

ADDENDUM TO
ENVIRONMENTALLY ACCEPTABLE FEASIBILITY REPORT –
ROCKY REACH DAM

April 9, 2024

The following is an addendum to the *Environmentally Acceptable Lubricant Feasibility Report – Rocky Reach Dam*, that was completed on April 20, 2020, by McMillen Jacobs Associates. This addendum serves as a follow-up to the analyses and recommendations set forth in the original document and provides a general plan for future implementation of EAL conversions. While the original report serves as the primary document, this addendum is a platform for providing information such as status for completion, changes in equipment or conditions, additional analysis, etc. One change of notable mention is one of the greases recommended in the original report, Panolin Margrease, is no longer available. Some of our equipment had already been converted to this grease prior to it becoming unavailable. Further analysis will need to be made to determine an acceptable alternative. Therefore, this addendum, in conjunction with the original report serves as the *Environmentally Acceptable Lubricants Annual Report* required by condition S11.B of the NPDES Permit for Rocky Reach.

Section 1 of this addendum provides an amended version of the table shown in Appendix B.4 – *EAL Implementation Analysis Summary* of the *Environmentally Acceptable Lubricant Feasibility Report – Rocky Reach Dam*. This table has been amended to show the equipment lubricant status, and references to additional information and comments.

Section 2 of this addendum provides the additional information referenced in the table provided in Section 1.

Section 3 of this addendum provides an anticipated conversion schedule for the next three years.

DEPARTMENT OF ECOLOGY

CENTRAL REGIONAL OFFICE

RECEIVED

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SECTION 1

ADDENDUM TO APPENDIX B.4 EAL IMPLEMENTATION ANALYSIS

Addendum to Appendix B.4 - EAL Implementation Analysis Summary

EAL Implementation Analysis - Summary										
	Priority	Likelihood of Water Contact	Ease of Implementation	Cost Feasibility	Applicable Equipment					
	High	High	High	High	Bull gear, chain drive, pillow blocks (Not contained)					
		Moderate	High	High	Sheaves, bearings, pillow blocks, chain drive, and couplings (minimally contained)					
	Moderate	Low	High	High	Sheaves, bearings, pillow blocks, chain drive, bull gear, and couplings (moderately contained)					
		High	High	Moderate	Surface collector couplings and gate hoist hooks, blocks, lifting beams (submerged)					
	Low	Negligible	High	High	Bearings, couplings, bushings, pillow blocks, chain drive (Thoroughly contained)					
		High	Moderate	Moderate	Tainter gate and orifice gate wire rope, Moffett crane wire rope, fish ladder wire rope, etc.					
		High	Moderate	Low	COH hoist wire rope (submerged)					
ID	Primary System	Equip. Description	Floor	EI.	Original/Non-EAL Grease	Likelihood of Water Contact	Ease of Implementation	Cost Feasibility	Priority	Status/Reference
1	Adult Fish Ladder (RRFW) - Picket Barrier Hoist	Fish screening gates sheaves	Upper Fishway Deck	717	248 Moly Syngard	Low	High	High	Moderate	Complete Renewable Bio HT 180
2	Adult Fish Ladder (RRFW) - Picket Barrier Hoist	Fish screening gates zerks	Upper Fishway Deck	717	248 Moly Syngard	Moderate	High	High	High	Complete Renewable Bio HT 180
3	Adult Fish Ladder (RRFW) - Picket Barrier Hoist	Fish screening gates wire rope	Upper Fishway Deck	717	Not Lubricated	High	Moderate	Moderate	Low	Reference 1
4	RRFW CS-S1 Operator	Limit Torques actuator - zerks	Upper Fishway Deck	717	248 Moly Syngard	Moderate	High	High	High	Reference 2
5	Adult Fish Ladder	Adjustable weir - pillow blocks	Upper Fishway Deck	710	248 Moly Syngard	Moderate	High	High	High	Complete Renewable Bio HT 180
6	Adult Fish Ladder	Adjustable weir - wire rope	Upper Fishway Deck	710	Not Lubricated	High	Moderate	Low	Low	Reference 3
7	Juvenile Fish Ladder (BC-G1,-G6,-G7	Radial gate - pillow blocks, zerks	Upper Fishway Deck	710	Huskey LVI-50	Moderate	High	High	High	Complete Panolin Margrease
8	Trash Hopper	Sheaves, roller bearings, zerks	Upper Fishway Deck	713	Huskey LVI-50	Low	High	High	Moderate	Reference 4
9	Surface Collector	Travelling Screens - motor coupling	Upper Fishway Deck	717	248 Moly Syngard	High	High	Moderate	Moderate	Complete Renewable Bio HT 180
10	Surface Collector	Travelling Screens - chains and sprocket	Upper Fishway Deck	717	Huskey LVI-50	Moderate	High	High	High	Complete Panolin Margrease
11	Forebay Intake Gate (ISFTP-S1, -S2)	Limit Torques - zerks	Upper Fishway Deck	717	248 Moly Syngard	Moderate	High	High	High	Partial Reference 5

Addendum to Appendix B.4 - EAL Implementation Analysis Summary

EAL Implementation Analysis - Summary										
	Priority	Likelihood of Water Contact	Ease of Implementation	Cost Feasibility	Applicable Equipment					
	High	High	High	High	Bull gear, chain drive, pillow blocks (Not contained)					
		Moderate	High	High	Sheaves, bearings, pillow blocks, chain drive, and couplings (minimally contained)					
	Moderate	Low	High	High	Sheaves, bearings, pillow blocks, chain drive, bull gear, and couplings (moderately contained)					
		High	High	Moderate	Surface collector couplings and gate hoist hooks, blocks, lifting beams (submerged)					
	Low	Negligible	High	High	Bearings, couplings, bushings, pillow blocks, chain drive (Thoroughly contained)					
		High	Moderate	Moderate	Tainter gate and orifice gate wire rope, Moffett crane wire rope, fish ladder wire rope, etc.					
		High	Moderate	Low	COH hoist wire rope (submerged)					
ID	Primary System	Equip. Description	Floor	EI.	Original/Non-EAL Grease	Likelihood of Water Contact	Ease of Implementation	Cost Feasibility	Priority	Status/Reference
12	Juvenile Fish Ladder	Fish screen gates - pillow blocks, zerks	Upper Fishway Deck	707	Mobil Unirex EP	Moderate	High	High	High	Complete Panolin Margrease
13	VBS Screen Cleaner	Couplers, motor bearings, and pillow blocks	Transformer Deck	717	Huskey LVI-50	Low	High	High	Moderate	Complete Panolin Margrease
14	Intake Gantry - COH	Trolley - wheel bearings, zerks	Transformer Deck	717	Mobil Unirex EP	Low	High	High	Moderate	Reference 6
15	Intake Gantry - COH	Hoist - bearings, gear reducer, couplings, bushings, pillow block	Transformer Deck	717	Mobil Unirex EP	Negligible	High	High	Low	Reference 7
16	Intake Gantry - COH	Hoist - wire rope	Transformer Deck	717	Mobilarma 798	High	Moderate	Low	Low	Reference 8
17	Intake Gantry - COH	Truck - zerks, bearings, couplings, seals	Transformer Deck	717	Mobil Unirex EP	Low	High	High	Moderate	Reference 6
18	Intake Gantry - COH	Aux. hoist - hoist chain	Transformer Deck	717	Fuchs Renolit LZR	Negligible	High	High	Low	Reference 9
19	Tainter Gates 2-10	Hoist - shaft pillow blocks, end bearing, zerks	Spillway	721	248 Moly Syngard	Low	High	High	Moderate	Reference 10
20	Tainter Gates 2-10	Hoist - wire rope	Spillway	721	Loob-it	High	Moderate	Moderate	Low	Reference 10
21	Tainter Gates 2-10	Hoist - bull gear	Spillway	721	Silver Streak	High	High	High	High	Reference 10
22	Tainter Gates 2-10	Hoist - chain drive, couplings	Spillway	721	Chevron Coupling	Low	High	High	Moderate	Reference 10
23	Tainter Gates 1, 11,12	Hoist - shaft pillow blocks, end bearing, zerks	Spillway	721	248 Moly Syngard	Low	High	High	Moderate	Reference 10
24	Tainter Gates 1, 11,12	Hoist - wire rope	Spillway	721	Loob-it	High	Moderate	Moderate	Low	Reference 10

Addendum to Appendix B.4 - EAL Implementation Analysis Summary

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	Priority	Likelihood of Water Contact	Ease of Implementation	Cost Feasibility	Applicable Equipment					
	High	High	High	High	Bull gear, chain drive, pillow blocks (Not contained)					
		Moderate	High	High	Sheaves, bearings, pillow blocks, chain drive, and couplings (minimally contained)					
	Moderate	Low	High	High	Sheaves, bearings, pillow blocks, chain drive, bull gear, and couplings (moderately contained)					
		High	High	Moderate	Surface collector couplings and gate hoist hooks, blocks, lifting beams (submerged)					
	Low	Negligible	High	High	Bearings, couplings, bushings, pillow blocks, chain drive (Thoroughly contained)					
		High	Moderate	Moderate	Tainter gate and orifice gate wire rope, Moffett crane wire rope, fish ladder wire rope, etc.					
		High	Moderate	Low	COH hoist wire rope (submerged)					
ID	Primary System	Equip. Description	Floor	EI.	Original/Non-EAL Grease	Likelihood of Water Contact	Ease of Implementation	Cost Feasibility	Priority	Status/Reference
25	Tainter Gates 1, 11,12	Hoist - bull gear	Spillway	721	Silver Streak	Moderate	High	High	High	Reference 10
26	Tainter Gates 1, 11,12	Hoist - chain drive, couplings	Spillway	721	Chevron Coupling	Negligible	High	High	Low	Reference 10
27	Middle Spillway Entrance (HS-1)	Actuator - zerk	Spillway	717	248 Moly Syngard	Moderate	High	High	High	Reference 11
28	Middle Spillway Entrance (MSE)	Dewater pump - zerk	Spillway	640	Huskey LVI-50	Negligible	High	High	Low	Reference 12
29	Middle Spillway Entrance (MSE, RG-1 Operator) ¹	Fish Intake gate - wire rope	Spillway	640	Not Lubricated	High	Moderate	Low	Low	Reference 13
30	Middle Spillway Entrance (MSE, RG-2 Operator) ¹	Rish intake gate - zerk, pillow blocks, couplings	Spillway	640	248 Moly Syngard	Moderate	High	High	High	Reference 14
31	Left Powerhouse Entrance (LPE, RG-1) ²	wire rope	Tailrace Deck	650	Not Lubricated	High	Moderate	Low	Low	Reference 15
32	Fish Unwatering Pump	Zerk	Tailrace Deck	650	248 Moly Syngard	Moderate	High	High	High	Reference 16
33	Left Powerhouse Entrance (LPE, RG-1 and RG-3) ³	Pillow blocks, couplings, chain drive	Tailrace Deck	650	248 Moly Syngard	Moderate	High	High	High	Reference 17
34	Left Powerhouse Entrance (LPE, RG-3) ³	Wire rope	Tailrace Deck	650	Not Lubricated	High	Moderate	Low	Low	Reference 15

Notes:

1. System description corrected to read RG-2 instead of RG-1
2. System description corrected from Right Powerhouse Entrance (RPE, RG-1 and RG-3)
3. System description corrected from Fishway Regulating Gates

Addendum to Appendix B.4 - EAL Implementation Analysis Summary

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	High	High	High	High	Bull gear, chain drive, pillow blocks (Not contained)					
		Moderate	High	High	Sheaves, bearings, pillow blocks, chain drive, and couplings (minimally contained)					
	Moderate	Low	High	High	Sheaves, bearings, pillow blocks, chain drive, bull gear, and couplings (moderately contained)					
		High	High	Moderate	Surface collector couplings and gate hoist hooks, blocks, lifting beams (submerged)					
	Low	Negligible	High	High	Bearings, couplings, bushings, pillow blocks, chain drive (Thoroughly contained)					
		High	Moderate	Moderate	Tainter gate and orifice gate wire rope, Moffett crane wire rope, fish ladder wire rope, etc.					
		High	Moderate	Low	COH hoist wire rope (submerged)					
ID	Primary System	Equip. Description	Floor	EI.	Original/Non-EAL Grease	Likelihood of Water Contact	Ease of Implementation	Cost Feasibility	Priority	Status/Reference
35	Tailrace Crane - Moffett	Truck - wheel bearings, zerks	Tailrace Deck	650	Chevron Ultra Duty EP	Moderate	High	High	High	Reference 18
36	Tailrace Crane - Moffett	Main hoist - wire rope	Tailrace Deck	650	Not Lubricated	High	Moderate	Low	Low	Reference 18
37	Tailrace Crane - Moffett	Main hoist - hooks, lifting beam, block zerks	Tailrace Deck	650	248 Moly Syngard	High	High	Moderate	Moderate	Reference 18
38	Tailrace Crane - Moffett	Hoist trolley - pulley/shaft bearing	Tailrace Deck	650	Chevron Ultra Duty EP	Low	High	High	Moderate	Reference 18
39	Tailrace Crane - Moffett	Orifice gate hoist - bearings	Tailrace Deck	650	Chevron Ultra Duty EP	Moderate	High	High	High	Reference 18
40	Tailrace Crane - Moffett	Orifice gate hoist - wire rope	Tailrace Deck	650	Not Lubricated	High	Moderate	Low	Low	Reference 18
41	Tailrace Crane - Moffett	Orifice gate hoist - zerks, hooks, lifting beam	Tailrace Deck	650	248 Moly Syngard	High	High	Moderate	Moderate	Reference 18
42	Wing Gates	Zerks	Tailrace Deck	650	248 Moly Syngard	Moderate	High	High	High	Reference 19
43	Wing Gates	Zerks	Lower Fishway Walkway	635	248 Moly Syngard	Moderate	High	High	High	Reference 19
44	Orifice Gate Hoist	Wire rope	Lower Fishway Walkway	635	Loob-it	High	Moderate	Moderate	Low	Reference 20
45	Orifice Gate Hoist	Zerks, pillow blocks, sheave block	Lower Fishway Walkway	635	248 Moly Syngard	Moderate	High	High	High	Reference 21

Addendum to Appendix B.4 - EAL Implementation Analysis Summary

EAL Implementation Analysis - Summary										
	Priority	Likelihood of Water Contact	Ease of Implementation	Cost Feasibility	Applicable Equipment					
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		Moderate	High	High	Sheaves, bearings, pillow blocks, chain drive, and couplings (minimally contained)					
	Moderate	Low	High	High	Sheaves, bearings, pillow blocks, chain drive, bull gear, and couplings (moderately contained)					
		High	High	Moderate	Surface collector couplings and gate hoist hooks, blocks, lifting beams (submerged)					
	Low	Negligible	High	High	Bearings, couplings, bushings, pillow blocks, chain drive (Thoroughly contained)					
		High	Moderate	Moderate	Tainter gate and orifice gate wire rope, Moffett craine wire rope, fish ladder wire rope, etc.					
		High	Moderate	Low	COH hoist wire rope (submerged)					
ID	Primary System	Equip. Description	Floor	EI.	Original/Non-EAL Grease	Likelihood of Water Contact	Ease of Implementation	Cost Feasibility	Priority	Status/Reference
46	Orifice Gate Hoist	Couplers	Lower Fishway Walkway	635	Chevron Coupling	Moderate	High	High	High	Reference 21
47	Fish Sampling Facility	Crowder - pillow blocks	West Bank	675	Huskey LVI-50	Moderate	High	High	High	Complete Panolin Margrease
48	Fish Sampling Facility	Process water pumps - zerks	West Bank	675	Huskey LVI-50	Low	High	High	Moderate	Complete Panolin Margrease
49	Fish Sampling Facility	Sampling screen - trucks, chain drive	West Bank	675	Huskey LVI-50	High	High	High	High	Reference 22
50	Fish Sampling Facility	Tainter gate - pillow blocks,zerks	West Bank	675	Huskey LVI-50	High	High	High	High	Complete Panolin Margrease

SECTION 2

REFERENCES FOR ADDENDUM TO APPENDIX B.4

REFERENCES FOR ADDENDUM TO APPENDIX B.4

The following is a list of references as shown in the *Status/Reference* column in the table of Section 1. These references indicate the corresponding ID #'s, equipment descriptions, and additional information relevant to EAL conversion.

REFERENCE 1:

ID#: 3

Primary System/Equipment: Adult Fishladder (RRFW) - Pickett barrier hoist wire ropes

- Likelihood of water contact: **High**
- Priority: **Low**

The galvanized wire ropes are pre-injected with lubricant prior to purchase but are not lubricated as part of any established preventative maintenance schedule. The wire ropes are replaced when certain criteria are met, such as a percentage of broken strands or an appreciable loss of wire rope diameter due to corrosion. Stainless steel wire rope conversion would be cost prohibitive due to the replacement of supporting equipment such as drums and sheaves to accommodate a larger diameter wire rope.

REFERENCE 2:

ID#: 4

Primary System/Equipment: RRFW CS-S1 Operator

- Likelihood of water contact: **Moderate**
- Priority: **High**

The CS-S1 actuator controls a sluice gate at the adult fishladder exit. This gate is used to help maintain a consistent level of water in the upper ladder to optimize fish passage. Modulation of this gate is directly influenced by changing headwater elevations and therefore is essential in maintaining compliant operation of our adult fishladder. Due to the criticality of this equipment and the functional unknowns with an EAL, the operational risk of converting the actuator to EAL is considered to be too high of a risk at this time.

REFERENCE 3:

ID#: 6

Primary System/Equipment: Adult Fishladder (RRFW) - Adjustable Weir -Wire rope

- Likelihood of water contact: **High**
- Priority: **Low**

The wire ropes on the adjustable weir are galvanized. The galvanized wire ropes are pre-injected with lubricant prior to purchase but are not lubricated as part of any established preventative maintenance schedule. Moving the wire rope to stainless is therefore unnecessary and would require costly changes to supporting assets.

REFERENCE 4:

ID#: 8

Primary System/Equipment: Juvenile Fish Bypass (JFB) trash hopper sheaves, roller bearings, zerks

- Likelihood of water contact: **Low**
- Priority: **Moderate**

The trash hopper is the only effective means of removing collected river debris harvested by the intake trashrakes. This asset assembly is critical to the function of the JFB. Due to the low probability of grease reaching the water, the functional unknowns with an EAL, and the critical nature of the trash handling system, converting the system to EAL is considered to be too high of a risk at this time.

REFERENCE 5:

ID#: 11

Primary System/Equipment: RRFW forebay intake gate actuators ISFTP-S1 and S2

- Likelihood of water contact: **Moderate**
- Priority: **High**

ISFTP-S1 actuator was converted to an EAL, Bio HT 180 EP2, in February of 2021. Refer to Section 3 of the Conversion Schedule for actuator ISFTP-S2 conversion.

REFERENCE 6:

ID#: 14 and 17

Primary System/Equipment: Intake Gantry Crane (COH) – Trolley and truck wheel bearings, zerks, couplings, and seals

- Likelihood of water contact rating: **Low**
- Priority: **Moderate**

The COH intake gantry crane was assembled and commissioned in 2018. This asset is a critical component to our preventative and corrective maintenance programs. The intake gantry is used to set unit head gates and when called upon, the crane is essential in delivering headgates into a unit in a runaway state. The crane must function, without question, when called upon. With the low probability of grease making contact with water, the functional unknowns with an EAL, and the criticality of the asset, the District deems the conversion of the trolley wheel bearings to EAL to be too great of a risk at this time.

REFERENCE 7:

ID#: 15

Primary System/Equipment: Intake Gantry Crane (COH) – Hoist bearings, gear reducers, coupling, bushings, and pillow blocks.

- Likelihood of water contact rating: **Negligible**
- Priority: **Low**

The hoist assets are protected with secondary containment trays and therefore the risk of grease contacting water is negligible. This, coupled with the asset's criticality and functional unknowns with an EAL the District deems the conversion of the hoist asset to be an unnecessary risk at this time.

REFERENCE 8:

ID#: 16

Primary System/Equipment: Intake Gantry Crane (COH) – Hoist wire rope

- Likelihood of water contact rating: **High**
- Priority: **Low**

The hoist wire ropes are a 6x36 EIPS IWRC and are galvanized. The ropes are lubricated by the manufacturer upon delivery and are not a part of a routine lubrication schedule. The wire ropes are instead inspected for corrosion, loss of steel, and broken strands and would be subject to replacement if certain criteria were met. Converting the wire ropes to stainless steel is cost prohibitive. Stainless steel is not as strong as steel which would likely call for an increase in the diameter of the wire rope, thereby forcing a complete replacement of the upper and lower sheave assemblies as well as the wire rope drums. It is for this reason the District considers the conversion of the wire ropes to stainless steel an impracticable option.

REFERENCE 9:

ID#: 18

Primary System/Equipment: Intake Gantry Crane (COH) – Auxiliary hoist chain

- Likelihood of water contact: **Negligible**
- Priority: **Low**

The trolley house auxiliary hoist chain is lubricated every 1,000 hours of operation. The hoist is used infrequently and is primarily intended to hoist tools, equipment, and 55-gallon barrels of oil up to the trolley house. The chain is never in contact with water, and it is for this reason the District deems conversion unnecessary.

REFERENCE 10:

ID#: 19 through 26

Primary System/Equipment: Tainter gates 1 through 12

Project 438618 – RR Spillway Modernization is in active development within our Project Delivery (PD) team. Most of the bridge components are expected to be replaced, including the hoisting ropes. The hoisting ropes would be changed to stainless steel which would not require lubrication. The District is directing the use of EAL options where feasible, and secondary containment where EAL use is not feasible. Early discussions indicate the modernization of the spillway will occur in two phases, with the schedule prioritizing high use gates (gates 4 through 8). The second phase will closely follow the first phase and will include the remaining gates, (gates 1 through 3 and gates 9 through 12). Currently the project is anticipated to start in 2026.

REFERENCE 11:

ID#: 27

Primary System/Equipment: RRFW Middle spillway entrance HS-1 actuator zerks

- Likelihood of water contact: **Moderate**
- Priority: **High**

The HS-1 actuator controls a sluice gate at the middle spillway entrance (MSE). This gate is used to maintain sufficient attraction water at the MSE, via a conduit fed by the headwater reservoir. This Limitorque actuator is scheduled for replacement in 2024. Due to its critical role in maintaining compliance with our fishway operations and the functional unknowns with an EAL the risk is considered to be too great to convert to EAL at this time.

REFERENCE 12:

ID#: 28

Primary System/Equipment: RRFW middle spillway entrance (MSE) dewatering pump zerk

- Likelihood of water contact: **Negligible**
- Priority: **Low**

Due to the unlikelihood of grease reaching water, and the low priority status, there is no justification for moving the motor bearings over to an EAL.

REFERENCE 13:

ID#: 29

Primary System/Equipment: RRFW middle spillway entrance (MSE) RG-1 operator wire ropes

- Likelihood of water contact: **High**
- Priority: **Low**

The wire ropes are pre-injected with lubricant prior to purchase but are not lubricated as part of any established preventative maintenance schedule. The ropes are replaced when certain criteria are met, such as a

percentage of broken strands or an appreciable loss of wire rope diameter due to corrosion. Stainless steel wire rope conversion would be cost prohibitive.

REFERENCE 14:

ID#: 30

Primary System/Equipment: RRFW Middle Spillway Entrance (MSE) RG-1 operator zerks, pillow blocks, couplings

- Likelihood of water contact: **Moderate**
- Priority: **High**

The MSE operator is used to deploy regulating stoplogs to either control the inflow of attraction water into the middle spillway entrance or to dewater the entrance for inspection during overhaul season. The two motor bearings, the pillow block bearings (4), and sheave blocks (2) will be converted to BIO HT 180 EP2.

REFERENCE 15:

ID#: 31 and 34

Primary System/Equipment: Left Powerhouse Entrance (LPE RG-1 and RG-3) hoist wire ropes

- Likelihood of water contact: **High**
- Priority: **Low**

The wire ropes are pre-injected with lubricant prior to purchase but are not lubricated as part of any established preventative maintenance schedule. The ropes are replaced when certain criteria are met, such as a percentage of broken strands or an appreciable loss of wire rope diameter due to corrosion. Stainless steel wire rope conversion would be cost prohibitive.

REFERENCE 16:

ID#: 32

Primary System/Equipment: Fishway Unwatering Pump

- Likelihood of water contact: **Moderate**
- Priority: **High**

A new fishway unwatering pump has been installed to replace the remaining original unwatering pump. The new one has product/water lubricated shaft bearings.

REFERENCE 17:

ID#: 33

Primary System/Equipment: RRFW Fishway regulating gates (LPE RG-1 and RG-3) pillow blocks, couplings, and chain drive.

- Likelihood of water contact: **Moderate**
- Priority: **High**

The regulating gate operators RG-1 and RG-3 are used to deploy stoplogs to control flow through the left powerhouse entrance (LPE) or to dewater the fishladder for maintenance. To date, the pillow blocks and motor coupling have been converted over to BIO HT 180 EP2 (February of 2021). The chain drive still has not been converted (see conversion schedule below).

REFERENCE 18:

ID#: 35 through 41

Primary System/Equipment: Tailrace Crane – Moffett

Project 340774 - RR Tailrace Gantry Crane Replacement is in active development within our PD team. The use of EALs and secondary containment will be evaluated as part of the design. The new crane is expected to be in operation by 2025.

REFERENCE 19:

ID#: 42 and 43

Primary System/Equipment: RRFW wing gate gearboxes U-1, U-2, X-1, X-2, X-3, and X-4 zerks

- Likelihood of water contact: **Moderate**
- Priority: **High**

The wing gates are a pair of controllable gates set in a series that divide water flow and establish the proper gradient of flow into the channels of the lower fishway. There are two gearboxes per wing gate operator. A larger scale analysis of this system and the operators will be occurring to look at alternatives. Conversion to EAL on these devices will be postponed pending this analysis.

REFERENCE 20:

ID#: 44

Primary System/Equipment: RRFW orifice gate wire ropes – 22 gates total

- Likelihood of water contact: **High**
- Priority: **Low**

Operation of the fishway does not require the majority of the orifice gates to be in operation. Typically, one to two of the orifice gates are in operation at any given time. The wire ropes are pre-injected with lubricant prior to purchase but are not lubricated as part of any established preventative maintenance schedule. The ropes are replaced when certain criteria are met, such as a percentage of broken strands or an appreciable loss of wire rope diameter due to corrosion. Stainless steel wire rope conversion would be cost prohibitive.

REFERENCE 21:

ID#: 45 and 46

Primary System/Equipment: RRFW orifice gate hoist operator pillow blocks, couplers, and sheave blocks

- Likelihood of water contact: **Moderate**
- Priority: **High**

The orifice gates are used to provide additional adult fish entry options into the lower fishway. The majority of the actuator motor couplings have been moved over to jaw-type Lovejoys which have an elastomer element or cushion and therefore do not require grease. Gates that still need coupling conversion to Lovejoy are OG 6 (Motor and coupling currently removed), OG 5, and OG 4 (motor currently removed). All pillow blocks and sheave blocks will be converted to EAL. Reference Section 3 Conversion Schedule for sheaves and bearing.

REFERENCE 22:

ID#: 49

Primary System/Equipment: JFB fish sampling facility sampling screen trucks and drive chain

- Likelihood of water contact: **Low**
- Priority: **Moderate**

The sampling screen is deployed in the bypass conduit flume to divert juvenile salmon to a facility for counting. The screen is the only means in which to divert the fish and therefore is critical to facilitate the fish sampling process. The sampling of juveniles helps us to meet our HCP objectives which is a part of our licensing. When not in use, the screen is stored above water. Since the screen is in and out of water frequently, lubricating with an EAL would result in a significant increase in operation and maintenance costs to keep lubrication at a level where it is protecting the equipment, thus the District does not intend to convert to an EAL.

SECTION 3

CONVERSION SCHEDULE

EAL CONVERSION SCHEDULE

The following is a list of equipment and anticipated timeline for conversion to EAL. Due to inherent challenges with operations, resources, and outage requirements, the schedules only show the year for anticipated completion to allow for work within changing conditions.

- **ID#: 30**
Primary System/Equipment: RRFW Middle Spillway Entrance (MSE) RG-1 operator
Scheduled Conversion: 2024

The MSE operator is used to deploy regulating stoplogs to either control the inflow of attraction water into the middle spillway entrance or to dewater the entrance for inspection during overhaul season. The two motor bearings, the pillow block bearings (4), and sheave blocks (2) will be converted to BIO HT 180 EP2.
- **ID#: 33**
Primary System/Equipment: RRFW Fishway regulating gates RG-1 and RG-3 chain drive.
Scheduled Conversion: 2024 (RG1 only)

Will convert the chain drive on RG-1 only at this time for testing and observation to ensure functionality for this equipment. RG-3 will be scheduled for conversion once there is operational assurance with this lubricant in this application.
- **ID#: 45 and 46**
Primary System/Equipment: RRFW orifice gate hoist operator pillow blocks, couplers, and sheave blocks
Scheduled Conversion: 2024 – 2026 (Convert some each year)

The orifice gates are used to provide additional adult fish entry options into the lower fishway. Most of the motor couplings have been moved over to jaw-type Lovejoys which have an elastomer element or cushion and therefore do not require grease. Gates that still need conversion to Lovejoy are OG 6 (Motor and coupling currently removed), OG 5, and OG 4 (motor currently removed). All pillow blocks and sheave blocks remaining. Due to the quantity and time required, the conversion will occur over a 3-year period.
- **ID#: 11**
Primary System/Equipment: RRFW forebay intake gates ISFTP-S1 and S2
Scheduled Conversion: 2027

ISFTP-S1 was converted to Bio HT 180 EP2 in February of 2021. ISFTP-S2 is scheduled for a 3-year preventative maintenance inspection where the actuator is opened, cleaned, and inspected for internal component wear. The next PM execution date is scheduled for January/February of 2027. It is at this time the actuator will be converted over to BIO HT 180 EP2.