# Fish Passage Plan (FPP) Change Request Form

**Change Form # & Title**: 20LMN006 – Unit Priority Update

**Date Submitted**: 6-May-2020

**Project**: Lower Monumental Dam

**Requester Name, Agency**: Lower Monumental Fisheries

**Final Action:**

**FPP Section**:

* Section 4.1.2 and Table LMN-5. (Unit Priority Order);
* Table LMN-6-A (Operating Ranges for Locked-Blade Units).

**Justification for Change**:

Unit 2 is out of service until summer 2020 for draft tube liner repair and blade seals. When Unit 2 returns to service, it will be a Kaplan and no longer restricted to a fixed operating range. Therefore, the FPP needs to be modified to move Unit 2 to second priority and to delete the restricted operating range table.

Units 4 and 5 were forced out of service last year and returned with hydraulically-locked blades in December 2019. Decreasing the amount of times Units 4 and 5 are started and stopped is necessary to protect the temporary repairs. The project is proposing to move Units 4 and 5 to last-on/first-off in unit priority until the blade seals are replaced and the units are restored to Kaplan.

**Proposed Change**:

*See next page with proposed edits.*

**Comments**:

**Record of Final Action**:

* 1. Turbine Unit Priority Order.

**4.1.2.** Unit 1 provides the best fish passage conditions by eliminating the eddy at the juvenile fish loading dock and providing attraction flow to the North adult fish ladder. Therefore, the default priority order for fish passage is Units 1–6 (in order from north to south). However, due to blade seal failures on Units 4 and 5, the blades are hydraulically locked at a fixed angle which restricts the units to a narrower operating range (see 1% range tables in **section 4.2**). To avoid excessive wear and tear from repeated starts/stops, Units 4 and 5 are operated last-on/first-off in the priority order for all flow conditions until repaired.

Current FPP Unit Priority Order Table LMN-5:

| **Season** | **Unit Priority Order** |
| --- | --- |
| March 1 – November 30  Fish Passage Season | DEFAULT = 1, 2, 3, 4, 5, 6  MODIFIED ORDER for Unit 2 w/ Fixed-Blades\*  Start-up (U1 available): 1, 3, 4, 5, 6, 2\*  Start-up (U1 not available): 2\*, 3, 4, 5, 6  Shutdown: 6, 5, 4, 3, 2\*, 1 |
| December 1 – End of February  Winter Maintenance Period | Any Order |

\*Unit 2 has hydraulically locked blades and is operated in the priority order to minimize starts/stops. When Unit 1 is unavailable, Unit 2 will be first priority for fish passage. When the blade seals are replaced, Unit 2 will resume operating in its default order.

Modified Unit Priority Order with Unit 2 restored to Kaplan and Units 4, 5 Locked-Blades:

| **Season** | **Unit Priority Order** |
| --- | --- |
| March 1 – November 30  Fish Passage Season | DEFAULT = 1, 2, 3, 4, 5, 6  MODIFIED ORDER for Units w/ Fixed-Blades\*  Start-up: 1, 2, 3, 6, 4\*, 5\*  Shutdown: 5\*, 4\*, 6, 3, 2, 1 |
| December 1 – End of February  Winter Maintenance Period | Any Order |

\*Units 4 and 5 have hydraulically locked blades and are operated in the priority order to minimize starts/stops. When the blade seals are replaced, the units will resume operating in the default priority order.

Table LMN-6-A. Temporary Operating Range Values for Lower Monumental Units 4 and 5 with Locked Runner Blades (Non-Adjustable). a

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Project** |  | | | | | | **LMN Units 4 and 5 (Blades Locked at 25°) – with STS** | | | | | |
| **Head** |  | |  | |  | | **Lower Limit** | | **Peak Efficiency** | | **Upper Limit** | |
| **(feet)** |  |  |  |  |  |  | **MW** | **cfs** | **MW** | **cfs** | **MW** | **cfs** |
| 85 |  |  |  |  |  |  | 111.2 | 17,959 | 113.5 | 18,226 | 116.3 | 18,791 |
| 86 |  |  |  |  |  |  | 112.5 | 17,951 | 114.9 | 18,223 | 117.8 | 18,794 |
| 87 |  |  |  |  |  |  | 113.9 | 17,942 | 116.3 | 18,220 | 119.3 | 18,796 |
| 88 |  |  |  |  |  |  | 115.2 | 17,933 | 117.7 | 18,216 | 120.8 | 18,798 |
| 89 |  |  |  |  |  |  | 116.6 | 17,924 | 119. 1 | 18,212 | 122.3 | 18,800 |
| 90 |  |  |  |  |  |  | 117.9 | 17,915 | 120.6 | 18,207 | 123.8 | 18,801 |
| 91 |  |  |  |  |  |  | 119.6 | 17,954 | 122.2 | 18,233 | 125.3 | 18,810 |
| 92 |  |  |  |  |  |  | 121.3 | 17,991 | 123.8 | 18,257 | 126.8 | 18,818 |
| 93 |  |  |  |  |  |  | 122.9 | 18,028 | 125.4 | 18,280 | 128.4 | 18,826 |
| 94 |  |  |  |  |  |  | 124.6 | 18,063 | 127.0 | 18,303 | 129.9 | 18,833 |
| 95 |  |  |  |  |  |  | 126.3 | 18,097 | 128.6 | 18,325 | 131.4 | 18,840 |
| 96 |  |  |  |  |  |  | 127.6 | 18,091 | 130.0 | 18,327 | 133.0 | 18,852 |
| 97 |  |  |  |  |  |  | 128.9 | 18,086 | 131.4 | 18,329 | 134.5 | 18,863 |
| 98 |  |  |  |  |  |  | 130.3 | 18,080 | 132.8 | 18,330 | 136.0 | 18,873 |
| 99 |  |  |  |  |  |  | 131.6 | 18,074 | 134.3 | 18,332 | 137.5 | 18,883 |
| 100 |  |  |  |  |  |  | 133.0 | 18,069 | 135.7 | 18,333 | 139.1 | 18,893 |
| 101 |  |  |  |  |  |  | 134.3 | 18,059 | 137. 1 | 18,339 | 140.6 | 18,918 |
| 102 |  |  |  |  |  |  | 135.5 | 18,050 | 138.5 | 18,345 | 142.2 | 18,943 |
| 103 |  |  |  |  |  |  | 136.8 | 18,041 | 140.0 | 18,351 | 143.8 | 18,967 |
| 104 |  |  |  |  |  |  | 138.1 | 18,032 | 141.4 | 18,357 | 145.4 | 18,991 |
| 105 |  |  |  |  |  |  | 139.4 | 18,024 | 142.8 | 18,362 | 147.0 | 19,014 |

1. Units 4 and 5 have hydraulically locked (non-adjustable) runner blades due to leaking blade seals and are restricted to a smaller operating range until the blade seals are repaired or replaced. Values provided by HDC based on the abbreviated index test for Unit 4 (Jan 2018) and Unit 5 (Feb 2020).