ENVIRONMENTAL IMPACT STATEMENT FOR FISHERIES RESOURCES FOR THE COAL VALLEY RESOURCES INC. OBED MOUNTAIN MINE EAST LIMB PIT EXPANSION

Prepared for

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1.0 INTRODUCTION

Coal Valley Resources Inc. (CVRI)) operates the Obed Mountain Mine (OMM), an open pit coal mine, east of Hinton, Alberta. The mine began operating in 1984. At present, OMM proposes to expand their existing mining operations in Red Pit and the East Limb Pit area.

The OMM lease area is approximately 3,254 ha and is situated on a high plateau rising approximately 1600 m above sea level. The area is of moderate relief, characterized by rounded hills and upland plateaus. The hills represent a transitional zone between the mountains and foothills. The lease area is primarily drained by the headwaters of Apetowun Creek, Baseline Creek and Canyon Creek, as well as tributaries to Oldman Creek. Newly proposed development in Red Pit and East Limb Pit area lie within the headwaters of the Baseline Creek drainage area (Matrix 2009).

Pisces Environmental Consulting Services Ltd. (Pisces) was retained by Millennium EMS Solutions Ltd. (MEMS) to assess potential impacts of proposed development on fish and fish habitat.

2.0 ASSESSMENT APPROACH

2.1. EXISTING (BASELINE) CONDITIONS ASSESSMENT

For the purpose of this impact assessment, existing information was utilized to characterize existing fish and fish habitat conditions on, and adjacent to, the OMM Lease. Fish and fish habitat in streams draining the lease area were first described by Zallen (1981). OMM commenced regular monitoring of fish populations in area streams beginning in 2000, with monitoring still occurring.

2.2. POTENTIAL IMPACTS

Mining and reclamation plans provided by MEMS were used to identify the potential effects resulting from mining activities in the Red Pit and East Limb Pit extension of the OMM. The surface water management plan (Matrix 2009) was used extensively in the identification of potential effects.

3.0 EXISTING CONDITIONS

3.1. APETOWUN CREEK

3.1.1. Habitat

Apetowun Creek drains the east slope of the OMM area beginning near the plant site and flowing north-east approximately 18 km to the Athabasca River. Apetowun Creek habitat was first described by Zallen (1981). The creek was divided into nine reaches; the upstream reaches (near OMM) were described as having occasional pools, silt laden substrate (particularly in pools) with undercut, silty banks (Zallen 1981).

In 2000, a fish population monitoring section was established on Apetowun Creek downstream of the OMM. Habitat within the section was inventoried using the O'Neil Method (O'Neil and Hidebrand 1986). Apetowun Creek was found to consist primarily of Class 3 (averaging less than 0.5 m deep) Run habitat (R3, Table 1.) and other shallow habitat types i.e. riffle (RF) and Class 3 Pool lacked Class 1 (greater than 1 m deep) habitat. Substrate within the creek was dominated by cobbles (CB) but also contained a substantial amount of fines (FN, Table 1). At the time of habitat assessment, mean wetted stream width over the inventory section was 1.9 metres at a discharge measured at 0.094 m^3/s.

Table 1. Habitat characteristics of a sample section of Apetowun Creek, August 2000.[1]

Habitat Type (% total area)		Substrate (% composition)		Cover (% total area)	
RF	17	FN	30.8	WD	10.2
R2	6.2	GR	15.4	OB	22.6
R3	55.7	CB	52.6	OV	0.2
P2	12.1	BL	1.2	AV	0
P3	8.7	Total	100	BG	0.3
LL	0.3			Total	33.3
Total	100				

[1] Habitat type, substrate type, and cover type abbreviation definitions provided in Appendix A.

3.1.2. Fish

Rainbow trout (*Oncorhynchus mykiss*), burbot (*Lota lota*), spoonhead sculpin (*Cottus ricei*), and mountain whitefish (*Prosopium williamsoni*) have all been reported from Apetowun Creek (Zallen 1981). Mountain whitefish distribution appears confined to the lower reaches of the creek (Zallen 1981).

In the Apetowun Creek monitoring section downstream of the OMM, rainbow trout density has been estimated in August 2000, 2003, 2006 (Pisces 2007) and in 2009 (Pisces, in prep.). Density in 2009 was reduced compared to relatively consistent density over previous monitoring years. (Table 2). The data set is not adequate to identify any definite trends.

Table 2. Rainbow trout density over time in the Apetowun Creek monitoring section.

Year	2000	2003	2006	2009
Density Estimate (fish/100m^2)	5.1	5.26	6.06	2.73
First run CPUE (fish/min)	0.22	0.71	0.48	0.37

Burbot are also often captured in the Apetowun Creek monitoring section, in variable numbers but may be increasing. Low numbers of burbot were captured in 2000; no burbot were captured or observed within the study section in 2003. Density estimates in 2006 and 2009 for burbot far exceeded previous estimates and catch-per-unit-effort (CPUE) was substantially higher than in previous years.

Table 3. Burbot density over time in the Apetowun Creek monitoring section.

Year	2000	2003	2006	2009
Density Estimate (fish/100m^2)	1.2	-	10.57	11.05
First run CPUE (fish/min)	0.075	-	0.53	0.46

The Foothills Model Forest (FMF) reported the capture of burbot at a site located immediately downstream of the OMM monitoring section (R. McCleary, Pers. comm.) and Zallen (1981) reported the capture of burbot from a section of Apetowun Creek that overlapped the OMM monitoring section. The absence or low density of burbot in certain years may be due to the presence of a barrier (or barriers) downstream of the OMM study section that impedes fish passage into the study section in certain years, or at specific times within the year, when flows are low.

3.2. UNNAMED TRIBUTARY TO CANYON CREEK

3.2.1. Habitat

The headwater tributary of Canyon Creek drains a small portion of the east slope below the OMM development area. The habitat of this branch of Canyon Creek was described by Zallen

(1981) as high gradient with variable substrate (fines, gravels, cobbles and boulders). The creek is distinguished by two prominent canyon reaches where habitat features include numerous chutes and/or cascades and bedrock sandstone outcrops (Zallen 1981).

In 2000, a fish population monitoring section was established on the unnamed tributary to Canyon Creek. Habitat inventory of the section at the time of establishment indicated that the creek consisted exclusively of shallow habitat types, primarily Cascade (CA, Table 4). Substrate was dominated by cobbles (CB) and boulders (BL, Table 4).

Table 4. Habitat characteristics of a sample section of the unnamed tributary to Canyon Creek, August 2000.

Habitat Type (% total area)		Substrate (% composition)		Cover (% total area)	
RF	10.5	FN	7.2	WD	7.6
R3	30.9	GR	14.2	OB	1.8
P3	11.7	CB	52.2	OV	1.7
CA	44.7	BL	25.2	AV	0
LL	0.1	BR	1.2	BG	12.8
LG	2.1	Total	100	Total	23.9
Total	100				

3.2.2. Fish

Brook trout are the only species that has been captured from the monitoring section established on the unnamed tributary to Canyon Creek. There was a decline in estimated brook trout density in the tributary exceeding an order of magnitude between 2000 and 2003; in 2006, a slight increase from 2003 was noted (Table 5, Pisces 2007) but in 2009 an all time low density was observed (Pisces, in prep.). A similar dramatic decline in CPUE was evident from 2000 to 2003 (Table 5). Discharge within the study section was substantially higher in 2000 (0.022m^3/s) as compared to later years (0.005m^3/s in 2003, 0.002 m^3/s in 2006 and 0.009 m^3/s in 2009) suggesting that there may be a link between discharge and brook trout density within the study section. No rainbow trout were captured or observed in any monitoring years, however Zallen (1981) reported that rainbow trout were more abundant than brook trout in 1980.

Table 5. Brook trout density over time in the tributary to Canyon Creek monitoring section.

Year	2000	2003	2006	2009
Density Estimate (fish/100m^2)	20.4	1.22	3.3	0.78
First run CPUE (fish/min)	1.21	0.09	0.12	0.08

3.3. OLDMAN CREEK

3.3.1. Habitat

A very small portion of the OMM Lease area drains to Oldman Creek. The habitat of Oldman Creek was first described by Zallen (1981) as wider and deeper than Apetowun Creek with low gradient and abundant pools. Substrate in pools was dominated by silt while riffle areas were dominated by cobbles (Zallen 1981).

In 2001, a fish population monitoring section was established on Oldman Creek downstream of the OMM. Habitat inventory of the section at the time of establishment indicated that the creek consisted primarily of Class 3 Run habitat (R3) but also contained a notable Class 2 (0.5 to 1 m deep) Run (R2) habitat (Table 6). Substrate within the creek was dominated by cobbles (CB) but also contained a substantial amount of gravel (GR). Mean wetted stream width over the inventory section was 7.0 metres at a discharge measured at 0.58 m^3/s.

Table 6. Habitat characteristics of a sample section of Oldman Creek, August 2001.

Habitat Type (% total area)		Substrate (% area where substrate type is dominant)		Cover (% total area)	
RF	12.2	FN	2.1	WD	2.9
R2	18.6	GR	26.7	OB	1.3
R3	62.5	CB	71.1	OV	0.2
P3	3.2	BL	-	AV	0.3
F3	3.5	Total	100	BG	-
Total	100			Total	4.7

3.3.2. Fish

Five species of fish have been reported from Oldman Creek in the vicinity of the monitoring section established in 2001 including rainbow trout, bull trout (*Salvelinus confluentus*), burbot, mountain whitefish and spoonhead sculpin. The capture of a bull trout in the monitoring section in 2004 may constitute a substantial upstream range extension (approximately 28 km) for this species in Oldman Creek. Although there has been substantial variation in percentage species composition (Table 7), rainbow trout remain the dominant species.

Table 7. Percent catch composition for Oldman Creek in the monitoring section.

Year	% of catch by species				
	rainbow trout	burbot	mountain whitefish	spoonhead sculpin	bull trout
1998[1]	87	8	5	0	0
2001	46	34	20	0	0
2004	78	9	0	11	1
2007	69	29	0	2	0

[1]data from C. Johnson, pers. comm.

Rainbow trout density in the monitoring section on Oldman Creek may be increasing over time; however, the data set is not adequate to identify any definite trends (Table 8).

Table 8. Rainbow trout density over time in the Oldman Creek monitoring section.

Year	2001	2004	2007
Density Estimate (fish/100m^2)	0.9	1.76	3.6
First run CPUE (fish/min)	0.20	n/a	0.58

3.4. BASELINE CREEK

3.4.1. Habitat

Baseline Creek is a steep gradient creek; the portion of creek upstream of the Emerson Lakes road was first described as shallow with a mixed grave and cobble substrate and occasional boulders (Zallen 1981).

In 2001, a fish population monitoring section was established on Baseline Creek downstream of the OMM. Habitat inventory of the section at the time of establishment indicated that the creek was dominated by Riffle (RF) and Class 3 Run habitat (R3, Table 9). Substrate within the creek was dominated by cobbles (CB) but also contained a substantial amount of gravel (GR). Mean wetted stream width over the inventory section was 3.0 metres.

Table 9. Habitat characteristics of a sample section of Baseline Creek, August 2001.

Habitat Type (% total area)		Substrate (% area where substrate type is dominant)		Cover (% total area)	
RF	47.4	FN	2.1	WD	3.2
R3	37.7	GR	24.4	OB	2.4
P3	9.1	CB	72.5	OV	0.6
CA	4.6	BL	1.0	AV	-
LL	1.3	Total	100	BG	3.6
Total	100			Total	9.8

3.4.2. Fish

Five species of fish have been captured in Baseline Creek downstream of the Emerson Lakes Road crossing; brook trout, rainbow trout, bull trout, burbot and mountain whitefish (*Prosopium williamsoni*, Hawryluk 1977; Schwartz 2002; Pisces 2005; C. Johnson, pers. comm.). Bull trout, burbot and mountain whitefish have not been reported from upstream of the Emerson Lake Road. Typically, bull trout, burbot, and mountain whitefish occur very infrequently and the fish population is increasingly dominated by brook trout, to the degree that in 2004 and 2007, brook trout were the only species captured in the OMM monitoring section upstream of the Emerson Lake Road.

The available fish density estimate data for Baseline Creek over time suggests that brook trout densities appear to be increasing over time, while rainbow trout densities appear to be decreasing (Table 10). The data set is not adequate to identify any definite trends.

Table 10. Trout density in Baseline Creek over time.

Data Source	Sample Site	Density n/100 m^2		
		Rainbow trout	Brook trout	All trout
Hawryluk 1977	d/s Emerson Lakes Road	5.4	6.2	10.3
C. Johnson pers. comm.[1]	FMF site ID 96152, d/s Emerson Lakes Road	1.0	8.5	9.5
Schwartz 2002	u/s Emerson Lakes Road[2]	0.14	14.6	14.8
Pisces 2005	u/s Emerson Lakes Road	0	20.8	20.8
Pisces 2007	u/s Emerson Lakes Road	0	14.9	14.9

[1]Sampling conducted in 1998.
[2]Permanent monitoring section established on Baseline Creek in 2001.

4.0 ASSESSMENT

4.1. STUDY AREAS

The footprint of the development is limited to the Baseline Creek drainage area. The Local Study Area (LSA) for the assessment includes the mainstem of Baseline Creek upstream of the Emerson Lakes Road while the Regional Study Area (RSA) includes the remainder of the Baseline Creek drainage to the confluence with the Athabasca River.

4.2. VALUED ECOSYSTEM COMPONENTS

Valued ecosystem components (VECs) identified for the impact statement for the proposed OMM Red Pit and East Limb Pit development include:

- rainbow trout
- bull trout
- burbot
- mountain whitefish

All above species are known to occur historically in Baseline Creek. Brook trout, known to occur in Baseline Creek in substantial numbers, is not selected as a VEC given Alberta Sustainable Resource Development's classification of this species as exotic/alien.

4.3. PATHWAYS OF EFFECT

The potential pathways of effects linking surface coal mining activities to impacts on fish habitat potential, and consequently the abundance, health and survival of fish populations (VEC species) within the LSA and RSA are:

- direct physical habitat disturbance
- potential changes to the fisheries resource access
- potential changes to water quality (sediment and other chemical contaminants)
- potential changes to surface water flow regime

4.3.1. Physical Habitat Disturbance

Direct physical disturbance may occur if the development involves any activities that impinge on or into water bodies. Direct physical disturbance may result in loss of habitat components, as in the case of an instream footprint resulting from infrastructure; or in habitat fragmentation, as in the case of an anthropogenic barrier to fish migration.

The footprint of the development is limited to the Baseline Creek drainage area. Natural drainage in the immediate area of disturbance was investigated by Matrix (2009). Four intermittent flowing channels, each flowing 1-3 L/s, were observed to drain into a wooded wetland area approximately 300 metres downslope of the toe of the development area. Based on the description of hydrologic characteristics, the area is deemed incapable of supporting fish.

The proposed development will include the addition of one sediment control pond facility (ELP2) to the existing surface water control infrastructure (Matrix 2009). This new pond will be located offstream and will not impinge on existing fish habitat.

Given the available information on surface water management facility design and area hydrological characteristics provided by Matrix (2009) it was determined that the proposed disturbance will not directly impinge on viable fish habitat.

4.3.2. Surface Water Quality (Sedimentation)

Assessment of the impacts of potential changes in surface water quality is limited to discussion of the impacts of instream sedimentation.

Increased sediment deposition can result in the infilling of over-wintering habitat as well as degradation of spawning habitat for fish species that spawn over coarse substrates. In addition, benthic habitat can be diminished by the infilling of interstitial spaces in coarser substrate (Brusven and Prather 1971, Waters 1995).

Increased sediment loads result in increased total suspended sediment (TSS), which can have direct adverse effects on fish health and fish behaviour. Increased levels of TSS in the water column may lead fish to exhibit an avoidance response (Waters 1995) and/or affect swimming ability (Bruton 1985), however Gregory et. al. (1993) note that fish may also use elevated TSS for cover. Further increase in TSS can cause physiological stress that can result in impaired growth, reduced resistance to disease and, respiratory difficulty which can lead to mortality (Robertson *et al.* 2006). The potential effects of sedimentation on fish health and fish behaviour are dependent on two variables: the concentration of TSS to which fish are exposed and the time of exposure (Newcombe and Jenson 1995). In addition, individual species sensitivity to suspended sediment is variable. High TSS levels can also lead to excessive fine sediment deposition if levels exceed the transport capacity of the receiving water which can lead to the suffocation of fish eggs and can interfere with respiratory and feeding activities of benthic invertebrates.

During mining operations, sediment sources which can result in adverse effects to aquatic habitat are run-off from cleared land, waste rock piles, haulroads and discharges from mine pits and water impoundments.

4.3.3. Changes in Flow Regime

Although streams tend to exhibit considerable natural seasonal variation in volume of flow or discharge, changes in discharge can have an adverse effect on lotic communities. As a general rule, induced changes in volume of flow that do not exceed natural seasonal extremes have little effect. Reductions in volume of flow during normal low flow periods tend to adversely affect aquatic resources as habitat (for both fish and benthic invertebrates) is least available at low flows. Increases in discharge during the normal high flow period tend to adversely affect habitat, principally due to the effects of erosion.

Changes to the natural drainage pattern to facilitate mining, disposal of groundwater from mining areas, and post reclamation drainage patterns could alter the flow regime in Baseline Creek to the detriment of fish and habitat. Diversions that cause increases in base flow and/or reductions in peak flows are usually beneficial. Decreases in base flow may threaten over winter survival and successful incubation of eggs deposited in fall. Increases in peak flow increase habitat instability and may reduce spring spawning activity and successful egg incubation.

4.3.4. Resource Access and Utilization

Increased access to aquatic resources due to the development of roads may result in an increase in resource utilization. The proposed OMM expansion will not result in any additional access points to fisheries resources in the area. Public access to the OMM Lease area is restricted and no additional pressure on fisheries resources is anticipated.

5.0 IMPACT STATEMENT

Potential impacts to VEC species and fish habitat in the LSA and RSA associated with the proposed mine expansion relate to potential sedimentation and potential alterations of flow regime. Given that there is no direct physical disturbance to fish habitat and no increased access to fisheries resources, these potential effects pathways are considered not valid.

5.1. SEDIMENT

All surface run-off from disturbed areas will be collected by the proposed drainage ditch at the toe of the dump slope; a portion of this run-off will be routed to an existing settling pond (ELP1) while the remained will report to a newly constructed settling pond (ELP2, Matrix 2009). The new pond results in one additional point source for sediment introduction into the aquatic ecosystem.

5.2. CHANGES IN FLOW REGIME

During the initial stages of development (first year of clearing and stripping) a short term increase in peak flows is predicted (Matrix 2009). However, the net effect during mining is expected to be a slight decrease in peak flows and a slight increase in base flows (Matrix 2009). As such, changes in flow regime during mining are deemed unlikely to have adverse impacts on fish and fish habitat.

Once reclamation is complete and drainage ditches and settling ponds are decommissioned, the reclaimed area will drain to Baseline Creek in a pattern similar to existing conditions but with a more regulated, reduced flow regime (Matrix 2009) The most significant reduction in flow regime is anticipated to occur post mining when the pit is beginning to retain water and is stabilizing this level. This stabilization is expected to occur relatively quickly therefore the impacts to flow regime for this limited time period are unlikely to result in significant impacts to fish and fish habitat in Baseline Creek.

In the post reclamation landscape, long term reductions in baseflows are anticipated to be relatively minimal (2 to 6% reduction in mean annual flow) at the mouth of Baseline Creek (Matrix 2009) and therefore impacts to fish and fish habitat are likely negligible at this location.

6.0 MITIGATION

6.1. SEDIMENT

Mitigation of potential sediment impacts during mining is achieved by effective implementation of an appropriate surface water management plan. Implementation of the surface water management plan described by Matrix (2009) is expected to provide effective mitigation of impacts to fish and fish habitat related to potential sediment introduction.

At reclamation, revegetation of exposed cuts, fills, and ditches will mitigate the longer-term potential effects of sediment generation.

6.2. SURFACE FLOW REGIME

Mitigation of potential flow impacts during mining is achieved by effective implementation of an appropriate surface water management plan.

During the reclamation phase (pit stabilization), judicious pumping to maintain flows in Baseline Creek (extend pit filling time) would reduce impacts on the flow regime of Baseline Creek.

Reclamation of the post mining drainage area should endeavour to simulate pre-mining drainage patterns as close as technically feasible.

7.0 MONITORING

Obed Mountain Mine will sample the discharge of the new impoundment for surface water quality and continue the fish population monitoring program initiated in 2000.

8.0 CLOSURE

Mining plans provided by MEMS were used in conjunction with existing baseline data and information from the surface water management plan (Matrix 2009) to assess the potential effects of the proposed Red Pit and East Limb Pit development on aquatic resources VECs. It is the opinion of Pisces Environmental Consulting Services Ltd. (Pisces) that the potential effects of sedimentation can be managed during mining by proper implementation of the mitigation strategies outlined in the surface water management plan (Matrix 2009).

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Appendix A:

Habitat inventory parameters

Table A1: Parameters used for habitat mapping and inventories.

DESCRIPTION					
habitat type	water depth	Surface	flow	substrate	velocity
Riffle (RF)	<0.5 m	irregular broken	turbulent	coarse	high
Class 1 Run (R1) R1°	>1.0 m >2.0 m	irregular rarely broken	moderate turbulence	coarse	moderate to high
Class 2 Run (R2)	0.5 to 1.0 m	irregular rarely broken	moderate turbulence	coarse	moderate to high
Class 3 Run (R3)	<0.5 m	irregular rarely broken	moderate turbulence	coarse	moderate
Class 1 Pool (P1) P1°	>1.0 m >2.0 m	smooth	low turbulence	variable	low, variable
Class 2 Pool (P2)	0.5 to 1.0 m	smooth	low turbulence	variable	low, variable
Class 3 Pool (P3)	<0.5 m	smooth	low turbulence	variable	low, variable
Class 1 Flat (F1) F1°	>1.0 m >2.0 m	smooth	laminar	fines	low
Class 2 Flat (F2)	0.5 to 1.0 m	smooth	laminar	fines	low
Class 3 Flat (F3)	<0.5 m	smooth	laminar	fines	low
Cascade (CA)	<0.5 m	irregular, broken	very turbulent	very coarse	highly variable
Rapids (RA)	>0.5 m	irregular, broken	very turbulent	very coarse	highly variable
Chutes (CH)	<0.5 m	irregular	shooting	bedrock	high
COVER COMPONENTS					
Woody Debris (WD)	large, in stream woody debris				
Overhanging Bank (OB)	undercut, overhanging bank				
Overhanging Vegetation (OV)	overhanging terrestrial vegetation				
Aquatic Vegetation (AV)	dense, well distributed aquatic vegetation providing cover				
Boulder Garden (BG)	dense, well distributed boulders providing cover				
OTHER FEATURES					
Ledges (LG)	bedrock outcrops forming hydraulic controls				
Log Ledge (LL)	large woody debris forming a hydraulic jump, typically with a scour pool beneath				
Beaver Dams (BD)	beaver dams				
Log Jam (LJ)	accumulation of woody debris across channel with water flowing through				

Table A2. Substrate types and description (from American Geophysical Union, Subcommittee on Sediment Terminology).

Type	bedrock	boulder	cobble	gravel	fines
abbreviation	BR	BL	CB	GR	FN
size (mm)	N/a	>250	64-250	2-64	<2