EROSION CONTROL PLAN
5-YEAR ROLLING ACTION PLAN
CALENDAR YEAR 2023

North Umpqua Hydroelectric Project
FERC Project No. 1927

AUTHORIZATIONS

Final Approved:	PacifiCorp	03/16/23 (date)	[signature]	(signature)
	USDA–FS	03/16/23 (date)	Pamela J Sichting	(signature)
	ODEQ	03/16/23 (date)	Chris Stino	(signature)
	ODFW	03/20/23 (date)	[signature]	(signature)

ATTACHMENTS

A 2022 Annual Erosion Control Plan Summary Report and 5-Year Rolling Action Plan

Erosion Control Program

2022 ANNUAL EROSION CONTROL PLAN SUMMARY REPORT AND 5-YEAR ROLLING ACTION PLAN

North Umpqua Hydroelectric Project (FERC Project No. 1927)

Prepared by:
Valley Science and Engineering
Albany, Oregon
and
PacifiCorp Energy
Portland, Oregon

August 29, 2022

TABLE OF CONTENTS

1.0 HISTORY OF EROSION CONTROL PLAN

PacifiCorp is the owner and operator of the North Umpqua Hydroelectric Project, Federal Energy Regulatory Commission (FERC) No. 1927 (Project), originally licensed in 1947 and relicensed in 2003. Under the terms of the 2003 license and Section 14.5 of the June 13, 2001 North Umpqua Hydroelectric Project Settlement Agreement (SA) between PacifiCorp and the U.S. Department of Agriculture, Forest Service (USDA-FS), U.S. Department of Interior, Bureau of Land Management (USDI-BLM), USDI Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), Oregon Departments of Fish and Wildlife (ODFW), Department of Environmental Quality (DEQ), and Oregon Water Resources (OWRD), collectively referred to as the Parties, PacifiCorp is required to prepare an Annual Erosion Control Plan (ECP) Summary Report (Report). The Report is a requirement in conducting an efficient erosion control program. It is intended to be used in conjunction with the ECP (PacifiCorp, 2004). Sections 2.2 and 2.3 of the ECP outline the purpose of the Report and the overall program components. For successful implementation and coordination of actions, the ECP identifies the following:

- Annual ECP Summary Report (this document)
- Rolling 5-Year ECP Action Plan (Section 6.0 of this document)
- Annual Plan Meeting

The Report serves a necessary monitoring function of the ECP by evaluating the program's progress. The Report also contains a schedule in Section 6.0 that functions as the draft 5-Year Rolling Action Plan, which is identified in the ECP. The schedule provides the base information for completing the 5-Year Rolling Action Plan. The Report will be used to conduct the Annual Plan Meeting with the Parties. All Parties will receive the Report and are requested to indicate if they will participate in the Annual Plan Meeting.

The Project will continue to be evaluated over the 35-year license term for ongoing erosion control in the vicinity of Project structures, assessment of the effectiveness of erosion mitigation measures installed during prior years, and the identification and evaluation of new erosion sites.

2.0 INTRODUCTION TO 2021 INSPECTION

Each identified erosion mitigation site was visited and assessed by a Valley Science and Engineering (Valley) Project Engineer and an Oregon-Registered Professional Environmental Engineer on June 13 and 14, 2022. Technical review of this document was provided by an Oregon-Registered Professional Engineer.

Inspections were completed along each of the Project waterways and access roads. Areas inspected included the following:

- Lemolo 2 (LM2)
- Clearwater 2 (CW2)
- Fish Creek (FC)
- Slide Creek (SC)
- Lemolo 1 (LM1)
- Deer Creek (DC)

The results of the inspection are presented in the following manner:

- Site Remediation Progress and Program Status
- Effectiveness Monitoring
  - Annual Inspection Forms
  - Photographic Documentation

3.0 OVERVIEW OF THE EROSION CONTROL WORK

No remediation was completed along Lemolo 2 Waterway between the 2021 and 2022 inspections. The Lemolo 2 Canal Shut-off and Drainage System was implemented in 2009. Remediation was conducted at LM2-25 and LM2-26 between the 2015 and 2016 inspections. These efforts included the installation of an aqueduct to channel a spring over the canal (LM2-25) and a new gabion wall (LM2-26). Annual re-evaluation monitoring will continue at the following sites: LM2-1, LM2-2, LM2-3, LM2-5, and LM2-16.

No remedial efforts were completed along the Clearwater 2 Waterway between the 2021 and 2022 inspections. The Clearwater 2 Canal Shut-off and Drainage System was completed in 2008/2009. Annual re-evaluation of the following sites will continue: CW2-2, CW2-7, CW2-10, CW2-12, and CW2-13.

Minor remediation to the canal wall at Site FC-3 was completed along the Fish Creek Waterway between the 2021 and 2022 inspections. New gunite armoring was placed along a previously cracked segment of the canal wall. Site FC-15 was added between the 2017 and 2018 inspections upslope from the westernmost residence in Toketee Village. The Fish Creek Canal Shut-off and Drainage System was completed in 2007. Annual re-evaluation monitoring will continue at the following sites: FC-3, FC-8, FC-9(1), FC-9(2), FC-13, and FC-15.

No remedial efforts were completed along the Slide Creek Waterway between the 2021 and 2022 inspections. Two new sites along the Slide Creek Waterway, SC-3 and SC-4, were added and remediated between the 2018 and 2019 inspections downslope from the canal between the Slide Creek Power Plant and the westernmost wildlife crossing. The remedial efforts included development of runoff control and slope stabilization with gunite to control downslope erosion below 2 sections of double walled concrete flumes east of the slide creek power plant. Annual re-evaluation monitoring will continue at the following sites: SC-1, SC-3, and SC-4.

No remediation activities were completed along the White Mule Creek Site (LM1-1) between the 2021 and 2022 inspections. Between the 2018 and 2020 inspections, a section of the Lemolo 1 Canal east of the White Mule Creek crossing was replaced with new concrete and the ground surface was regraded.

No new work was performed along the Deer Creek Waterway between the 2021 and 2022 inspection. Regular maintenance measures are needed to control the blockage of the culvert at DC-1.

Overall, 58 of the total 75 sites (77%) have been remediated. Of the 58 completed sites, LM2-7, LM2-23, LM2-30(2), FC-13, and FC-2 were partially remediated. A total of 16 of the 75 sites (21%) require no action other than monitoring and have not been remediated. A total of 3 (FC-3, FC-4, and LM2-30(1)) of the 75 sites (4%) have not been remediated and will continue to be monitored.

The 75 sites are identified with the following original rankings: 35 HIGH; 31 MEDIUM; and 9 LOW. After 2011-2021 remediation activities and the 2022 annual inspection, the 75 sites have the following current priority rankings: 3 HIGH; 23 MEDIUM; and 49 LOW. The 3 high priority sites are CW2-4, CW2-9 and FC-8, and generally consist of cliffs above or below the waterways. These sites are monitored annually for changes. The ranking system is discussed in Section 5.1.

The 5-Year Rolling Action Plan (Section 6.0 of this Report) outlines the schedule for sites planned for remediation through the year 2023. Tables 1 through 4 below that show the status of site remediation.

The priority rating of sites have been modified to reflect the current conditions. The criteria for modification of risk and impact status of the sites are discussed in Section 4.0.

Table 1. Lemolo 2 Erosion Sites

Site No.	Original Erosion Hazard Description	Remediated? (Year)	Current Ranking			Original Priority Ranking
			Impact	Risk	Priority Ranking	
LM2-1	Glacial Deposits above canal, 1:1 slope, seepage evident	Monitoring	L	L	L	L
LM2-2	Spoil pile with gullying, rock fall hazard above canal	Monitoring	L	L	L	L
LM2-3	Spoil pile with some vegetation, cut slope above road with evidence of past failure	Monitoring	L	M	L	L
LM2-4	Failure of Deer Creek access road, failed in 1997 along approximately 70 feet of road, slid directly into Deer Creek, failure height about 30 feet	Yes 2000, 2009	M	M	M	H
LM2-5	Rock fall in channel	Monitoring	L	L	L	L
LM2-6	Shallow slump, bulge in canal with geomembrane and gunite repair, spoil on downslope of canal	Yes 2007	H	M	M	H
LM2-7	Fill failure on Potter Mtn. Rd, 40 feet over steepened fill	Yes 2004, 2011	L	H	M	M
LM2-8	Alvin Creek, potential fill failure or debris flow plugging culvert and overtopping fill, scour at culvert outlet, shotcrete culvert outlet	Yes 2015	L	L	L	H
LM2-9	Potential fill failure or debris flow plugging culvert and overtopping fill	Yes 2011	H	L	M	M
LM2-10	Sidecast fill below road, cut slope above canal with boulders	Yes 2004	L	M	L	M
LM2-11	Patricia Creek crossing, potential fill failure or debris flow plugging culvert, shotcrete culvert outlet	Yes 2003	M	L	L	H
LM2-12	Over steepened slope below road, seepage, with failure channels extending to bottom of slope	Yes 2004, 2008	M	L	L	H
LM2-13	Rock slope above flume with large boulders, 0.5:1 % slopes, site is at west end of Sag Pipe	Yes 2003	M	L	L	M
LM2-13	Sidecast fill below road	Yes 2003	L	L	L	M
LM2-14	Sidecast fill below road	Yes 2004	M	L	L	H
LM2-15	Spill structure upstream of Sag Pipe, erosion occurring in channel at base of culvert outlet	Yes 2011	M	M	M	H
LM2-16	Potential rock fall into canal	Monitoring	L	L	L	L
LM2-17	Nurse Creek crossing, potential fill failure or debris flow plugging culvert, shotcrete culvert outlet	Yes 2004	L	L	L	H
LM2-17	Sidecast fill below road	Yes 2004	L	L	L	H
LM2-18	Laura Creek crossing, potential fill failure or debris flow plugging culvert	Yes 2004, 2009	L	L	L	H
LM2-18	Sidecast fill below road	Yes 2004, 2009	M	L	L	H
LM2-19	Cut slope failure above canal and sidecast failures below, west of Potter Creek	Yes 2004	M	L	L	H
LM2-20	Potter Creek, debris flow potential, unstable slopes above and below canal, spillway erosion at end of gunite section	Yes 2005	M	L	L	H
LM2-21	Sally Creek crossing, potential fill failure or debris flow plugging culvert, 2 culverts	Yes 2004, 2007	M	L	L	H
LM2-22	Dorothy Creek crossing, potential fill failure or debris flow plugging culvert, 2 culverts, upper one shotcrete with trashrack at intake	Yes 2005	H	L	M	H
LM2-22	Sidecast below road with active sliding into the North Umpqua River	Yes 2004	M	L	L	H
LM2-23	Steep, near vertical slope in alluvial/boulders above canal, slope 20-30 feet high, sidecast removal over 70% of this section	Yes 2004, 2009	M	M	M	H
LM2-24	Norma Creek crossing, culvert armoring completed	Yes 2013	L	L	L	M

Legend: Risk Rating L - Low M - Medium H – High

Table 1. Lemolo 2 Erosion Sites (continued)

Site No.	Original Erosion Hazard Description	Remediated? (Year)	Current Ranking			Original Priority Ranking
			Impact	Risk	Priority Ranking	
LM2-25	Slope 20-30 feet high above canal, mudflow with boulders, possible deposits in canal, includes Helen Creek crossing	Yes 2016	M	L	M	M
LM2-26	Beverly Creek crossing, potential fill failure or debris flow plugging culvert, also sidecast fill failure potential	Yes 2003, 2016	M	L	L	H
LM2-27	Mudflow breccia, boulders into canal, includes Flume 2 failure area	Yes 2002	M	L	L	H
LM2-27	Spoil piles over 80% of this reach	Yes 2004	M	M	M	H
LM2-28	Sidecast with 80% slopes	Yes 2004	M	L	L	H
LM2-29	Nancy Creek crossing, potential fill failure or debris flow plugging culvert, also sidecast fill failure potential, shotcrete culvert outlet	Yes 2004, 2011	L	L	L	M
LM2-30	Mudflow breccia, boulders into canal	No	L	L	L	M
LM2-30	Sidecast below road	Yes (partial) 2004, Monitoring	L	L	L	M

Legend: Risk Rating L - Low M - Medium H – High

Table 2. Clearwater 2 Erosion Sites

Site No.	Original Erosion Hazard Description	Remediated? (Year)	Current Ranking			Original Priority Ranking
			Impact	Risk	Priority Ranking	
CW2-1	Basalt outcrop with unfavorable joint orientation above canal	Yes 2008	M	L	L	M
CW2-2	Mudflow breccia with small slumps and wedges	Monitoring	M	M	M	M
CW2-3	1997 flume failure location	Yes 1997	M	L	L	M
CW2-4	Mudflow breccia above canal about slopes 30 feet high, erosion below road from overflow	Yes 2008	H	M	H	H
CW2-5	Breccia outcrops above canal about 20-40 feet high, rock fall in channel	Yes 2008	H	L	M	H
CW2-6	Slide area defined by 2 gullies with debris flows. Movement observed in 2006	Yes 1997, 2003	M	L	L	H
CW2-7	Mudflow exposures 20-40 feet high upslope of canal, potential slumps or wedge failures	Monitoring	M	M	M	M
CW2-8	Road fill failure at No Tunnel Creek crossing due to drainage from western side crossing road surface	Yes 2005	M	L	L	H
CW2-9	Potential rock fall from basalt cliffs above canal	Yes 2008	H	M	H	H
CW2-9	Sidecast along road through about 60% of this segment	Yes 2007	M	M	M	M
CW2-10	Discontinuous mudflow breccia upslope of canal about 20-40 feet high. Slump observed in 2006	Monitoring	M	M	M	M
CW2-11	Slump in mudflow/ash deposit on slope above canal, 50 x 30 x 5 feet thick	Yes 2007	M	L	L	M
CW2-12	Pumice slope above canal about 20 feet high	Monitoring	L	L	L	L
CW2-13	Pumice slope above canal about 30-50 feet high	Monitoring	L	L	L	L
CW2-14	Drainage causing erosion on the road below the canal	Yes 2011	L	L	L	L

Legend: Risk Rating L – Low M - Medium H – High

Table 3. Fish Creek Erosion Sites

Site No.	Original Erosion Hazard Description	Remediated? (Year)	Current Ranking			Original Priority Ranking
			Impact	Risk	Priority Ranking	
FC-1	Ash on upslope area overlain by basalt with adverse joint orientations, boulders could impact flume	Yes 2005	L	L	L	M
FC-2	Spoil piles/sidecast going into river	Yes 2002, 2015(partial)	M	L	L	H
FC-3	Potential rock fall, which could plug waterway	No Monitoring	M	M	M	M
FC-4	Surface erosion/raveling of pumice slopes above	No Monitoring	L	L	L	L
FC-5	Spoil piles/sidecast below road	Yes 2002	L	M	L	M
FC-6	Active earthflow in 1980's failed canal, spoil pile/sidecast washed out by spill, eroded area has 30 feet vertical pumice banks that may continue to slump and deliver sediment to creek	Yes 2003	M	M	M	H
FC-7	Rock falls potentially impact canal wall	Yes 2002	M	L	L	M
FC-7	Spoil piles/sidecast below road	Yes 2002	L	L	L	M
FC-8	Active earthflow beneath waterway, which is in wood flume, slump rotational feature below road, activated/enhanced by seepage beneath canal when upslope side of concrete flume upstream was punctured by boulder impact, evidence of multiple past failures, each 100-200+ cubic yards	No Monitoring	H	M	H	H
FC-9	Rock falls potentially impact canal wall. Rocks in channel	No Monitoring	M	M	M	M
FC-9	Spoil piles/sidecast below road, heavily vegetated	No Monitoring	M	M	M	M
FC-10	Rock falls potentially impact canal wall	Yes 2003	M	L	L	H
FC-11	Emergency spillway flow path that has not been used for decades received flow that caused erosion along the designated flow channel	Yes 2005	M	L	L	H
FC-12	Blockage of culvert allowed water to build up and seep under flume resulting in slope failure below access road, remediation to be done during installation of drop-pipe structures	Yes 2007	H	L	M	H
FC-13	Culvert discharge from OR Highway 138 is washed out slope above access road.	Yes (partial)– 2012, 2018 Monitoring	L	L	L	H
FC-14	Cedar Springs crossing	Yes 2015	M	M	M	H
FC-15	Washout and erosion immediately upslope from residence	Yes 2017 Monitoring	M	M	M	M

Legend: Risk Rating L – Low M - Medium H – High

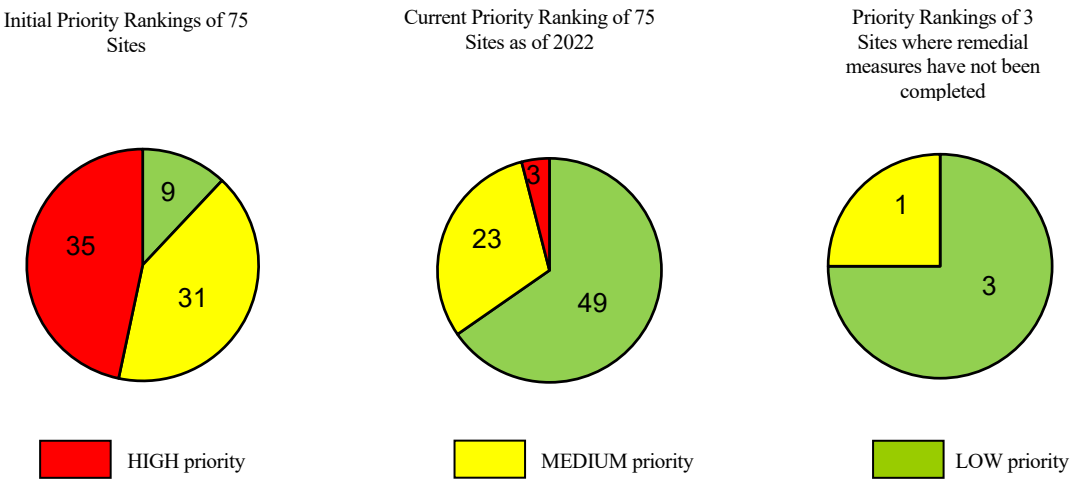
Table 4. Other Erosion Sites

Site No. Location	Original Erosion Hazard Description	Remediated? (Year)	Current Ranking			Original Priority Ranking
			Impact	Risk	Priority Ranking	
SC-1 Slide Creek Diversion Dam	Erosion and failure of timber crib retaining wall	Monitoring	L	L	L	M
SC-2 Slope below Toketee Control Center	Slope failure below the Toketee Control Center	Yes 2014	M	L	L	M
SC-3 Slope below Slide Creek Waterway between SC Power Plant and Wildlife Crossing (South Site)	Slope failure below the Slide Creek Waterway.	Yes 2018 Monitoring	M	L	L	L
SC-4	Slope failure below the Slide Creek Waterway.	Yes 2018	M	L	L	L

Site No. Location	Original Erosion Hazard Description	Remediated? (Year)	Current Ranking			Original Priority Ranking
			Impact	Risk	Priority Ranking	
Slope below Slide Creek Waterway between SC Power Plant and Wildlife Crossing (North Site)		Monitoring				
LM1-1 Lemolo 1 canal - White Mule Creek	Rock fall from breccia and mudflow slope 15-20 feet high above canal	Yes 2007	M	L	L	M
LM1-1 Lemolo 1 canal - White Mule Creek	Sidecast below road	Yes 2007	M	L	L	M
DC-1 Deer Creek Diversion Road	Failure of Deer Creek access road, failed in the winter of 2004 along approximately 70 feet of road, slid directly into Deer Creek, failure height about 30 feet	Yes 2005	M	L	L	H

Legend: Risk Rating L – Low M - Medium H – High

The pie charts below provide a graphic summarization of the changes in erosion site rankings from their original designations through 2022, as provided in Tables 1 through 4. The pie charts clearly show that the remediation measures implemented under the ECP have substantially reduced erosion hazards associated with the project over time. The original 2004 ECP rankings included a total of 58 sites, with 30 HIGH priority sites, 28 MEDIUM priority sites and no LOW priority sites. Site FC-11 was added in 2005 and site FC-12 was added in 2006. Eight sites were added to the annual inspections in 2008: LM2-1, LM2-2, LM2-3, LM2-5, LM2-16, FC-4, CW2-12, and CW2-13. Sites CW2-14 and FC-13 were added in 2011. Site SC-2 was added in 2014 following the failure of the slope below the Toketee Control Center. Site FC-14 was added and remediated in 2015. Site FC-15 was added at Boyden Spring in 2018. Sites SC-3 and SC-4 were added near the Slide Creek Power Plant in 2019, bringing the total number to 75 sites. The current 2022 year priority rankings include 49 LOW; 23 MEDIUM; and 3 HIGH. Remediation measures have not been completed at 3 sites: LM2-30(1), FC-3, and FC-4. Remedial efforts completed in 2019 were evaluated in the subsequent inspections and no changes were noted. LM2-30(1) and FC-4 were reduced from Medium priority to Low priority sites. The 5-Year Rolling Action Plan (Section 6.0) outlines the schedule for remediation activities. Monitoring is required at 16 sites: LM2-1, LM2-2, LM2-3, LM2-5, LM2-16, CW2-2, CW2-7, CW2-10, CW2-12, CW2-13, FC-3, FC-8, FC-9 (2 sites), FC-13, FC-15, SC-1, SC-3, and SC-4.



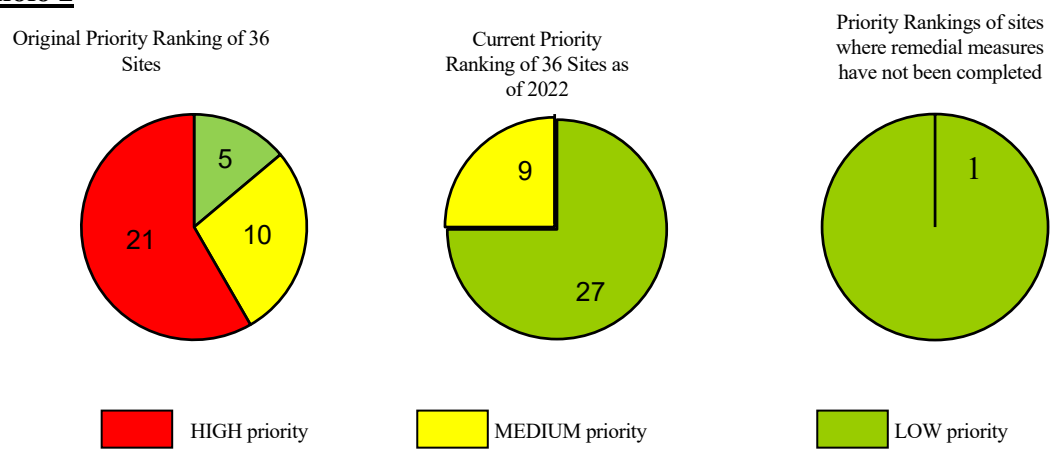
3.1 2022 Work – Lemolo 2 Waterway

The Lemolo 2 Canal Shut-off and Drainage System was implemented in 2009. No remediation work was conducted on the Lemolo 2 Waterway sites between the 2021 and 2022 inspections.

The original 2004 ECP rankings included 21 HIGH and 10 MEDIUM priority sites along the Lemolo 2 Waterway. Extensive mitigation measures have been implemented, including the construction of the canal shut-off and drainage system in 2009/2010, culvert replacement at Dorothy Creek, and remediation of the Potter Creek site in 2005, which decreased the risk at various sites. In 2008, 5 original LOW priority sites were added to the annual inspection to follow the requirements of the ECP for annual monitoring: LM2-1, LM2-2, LM2-3, LM2-5, and LM2-16.

During the 2022 inspection, there were no LM2 sites rated as HIGH priority, 9 sites rated as MEDIUM priority, and 27 sites ranked as LOW priority. Remediation measures have not been completed at LM2-30(1). Site LM2-30(2) has only been partially remediated. Site LM2-24 was remediated in 2013 and LM2-8, LM2-25 and LM2-26 were remediated between the 2015 and 2016 inspections. Monitoring will continue at the following 5 sites where no remediation is currently planned: LM2-1, LM2-2, LM2-3, LM2-5, and LM2-16.

Lemolo 2



3.2 2022 Work – Clearwater 2 Waterway

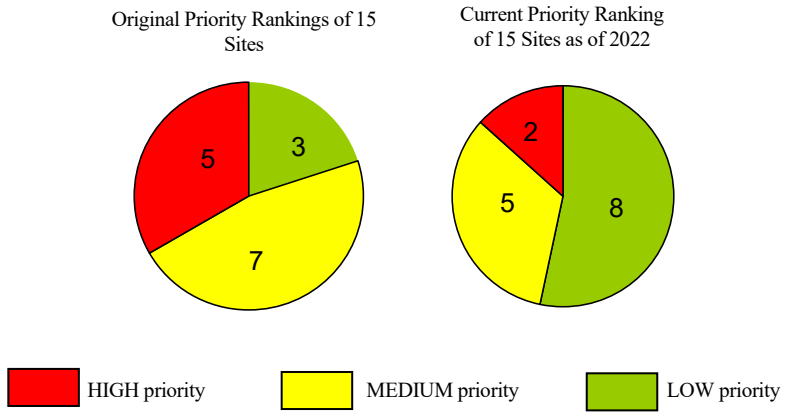
No sites were remediated along the Clearwater 2 Waterway between the 2021 and 2022 inspections. The Clearwater 2 Canal and Drainage Shut-off System was completed in 2008.

The 2004 ECP identified 14 sites along Clearwater 2. Of these, 5 sites were ranked as HIGH priority, 7 as MEDIUM priority, and 2 as LOW priority. A new site (CW2-14, located between CW2-4 and CW2-5), ranked as a LOW priority, and was remediated in 2011.

Of the 15 sites, remedial measures were implemented at 10 of them (CW2-1, CW2-3, CW2-4, CW2-5, CW2-6, CW2-8, CW2-9 (both), CW2-11, and CW2-14), including replacement of the Tunnel Creek culvert, which was part of the Q100 culvert upgrades. No other remediation actions are currently required by the ECP; however, monitoring is recommended at the following 5 sites: CW2-2, CW2-7, CW2-10, CW2-12, and CW2-13. Maintenance at CW2-12 and CW2-13 was originally scheduled for

2010; however, PacifiCorp engineers evaluated the sites and determined they would prefer annual monitoring.

Clearwater 2

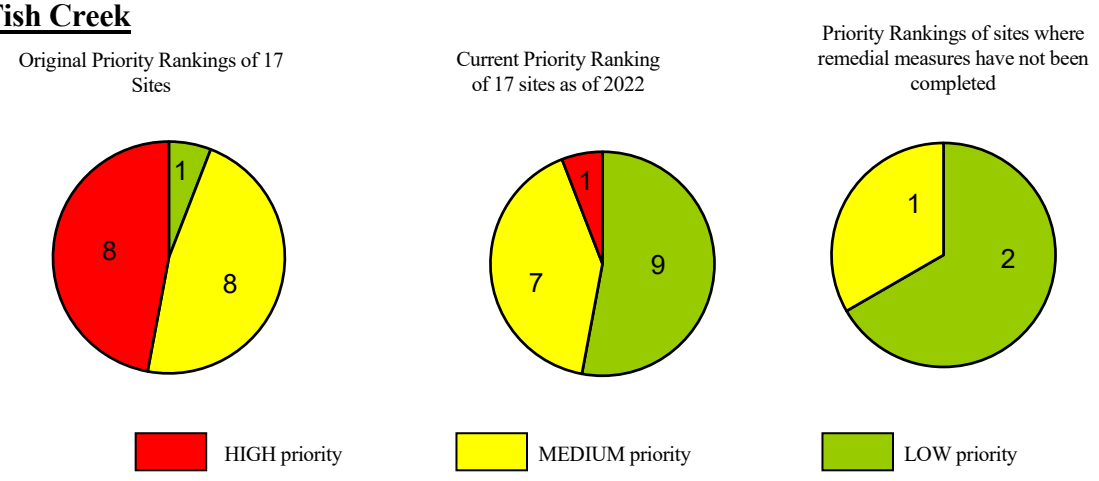


3.3 2022 Work – Fish Creek Waterway

The Fish Creek Canal Shut-off and Drainage System was completed in 2007. A total of 12 Fish Creek sites were identified in the 2004 ECP, with 4 ranked as HIGH priority, 7 as MEDIUM priority, and 1 as LOW priority. Site FC-11 was added in 2004, FC-12 was added in 2006, and FC-13 was added in 2011. Site FC-14 was added in 2014 and was remediated in 2015 at Cedar Springs. Site FC-15 was added in 2018 at Boyden Spring and is situated upslope from the westernmost residence at 7229 Toketee School Road in Toketee Village. An armored run-on ditch was developed between the 2017 and 2018 inspections to divert drainage from Boyden Spring away from the residence. This site was assigned a MEDIUM priority in 2018. During the 2022 inspection, vegetation appeared to be establishing in the armored drainage channel. Annual monitoring will continue to assess the condition of the remediation work.

Remediation measures have been completed at 12 of the 17 sites. Remediation is necessary at FC-3 and FC-4. New tree fall was observed at FC-3 during the 2022 inspections. Because no changes had been observed prior to 2021, FC-3 was reduced from a Medium priority to Low priority site. Site FC-3 has been assigned Medium priority in 2022 due to the changes observed. Partial remediation was conducted at FC-2 and FC-13. Monitoring is presently recommended at FC-3, FC-4, FC-8, FC-9(1), FC-9(2), FC-13, and FC-15.

Fish Creek



3.4 2022 Work – Slide Creek Diversion Dam and Waterway

There are 4 sites located at the Slide Creek Diversion Dam. Previous inspections identified erosion caused by spillway flow to bedrock downstream of the dam (SC-1). No significant changes have occurred at this site since the last inspection and continued monitoring is recommended.

Site SC-2 was added in 2014 at the slide area below the Toketee Control Center. This site was originally identified as a MEDIUM priority. Remediation, which included installation of a new 6-inch HDPE drainage pipe and revegetation, was completed in 2014 and SC-2 is now a LOW priority site. The site will continue to be monitored during future inspections.

Sites SC-3 and SC-4 were added in 2019 below the Slide Creek waterway east of the Slide Creek power plant. These sites were added because of eroded areas downslope of the double walled concrete flume. Gunite reinforcement was added to the slope to protect the ground surface from slumping and eroding. Both sites were assigned a LOW priority rating and ongoing monitoring is recommended. Minor cracks in the gunite near the base of the canal were noted at the SC-3 site in subsequent inspections , and the site will be monitored annually.

3.5 2022 Work – Lemolo 1 Waterway

Completion of riparian habitat restoration, in accordance with the North Umpqua Settlement Agreement Section 10.5 - White Mule Creek, at site LM1-1 was completed in 2007 and 2008 to re-establish aquatic connectivity between White Mule Creek and the North Umpqua River. Minor remediation occurred which consisted of repairing the concrete flume wall and re-grading of the adjacent road surface after the 2018 inspection. The White Mule Creek culvert was replaced in August 2012.

3.6 2022 Work – Deer Creek Waterway

No new work was performed along the Deer Creek Waterway. Remedial measures were completed in March of 2005 to stabilize approximately 50-feet of access road embankment that failed. This slide was the result of inadvertent re-routing of surface drainage along the access road during snow clearing operations. A culvert and drainage ditch were installed to divert surface runoff away from any road embankments. Regular maintenance measures are needed to control blockage of the culvert.

4.0 EFFECTIVENESS MONITORING THROUGH SITE INSPECTIONS

Sites are inspected annually and an inspection form is completed for each site. Inspection forms from prior years are used to provide a basis for comparison of change in erosion status. Any changes are recorded on the current year site inspection form, which includes photographs to document conditions. This allows for 2 levels of monitoring – visual inspection of current conditions and photographic evaluations of changes across several years. In the event that new sites are identified, either during the course of the inspection or by others in the time period between inspections, remediation assessment forms are also completed together with the site inspection forms.

Site inspection forms were completed for each HIGH, MEDIUM, and LOW priority site and are included in this Report. Sites LM2-25, LM2-26, and FC-14 were remediated between the 2015 and 2016. Site FC-13 was remediated between 2011 and 2012 and between 2017 and 2018. Site FC-15 was remediated between 2017 and 2018. SC-3 and SC-4 were remediated between 2018 and 2019. Currently, there are 75 sites that are monitored as part of the ECP annual inspection effort.

Table 5. Project Sites in Program

Project Feature	Number of Sites
Lemolo 2	36
Clearwater 2	15
Fish Creek	17
Slide Creek	4
Lemolo 1	2
Deer Creek	1
Total sites presently included in program	**75**

All site photographs taken during the 2022 inspection are included on a compact disc (CD) provided with this Report. Sections 3.1 through 3.6 present brief summaries of conditions observed during inspections. Each site inspection form includes comments regarding the changes (if any) observed at the site, based on comparison with previous site photographs.

4.1 Lemolo 2 Inspections

No remedial activities were conducted along the Lemolo 2 Waterway sites between the 2021 and 2022 inspections. In general, sites were largely unchanged from 2021. Photographic documentation of some of the more current remedial efforts at selected Lemolo 2 sites is provided below.

Backfill and reclamation was performed at LM2-2 along the Lemolo 2 Waterway between the 2016 and 2017 inspections. Photographs below depict the site in May 2016 compared to the June 2022 inspection.

Lemolo 2 – Site LM2-2 (May 2016)

Lemolo 2 – Site LM2-2 (June 2022)

New shotcrete was placed and vegetation was removed at LM2-6 along the Lemolo 2 Waterway between the 2016 and 2017 inspections. Photographs below depict the site in May 2016 compared to the June 2022 inspection. LM2-6 has exhibited no visible change in the canal bulge and no indications of erosion. This site appears to be stable, and the risk level was lowered from MEDIUM to LOW in 2012. The site will be monitored in future inspections.

Lemolo 2 – Site LM2-6 (May 2016)

Lemolo 2 – Site LM2-6 (June 2022)

LM2-25 was remediated along the Lemolo 2 Waterway between the 2015 and 2016 inspections. Photographs below depict the site in June 2015 compared to the June 2022 inspection.

Lemolo 2 – Site LM2-25 (June 2015)

Lemolo 2 – Site LM2-25 (June 2022)

LM2-26 was remediated along the Lemolo 2 Waterway between the 2015 and 2016 inspections. Photographs below depict the site in June 2015 compared to the June 2022 inspection.

Lemolo 2 – Site LM2-26 (June 2015)

Lemolo 2 – Site LM2-26 (June 2022)

Installation of the Canal Shut-off and Drainage System along Lemolo 2 was completed between 2009 and 2010 inspections. Several high priority sites that have been remediated are shown below to monitor the effectiveness of the remedial efforts.

The 2 photographs below depict site LM2-4, where a slump failure released a portion of FR 090 between the 2007 and 2008 inspections. Remedial efforts in 2009/2010 appear to be effective, and vegetation density continues to improve. Monitoring at this site will continue to evaluate the effectiveness of the remediation effort.

Lemolo 2 – Site LM2-4 (May 2014)

Lemolo 2 – Site LM2-4 (June 2022)

The corrugated metal discharge pipe at site LM2-15 failed in July 2011. PacifiCorp re-armored the slope below the road and constructed a flume to channel overflow from the nearby Flume 15. Photos from July 2011 and June 2022 show the difference between before and after the site was remediated. The remediation appears to be effective.

Lemolo 2 – Site LM2-15 (July 2011)

Lemolo 2 – Site LM2-15 (June 2022)

4.2 Clearwater 2 Inspections

No remedial activities were conducted along the Clearwater 2 Waterway sites between the 2021 and 2022 inspections. The installation of the Canal Shut-off and Drainage System along Clearwater 2 was completed in 2008. Several high priority sites that have been remediated or are monitored are shown below to monitor the effectiveness of the remedial efforts.

At site CW2-5, additional rock fall was noted from the slopes above the canal between the 2018 and 2019 inspections. Vegetation coverage has improved, and the pumice padding is in excellent condition (see photographs below).

Clearwater 2 – Site CW2-5 (May 2018)

Clearwater 2 – Site CW2-5 (June 2022)

No obvious changes were observed to the scarp at site CW2-6 since the 2014 inspection. The scarp is shown in the upper left corner of the following pictures.

Clearwater 2 – Site CW2-6 (May 2014)

Clearwater 2 – Site CW2-6 (June 2022)

At site CW2-12, a small horizontal crack on the west side of the pumice wall was observed as indicated by the arrow in the 2019 photograph below. No significant changes were noted between the 2019 and 2022 inspections. This site has not been remediated and will be monitored annually.

Clearwater 2 – Site CW2-12 (June 2019)

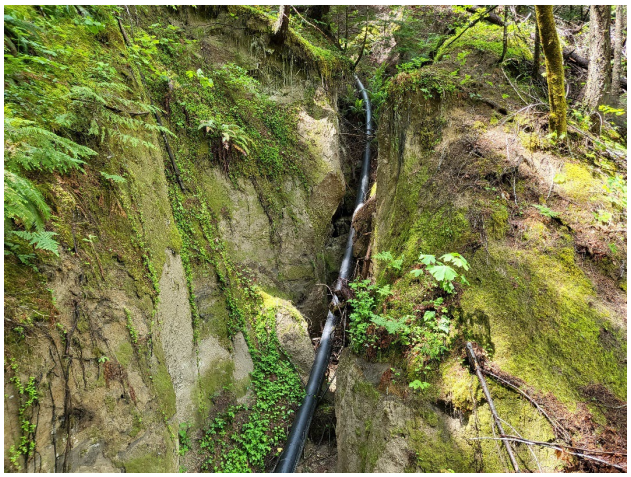
Clearwater 2 – Site CW2-12 (June 2022)

4.3 Fish Creek Inspections

The Fish Creek Canal Shut-off and Drainage System became operational in the spring of 2009. Several high priority sites that have been remediated are shown below to monitor the effectiveness of the remedial efforts. Remedial activities were conducted at FC-13 between the 2012 and 2013 inspections. This effort was the result of erosion from a culvert under OR 138 at milepost 58, above the site. Remediation included rehabilitation of service road 4700570, installation of a culvert and armoring downslope from the service road at the area of erosion. Additional erosion was noted along the roadway, which appeared to cut away the insloped relief ditch (June 2022 photo below). However, the ditch has been piped and

directed across the road towards the downslope armored culvert and appears to be stable. The following photos show the condition of FC-13 between the 2018 and 2022 inspections.

Fish Creek – Site FC-13 (June 2018)



Fish Creek – Site FC-13 (June 2022)

The culvert and armoring are shown in the following photographs:

Fish Creek – Site FC-13 (May 2014)

Fish Creek – Site FC-13 (June 2022)

Site FC-2 was remediated in 2002 and partially remediated in 2015. In 2015, the road was regraded and silt fencing was installed on the creek side of the inspection area. The silt fencing had been knocked down in several locations during the 2016 inspection. More vegetation was observed during the 2017 inspection. However, the silt fencing was still partially buried and a new crack in the ground formed due to slumping between the 2018 and 2019 inspections. The crack appeared to be unchanged between the 2019 and 2022 photos, as shown below.

Fish Creek – Site FC-2 (June 2019)

Fish Creek – Site FC-2 (June 2022)

The remedial effort at site FC-14, Cedar Springs was performed between the 2015 and 2016 inspections. It consisted of armoring of the footings of bents #29 and #30 of Flume #7. The remediation appears to be effective.

Fish Creek – Site FC-14 (June 2016)

Fish Creek – Site FC-14 (June 2022)

Site FC-15, added between 2017 and 2018, is situated upslope from the westernmost residence at 7229 Toketee School Road in Toketee Village. An armored run-on ditch was developed between the 2017 and 2018 inspections to divert drainage from Boyden Spring away from the residence. This site was assigned a MEDIUM priority in 2018, and subsequent inspections showed that vegetation was establishing in the drainage channel. The ditch will continue to be monitored annually.

Fish Creek – Site FC-15 (June 2018)

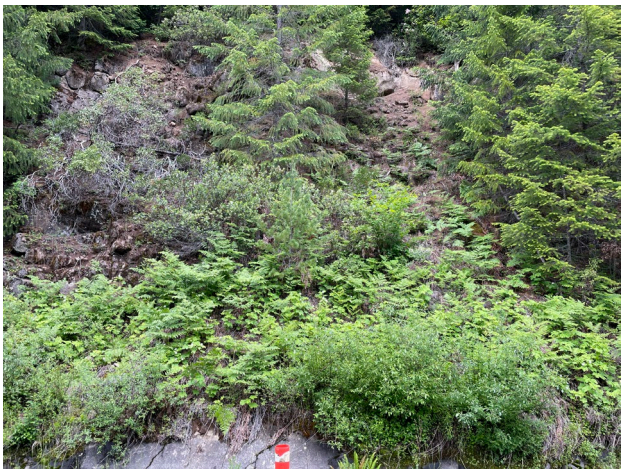
Fish Creek – Site FC-15 (June 2022)

A large boulder was observed downstream of site FC-7 during the 2019 inspection and appears unchanged in the 2022 inspection, as shown in the photographs below. Site FC-7 was remediated in 2002. Additional rock fall is not anticipated, but cannot be ruled out in this area.

Fish Creek – Site FC-7 (June 2019)

Fish Creek – Site FC-7 (June 2022)

A tree had fallen at site FC-3 between the 2021 and 2022 inspections. The debris from the tree fall had been removed and new gunite was placed along the canal below the slope. This site was downgraded to a low priority rating in 2021, but has been assigned a medium rating in 2022.



Fish Creek – Site FC-3 (June 2021)

Fish Creek – Site FC-3 (June 2022)

4.4 Lemolo 1 Inspections

The connectivity of White Mule Creek was restored at site LM1-1 in fall 2006, with revegetation completed in summer 2007. Additionally, the site was remediated in summer 2007 by placement of pumice padding on the upslope canal wall. The sidecast between the access road and the North Umpqua River has been left in-place. Large trees growing on the sidecast appear to have stabilized the slope. Replanting the slope for stability was selected over pulling back the steep slope. Hazards continue to exist for rockfall in the canal. Minor remediation occurred which consisted of repair to the concrete flume wall and regrading the adjacent road surface since the 2018 inspection. Monitoring will continue, and reshaping or removal of the sidecast may be required, as determined by monitoring activities.

Lemolo 1 – Site LM1-1 (June 2018)

Lemolo 1 – Site LM1-1 (June 2022)

4.5 Slide Creek Inspections

No changes were noted at the site downstream of the Slide Creek Dam spillway. The site appears to be stable and no action is needed for mitigation unless additional access is required to the dam from downstream.

Site SC-2 was added in 2014 at the slide below the Toketee Control Center. Erosion at this site occurred below the outfall of a parking lot drain line. The Site was assigned a MEDIUM priority and was remediated in 2014, as shown below. The remediation appears to be effective.

Slide Creek – Site SC-2 (May 2014)

Slide Creek – Site SC-2 (June 2022)

Sites SC-3 and SC-4 were added in 2019 below the Slide Creek waterway east of the Slide Creek power plant. Erosion at these sites occurred downslope of the double walled concrete flume. Gunite reinforcement was added to the slope to protect the ground surface from slumping and erosion. Both sites were assigned a LOW priority rating and ongoing monitoring is currently recommended. In 2020, a small crack was noted at SC-3 where the gunite meets the bottom of the concrete flume.

Slide Creek – Site SC-3 (June 2021)

Slide Creek – Site SC-3 (June 2022)

A site near the top of the Slide Creek penstock has been used for disposal of pumice from slump failures onto the access road surface. This site has been examined during each of the past ECP inspections and appears to be in good condition. Pumice has been placed in a controlled fashion immediately downslope of the access road and has appropriate check dams, cross drainage channels, and silt fencing installed. Vegetative cover continues to increase on these disposal sites. This site does not presently warrant inclusion as an identified site. This area will continue to be monitored as part of the annual inspection, and

evaluation of the effectiveness of these placement techniques will continue. If excessive erosion is observed, this site will be formally evaluated, ranked, and scheduled for appropriate remediation.

4.6 Lemolo Lake Shoreline Inspections

The Lemolo Lake shoreline appears to be relatively unchanged from the 2021 inspection. Historic treefall has been observed in the lake, although none have been noted since the 2011 inspection. No changes were observed in the pumice exposures along the shoreline of Lemolo Lake, and no significant sites have been identified along the lakeshore.

5.0 ASSESSMENT OF NEW AND REMEDIATED SITES

The site at FC-14 (Cedar Spring) was remediated in 2015. In 2018, a new site (FC-15) was added at Boyden Spring and is situated upslope from the westernmost residence at 7229 Toketee School Road in Toketee Village. An armored run-on ditch was developed between the 2017 and 2018 inspections to divert drainage from Boyden Spring away from the residence. This site was assigned a MEDIUM priority and will be continued to be annually monitored. Between the 2018 and 2019 inspection, 2 new sites were added (SC-3 and SC-4) east of the Slide Creek power plant, downslope of the double walled concrete flume. Gunite cover was placed over 2 erosion sites to provide stable drainage over the previously unstable slope. During the 2020 inspection, small cracks in the gunite where it meets the bottom of the concrete flume were noted at SC-3, and seem relatively unchanged during the 2022 inspection. Site SC-2 was remediated in 2014, and LM2-8, FC-2 and FC-14 were remediated in 2015, LM2-25 and LM2-26 were remediated in 2016, and FC-13 was remediated between the 2012 and 2013 and the 2017 and 2018 inspections. Site FC-13 appears to be generally stable; new rock armor was added between the 2016 and 2017 inspections, and a new drainage pipe was added between the 2018 and 2019 inspections. Site FC-13 was lowered from HIGH priority rating to LOW in 2015. Service road 4700570 was rehabilitated and resurfaced. Erosion issues upslope from the site along OR Highway 138 have reportedly been addressed and the area downslope from the service road was armored and a new culvert was installed. No additional erosion was noted along the insloped relief ditch. The culvert will likely need regular maintenance to prevent further erosion. This site will be monitored during future annual inspections.

5.1 Initial Ranking of Identified Sites

Each identified site is given a priority ranking based on a combination of risk and impact assessments. The criteria for ranking are described in the ECP and are copied here for convenience:

> *METHOD FOR PRIORITIZING EROSION SITES*
>
> *The objective of erosion site prioritization is to identify and rank all unstable and potentially unstable sites. A resource team comprised of USDA-FS, PacifiCorp and consulting engineers, identified erosion sites, developed an evaluation matrix for prioritizing sites as HIGH, MEDIUM, or LOW for both risk and impact, and completed the site prioritization. Table 6 below shows how sites were prioritized.*
>
> *Risk factors take into account a subjective evaluation of the geologic hazard, such as the type and magnitude of an erosion event and the likelihood that the event will occur. The impact rating is resource based, (i.e., how valuable is the resource, and to what extent will it be impacted by the event). Riparian, aquatic, and terrestrial resources are considered in the impact rating. Included in these evaluations are the amount and type of sediment (coarse versus fine) that could be transported*

into the stream, potential channel and hydrologic process changes (both long-term and short-term) that would occur as a result of the sediment influx, riparian function, and habitat fragmentation.

Numbers are assigned for each of the designations (low, medium, or high). Assignment of impact and risk ratings create 5 numeric categories of sites, ranging from a high risk and impact rating of 5, to a low risk and impact rating of one, as illustrated in the following table.

Table 6. Erosion Site Priority Evaluation Matrix

		IMPACT		
		Low	***Medium***	***High***
Risk	***Low***	*1*	*2*	*3*
	Medium	*2*	*3*	*4*
	High	*3*	*4*	*5*

Ranking outcomes:

Priority	***Score***
HIGH PRIORITY	*4-5*
MEDIUM PRIORITY	*3*
LOW PRIORITY	*1-2*

5.2 Reassessment of Remediated Sites

When a site is remediated, the priority ranking may be reduced. The process of site remediation may modify the priority ranking in multiple ways. In general, remediation focuses on the risk portion of the priority rating by reducing the risk of the identified erosion hazard from occurring. The impact rating can also be modified. The value of the resource generally does not change, but the volume or character of material that may enter the waterway can be modified. Risk evaluations of sites which show no change in conditions over 5 to 10 years, may also be re-examined.

The inspection sheets for all sites are updated each year to indicate modifications to the risk and impact rankings. Inspection sheets also provide evaluations of remediation progress and highlight any significant changes at the sites. Tables 1 through 4 in Section 3.0 have been updated to be consistent with the inspection forms.

A site that combines a HIGH rating for impact or risk with a MEDIUM rating for impact or risk will have a priority rating of HIGH. A site that combines a LOW rating for impact or risk with a MEDIUM rating for impact or risk will have a priority rating of LOW.

6.0 ECP 5-YEAR ROLLING ACTION PLAN

The ECP, Exhibit E, outlines a recommended format for the 5-Year Rolling Action Plan. For meeting the intent of the ECP, Table 7 below, provides a listing of the sites by year for remediation. Current site rankings have the following color indicators: red are HIGH Priority, yellow are MEDIUM, and green are LOW. Table 8 lists those sites that are not scheduled for remediation but are to be monitored and re-evaluated annually.

Table 7. List of Sites to be Remediated

2019	2020	2021	2022	2023
SC-3				
SC-4				

Table 8. List of Sites to Be Annually Re-Evaluated

Lemolo 2 Sites	LM2-1	LM2-2	LM2-3	LM2-5	LM2-16	LM2-30
Clearwater 2 Sites	CW2-2	CW2-7	CW2-10	CW2-12	CW2-13	
Fish Creek Sites	FC-3	FC-4	FC-8	FC-9 (2)	FC-13	FC-15
Slide Creek Sites	SC-1	SC-3	SC-4			

7.0 FLUME FAILURES, SHUT-OFF AND DRAINAGE SYSTEM

The Fish Creek and Clearwater 2 Canal Shut-off and Drainage Systems were completed and became operational in 2009. The Lemolo 2 Canal Shut-off and Drainage System was constructed in 2009 and was operational as of May 2010.

Fish Creek Canal Shut-off and Drainage System – Drain Site 2

Clearwater 2 Canal Shut-off and Drainage System – Gate Site 2

8.0 CONCLUSION

The 2022 Annual ECP Summary Report and 5-Year Rolling Action Plan provide the history of the erosion site remediation for the given year, the results of monitoring, and a schedule for continued progress on the program. The Parties are welcome to review and comment on this Report. It is requested that the Parties review and approve this Report in accordance with the terms of the ECP, which identifies the Parties as signatories to the 5-Year Rolling Action Plan. This review and approval will be facilitated through the Annual Rolling Action Plan Meetings to be scheduled in late 2022.