,041	2,027	2,033
33%	2,006	1,983	1,962	1,942	1,939	1,987	2,037	2,051	2,050	2,050	2,041	2,026	2,032

P5 – Monthly Elevation Duration (2 of 3)

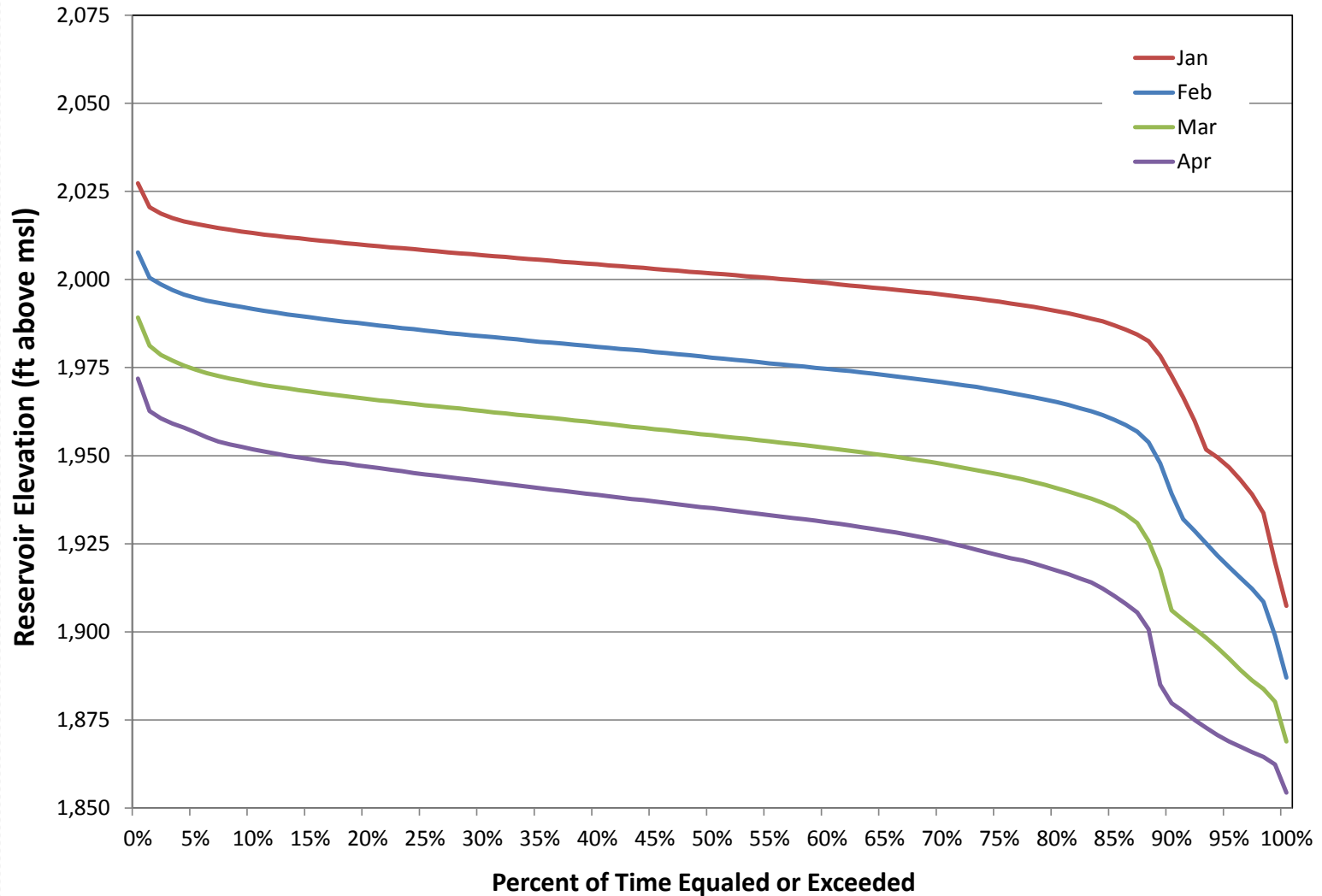
Percentile	Month												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
34%	2,006	1,983	1,961	1,941	1,939	1,986	2,036	2,051	2,050	2,050	2,041	2,026	2,031
35%	2,006	1,982	1,961	1,941	1,938	1,986	2,036	2,050	2,050	2,050	2,041	2,026	2,029
36%	2,005	1,982	1,961	1,940	1,937	1,985	2,035	2,050	2,050	2,050	2,041	2,026	2,028
37%	2,005	1,982	1,960	1,940	1,937	1,984	2,034	2,050	2,050	2,050	2,041	2,026	2,026
38%	2,005	1,982	1,960	1,940	1,936	1,983	2,033	2,050	2,050	2,050	2,041	2,025	2,025
39%	2,005	1,981	1,960	1,939	1,935	1,983	2,033	2,050	2,050	2,050	2,040	2,025	2,023
40%	2,004	1,981	1,959	1,939	1,935	1,982	2,032	2,050	2,050	2,050	2,040	2,025	2,021
41%	2,004	1,981	1,959	1,939	1,934	1,981	2,031	2,050	2,050	2,049	2,040	2,025	2,019
42%	2,004	1,980	1,959	1,938	1,933	1,980	2,030	2,050	2,050	2,049	2,040	2,024	2,018
43%	2,004	1,980	1,958	1,938	1,933	1,980	2,030	2,050	2,050	2,049	2,040	2,024	2,016
44%	2,003	1,980	1,958	1,937	1,932	1,979	2,029	2,050	2,050	2,049	2,040	2,024	2,014
45%	2,003	1,979	1,958	1,937	1,932	1,978	2,028	2,050	2,050	2,049	2,039	2,024	2,012
46%	2,003	1,979	1,957	1,937	1,931	1,977	2,027	2,050	2,050	2,049	2,039	2,024	2,010
47%	2,003	1,979	1,957	1,936	1,930	1,977	2,027	2,050	2,050	2,049	2,039	2,023	2,008
48%	2,002	1,979	1,957	1,936	1,930	1,976	2,026	2,050	2,050	2,049	2,039	2,023	2,006
49%	2,002	1,978	1,956	1,935	1,930	1,975	2,025	2,050	2,050	2,049	2,039	2,023	2,005
50%	2,002	1,978	1,956	1,935	1,929	1,974	2,024	2,050	2,050	2,049	2,039	2,023	2,003
51%	2,002	1,978	1,955	1,935	1,929	1,974	2,024	2,050	2,050	2,049	2,038	2,022	2,001
52%	2,001	1,977	1,955	1,934	1,929	1,973	2,023	2,050	2,050	2,049	2,038	2,022	1,999
53%	2,001	1,977	1,955	1,934	1,928	1,972	2,022	2,050	2,050	2,049	2,038	2,022	1,998
54%	2,001	1,977	1,954	1,934	1,928	1,971	2,021	2,050	2,050	2,049	2,038	2,022	1,996
55%	2,000	1,976	1,954	1,933	1,927	1,971	2,020	2,050	2,050	2,049	2,038	2,021	1,994
56%	2,000	1,976	1,954	1,933	1,927	1,970	2,020	2,050	2,050	2,049	2,038	2,021	1,992
57%	2,000	1,976	1,953	1,932	1,926	1,969	2,019	2,050	2,050	2,049	2,037	2,021	1,990
58%	2,000	1,975	1,953	1,932	1,925	1,968	2,018	2,050	2,050	2,048	2,037	2,021	1,988
59%	1,999	1,975	1,953	1,932	1,925	1,967	2,017	2,050	2,050	2,048	2,037	2,021	1,986
60%	1,999	1,975	1,952	1,931	1,924	1,966	2,016	2,050	2,050	2,048	2,037	2,020	1,984
61%	1,999	1,974	1,952	1,931	1,924	1,965	2,015	2,050	2,050	2,048	2,037	2,020	1,982
62%	1,998	1,974	1,951	1,930	1,923	1,965	2,014	2,050	2,050	2,048	2,037	2,020	1,980
63%	1,998	1,974	1,951	1,930	1,922	1,964	2,014	2,049	2,050	2,048	2,036	2,020	1,978
64%	1,998	1,973	1,951	1,929	1,921	1,963	2,013	2,049	2,050	2,048	2,036	2,019	1,976
65%	1,997	1,973	1,950	1,929	1,921	1,962	2,011	2,049	2,050	2,048	2,036	2,019	1,974
66%	1,997	1,973	1,950	1,928	1,920	1,961	2,010	2,049	2,050	2,048	2,036	2,019	1,972

P5 – Monthly Elevation Duration (3 of 3)

Percentile	Month												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67%	1,997	1,972	1,949	1,928	1,919	1,960	2,009	2,049	2,050	2,048	2,036	2,018	1,970
68%	1,996	1,972	1,949	1,927	1,917	1,959	2,008	2,048	2,050	2,047	2,035	2,018	1,968
69%	1,996	1,971	1,948	1,926	1,916	1,958	2,007	2,047	2,050	2,047	2,035	2,018	1,966
70%	1,996	1,971	1,948	1,926	1,916	1,956	2,005	2,046	2,049	2,047	2,035	2,018	1,965
71%	1,995	1,970	1,947	1,925	1,915	1,955	2,004	2,045	2,049	2,047	2,035	2,017	1,963
72%	1,995	1,970	1,947	1,924	1,914	1,953	2,003	2,044	2,049	2,047	2,035	2,017	1,962
73%	1,995	1,970	1,946	1,923	1,913	1,952	2,002	2,043	2,049	2,047	2,034	2,017	1,960
74%	1,994	1,969	1,945	1,923	1,912	1,950	2,000	2,042	2,049	2,047	2,034	2,016	1,958
75%	1,994	1,968	1,945	1,922	1,911	1,949	1,999	2,041	2,049	2,046	2,034	2,016	1,957
76%	1,993	1,968	1,944	1,921	1,910	1,948	1,998	2,039	2,049	2,046	2,034	2,016	1,955
77%	1,993	1,967	1,943	1,920	1,909	1,946	1,996	2,037	2,049	2,046	2,033	2,015	1,953
78%	1,992	1,967	1,943	1,919	1,908	1,944	1,995	2,036	2,049	2,046	2,033	2,015	1,951
79%	1,992	1,966	1,942	1,918	1,907	1,943	1,994	2,034	2,049	2,046	2,033	2,014	1,950
80%	1,991	1,965	1,941	1,917	1,906	1,941	1,992	2,032	2,049	2,045	2,032	2,014	1,948
81%	1,990	1,964	1,940	1,916	1,905	1,939	1,991	2,031	2,049	2,045	2,032	2,013	1,946
82%	1,990	1,964	1,939	1,915	1,903	1,937	1,989	2,029	2,048	2,045	2,032	2,013	1,945
83%	1,989	1,963	1,938	1,914	1,902	1,934	1,987	2,027	2,047	2,045	2,031	2,012	1,943
84%	1,988	1,962	1,937	1,912	1,901	1,932	1,984	2,025	2,046	2,044	2,031	2,012	1,941
85%	1,987	1,960	1,935	1,910	1,900	1,930	1,982	2,022	2,044	2,044	2,030	2,011	1,939
86%	1,986	1,959	1,933	1,908	1,897	1,928	1,979	2,019	2,042	2,043	2,029	2,010	1,937
87%	1,984	1,957	1,931	1,906	1,894	1,926	1,975	2,014	2,040	2,042	2,028	2,009	1,935
88%	1,983	1,954	1,926	1,901	1,891	1,924	1,970	2,009	2,037	2,041	2,027	2,007	1,933
89%	1,978	1,948	1,918	1,885	1,886	1,921	1,965	2,006	2,035	2,039	2,025	2,005	1,931
90%	1,973	1,939	1,906	1,880	1,880	1,919	1,962	2,002	2,033	2,035	2,021	2,000	1,929
91%	1,967	1,932	1,903	1,878	1,872	1,916	1,959	1,996	2,031	2,032	2,017	1,995	1,926
92%	1,960	1,929	1,901	1,875	1,867	1,913	1,956	1,992	2,027	2,029	2,012	1,990	1,923
93%	1,952	1,925	1,898	1,873	1,864	1,910	1,953	1,988	2,019	2,024	2,006	1,981	1,920
94%	1,950	1,922	1,896	1,871	1,863	1,907	1,950	1,985	2,002	2,001	1,984	1,964	1,915
95%	1,947	1,918	1,892	1,869	1,862	1,903	1,946	1,982	2,000	1,998	1,979	1,962	1,910
96%	1,943	1,915	1,889	1,867	1,862	1,898	1,943	1,979	1,998	1,994	1,974	1,959	1,905
97%	1,939	1,912	1,886	1,866	1,861	1,892	1,938	1,974	1,995	1,991	1,970	1,956	1,896
98%	1,934	1,909	1,884	1,865	1,859	1,887	1,934	1,967	1,993	1,985	1,967	1,953	1,882
99%	1,920	1,899	1,880	1,862	1,856	1,879	1,927	1,964	1,963	1,962	1,953	1,939	1,867
100%	1,907	1,887	1,869	1,854	1,853	1,857	1,909	1,956	1,963	1,958	1,945	1,927	1,853

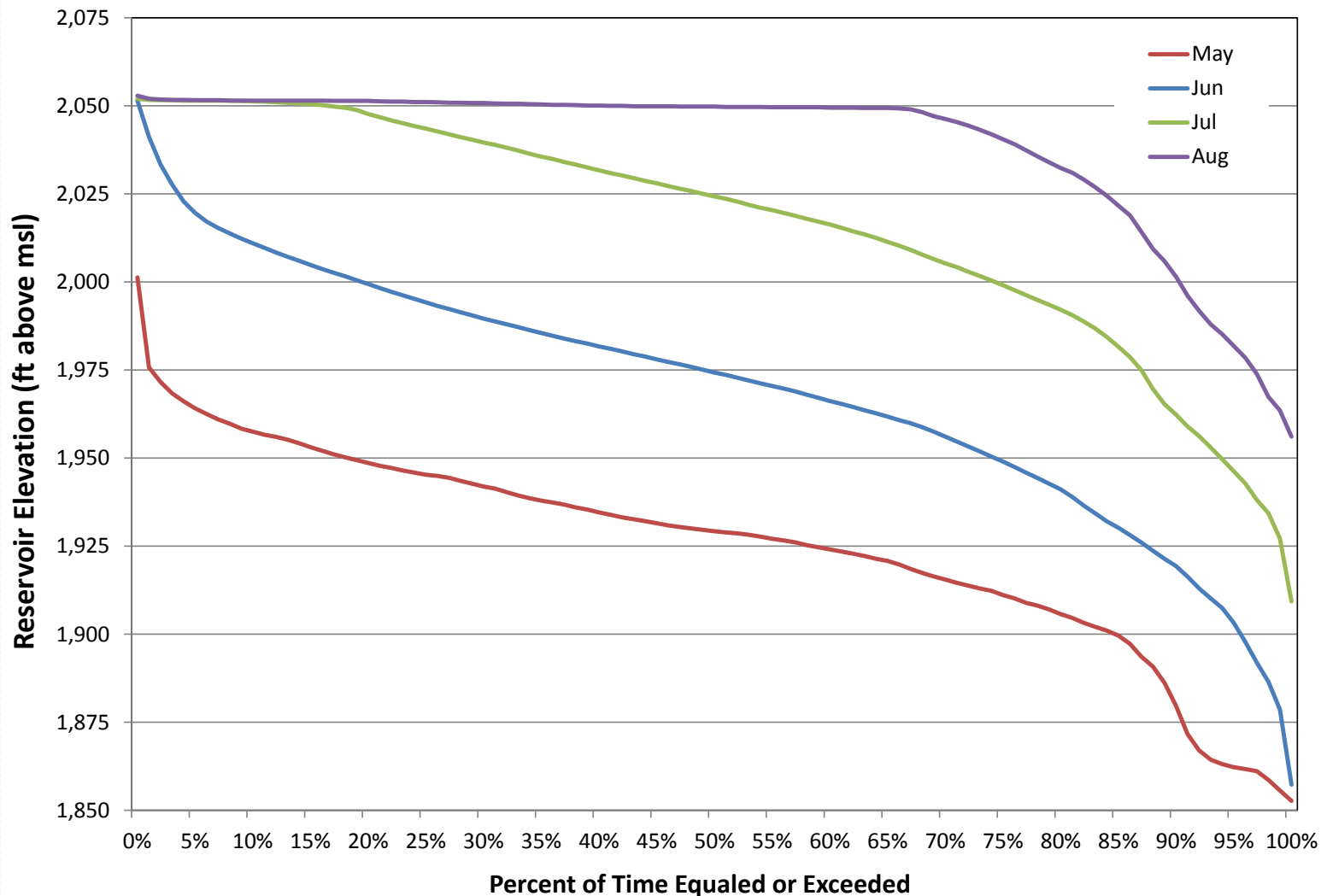
P5 – Monthly Elevation Duration Curves

January - April



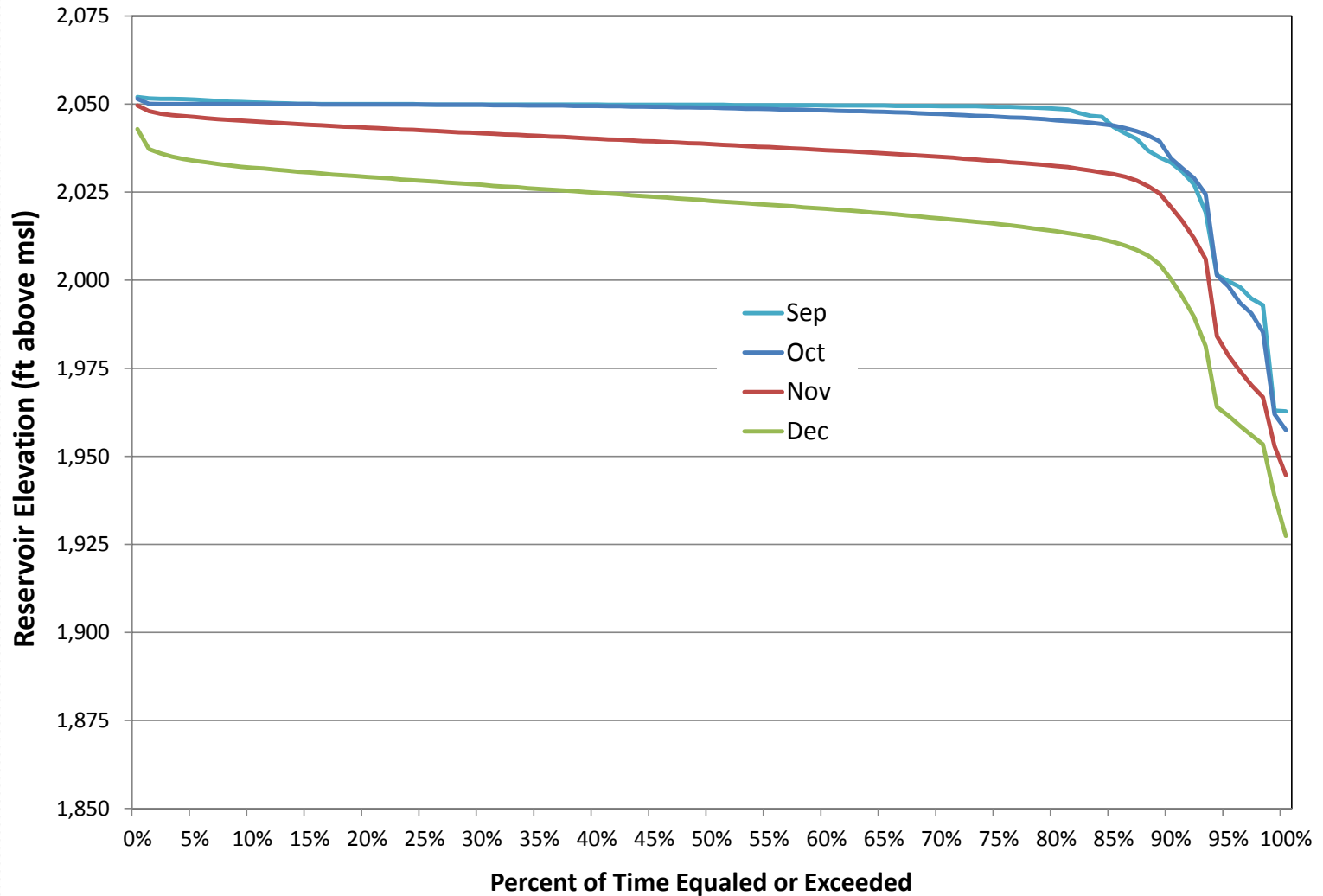
P5 – Monthly Elevation Duration Curves

May - August



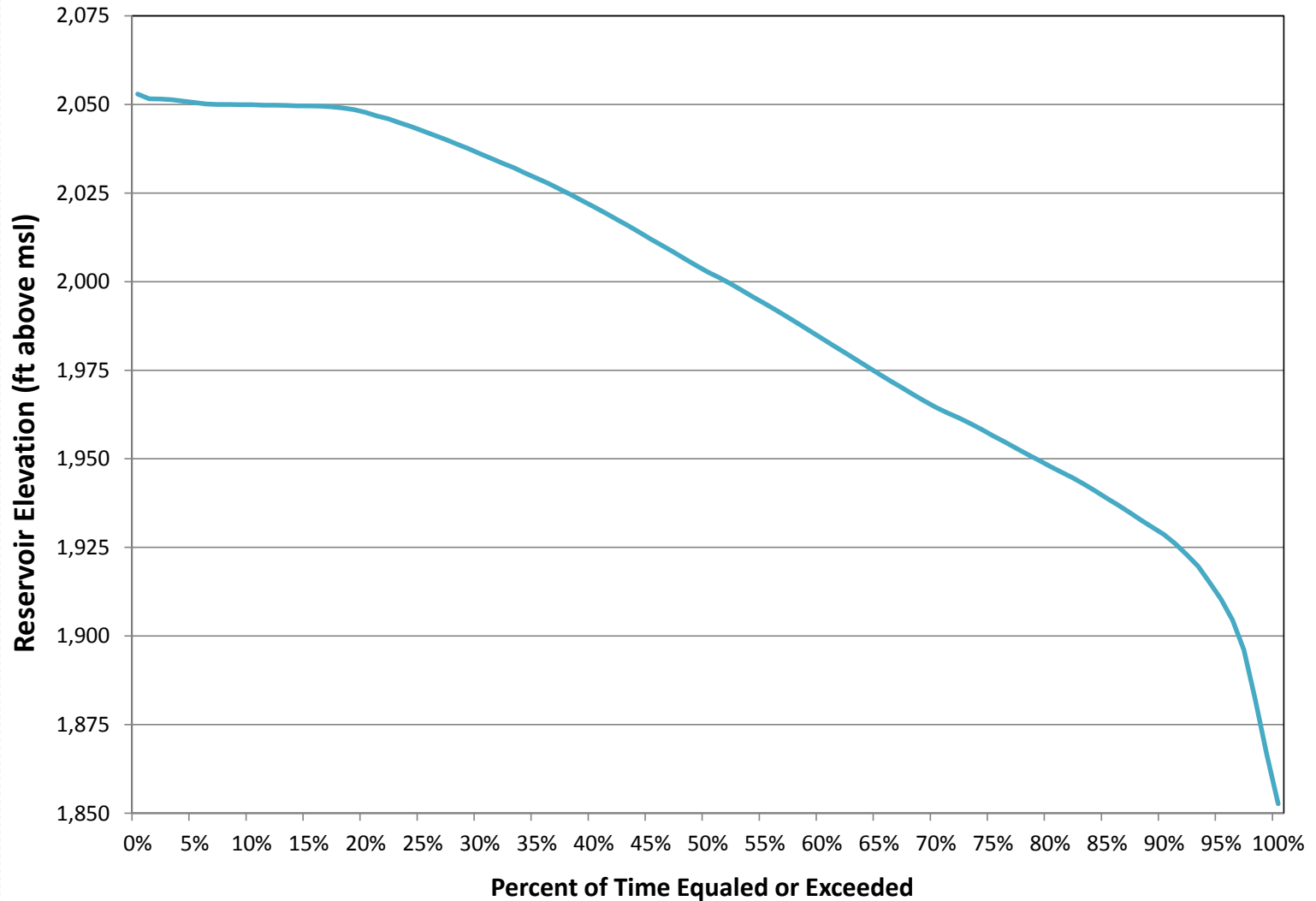
P5 – Monthly Elevation Duration Curves

September - December



P5 – Annual Elevation Duration Curve

Annual



ILF-1 Intermediate Load Following

- Operating scenario ILF-1 assumes that the other Railbelt hydropower plants (Bradley Lake, Eklutna Lake, and Cooper Lake) would provide load following to the extent possible. Susitna-Watana is assigned the remainder of the load following, with none assigned to thermal resources.
- Includes a dry water year rule curve for the purposes of preventing the reservoir from emptying in dry year sequences. Watana generation would be reduced depending on the distance of the reservoir level below the rule curve.
- Includes spring (season) inflow forecasting.
- Normal operating pool is EI 1850 to EI 2050.
- 600 MW at EI 2050, the maximum normal operating level.
- 32,000 cfs valve capability; spillway operations begins at EI 2057.6.
- Environmental minimum flows at Gold Creek based on the 1980's Case E-VI, modified to be not less than 3,000 cfs.
- Emergency conditions are excluded

P4 - Monthly Flow Durations – Turbines (1 of 3)

Percentile	Month												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0%	11,692	12,057	10,464	12,095	12,805	12,362	13,800	13,800	13,800	13,800	10,939	11,518	13,800
1%	10,457	10,820	9,606	10,676	11,514	10,807	13,800	13,800	13,800	13,800	9,943	10,157	13,800
2%	10,037	10,422	9,399	10,415	11,195	10,464	13,800	13,800	13,800	13,800	9,477	9,771	13,800
3%	9,861	10,150	9,284	10,250	10,989	10,191	9,381	13,800	13,800	13,800	9,214	9,541	13,800
4%	9,729	9,964	9,210	10,146	10,822	9,930	8,485	13,800	13,800	13,163	9,006	9,417	13,800
5%	9,655	9,828	9,153	10,059	10,689	9,763	8,300	13,800	13,800	11,743	8,808	9,346	13,800
6%	9,597	9,739	9,103	9,978	10,552	9,610	8,187	13,800	13,800	10,321	8,670	9,292	12,453
7%	9,544	9,668	9,059	9,909	10,448	9,501	8,118	13,800	13,800	9,397	8,581	9,249	10,790
8%	9,496	9,610	9,019	9,840	10,357	9,403	8,036	13,800	13,800	8,772	8,520	9,213	10,318
9%	9,458	9,558	8,980	9,783	10,268	9,324	7,977	13,800	13,800	8,442	8,462	9,181	10,031
10%	9,425	9,510	8,946	9,728	10,191	9,253	7,896	13,800	13,800	8,270	8,401	9,152	9,827
11%	9,391	9,467	8,913	9,678	10,113	9,183	7,840	13,800	13,800	7,986	8,350	9,128	9,674
12%	9,360	9,426	8,884	9,630	10,047	9,104	7,773	13,800	13,800	7,799	8,309	9,103	9,558
13%	9,331	9,394	8,855	9,585	9,987	9,041	7,711	13,800	13,800	7,647	8,270	9,080	9,456
14%	9,299	9,361	8,829	9,541	9,929	8,984	7,668	13,800	13,800	7,493	8,237	9,058	9,375
15%	9,272	9,332	8,803	9,503	9,868	8,936	7,603	13,800	13,800	7,352	8,208	9,036	9,303
16%	9,244	9,306	8,778	9,464	9,809	8,873	7,540	13,800	13,800	7,240	8,179	9,017	9,238
17%	9,220	9,281	8,754	9,427	9,755	8,816	7,500	13,800	13,800	7,152	8,152	8,997	9,180
18%	9,194	9,255	8,730	9,394	9,713	8,760	7,451	13,800	13,800	7,076	8,125	8,978	9,125
19%	9,168	9,229	8,707	9,358	9,666	8,719	7,402	13,800	13,800	7,010	8,099	8,959	9,075
20%	9,144	9,205	8,684	9,322	9,622	8,677	7,362	13,800	13,800	6,968	8,074	8,939	9,028
21%	9,117	9,180	8,663	9,286	9,580	8,634	7,323	13,800	13,800	6,935	8,048	8,918	8,984
22%	9,090	9,159	8,640	9,255	9,536	8,590	7,293	13,800	13,800	6,908	8,023	8,899	8,943
23%	9,067	9,137	8,618	9,222	9,492	8,545	7,255	13,800	13,800	6,886	7,996	8,879	8,901
24%	9,043	9,115	8,598	9,193	9,446	8,502	7,223	13,800	13,800	6,862	7,970	8,858	8,862
25%	9,021	9,096	8,576	9,161	9,404	8,459	7,188	13,800	13,800	6,839	7,943	8,839	8,823
26%	8,998	9,077	8,556	9,133	9,363	8,422	7,160	13,800	13,800	6,817	7,918	8,817	8,785
27%	8,976	9,060	8,535	9,106	9,316	8,386	7,124	13,800	13,800	6,792	7,892	8,797	8,746
28%	8,957	9,042	8,513	9,080	9,272	8,352	7,098	13,080	13,800	6,764	7,866	8,776	8,709
29%	8,937	9,026	8,492	9,054	9,228	8,319	7,067	11,071	13,800	6,732	7,843	8,756	8,672
30%	8,919	9,009	8,471	9,028	9,183	8,290	7,040	8,355	13,800	6,703	7,821	8,735	8,635
31%	8,902	8,991	8,451	9,002	9,136	8,257	7,010	7,586	13,800	6,677	7,798	8,713	8,597
32%	8,885	8,973	8,429	8,979	9,094	8,222	6,983	7,330	13,800	6,646	7,778	8,691	8,560
33%	8,870	8,958	8,408	8,954	9,052	8,192	6,960	7,113	13,800	6,620	7,759	8,671	8,521

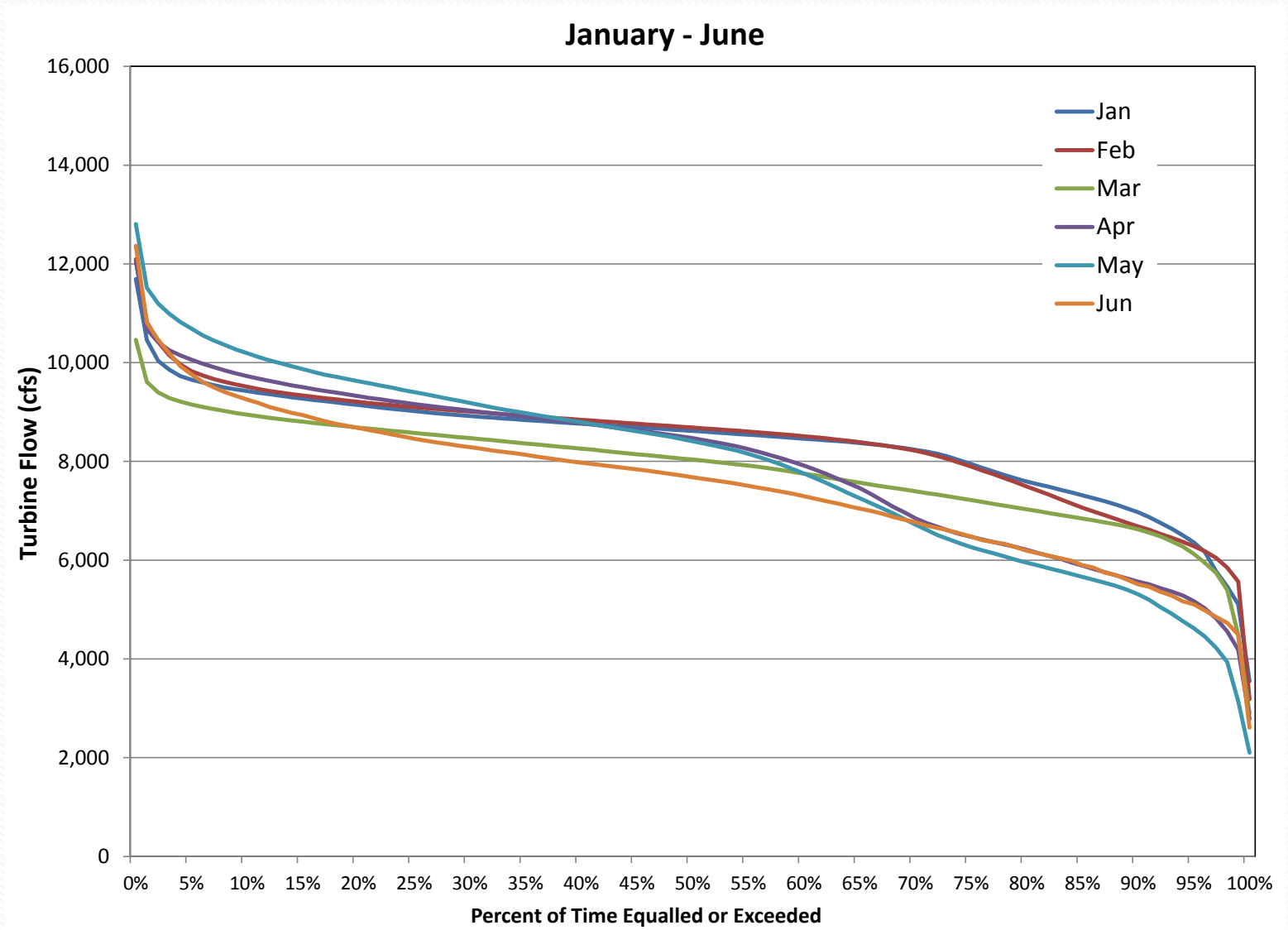
P4 - Monthly Flow Durations – Turbines (2 of 3)

Percentile	Month												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
34%	8,854	8,940	8,387	8,929	9,014	8,165	6,933	6,991	13,489	6,595	7,740	8,648	8,482
35%	8,839	8,923	8,365	8,905	8,976	8,133	6,910	6,870	13,027	6,567	7,723	8,626	8,441
36%	8,823	8,906	8,343	8,881	8,940	8,097	6,883	6,800	12,377	6,533	7,705	8,606	8,400
37%	8,808	8,892	8,323	8,855	8,902	8,064	6,860	6,720	11,567	6,503	7,686	8,584	8,357
38%	8,793	8,875	8,301	8,828	8,864	8,033	6,835	6,620	10,971	6,480	7,668	8,561	8,314
39%	8,778	8,859	8,279	8,803	8,829	8,003	6,813	6,560	10,540	6,461	7,650	8,537	8,269
40%	8,763	8,842	8,258	8,773	8,794	7,976	6,785	6,502	10,109	6,444	7,634	8,511	8,222
41%	8,749	8,826	8,237	8,746	8,757	7,946	6,768	6,470	9,781	6,426	7,618	8,488	8,175
42%	8,734	8,810	8,214	8,718	8,719	7,919	6,741	6,400	9,421	6,408	7,600	8,462	8,124
43%	8,720	8,794	8,191	8,686	8,683	7,890	6,720	6,360	9,191	6,389	7,582	8,437	8,073
44%	8,706	8,778	8,168	8,659	8,646	7,863	6,700	6,320	8,933	6,364	7,565	8,414	8,022
45%	8,692	8,763	8,145	8,627	8,609	7,840	6,673	6,284	8,655	6,340	7,548	8,389	7,971
46%	8,677	8,747	8,125	8,598	8,574	7,811	6,655	6,252	8,399	6,319	7,531	8,368	7,919
47%	8,662	8,732	8,103	8,568	8,537	7,779	6,631	6,230	8,138	6,295	7,514	8,345	7,866
48%	8,648	8,716	8,081	8,536	8,498	7,745	6,613	6,190	7,925	6,264	7,497	8,321	7,813
49%	8,632	8,702	8,058	8,505	8,454	7,715	6,587	6,140	7,697	6,240	7,480	8,297	7,756
50%	8,617	8,685	8,038	8,473	8,408	7,680	6,565	6,140	7,489	6,217	7,463	8,274	7,700
51%	8,603	8,667	8,014	8,432	8,363	7,648	6,541	6,090	7,304	6,195	7,446	8,251	7,643
52%	8,587	8,652	7,991	8,390	8,318	7,612	6,518	6,055	7,113	6,172	7,428	8,226	7,588
53%	8,571	8,637	7,966	8,350	8,269	7,581	6,487	6,033	6,920	6,151	7,409	8,203	7,532
54%	8,556	8,621	7,940	8,303	8,215	7,544	6,467	5,990	6,750	6,133	7,391	8,178	7,476
55%	8,541	8,604	7,914	8,249	8,153	7,505	6,437	5,990	6,594	6,115	7,370	8,150	7,420
56%	8,526	8,587	7,887	8,189	8,085	7,466	6,418	5,940	6,486	6,101	7,349	8,123	7,362
57%	8,510	8,569	7,857	8,125	8,012	7,426	6,400	5,940	6,414	6,087	7,324	8,096	7,303
58%	8,493	8,549	7,825	8,063	7,932	7,386	6,380	5,900	6,339	6,071	7,299	8,067	7,242
59%	8,476	8,530	7,789	7,989	7,842	7,346	6,352	5,900	6,272	6,057	7,267	8,041	7,175
60%	8,460	8,510	7,752	7,916	7,758	7,296	6,330	5,863	6,208	6,040	7,229	8,015	7,110
61%	8,444	8,488	7,717	7,833	7,660	7,244	6,313	5,850	6,149	6,026	7,186	7,991	7,050
62%	8,428	8,465	7,678	7,745	7,563	7,194	6,288	5,840	6,102	6,013	7,142	7,970	6,996
63%	8,411	8,442	7,642	7,651	7,459	7,149	6,269	5,800	6,062	6,001	7,103	7,945	6,945
64%	8,393	8,418	7,607	7,556	7,354	7,093	6,246	5,800	6,016	5,990	7,073	7,922	6,893
65%	8,372	8,390	7,570	7,460	7,252	7,044	6,227	5,751	5,965	5,980	7,047	7,897	6,840
66%	8,349	8,360	7,534	7,341	7,152	6,998	6,201	5,750	5,919	5,970	7,026	7,873	6,786

P4 - Monthly Flow Duration - Turbines (3 of 3)

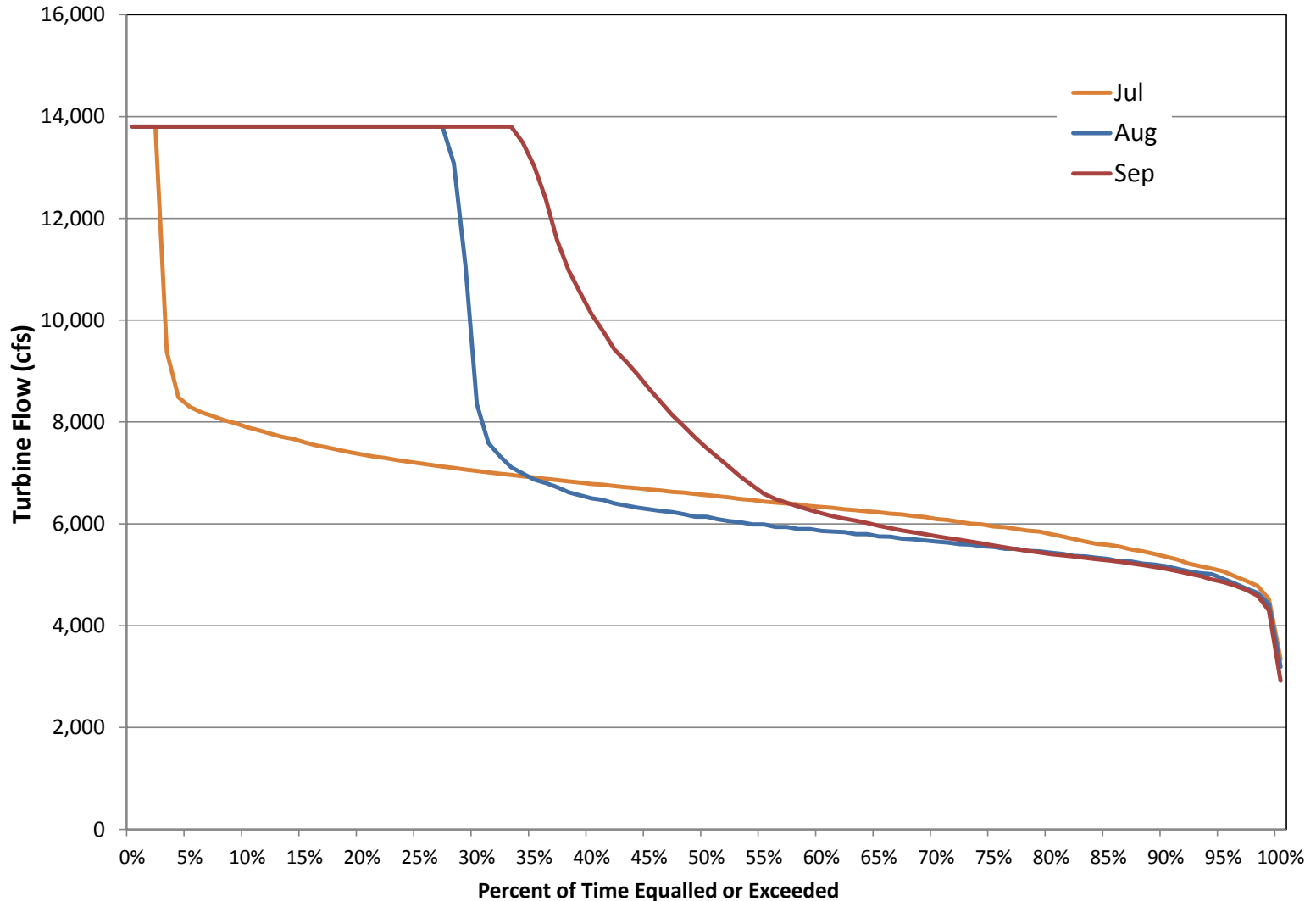
Percentile	Month												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67%	8,325	8,330	7,496	7,211	7,053	6,943	6,185	5,711	5,870	5,959	7,005	7,848	6,728
68%	8,297	8,293	7,461	7,081	6,948	6,876	6,152	5,700	5,836	5,947	6,985	7,818	6,674
69%	8,270	8,256	7,430	6,970	6,833	6,820	6,136	5,674	5,800	5,933	6,967	7,783	6,620
70%	8,234	8,215	7,394	6,848	6,718	6,770	6,094	5,650	5,758	5,919	6,948	7,742	6,565
71%	8,196	8,165	7,360	6,750	6,613	6,704	6,074	5,636	5,720	5,901	6,927	7,695	6,508
72%	8,152	8,109	7,327	6,675	6,506	6,650	6,040	5,600	5,687	5,879	6,904	7,645	6,454
73%	8,092	8,043	7,292	6,598	6,422	6,600	6,006	5,592	5,652	5,855	6,873	7,591	6,403
74%	8,021	7,971	7,254	6,530	6,341	6,540	5,990	5,560	5,614	5,831	6,832	7,538	6,350
75%	7,948	7,899	7,217	6,474	6,263	6,480	5,949	5,548	5,575	5,806	6,775	7,479	6,301
76%	7,871	7,817	7,180	6,418	6,198	6,406	5,935	5,510	5,536	5,783	6,724	7,421	6,249
77%	7,796	7,742	7,142	6,368	6,139	6,364	5,900	5,510	5,501	5,760	6,680	7,366	6,193
78%	7,722	7,662	7,105	6,319	6,077	6,330	5,865	5,470	5,470	5,731	6,637	7,316	6,140
79%	7,656	7,579	7,067	6,266	6,007	6,265	5,850	5,460	5,436	5,694	6,594	7,255	6,090
80%	7,593	7,493	7,031	6,209	5,950	6,190	5,800	5,434	5,404	5,647	6,550	7,196	6,040
81%	7,538	7,407	6,992	6,145	5,892	6,140	5,753	5,410	5,381	5,608	6,502	7,131	5,990
82%	7,487	7,325	6,954	6,086	5,837	6,090	5,700	5,371	5,360	5,569	6,444	7,048	5,945
83%	7,428	7,237	6,917	6,029	5,779	6,040	5,650	5,360	5,332	5,535	6,367	6,974	5,900
84%	7,373	7,148	6,882	5,952	5,723	5,990	5,608	5,331	5,307	5,455	6,289	6,899	5,850
85%	7,314	7,064	6,843	5,888	5,660	5,900	5,589	5,310	5,283	5,341	6,191	6,832	5,796
86%	7,256	6,985	6,805	5,820	5,604	5,850	5,550	5,266	5,253	5,271	6,100	6,768	5,735
87%	7,196	6,910	6,766	5,755	5,542	5,750	5,497	5,260	5,224	5,211	6,014	6,695	5,670
88%	7,125	6,832	6,724	5,694	5,477	5,700	5,460	5,220	5,190	5,161	5,920	6,625	5,604
89%	7,050	6,757	6,681	5,628	5,402	5,605	5,410	5,199	5,157	5,107	5,825	6,549	5,553
90%	6,971	6,683	6,626	5,566	5,308	5,512	5,357	5,168	5,116	5,060	5,727	6,459	5,482
91%	6,869	6,614	6,558	5,509	5,196	5,460	5,303	5,120	5,073	5,017	5,651	6,359	5,410
92%	6,756	6,534	6,485	5,434	5,051	5,360	5,220	5,070	5,025	4,964	5,578	6,263	5,348
93%	6,636	6,454	6,384	5,363	4,915	5,283	5,170	5,033	4,975	4,901	5,509	6,176	5,269
94%	6,503	6,375	6,278	5,289	4,769	5,170	5,123	5,012	4,907	4,843	5,445	6,036	5,192
95%	6,360	6,283	6,127	5,168	4,622	5,104	5,070	4,923	4,860	4,792	5,382	5,808	5,105
96%	6,163	6,182	5,944	5,023	4,453	4,980	4,970	4,830	4,789	4,742	5,319	5,568	4,998
97%	5,771	6,046	5,739	4,815	4,225	4,848	4,880	4,732	4,704	4,675	5,243	5,347	4,852
98%	5,463	5,849	5,396	4,555	3,935	4,730	4,780	4,644	4,590	4,546	5,145	5,115	4,682
99%	5,107	5,566	4,481	4,185	3,140	4,490	4,521	4,419	4,299	3,878	4,727	4,662	4,342
100%	3,548	3,184	2,899	2,784	2,100	2,609	3,344	3,192	2,919	2,641	2,540	3,361	2,100

P4 – Monthly Flow Duration Curves – Turbines



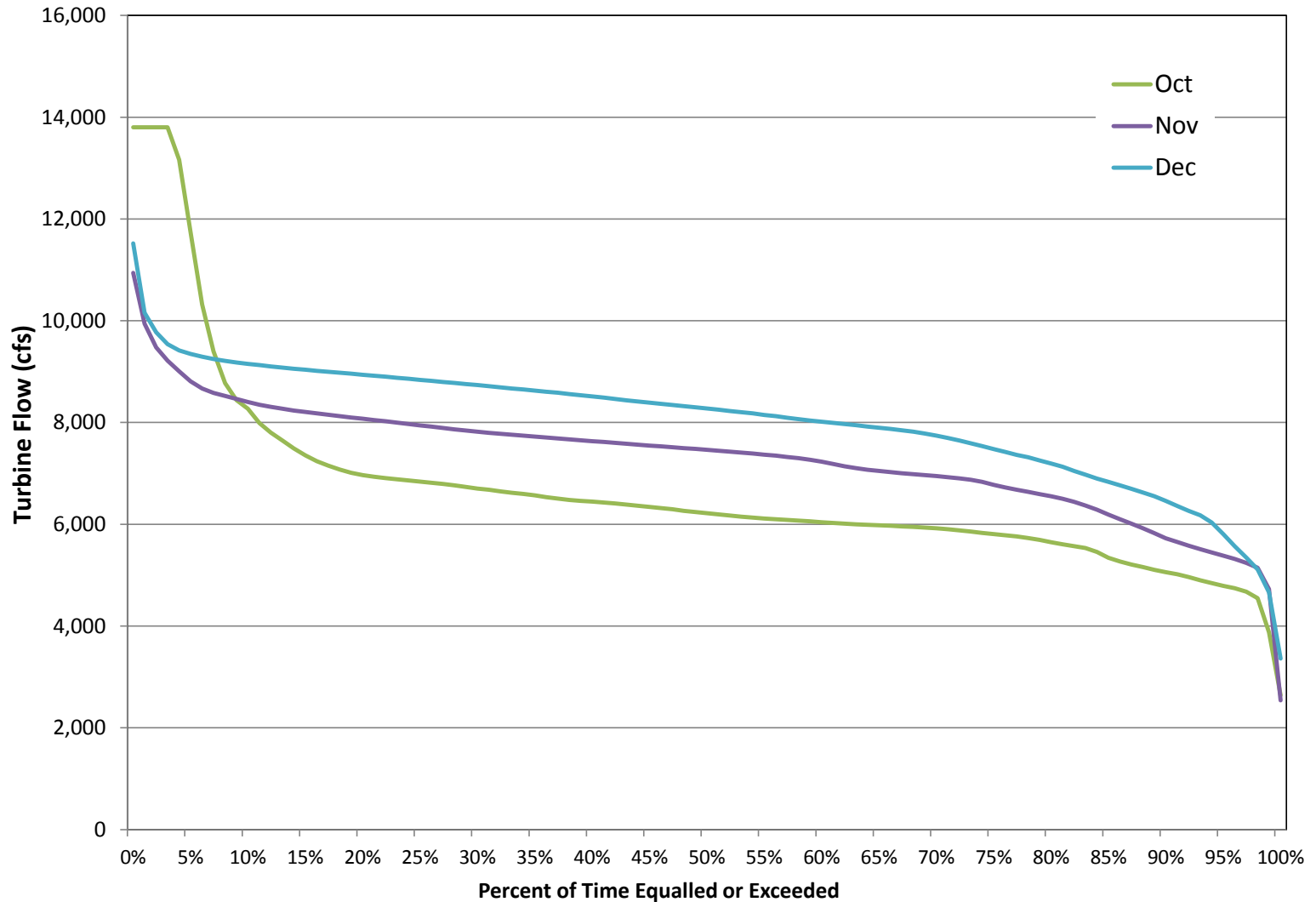
P4 – Monthly Flow Duration Curves – Turbines

July - September

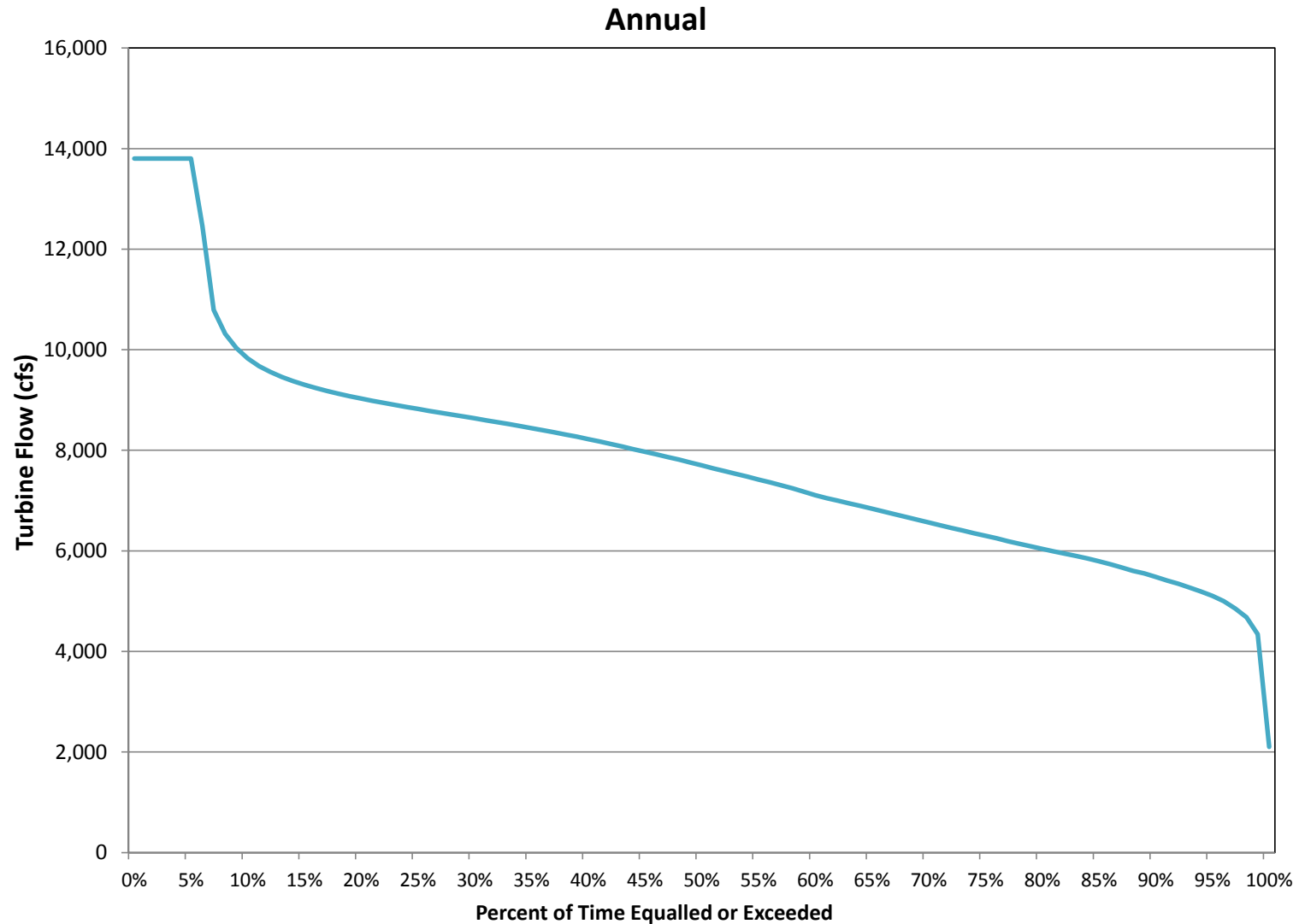


P4 – Monthly Flow Duration Curves – Turbines

October - December



P4 – Annual Flow Duration Curve - Turbines

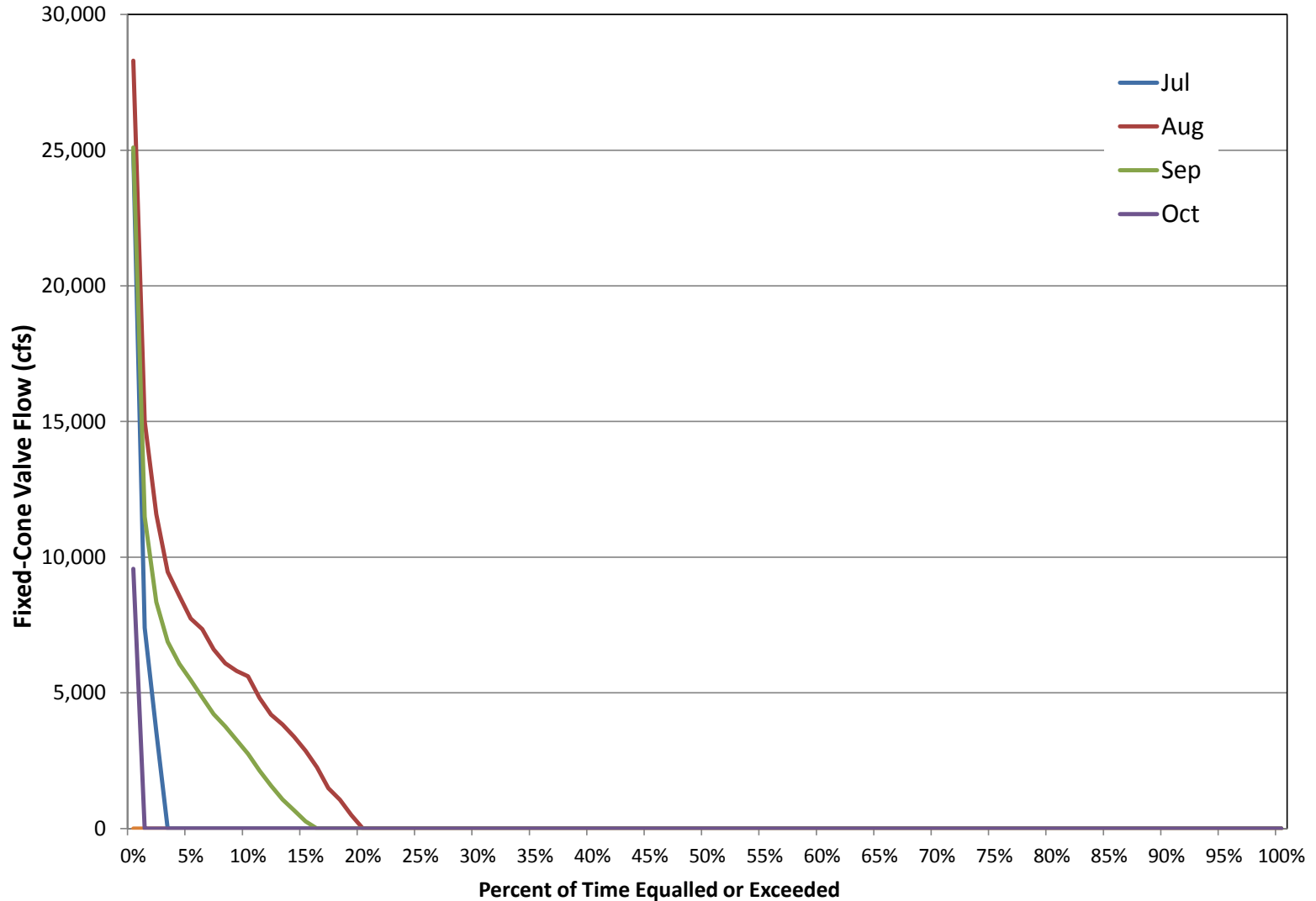


P4 - Monthly Flow Duration – Fixed-Cone Valves

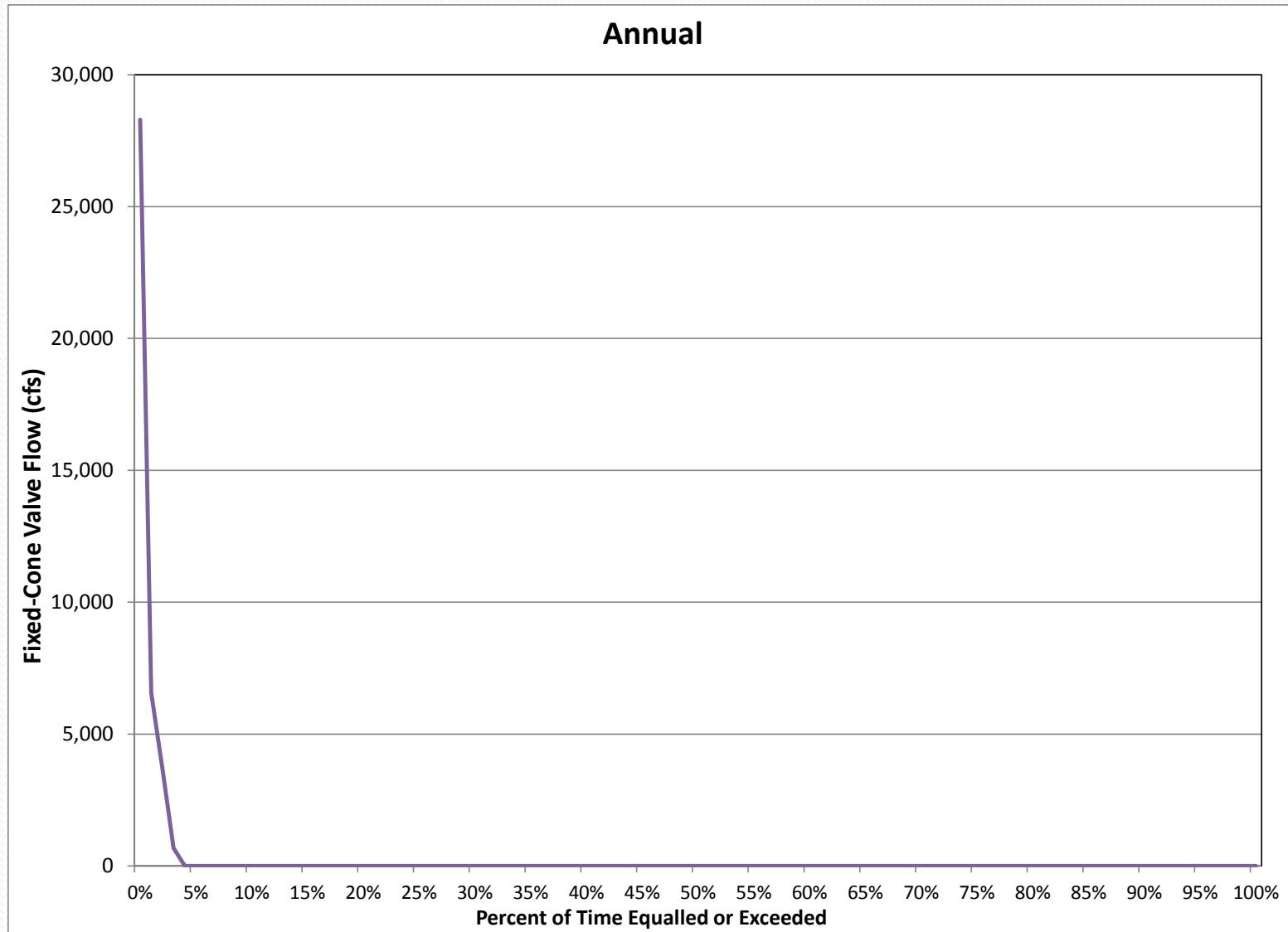
Percentile	Month												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0%	0	0	0	0	0	0	24,906	28,297	25,102	9,570	0	0	28,297
1%	0	0	0	0	0	0	7,401	15,012	11,484	0	0	0	6,570
2%	0	0	0	0	0	0	3,573	11,578	8,352	0	0	0	3,672
3%	0	0	0	0	0	0	0	9,461	6,883	0	0	0	672
4%	0	0	0	0	0	0	0	8,578	6,072	0	0	0	0
5%	0	0	0	0	0	0	0	7,742	5,469	0	0	0	0
6%	0	0	0	0	0	0	0	7,344	4,828	0	0	0	0
7%	0	0	0	0	0	0	0	6,602	4,219	0	0	0	0
8%	0	0	0	0	0	0	0	6,086	3,758	0	0	0	0
9%	0	0	0	0	0	0	0	5,805	3,258	0	0	0	0
10%	0	0	0	0	0	0	0	5,607	2,750	0	0	0	0
11%	0	0	0	0	0	0	0	4,805	2,125	0	0	0	0
12%	0	0	0	0	0	0	0	4,196	1,576	0	0	0	0
13%	0	0	0	0	0	0	0	3,828	1,070	0	0	0	0
14%	0	0	0	0	0	0	0	3,383	672	0	0	0	0
15%	0	0	0	0	0	0	0	2,859	266	0	0	0	0
16%	0	0	0	0	0	0	0	2,256	0	0	0	0	0
17%	0	0	0	0	0	0	0	1,484	0	0	0	0	0
18%	0	0	0	0	0	0	0	1,055	0	0	0	0	0
19%	0	0	0	0	0	0	0	492	0	0	0	0	0
20%	0	0	0	0	0	0	0	0	0	0	0	0	0
30%	0	0	0	0	0	0	0	0	0	0	0	0	0
40%	0	0	0	0	0	0	0	0	0	0	0	0	0
50%	0	0	0	0	0	0	0	0	0	0	0	0	0
60%	0	0	0	0	0	0	0	0	0	0	0	0	0
70%	0	0	0	0	0	0	0	0	0	0	0	0	0
80%	0	0	0	0	0	0	0	0	0	0	0	0	0
90%	0	0	0	0	0	0	0	0	0	0	0	0	0
100%	0	0	0	0	0	0	0	0	0	0	0	0	0

P4 – Monthly Flow Duration Curves – Fixed-Cone Valves

July - October



P4 – Annual Flow Duration Curve – Fixed-Cone Valves



P4 - Monthly Flow Duration – Spillway

There was no spillway flow during any hour of the 61-year period of hourly simulation.

P5 – Monthly Elevation Duration (1 of 3)

Percentile	Month												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0%	2,027	2,007	1,989	1,972	1,980	2,043	2,052	2,052	2,052	2,051	2,050	2,043	2,052
1%	2,021	2,001	1,982	1,962	1,959	2,017	2,051	2,052	2,051	2,051	2,049	2,038	2,051
2%	2,018	1,998	1,979	1,958	1,957	2,008	2,051	2,051	2,051	2,050	2,048	2,037	2,051
3%	2,017	1,997	1,977	1,954	1,953	2,002	2,050	2,051	2,051	2,050	2,048	2,035	2,051
4%	2,016	1,996	1,975	1,952	1,950	1,998	2,047	2,051	2,051	2,050	2,047	2,035	2,051
5%	2,016	1,995	1,974	1,951	1,948	1,993	2,044	2,051	2,051	2,050	2,047	2,034	2,050
6%	2,015	1,994	1,973	1,950	1,946	1,990	2,040	2,051	2,051	2,050	2,047	2,034	2,050
7%	2,014	1,993	1,972	1,949	1,944	1,988	2,037	2,051	2,051	2,050	2,047	2,033	2,050
8%	2,014	1,993	1,972	1,948	1,942	1,986	2,036	2,051	2,051	2,050	2,046	2,033	2,050
9%	2,013	1,992	1,971	1,948	1,941	1,985	2,034	2,051	2,051	2,050	2,046	2,033	2,050
10%	2,013	1,992	1,970	1,947	1,940	1,984	2,032	2,051	2,051	2,050	2,046	2,032	2,050
11%	2,013	1,991	1,970	1,946	1,939	1,982	2,031	2,051	2,051	2,050	2,046	2,032	2,050
12%	2,012	1,991	1,969	1,946	1,938	1,981	2,029	2,051	2,051	2,050	2,046	2,032	2,049
13%	2,012	1,990	1,969	1,945	1,937	1,980	2,028	2,051	2,051	2,050	2,045	2,031	2,049
14%	2,011	1,990	1,968	1,945	1,936	1,979	2,027	2,051	2,051	2,050	2,045	2,031	2,048
15%	2,011	1,990	1,968	1,944	1,935	1,978	2,025	2,051	2,051	2,050	2,045	2,031	2,048
16%	2,011	1,989	1,967	1,944	1,935	1,977	2,024	2,051	2,051	2,050	2,045	2,031	2,047
17%	2,010	1,989	1,967	1,943	1,934	1,977	2,023	2,051	2,051	2,050	2,045	2,030	2,046
18%	2,010	1,988	1,966	1,943	1,933	1,976	2,022	2,051	2,051	2,050	2,044	2,030	2,045
19%	2,010	1,988	1,966	1,942	1,933	1,975	2,021	2,051	2,051	2,050	2,044	2,030	2,044
20%	2,009	1,988	1,966	1,942	1,932	1,974	2,020	2,051	2,051	2,050	2,044	2,030	2,043
21%	2,009	1,987	1,965	1,941	1,932	1,973	2,019	2,051	2,051	2,050	2,044	2,029	2,041
22%	2,009	1,987	1,965	1,941	1,931	1,972	2,018	2,051	2,051	2,050	2,044	2,029	2,040
23%	2,009	1,987	1,964	1,940	1,931	1,971	2,017	2,051	2,051	2,050	2,044	2,029	2,039
24%	2,008	1,986	1,964	1,940	1,931	1,971	2,016	2,051	2,051	2,050	2,044	2,029	2,038
25%	2,008	1,986	1,964	1,939	1,930	1,970	2,016	2,051	2,050	2,050	2,043	2,028	2,036
26%	2,008	1,986	1,963	1,939	1,930	1,969	2,015	2,050	2,050	2,050	2,043	2,028	2,035
27%	2,007	1,985	1,963	1,939	1,929	1,968	2,014	2,050	2,050	2,050	2,043	2,028	2,034
28%	2,007	1,985	1,962	1,938	1,929	1,967	2,013	2,050	2,050	2,050	2,043	2,028	2,032
29%	2,007	1,985	1,962	1,938	1,928	1,967	2,012	2,050	2,050	2,050	2,043	2,028	2,031
30%	2,007	1,984	1,962	1,937	1,928	1,966	2,012	2,050	2,050	2,050	2,043	2,027	2,029
31%	2,006	1,984	1,961	1,937	1,927	1,965	2,011	2,050	2,050	2,050	2,042	2,027	2,028
32%	2,006	1,984	1,961	1,937	1,927	1,964	2,010	2,049	2,050	2,050	2,042	2,027	2,026
33%	2,006	1,984	1,961	1,936	1,926	1,964	2,009	2,048	2,050	2,050	2,042	2,027	2,024

P5 – Monthly Elevation Duration (2 of 3)

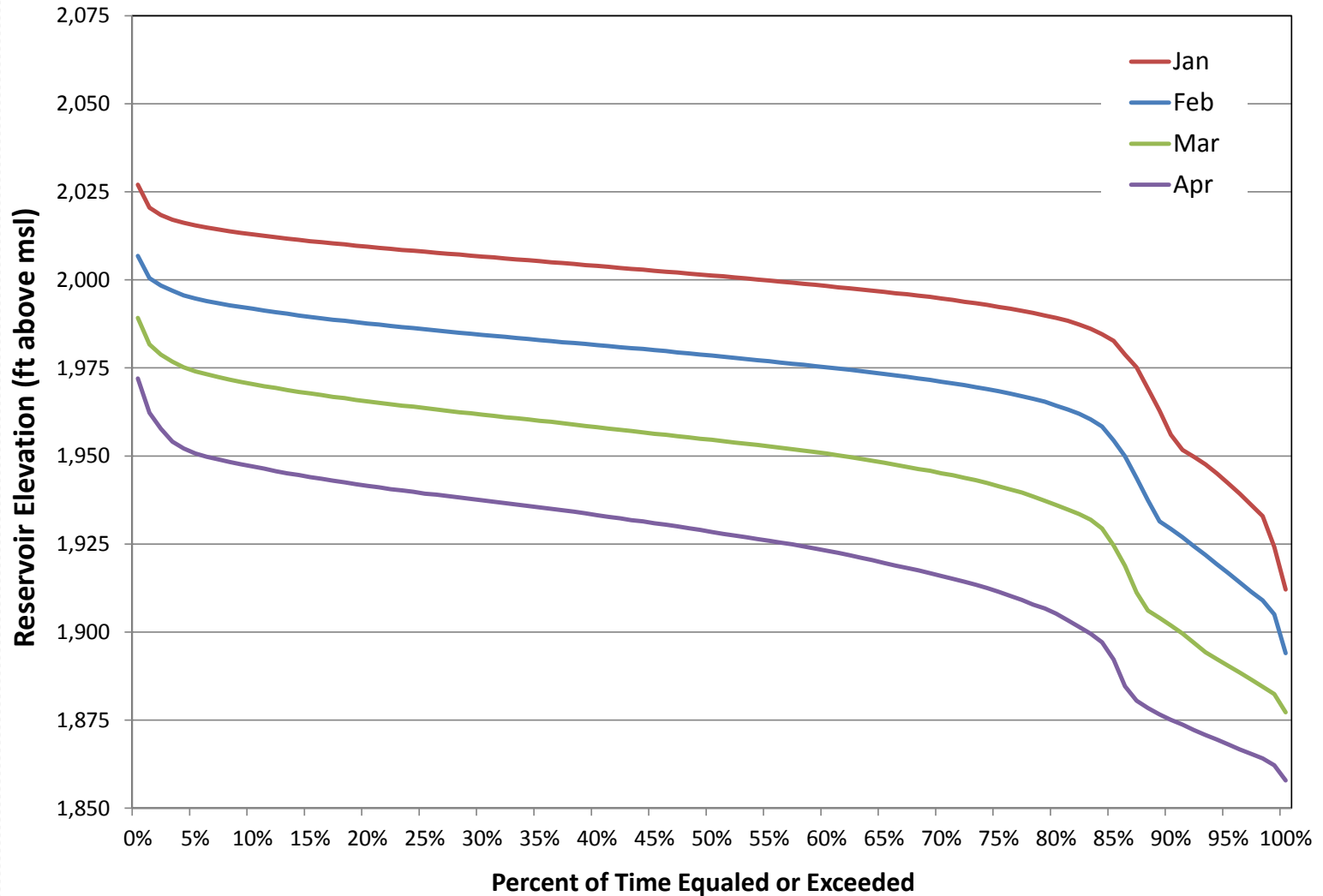
Percentile	Month												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
34%	2,006	1,983	1,960	1,936	1,925	1,963	2,009	2,047	2,050	2,050	2,042	2,026	2,023
35%	2,005	1,983	1,960	1,935	1,925	1,962	2,008	2,047	2,050	2,050	2,042	2,026	2,021
36%	2,005	1,983	1,960	1,935	1,925	1,961	2,007	2,046	2,050	2,050	2,042	2,026	2,019
37%	2,005	1,982	1,959	1,935	1,924	1,961	2,006	2,045	2,050	2,050	2,041	2,026	2,018
38%	2,005	1,982	1,959	1,934	1,923	1,960	2,006	2,045	2,050	2,050	2,041	2,025	2,016
39%	2,004	1,982	1,959	1,934	1,922	1,959	2,005	2,044	2,050	2,050	2,041	2,025	2,014
40%	2,004	1,982	1,958	1,933	1,922	1,958	2,004	2,043	2,050	2,050	2,041	2,025	2,012
41%	2,004	1,981	1,958	1,933	1,921	1,958	2,004	2,043	2,050	2,050	2,041	2,025	2,010
42%	2,003	1,981	1,957	1,932	1,920	1,957	2,003	2,042	2,050	2,049	2,041	2,025	2,009
43%	2,003	1,981	1,957	1,932	1,919	1,956	2,002	2,042	2,050	2,049	2,041	2,024	2,007
44%	2,003	1,980	1,957	1,931	1,918	1,955	2,002	2,041	2,050	2,049	2,040	2,024	2,005
45%	2,003	1,980	1,956	1,931	1,917	1,955	2,001	2,041	2,050	2,049	2,040	2,024	2,004
46%	2,002	1,980	1,956	1,931	1,917	1,954	2,000	2,040	2,050	2,049	2,040	2,024	2,002
47%	2,002	1,979	1,956	1,930	1,916	1,953	1,999	2,039	2,050	2,049	2,040	2,023	2,001
48%	2,002	1,979	1,955	1,930	1,916	1,953	1,999	2,039	2,050	2,049	2,040	2,023	1,999
49%	2,002	1,979	1,955	1,929	1,915	1,952	1,998	2,038	2,050	2,049	2,040	2,023	1,997
50%	2,001	1,979	1,955	1,928	1,914	1,951	1,997	2,038	2,050	2,049	2,039	2,023	1,995
51%	2,001	1,978	1,954	1,928	1,914	1,951	1,997	2,037	2,050	2,049	2,039	2,022	1,994
52%	2,001	1,978	1,954	1,927	1,913	1,950	1,996	2,036	2,050	2,049	2,039	2,022	1,992
53%	2,000	1,978	1,954	1,927	1,913	1,949	1,995	2,036	2,050	2,049	2,039	2,022	1,990
54%	2,000	1,977	1,953	1,926	1,912	1,948	1,995	2,035	2,050	2,049	2,039	2,022	1,988
55%	2,000	1,977	1,953	1,926	1,911	1,947	1,994	2,034	2,050	2,049	2,038	2,021	1,986
56%	2,000	1,977	1,952	1,925	1,910	1,946	1,994	2,034	2,050	2,049	2,038	2,021	1,984
57%	1,999	1,976	1,952	1,925	1,909	1,946	1,993	2,033	2,050	2,048	2,038	2,021	1,982
58%	1,999	1,976	1,952	1,924	1,908	1,945	1,993	2,032	2,050	2,048	2,038	2,021	1,981
59%	1,999	1,976	1,951	1,924	1,908	1,944	1,992	2,032	2,050	2,048	2,038	2,020	1,979
60%	1,998	1,975	1,951	1,923	1,907	1,943	1,991	2,031	2,050	2,048	2,038	2,020	1,977
61%	1,998	1,975	1,950	1,923	1,906	1,942	1,991	2,030	2,050	2,048	2,037	2,020	1,975
62%	1,998	1,975	1,950	1,922	1,906	1,941	1,990	2,030	2,050	2,048	2,037	2,020	1,973
63%	1,997	1,974	1,949	1,921	1,905	1,940	1,989	2,029	2,050	2,048	2,037	2,019	1,971
64%	1,997	1,974	1,949	1,920	1,904	1,939	1,988	2,028	2,050	2,048	2,037	2,019	1,969
65%	1,997	1,973	1,948	1,920	1,903	1,939	1,987	2,028	2,050	2,048	2,036	2,019	1,967
66%	1,996	1,973	1,948	1,919	1,902	1,938	1,987	2,027	2,049	2,048	2,036	2,018	1,965

P5 – Monthly Elevation Duration (3 of 3)

Percentile	Month												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
67%	1,996	1,973	1,947	1,918	1,902	1,937	1,986	2,026	2,049	2,047	2,036	2,018	1,964
68%	1,996	1,972	1,946	1,918	1,901	1,936	1,985	2,025	2,049	2,047	2,036	2,018	1,962
69%	1,995	1,972	1,946	1,917	1,900	1,935	1,984	2,025	2,049	2,047	2,036	2,017	1,960
70%	1,995	1,971	1,945	1,916	1,899	1,934	1,983	2,024	2,049	2,047	2,035	2,017	1,958
71%	1,994	1,971	1,945	1,915	1,898	1,933	1,982	2,023	2,048	2,047	2,035	2,017	1,956
72%	1,994	1,970	1,944	1,914	1,897	1,932	1,981	2,022	2,047	2,047	2,035	2,016	1,954
73%	1,993	1,970	1,943	1,913	1,896	1,931	1,979	2,021	2,046	2,047	2,035	2,016	1,953
74%	1,993	1,969	1,942	1,913	1,896	1,930	1,978	2,020	2,046	2,046	2,034	2,016	1,951
75%	1,992	1,968	1,941	1,911	1,895	1,929	1,977	2,019	2,044	2,046	2,034	2,015	1,949
76%	1,992	1,968	1,941	1,910	1,894	1,928	1,975	2,018	2,044	2,046	2,034	2,015	1,947
77%	1,991	1,967	1,940	1,909	1,893	1,927	1,974	2,017	2,043	2,046	2,033	2,014	1,945
78%	1,991	1,966	1,939	1,908	1,892	1,926	1,973	2,015	2,043	2,046	2,033	2,014	1,943
79%	1,990	1,965	1,937	1,907	1,890	1,925	1,971	2,014	2,042	2,045	2,033	2,013	1,941
80%	1,989	1,964	1,936	1,905	1,887	1,924	1,969	2,013	2,041	2,045	2,032	2,013	1,939
81%	1,988	1,963	1,935	1,903	1,885	1,923	1,968	2,011	2,040	2,045	2,032	2,012	1,937
82%	1,987	1,962	1,934	1,902	1,883	1,921	1,967	2,010	2,039	2,044	2,031	2,011	1,935
83%	1,986	1,960	1,932	1,900	1,882	1,920	1,966	2,008	2,038	2,043	2,031	2,011	1,933
84%	1,985	1,958	1,929	1,897	1,880	1,918	1,964	2,007	2,036	2,043	2,030	2,010	1,931
85%	1,983	1,954	1,925	1,892	1,877	1,917	1,963	2,005	2,035	2,042	2,029	2,008	1,930
86%	1,979	1,950	1,919	1,885	1,874	1,915	1,961	2,004	2,034	2,040	2,027	2,005	1,928
87%	1,975	1,944	1,911	1,881	1,871	1,913	1,960	2,001	2,032	2,037	2,023	2,002	1,925
88%	1,969	1,937	1,906	1,878	1,868	1,912	1,958	1,999	2,031	2,035	2,020	1,998	1,923
89%	1,963	1,931	1,904	1,877	1,867	1,910	1,957	1,997	2,027	2,031	2,015	1,992	1,920
90%	1,956	1,929	1,902	1,875	1,865	1,908	1,955	1,995	2,022	2,025	2,010	1,986	1,917
91%	1,952	1,927	1,900	1,874	1,864	1,906	1,953	1,992	2,017	2,020	2,003	1,978	1,914
92%	1,950	1,924	1,897	1,872	1,863	1,903	1,952	1,990	2,007	2,006	1,992	1,968	1,911
93%	1,948	1,922	1,894	1,871	1,863	1,900	1,950	1,988	2,006	2,004	1,989	1,965	1,907
94%	1,945	1,919	1,892	1,870	1,862	1,897	1,948	1,985	2,005	2,002	1,985	1,963	1,903
95%	1,942	1,917	1,890	1,868	1,861	1,893	1,946	1,983	2,003	2,000	1,982	1,960	1,898
96%	1,939	1,914	1,889	1,867	1,859	1,890	1,942	1,980	2,001	1,998	1,979	1,958	1,892
97%	1,936	1,911	1,887	1,865	1,857	1,886	1,939	1,976	2,000	1,996	1,974	1,956	1,883
98%	1,933	1,909	1,885	1,864	1,854	1,882	1,935	1,970	1,997	1,992	1,971	1,954	1,874
99%	1,924	1,905	1,882	1,862	1,851	1,875	1,928	1,966	1,966	1,965	1,957	1,942	1,864
100%	1,912	1,894	1,877	1,858	1,850	1,853	1,912	1,961	1,966	1,961	1,948	1,932	1,850

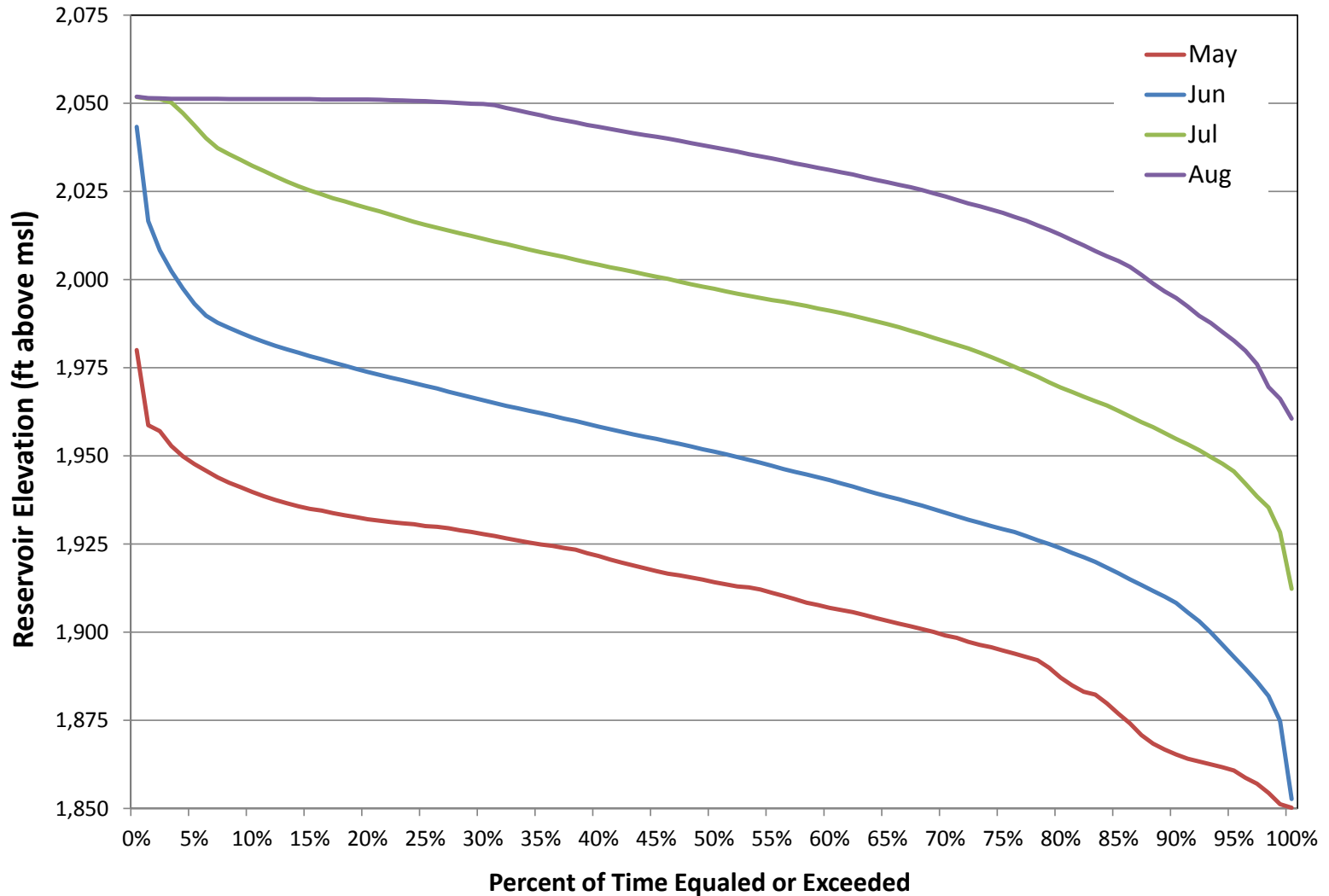
P5 – Monthly Elevation Duration Curves

January - April



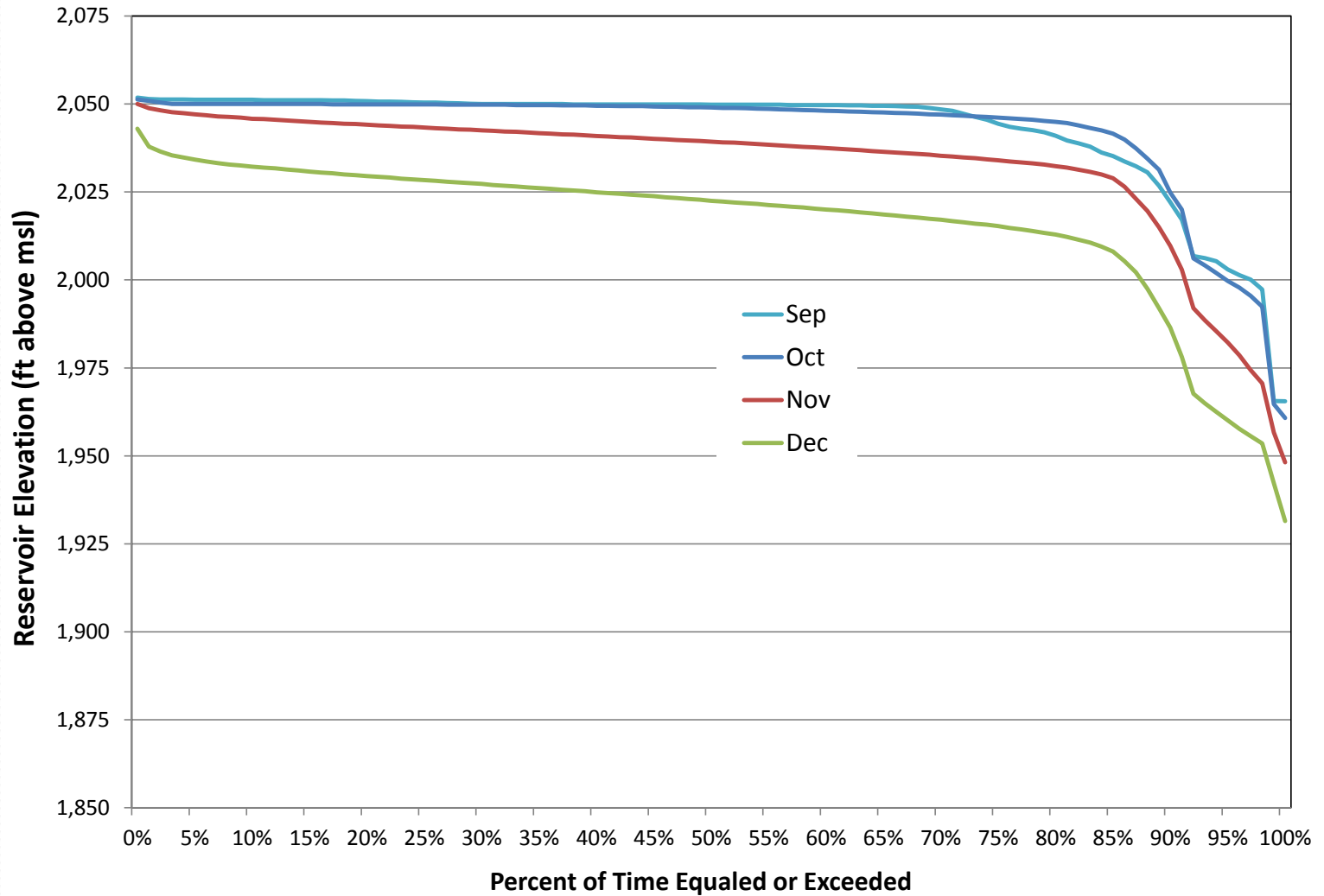
P5 – Monthly Elevation Duration Curves

May - August



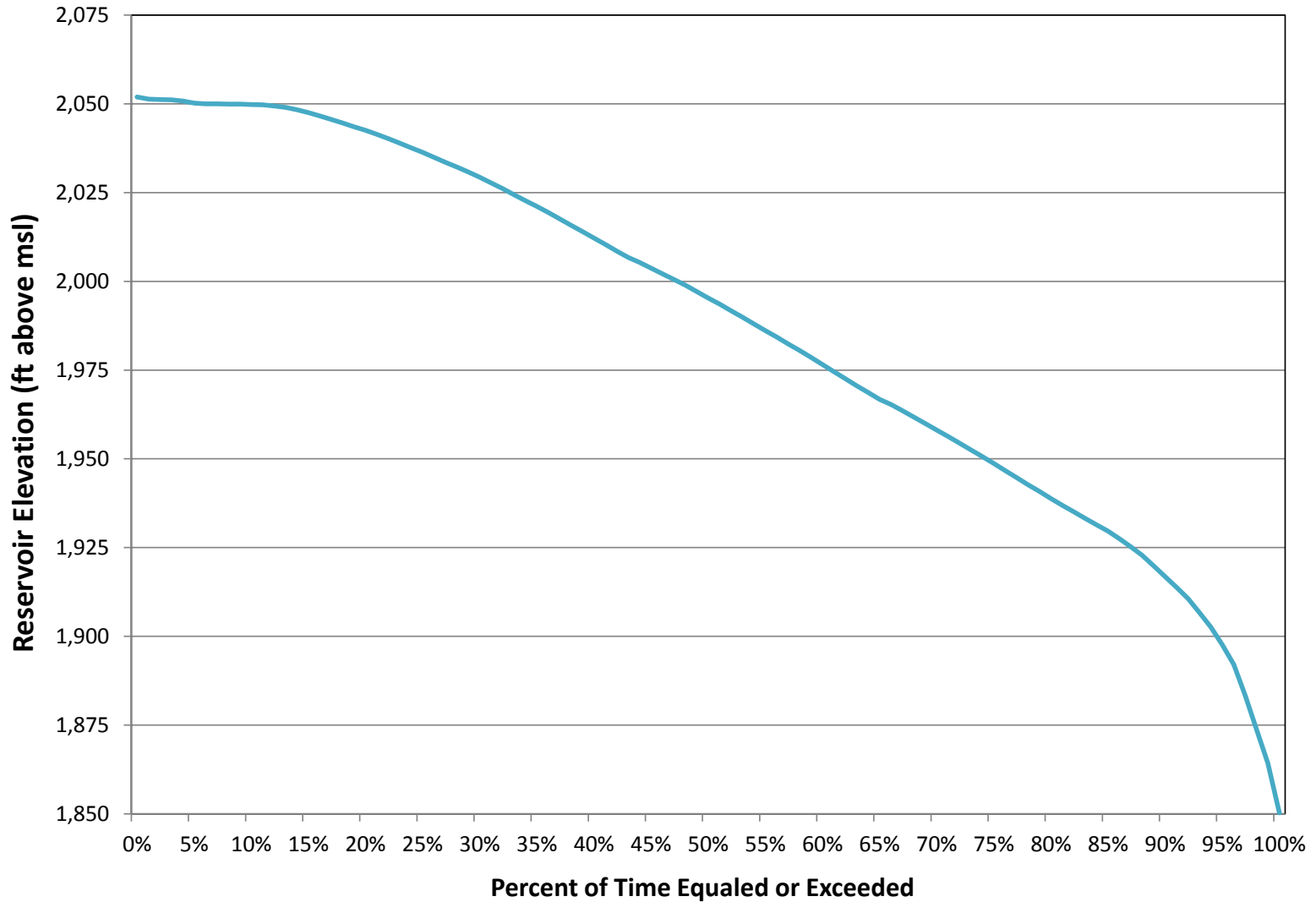
P5 – Monthly Elevation Duration Curves

September - December



P5 – Annual Elevation Duration Curve

Annual

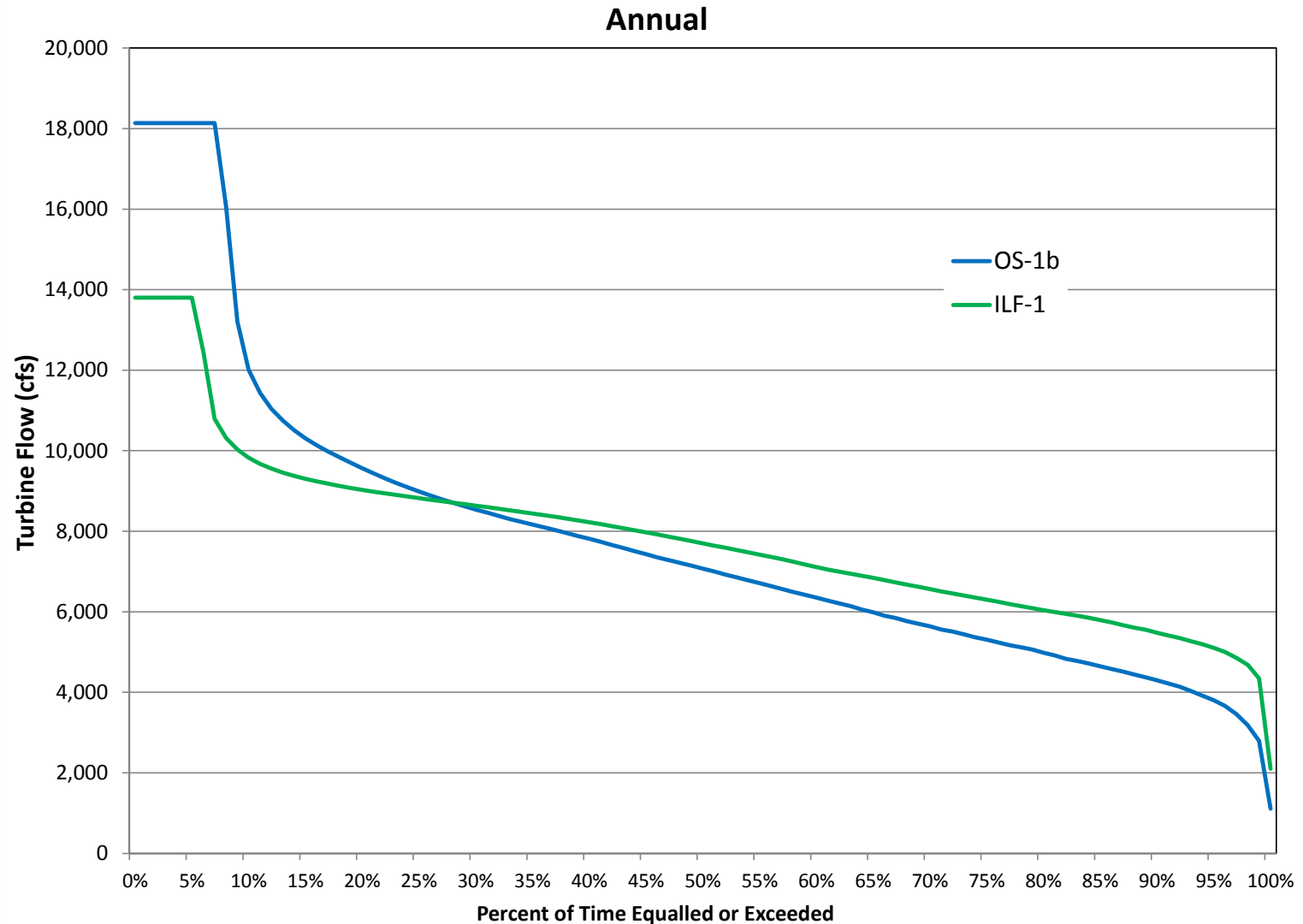


Comparison of Operating Scenarios OS-1b and ILF-1

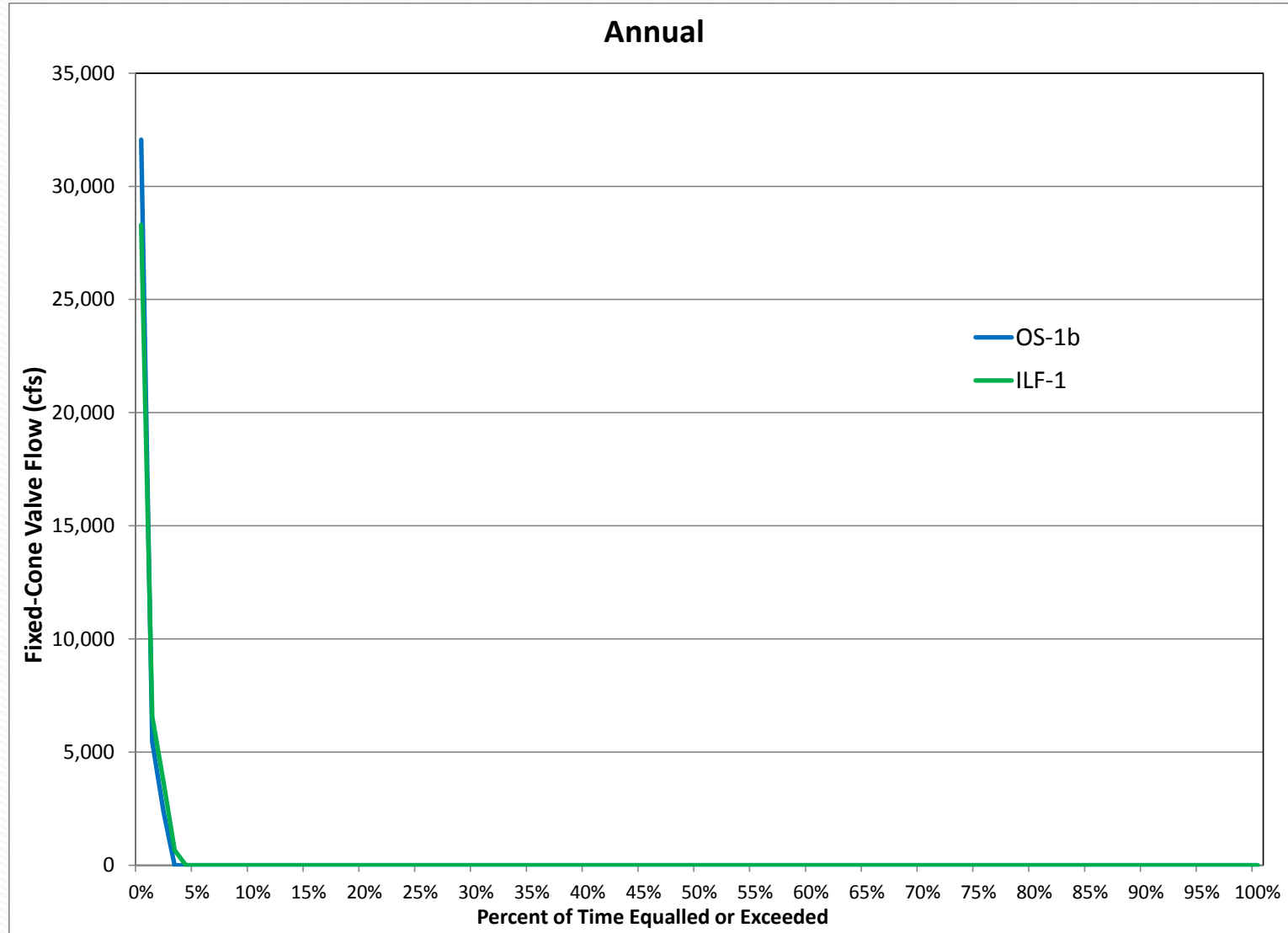
The differences in results between operating scenarios result from differences in the following parameters:

- Maximum load following or intermediate load following
- Turbine hydraulic capacity
- With or without preliminary inflow forecasting

P4 – Annual Flow Duration Curves - Turbines



P4 – Annual Flow Duration Curves – Fixed-Cone Valves



P5 – Annual Elevation Duration Curves

Annual

