

March 23, 2023

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Subject: Road Deactivation Assessment: Atleo River Watershed

Onsite File #: 1681-2-2

Jaime Eggers, P.Geo. and Jon Kroon, P.Geo., of Onsite Engineering Ltd (OEL) carried out a road deactivation assessment on February 21-24, 2023 for the Atleo River Watershed, including portions of West Atleo Main, WA100, WA500, EA1000, EA1200, and all of WA100A, WA300, EA500, and EA500A (the Roads). The assessment was carried out to evaluate the existing stability conditions and develop effective road deactivation prescriptions. At the time of the assessment, the conditions were very cold and clear with occasional flurries. Surface runoff was at low levels and many streams were frozen.

SUMMARY

Deactivation works as prescribed in this report are provided in a manner consistent with the “Best Management Practices Handbook, Hillslope *Restoration in British Columbia*” (BC Ministry of Forests, 2001). Adherence to recommendations provided will reduce the hazard of landslides initiating due to road instabilities. Landslide hazard will be reduced where deactivation recommendations are completed. Expect the landslide hazard to become closer to the natural hazard levels for the area slopes.

1.0 OBJECTIVES

The objective is to permanently deactivate the Roads to restore natural hillslope drainage paths, reduce slope instability, and enhance site productivity. As discussed below, the prescriptions to attain these objectives were marked directly in the field as well as documented in this report.

2.0 BACKGROUND

The study area is located in Ahousaht territory, between Herbert Inlet and Millar Channel, roughly 25 km northwest of the town of Tofino on the west coast of Vancouver Island. The Roads are located in the upper Atleo River Watershed, upstream of the confluence with Barra Creek. They cross lower to upper elevation terrain on both sides of the valley.

West Atleo Mainline branches off Sulphur Main just past the Atleo River bridge. It is a roughly 10 km long road that extends to upper elevation terrain by way of a switchback near the back end of the valley. The lower elevation portion of West Atleo Mainline mostly follows gentle to moderate gradient benches and irregular slopes. Beyond the junction with spur road WA300, the mainline begins its climb, where it crosses many sections of steep terrain.

EA1000 was the main road used to access the eastern side of the upper Atleo River valley. It is roughly 8 km in length and crosses lower elevation terrain for its entirety. The last 800 m of EA1000 wraps around over to the west side of the valley at the very back end of the watershed.

The West Atleo Mainline and EA1000 and their associated spur roads were constructed in the late 1980's to early 1990's to facilitate harvesting in a number of conventional clear cut cutblocks (pre-Code). The Roads were constructed using conventional cut and fill side cast methods, even across steep terrain (>65%). Fill was thrown down the hillside with some sections of fill observed 9 m below the road edge during the 2023 assessments. Road construction on moderately-steep to steep gradient terrain (i.e. >65%) generally requires full bench cuts with some areas of $\frac{3}{4}$ bench on slopes down to 55%. Where $\frac{3}{4}$ bench cuts are prescribed the fill slope is generally constructed with keyed-in coarse angular rock. These methods are standard for roads constructed post-Code.

By the mid 1990's to early 2000's a number of road fillslope and cutslope landslides had initiated along the Roads. Many of these landslides directly entered the Atleo River and or its fish bearing tributary streams. This prompted a round of road deactivation within the watershed in an attempt to stabilize the road prisms. Observed deactivation techniques throughout the assessment area included light to heavy pullback sections and culvert removal. Unfortunately the methods used were sub-par and not carried out across the entire road network. Numerous sections of fill slope settling and tension cracks were noted in areas where pullback had been attempted in the first round of deactivation. To make things worse, several landslides have initiated upslope of the roads damaging the existing bridges and many of the woodbox culverts along the roads have collapsed impeding machine access in several areas.

Many sections of unstable road were observed during the 2022 road hazard assessments and the 2023 road deactivation assessments. Most of the identified areas have a moderate to high likelihood of impacting the Atleo River.

3.0 WORK CARRIED OUT

During the assessment, stability conditions were inferred from observed conditions of the road such as existing landslides, tension cracks, road drainage conditions, the amount and composition of the road fill and the stability conditions downslope and in proximal terrain. In the field, pink flagging marks stations and prescriptions along the road. These field markings correspond directly to those in the deactivation tables.

The deactivation tables should be used to re-establish the field markings if necessary. **The site supervisor must verify, and where necessary replace, the field marks immediately before starting deactivation.**

Unfortunately, due to high snow levels on the roads, road West Atleo Main was not assessed beyond the junction with WA500. This section of terrain was walked briefly during the 2022 hazard assessment and was deemed to be unstable with pullback attempted along the steeper portions of the road. A prescription of heavy pullback is anticipated for this portion of the road.

Additionally, EA1000 and EA1200 were not completely assessed for road deactivation due to a lack of time. A helicopter fly over of both road segments was completed and confirmed that pullback has been completed however the remaining road hazards are unknown. Should road deactivation go ahead, all of

the unassessed road intervals can be assessed during reactivation and/or mobilization at the front end of the road systems.

4.0 SITE OBSERVATIONS, CONCLUSIONS AND RECOMMENDATIONS

It is understood the information contained in the *Best Management Practices Handbook: Hillslope Restoration in British Columbia* will be used as the standard when carrying out the work contained in the prescriptions. Failing to follow these standard operating procedures will result in inadequate pullback and potentially unsafe working situations for the excavator operator.

Existing Conditions

The existing stability hazard and resulting sediment delivery potential to fish resources in the Atleo River are outlined in Table 1 below.

Table 1: Road Hazard and Sediment Delivery Potential

Road	Start Stn.	End Sta.	Stability Hazard	Sediment Delivery Potential	Deactivation Level
W.Atleo ML	JK172	JK169	Moderate	Moderate	Permanent
W.Atleo ML	JK169	JK166	High	Moderate	Permanent
W.Atleo ML	JK166	JK164	Moderate	Moderate	Permanent
W.Atleo ML	JK164	JK152A	High	Moderate	Permanent
W.Atleo ML	JK152A	JK144	Moderate	Moderate	Permanent
W.Atleo ML	JK144	JK139	High	Moderate	Permanent
W.Atleo ML	JK139	JK137	Low	Moderate	Permanent
W.Atleo ML	JK137	JK136	Moderate	Moderate	Permanent
W.Atleo ML	JK136	JK133	Low	High	Permanent
W.Atleo ML	JK133	JK130	High	High	Permanent
W.Atleo ML	JK130	JK128	Low	High	Permanent
W.Atleo ML	JK128	JK123	High	High	Permanent
W.Atleo ML	JK123	JK117	Moderate	High	Permanent
W.Atleo ML	JK117	JK106	High	High	Permanent
W.Atleo ML	JK106	JK104A	Low	High	Permanent
W.Atleo ML	JK104A	JK103	Moderate	High	Permanent
W.Atleo ML	JK103	JE186	High	High	Permanent
W.Atleo ML	JE186	JE184	Moderate	High	Permanent
W.Atleo ML	JE184	JE179	High	High	Permanent
W.Atleo ML	JE179	JE169	Moderate	High	Permanent
W.Atleo ML	JE169	JE167	High	High	Permanent
W.Atleo ML	JE167	JE126	Moderate	Moderate	Permanent
W.Atleo ML	JE126	JE122	High	Moderate	Permanent
W.Atleo ML	JE122	JE121	Low	Moderate	Permanent
W.Atleo ML	JE121	JE120	High	Moderate	Permanent
W.Atleo ML	JE120	JE99	Low	Moderate	Permanent

W.Atleo ML	JE99	JE98	Moderate	High	Permanent
W.Atleo ML	JE98	JE94	Low	High	Permanent
W.Atleo ML	JE94	JE47	Moderate	High	Permanent
W.Atleo ML	JE47	JE42	Low	High	Permanent
W.Atleo ML	JE42	JE2	Moderate	Moderate	Permanent
WA300	E/L	JE106	Low	Moderate	Permanent
WA300	JE106	JE101	Moderate	Moderate	Permanent
WA500	JK170	JK171	Low	Low	Permanent
EA1000	JK43	JK74	Moderate	High	Permanent
EA1000	JK74	JK80	High	High	Permanent
EA1000	JK80	JK27	Moderate	High	Permanent
EA1000	JK27	JK3	Low	Moderate	Permanent
EA500	E/L	0+000	Low	Moderate	Permanent
EA500A	E/L	0+000	Low	Moderate	Permanent
EA1200	JK96	JK94	Low	High	Permanent
EA1200	JK94	0+000	Low	Moderate	Permanent

Reconstruction (for access)

West Atleo Mainline:

JE43 to JE45: Slide debris 2 m high will require clearing

JE70: Wood box culvert collapsed – may require portable bridge for access or build modified access route around crossing (P.Eng assessment required)

JE84: Slide crosses road – construct conventional cut and fill trail

JE130 to JE132: Slide debris 1 m high will require clearing

JE158 to JE161: Slide debris 0.5 m high will require clearing – build full bench trail for access

JE183: 14m span wooden bridge eroded on both ends – will require portable bridge (P.Eng. assessment required).

JK104: cutslope slide deposited onto road: clean road surface

JK116 to JK123: Ravel on road at Jk123, cutslope slump at JK116, fillslope slide at JK121 – build full bench trail for access

JK133 to JK137: Road is recontoured – build full bench trail for access

EA1000:

JK84, JK85, and JK23: existing wood box culverts, may still be useable (P.Eng. assessments required).

Deactivation

Culvert removal and cross ditching is required along many sections of the roads to reestablish the natural drainage patterns. All woodbox culverts and wooden bridges should be removed from the site and placed in an appropriate location.

Road fill pullback is recommended along some sections to stabilize the roads for the long term. The length of pullback is indicated in the prescriptions (i.e. light (P3), moderate (P6), heavy (P9), and heavy+ (P12)) as an estimate of slope distance from the crest of the fill slope/edge of the road (Figure 1a). Additional pullback may be needed at some locations if more road fill is present than evident from the visual inspection during the work.

Pullback Prescriptions

Light pullback – Tension cracks and settling on outer 1-2 m of road, windrows or large berms present; likely only a thin wedge of fill material present. Remove side cast material built up on the outside shoulder. All sidecast with the potential to start a landslide must be retrieved. (Figure 1b).

Moderate pullback (discretionary) – Failing fillslope, tension cracks and settling on outer +2m of road; likely a thicker wedge of fill. Comb fillslope material back to original ground surface or until coarse and rocky material remains. **The objective is to comb-back the fill, ensuring that there is no lip remaining at the toe of the pullback.** This may require all fill material to be pulled back. All sidecast with the potential to start a landslide must be retrieved.

Heavy pullback (full) – In thick fills where entire fillslope is or may become unstable and large tension cracks or fillslope failures are present or starting to fail, pull back fillslope material to original ground. All sidecast with the potential to start a landslide must be retrieved. Where full (heavy+) pullback is prescribed and where safety permits, benching downslope to retrieve all fill material may be required.

All fill should be placed along the inside edge of the road, alleviating the ditchline completely.

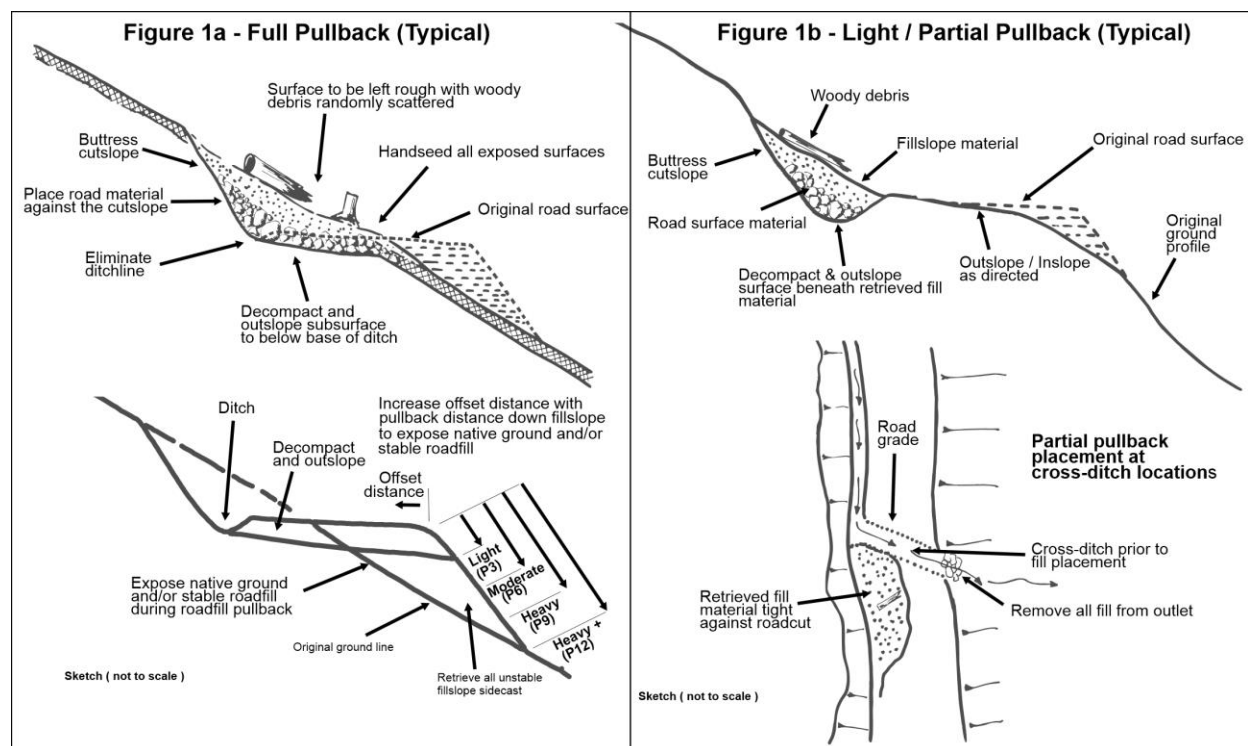


Figure 1: Typical pullback methods (1999 FRBC, Technical Standards and Guidelines for Road Deactivation/Restoration Activities)

6.0 INSPECTIONS AND VERIFICATION

Senior personnel familiar with the deactivation techniques in the Best Management Practices Handbook should carry out inspections during the deactivation work and **a qualified registered professional should review the deactivation work prior to completion and sign off on the same** (Appendix 2 in Guidelines for Professional Services in the Forest Sector – Forest Roads, June 2012). The inspections and review should also verify the accuracy of the cost estimates for use in future costing and budgeting.

In areas where road fill cannot be safely retrieved, and some residual hazard is expected to remain, an inspection by a qualified registered professional is prudent. The size and extent of such an area, as well as the downslope / downstream risks, are important considerations regarding the timing of the inspection. Smaller areas, or areas of lesser risk, can be inspected following completion of the work. For larger areas, or areas with high downslope / downstream risks, inspections concurrent with the work are recommended to address deficiencies in conjunction with full time supervision.

7.0 LIMITATIONS AND CLOSURE

These permanent deactivation prescriptions are made based on a visual inspection of the Atleo River Road Network using the techniques described in the Best Management Practices Handbook. If site conditions change, or the prescriptions are not expected to meet the objectives discussed in this report, some on site changes may be needed to the prescriptions. If any significant changes are required, contact a qualified registered professional with proven knowledge and experience in road deactivation and terrain stability assessment.

We trust this report outlines the requirements for deactivation along the assessed spur roads. If you have any questions regarding this report, please contact our office at your convenience.

Respectfully submitted,
Onsite Engineering Ltd.

Prepared by: Jaime Eggers, P.Ge.
Reviewed by: Richard Norman, P.Ge.

Attached

Table 2: West Atleo Mainline Road Deactivation
Table 3: WA100 Road Deactivation
Table 4: WA100A Road Deactivation
Table 5: WA300 Road Deactivation
Table 6: Unnamed Spur A Road Deactivation
Table 7: EA500 Road Deactivation
Table 8: EA600 Road Deactivation
Table 9: EA1000 Road Deactivation
Table 10: EA1200 Road Deactivation
Road Deactivation Overview Map
1:10,000 scale Atleo Road Deactivation Maps 1, 2, & 3
1:5,000 scale West Atleo Main Deactivation Maps 1, 2, & 3 (detail)

West Atleo Mainline, WA300, WA100, WA100A, Unnamed Spur A, EA500, EA600, EA1000 & EA1200 - Road Deactivation Prescriptions

Date Surveyed:

February 22nd to 24th, 2023

Surveyors:

Jaime Eggers, P.Geo, & Jon Kroon, P.Geo (Onsite Engineering Ltd.)

Permanent Deactivation.

Table 2: West Atleo Mainline Road Deactivation

Road	Sta.	Recommendation	Comments
West Atleo ML	JK 172	No recommendation	Coarse rock fill, start of tension cracks, blocky fill likely not retrievable, consequence is low, onto wide bench 20m below.
West Atleo ML	JK 171	Pull woodbox culvert and Install cross ditch.	2m WBC, plugged.
West Atleo ML	JK 170	Preserve cross ditch	Existing cross ditch, good.
West Atleo ML	JK 169	Deepen existing cross ditch.	Existing cross ditch, shallow.
West Atleo ML	JK 168	Start heavy pullback.	Thick fills still.
West Atleo ML	JK 167	Preserve cross ditch.	Existing cross ditch, good.
West Atleo ML	JK 166	End heavy pullback.	Start of big tension cracks again.
West Atleo ML	JK 165	Preserve cross ditch	Shallow cross ditch. Existing.
West Atleo ML	JK 164	Start heavy pullback.	Road through ridge nose, seems FB, no action in fill.
West Atleo ML	JK 163	End heavy pullback. Start moderate pullback.	Increased fills, Light pullback completed but insufficient.
West Atleo ML	JK 155	Install cross ditch.	water on road.
West Atleo ML	JK 154	No recommendation	Thick fills water on road, no settling, existing minor light pullback, small t.cks ahead
West Atleo ML	JK 153	Pull woodbox culvert and install cross ditch.	Existing cross ditch, good, WBC is 3m plugged.
West Atleo ML	JK 152A	End moderate pullback.	Settling adjacent to creek crossing.
West Atleo ML	JK 152	Preserve ditchline and allow road water to drain to last cross ditch.	Existing cross ditch, good, but some water on road camp side because of berm.
West Atleo ML	JK 160	Add waterbar.	Road drainage from berm on fill side.
West Atleo ML	JK 151	No recommendation	Small cut slope slide deposition.
West Atleo ML	JK 150	Preserve cross ditch.	Main stream is in good cross ditch.
West Atleo ML	JK 149	Install cross ditch.	Main creek in 20m wide slide path, flows bush side around deposit.
West Atleo ML	JK 148	Install cross ditch.	creek on edge of slope flows here and goes subsurface at road.
West Atleo ML	JK 147	Install cross ditch.	Erosion on road, moderate slopes below to benches.
West Atleo ML	JK 146	No action required.	Tension cracks in road edge, wide bench 20m below, moderate slide hazard with low consequence

West Atleo ML	JK 145	Preserve cross ditch.	Big cross ditch, good
West Atleo ML	JK 144	Start heavy pullback.	Onto local bench fills okay, Light pullback. Done.
West Atleo ML	JK 143	Preserve cross ditch.	Existing cross ditch, good.
West Atleo ML	JK 142	Pull woodbox culvert and install cross ditch.	4-5m WBC, large logs, functioning, stability uncertain, fill slope slide on bush side.
West Atleo ML	JK 140	Pull woodbox culvert and install cross ditch.	3m WBC big logs, functioning.
West Atleo ML	JK 139	End heavy pullback.	Thick fills with tension crack starting again.
West Atleo ML	JK 138	Preserve cross ditch.	Existing cross ditch.
West Atleo ML	JK 137	Start moderate pullback. Rock fall hazard locally, full bench trail through rock fall deposit and beyond.	Bluffs with rock fall hazard and no rd surface, recontoured ahead, with decent looking fills 70%, some raveling fill.
West Atleo ML	JK 136	End moderate pullback.	fills with minor tension cracks leading to old fill slide, 10m w minor travel?
West Atleo ML	JK 135	Deepen existing cross ditch.	existing shallow cross ditch.
West Atleo ML	JK 134	Preserve cross ditch.	Existing cross ditch, good.
West Atleo ML	JK 133	Start heavy pullback.	Fills now on local bench, few vet cedar at fill toe, possible landing area.
West Atleo ML	JK 132	End heavy pullback. Start moderate pullback.	Shift to thicker fill with tension cracks.
West Atleo ML	JK 131	End moderate pullback. Start light pullback.	Shift to thicker fill.
West Atleo ML	JK 130	End light pullback.	Very localized tension crack, only in road surfacing.
West Atleo ML	JK 129	Deepen existing cross ditch.	Shallow cross ditch.
West Atleo ML	JK 128	Hazardous tree on fill slope. Start heavy pullback, eliminate ditch, decompact ditch and move berm against cut slope	Danger tree on fill, ahead at cross ditch. fill is lumpy and stable, existing light pullback, bermed mid road, ditch exists above berm.
West Atleo ML	JK 126	Deepen existing cross ditch	Shallow cross ditch.
West Atleo ML	JK 124	Continue HPB	7m horizontal to bedrock, must excavate ravel, slopes below not safe.
West Atleo ML	JK 123	End heavy pullback. Start moderate pullback.	Shift to thick fills again with tension cracks, 5m wide fills over steep, high bedrock cuts where ravel has covered road, must dig for access.
West Atleo ML	JK 121	Stay tight against cut face during access; hazardous edge flagged in field. Side cast into draw and fill for crossing stream. Preserve stream crossing upon egress.	Large fill slope slide 2m high hw, bedrock knob makes road narrow, with unstable outer lip, max 4.0 width of stable, narrow road at bush side of draw too.
West Atleo ML	JK 120	Excavate full bench for access. Preserve cross ditch.	Creek with effective cross ditch, cutslope slide 20m high by 15m wide.
West Atleo ML	JK 119	End moderate pullback.	Continued existing light pullback, with fills again against old growth stumps 3m thick, steep into

			gully, 20m wide cut slope slide, debris removed, but still ravelling.
West Atleo ML	JK 117	Start heavy pullback.	Shift to local bench off thick fills, vet stump ahead.
West Atleo ML	JK 116	Excavate full bench for access	Small cut slope slump, blocking road access, room on outside to dig and get around, could locally stop pullback.
West Atleo ML	JK 115	End heavy pullback.	More tension cracks again, existing Light pullback. continues, 80% slopes below.
West Atleo ML	JK 114	Preserve cross ditch.	Decent looking cross ditch.
West Atleo ML	JK 113	Start heavy pullback.	Light pullback continues, smooth slopes below, no tension cracks.
West Atleo ML	JK 112	Deepen existing cross ditch.	Existing shallow cross ditch.
West Atleo ML	JK 110	Deepen existing cross ditch	Existing cross ditch, salmon berry fills, existing light pullback continues.
West Atleo ML	JK 109	Pull woodbox culvert and install cross ditch.	4m WBC, large logs, functioning still not much water, nearly plugged.
West Atleo ML	JK 108	Deepen existing cross ditch	Existing cross ditch. Shallow.
West Atleo ML	JK 106	End heavy pullback.	Past slide, thick fill 3m of settling, 0.5m deep.
West Atleo ML	JK 105	Preserve cross ditch.	Creek is 0.5m over bedrock and into 30m w slide to bedrock, existing cross ditch is good.
West Atleo ML	JK 104A	Large deadfall to remove for access. Start moderate pull back. Decompact ditchline and spoil against cut.	4.0m w stable portion.
West Atleo ML	JK 104	Excavate full bench for access.	Tension cracks start again, cut slope slide deposit on road with continuing pull back.
West Atleo ML	JK 103	End moderate pullback. Start heavy pullback. Decompact ditch and move existing pull back spoil against cutslope.	Existing light pull back mounded on road, directs water to slide site.
West Atleo ML	JK 102	Install cross ditch.	Fill slope slide, 20m wide, alder path on 80%.
West Atleo ML	JK 101A	Eliminate cross ditch.	Existing shallow cross ditch, over steep slopes below.
West Atleo ML	JK 100	Deepen existing cross ditch.	Existing shallow cross ditch.
West Atleo ML	Je186	End heavy pullback.	
West Atleo ML	Je185	Install cross ditch.	
West Atleo ML	Je184	Start heavy pullback.	
West Atleo ML	Je183	Will require portable bridge. Pull wooden bridge during deact.	Eroded on both sides. Camp has 2 m gap with sill and stringers exposed. 14 m bridge. Would require another 6 m to extend beyond fillslope failure and tensioning bridge edge.
West Atleo ML	Je182	Deepen existing cross ditch.	
West Atleo ML	Je181	Deepen existing cross ditch.	Continue heavy pullback.

West Atleo ML	Je180	Install cross ditch.	
West Atleo ML	Je179	End heavy pullback.	
West Atleo ML	Je178	No recommendations	Existing cross ditch.
West Atleo ML	Je177	Install reverse water bar.	NNE oriented.
West Atleo ML	Je176	Install reverse water bar.	SE oriented.
West Atleo ML	Je175	Deepen existing cross ditch.	Stream flows across road.
West Atleo ML	Je174	Install cross ditch.	Settling at seepage site.
West Atleo ML	Je173	Deepen existing cross ditch.	
West Atleo ML	Je172	Deepen existing cross ditch.	
West Atleo ML	Je171	Pull wooden bridge.	4 m span buried bridge. Machine can walk through creek
West Atleo ML	Je170	Install cross ditch.	Seepage site with settling over mod.
West Atleo ML	Je169	Start heavy pullback.	
West Atleo ML	Je168	Deepen existing cross ditch.	Continue heavy pullback.
West Atleo ML	Je167	End heavy pullback.	
West Atleo ML	Je166	Install cross ditch.	
West Atleo ML	Je165	Start moderate pullback.	Settling to almost inside of road but very moderate slopes.
West Atleo ML	Je164	End moderate pullback.	
West Atleo ML	Je163	Preserve existing cross ditch	Existing cross ditch.
West Atleo ML	Je162	Install cross ditch.	
West Atleo ML	Je161	End reconstruction at full bench endhaul back onto road.	
West Atleo ML	Je160	Install cross ditch.	
West Atleo ML	Je160	Reconstruct at full bench endhaul coming out of stream draw.	
West Atleo ML	Je159		Slide has taken out 2-3 m wide Stream with sprawling slide debris. Dry channel.
West Atleo ML	Je158	Debris to be removed for access	Edge of slide debris 0.5 m high.
West Atleo ML	Je158	Start light pullback.	
West Atleo ML	Je157	Deepen existing cross ditch.	Continue Light pullback.
West Atleo ML	Je156	End Light pullback.	Settling & tension cracks.
West Atleo ML	Je155	Deepen existing cross ditch.	
West Atleo ML	Je154	Install cross ditch.	
West Atleo ML	Je153	Start light pullback.	
West Atleo ML	Je152	End light pullback.	
West Atleo ML	Je151	Install cross ditch.	Water coming across road caused settling on mod slopes could pull back any loose fill on either side of cross ditch.
West Atleo ML	Je150	Install cross ditch.	
West Atleo ML	Je149	Start moderate pullback.	
West Atleo ML	Je148	No recommendation	5 m wide fs failure.
West Atleo ML	Je147	Deepen existing cross ditch.	Continue moderate pullback.

West Atleo ML	Je146	End moderate pullback.	
West Atleo ML	Je145	Pull woodbox culvert and install cross ditch.	1*1 with undermining on woods side
West Atleo ML	Je144	No recommendation	0.5 m wide Stream currently flows down ditch. - 25%(5);-45(5);60
West Atleo ML	Je143	Deepen Existing cross ditch.	
West Atleo ML	Je142	Install cross ditch.	
West Atleo ML	Je141	Deepen Existing cross ditch.	
West Atleo ML	Je140	Install cross ditch.	
West Atleo ML	Je139	Start moderate pullback.	Slopes gentle.
West Atleo ML	Je138	End moderate pullback. start Light pullback.	
West Atleo ML	Je137	Deepen Existing cross ditch.	Continue Light pullback.
West Atleo ML	Je136	End Light pullback.	
West Atleo ML	Je135	Pull woodbox culvert and install cross ditch.	1*2
West Atleo ML	Je134	Start moderate pullback.	
West Atleo ML	Je133	End moderate pullback. and remove windrow.	
West Atleo ML	Je132	No recommendation	Stream impacted by slide 1 m wide gap between R sidewall and wooden bridge. Can walk machine around up Stream during low summer flows. Slide debris ends 5 m past woods side.
West Atleo ML	Je131	No recommendation	Start of slide debris old large woody debris, 1 m high.
West Atleo ML	Je130	Install cross ditch and excavate stream channel through slide path.	Debris ends just past here mostly fines. 15 m wide at road.
West Atleo ML	Je129	No recommendation	Start of slide debris.
West Atleo ML	Je128	Install cross ditch.	
West Atleo ML	Je127	Deepen existing cross ditch.	
West Atleo ML	Je126	Install cross ditch.	
West Atleo ML	Je125	Start heavy pullback.	
West Atleo ML	Je124	End heavy pullback. Start moderate pullback.	
West Atleo ML	Je123	End Moderate pullback.	
West Atleo ML	Je122	Install cross ditch.	
West Atleo ML	Je122a	Preserve existing cross ditch.	
West Atleo ML	Je121	Start heavy pullback.	
West Atleo ML	Je120	End heavy pullback	
West Atleo ML	Je119	Install water bar.	
West Atleo ML	Je117	No recommendation	Existing cross ditch. water flow from near junction to here.

West Atleo ML	Je100	Install cross ditch.	
West Atleo ML	Je99	Start moderate pullback.	Junction with WA300.
West Atleo ML	Je98	End moderate pullback.	Begin settling and tension crack.
West Atleo ML	Je97	No recommendation	Subvert off landing could do some Light pullback. but might be best not to disturb standing timber no sign of failure.
West Atleo ML	Je96	Install cross ditch.	
West Atleo ML	Je95	Install cross ditch.	
West Atleo ML	Je94	Start Light pullback.	
West Atleo ML	Je93	End Light pullback.	Settling down very mod steep direct to Atleo.
West Atleo ML	Je92	Install cross ditch.	
West Atleo ML	Je91	Deepen existing cross ditch.	
West Atleo ML	Je90	Remove slide debris and install cross ditch.	
West Atleo ML	Je89	No recommendation	Start pile of slide debris.
West Atleo ML	Je88	Install water bar.	
West Atleo ML	Je87	No recommendation	Quarry? area good spoil site all flat.
West Atleo ML	Je86	Pull remainder of Woodbox culvert install large cross ditch.	Collapsed with 2 m deep person sized hole 1*2.
West Atleo ML	Je85	Pull woodbox culvert and install cross ditch.	1*3 dry with limestone ra.
West Atleo ML	Je84	Reconstruct through slide path	Old slide crosses road. Reconstruct through slide path. Some settling of edge. -40%.
West Atleo ML	Je83	Install cross ditch.	
West Atleo ML	Je82	Pull woodbox culvert and install cross ditch.	Partially collapsed Woodbox culvert 1*2. 1*1*0.5D hole on inside edge and outlet area are failing.
West Atleo ML	Je81	No recommendation	Wsh 2*2*2 Boulder has rolled down to here.
West Atleo ML	Je80	Heavy pull back of end landing	Settling 5 m in from edge of landing area, lots of material to move, -68% off edge, pgeo on site can determine appropriate level of pullback during works.
West Atleo ML	Je79	Install large cross ditch.	Water jumps ditch just below and then flows down road with large windrow.
West Atleo ML	Je78	Deepen existing cross ditch.	
West Atleo ML	Je77	Install cross ditch.	
West Atleo ML	Je76	Pull woodbox culvert install cross ditch.	1*3 with moderate Transport Potential Stream.
West Atleo ML	Je75	Deepen Existing cross ditch.	
West Atleo ML	Je74	Pull remainder of woodbox culvert and install large cross ditch.	Collapsed 1*2 or 1*3.
West Atleo ML	Je73	Pull remainder of woodbox culvert and install large cross ditch.	Collapsed 1*2 or 1*3 3 m across 1.5 m down.

West Atleo ML	Je72	Install cross ditch.	Looks like there could be a cmp installed here but nothing confirmed
West Atleo ML	Je71	Install cross ditch.	
West Atleo ML	Je70	Pull Woodbox culvert and install large cross ditch. Needs inspection by P.Eng	Woodbox culvert is collapsed 6 m wide 5 m deep from road surface 2 m from sill log. Would need temporary log bridge. Or could potentially walk the machine through on the high side and make temp route for truck to cross. ~1*5 Woodbox culvert.
West Atleo ML	Je69	Pull woodbox culvert and install cross ditch.	Dry Stream 1*2 or 1*3 hard to tell due to collapsed edge.
West Atleo ML	Je68	Install cross ditch.	No Woodbox culvert found dry draw here.
West Atleo ML	Je67	Pull woodbox culvert and install cross ditch.	1*3 Woodbox culvert.
West Atleo ML	Je49	Pull woodbox culvert and install cross ditch.	Woodbox culvert is collapsed with 0.5 m deep hole in road. Looks like 1*2 or 1*3.
West Atleo ML	Je48	Install cross ditch.	0.5 m wide Stream currently flows down ditch.
West Atleo ML	Je47	Deepen existing cross ditch.	
West Atleo ML	Je46	Preserve cross ditch	Existing cross ditch.
West Atleo ML	Je45	No recommendation	End of debris 2 m high.
West Atleo ML	Je44	No recommendation	Slide path fine to cross with machine 12 m wide by 2 m deep draw now. moderate Transport Potential channel.
West Atleo ML	Je43	No recommendation	Start of slide debris.
West Atleo ML	Je42	Install cross ditch.	
West Atleo ML	Je41	Install cross ditch.	
West Atleo ML	Je40	Install cross ditch.	
West Atleo ML	Je39	Pull woodbox culvert and install cross ditch.	1*2 no Stream empties ditch water from both directions.
West Atleo ML	Je38	Install cross ditch.	Could be buried wbc
West Atleo ML	Je37	Install cross ditch.	Could be buried wbc. 1 m wide Stream flows in plugged ditch and then down road.
West Atleo ML	Je36	Install cross ditch.	
West Atleo ML	Je35	Install large cross ditch.	3 m high windrow constructed after slide impacted stream. Put stream back in right spot. Could be buried woodbox culvert.
West Atleo ML	Je34	Install cross ditch.	Ditch is full!
West Atleo ML	Je33	Install cross ditch.	Significant water on road.
West Atleo ML	Je32	Pull woodbox culvert and install cross ditch.	Site water is draining to. 1*2 wbc.
West Atleo ML	Je31	No recommendation	0.5 m wide S6 comes out here but rise on slope on outlet side would have to be 30-40 m long cross ditch. Can stay on road here on flats.
West Atleo ML	Je30	Pull woodbox culvert and install cross ditch.	1*2 wbc

West Atleo ML	Je29	No recommendation	0.5 m wide S6 comes out here but 2-3 m high windrow impedes outlet of potential cross ditch. no recc.
West Atleo ML	Je28	Install cross ditch	
West Atleo ML	Je27	Pull woodbox culvert and install cross ditch.	Drainage is being concentrated to this 1*2.
West Atleo ML	Je26	Install cross ditch.	Stream is .5 m wide into ditch.
West Atleo ML	Je25	Pull woodbox culvert and install cross ditch.	0.5*2 m Woodbox culvert.
West Atleo ML	Je24	No recommendation	Stream confined rd out here, but 2-3 m high windrow starts would be large excavation to return to g drainage. Flows up chain down road.
West Atleo ML	Je23	Install cross ditch.	Put Stream back into original draw.
West Atleo ML	Je22	No recommendation	Existing cross ditch. Water flowing down ditch line from upper road. Seems fine possibly manage upslope.
West Atleo ML	Je21	Preserve cross ditch	Existing cross ditch.
West Atleo ML	Je20	Preserve cross ditch	Existing cross ditch.
West Atleo ML	Je19	Install cross ditch.	Stream runs down road to lower cross ditch.
West Atleo ML	Je18	No recommendation	Existing cross ditch.
West Atleo ML	Je17	Preserve cross ditch	Existing cross ditch.
West Atleo ML	Je16	Preserve cross ditch	Existing cross ditch.
West Atleo ML	Je15	Worker Safety Hazard: keep machines back from outer road edge.	Tension cracks but just 7 m to big bench wsh 20 m interval starts here.
West Atleo ML	Je14	Preserve cross ditch	Existing cross ditch.
West Atleo ML	Je13	Preserve cross ditch	Existing cross ditch.
West Atleo ML	Je12	Preserve cross ditch	Existing cross ditch.
West Atleo ML	Je11	No recommendation	Spur road on benches. Not mapped
West Atleo ML	Je10	Preserve cross ditch	Existing cross ditch.
West Atleo ML	Je9	Preserve cross ditch	Existing cross ditch.
West Atleo ML	Je8	Preserve cross ditch	Existing cross ditch.
West Atleo ML	Je7	Preserve cross ditch	Existing cross ditch.
West Atleo ML	Je6	Install cross ditch.	
West Atleo ML	Je5	Preserve cross ditch	Existing cross ditch. Looks man made and impacted by slide.
West Atleo ML	Je4	Install cross ditch.	
West Atleo ML	Je3	Install cross ditch.	No wbc found.
West Atleo ML	Je2	Install cross ditch.	

Table 3: WA100 Road Deactivation **no further deactivation recommended*

Road	Sta.	Recommendation	Comments
WA100	Je52	No recommendation	Ending survey in middle of Heavy Pullback interval. up to this point all culverts pulled and Heavy Pullback effectively completed through draws.
WA100	Je53	No recommendation	End of Heavy Pullback.
WA100	Je54	No recommendation	Back into Heavy Pullback.
WA100	Je55	No recommendation	End of Heavy Pullback.
WA100	Je56	No recommendation	Culvert pulled and adjacent slopes Heavy Pullback.
WA100	Je57	Preserve cross ditch	Existing cross ditch.
WA100	Je58	Preserve cross ditch	Existing cross ditch.
WA100	Je59	Preserve cross ditch	Existing cross ditch.
WA100	Je60	Preserve cross ditch	Existing cross ditch.
WA100	Je61	Preserve cross ditch	Existing cross ditch.

Table 4: WA100A Road Deactivation **no further deactivation recommended*

Road	Sta.	Recommendation	Comments
WA100A	Je66	No recommendation	Another narrow slide path. Road has been taken back by the forest. Up on rock knob now seems like end of road.
WA100A	Je65	No recommendation	Very old debris flow path crosses road. 5 m wide water is confined.
WA100A	Je64	No recommendation	Slide 10 m wide crossing road water confined in scour.
WA100A	Je66	No recommendation	Another narrow slide path. Road has been taken back by the forest. Up on R knob now seems like end of road.
WA100A	Je65	No recommendation	Very old debris flow path crosses road. Debris flow is 5 m wide. Water is confined.
WA100A	Je64	No recommendation	Slide 10 m wide crossing road. Water confined in scour.
WA100A	Je63	Preserve cross ditch	Existing cross ditch.
WA100A	Je61A	Preserve cross ditch	Existing cross ditch.

Table 5: WA300 Road Deactivation

Road	Sta.	Recommendation	Comments
WA300	Je117	No recommendation	Stream comes in here.
WA300	Je116	No recommendation	Stream runs down road and crosses here.
WA300	Je115	Pull woodbox culvert and install cross ditch.	Possibly leave as road is all on benches. 1*3 partially collapsed.
WA300	Je114	Preserve cross ditch	Existing cross ditch.
WA300	Je113	Preserve cross ditch	Existing cross ditch.

WA300	Je112	Preserve cross ditch	Existing cross ditch.
WA300	Je111	No recommendation	Stream crossing road. Moderate transport potential. Full of sediment. Potential rehab site with redd fish crews.
WA300	Je110	Preserve cross ditch	Existing cross ditch. Stream flows across road.
WA300	Je109	Deepen existing cross ditch.	
WA300	Je108	Preserve cross ditch	Existing cross ditch.
WA300	Je107	Deepen existing cross ditch.	Stream has blown across road.
WA300	Je106	Start Moderate Pullback.	
WA300	Je105	End Moderate Pullback.	Windrow with tenson crack starting just ahead.
WA300	Je104	Install cross ditch.	
WA300	Je103	Deepen existing cross ditch.	Stream has blown across road.
WA300	Je102	Start Light Pullback.	
WA300	Je101	End Light Pullback.	

Table 6: Unnamed Spur A Road Deactivation

Road	Sta.	Recommendation	Comments
Unnamed spur A	Je51	Pull cmp add cross ditch	End of spur.
Unnamed spur A	Je50	Pull cmp add cross ditch	Existing cross ditch. Stream with moderate transport potential.

Table 7: EA500 Road Deactivation

Road	Sta.	Recommendation	Comments
EA500	JK 14	Install cross ditch.	Seepage flows down road here, down chain.
EA500	JK 13	Pull woodbox culvert and install cross ditch.	Plugged woodbox culvert 2m, seeps through.
EA500	JK 12	No recommendation	Small stream from cut flows upchain.
EA500	JK 11	No action required	Stream channel above, follows ditch to jk10, road ditch eroded into very dense gravelly, sand and silt till, appears to have stabilized. No material to armour ditch, but not needed.
EA500	JK 10	Pull woodbox culvert and install cross ditch.	Existing functioning 4m WBC, receives water from both directions of ditch.
EA500	JK 9	No recommendation	Wet road on benches, okay, continues to main creek at jk10.
EA500	JK 8	Pull woodbox culvert and install cross ditch.	Existing functioning 4m woodbox culvert. Requires inspection by M.Foster to cross with machine
EA500	JK 7	No recommendation	Seeps off cut, and creek into ditch flowing upchain, behind is ditch with standing water and berm below road.

Table 8: EA600 Road Deactivation

Road	Sta.	Recommendation	Comments
EA600	JK90	Pull woodbox culvert and add cross ditch.	2m woodbox culvert is functioning.
EA600	JK91	Preserve cross ditch	old channel, no water, shallow swale at road

Table 9: EA1000 Road Deactivation **road not assessed beyond (upchain) JK43*

Road	Sta.	Recommendation	Comments
EA1000	JK 43	Clean ditch, berm road centre.	Ditch water spilling over road, eroding.
EA1000	JK 44	No recommendation	Slide, 1m blocks on rd, ditch okay.
EA1000	JK 45	Preserve cross ditch	Cross ditch 1m deep by 5m wide, good.
EA1000	JK 46	Install cross ditch.	small stream, flows down ditch, moderate slopes below.
EA1000	JK 47	Pull woodbox culvert and install cross ditch.	3m woodbox culvert, partly functioning, erosion across road.
EA1000	JK 48	Install cross ditch.	Waterbar, shallow.
EA1000	JK 49	Pull woodbox culvert and install cross ditch.	4m woodbox culvert 1.5m ck, partly collapsing.
EA1000	JK 50	No recommendation	Good back up cross ditch.
EA1000	JK 51	Install waterbar, no ribbon.	interval without cross ditch, no water visible on rd, but at camp side cross ditch minor road wash erosion.
EA1000	JK 52	No recommendation	Stream with cross ditch, good condition.
EA1000	JK 53	No recommendation	From last cross ditch bush side, cut slope in till, ravelled filling ditch big berm below road no surface erosion, here cross ditch at 1m stream, good.
EA1000	JK 54	Pull woodbox culvert and install cross ditch.	From last berm continues, ditch okay, 3m woodbox culvert, partly functioning, erosion at sump, gravel passing through mostly but will fill up.
EA1000	JK 55	Preserve cross ditch	1m stream, woodbox pulled but sill logs still in place, cross ditch effective, seems okay to leave.
EA1000	JK 56	No recommendation	Small woodbox, good.
EA1000	JK 57	Deepen existing cross ditch.	3m stream with old slide, shallow at crossing.
EA1000	JK 58	Preserve cross ditch	Shallow cross ditch, okay.
EA1000	JK 59	Deepen existing cross ditch.	Collapsed Woodbox, one log in place forms dam, cross ditch edges eroding into road.
EA1000	JK 60	No recommendation	Note, minor ditch water on benches, could consider cross ditch somewhere along here.
EA1000	JK 61	Install cross ditch.	Small stream on flats, pooling water.
EA1000	JK 62	No recommendation	Gravel quarry.

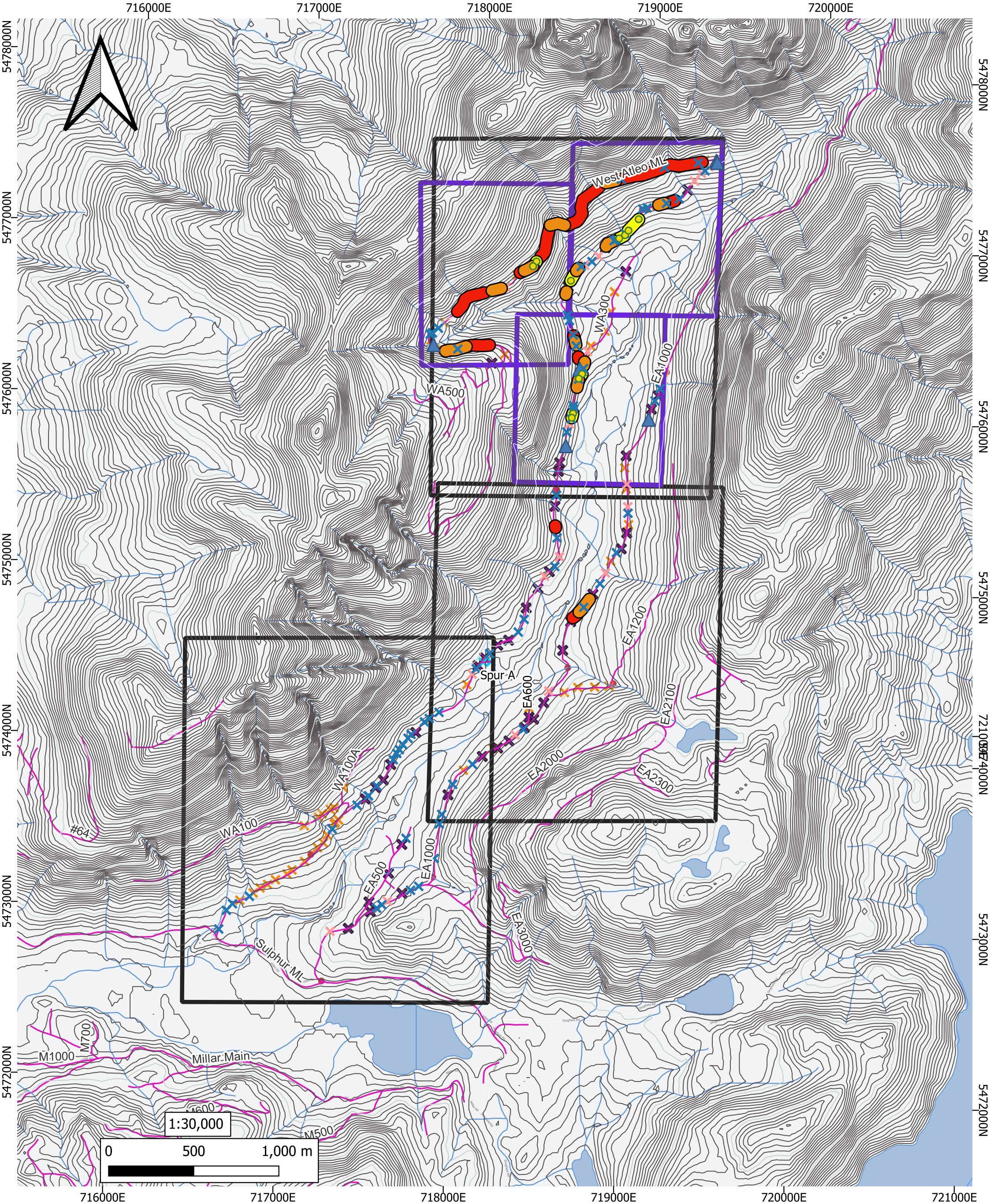
EA1000	JK 63	Preserve cross ditch.	13m wide eroded draw, 2 to 4m deep, high side crossable, but needs path dug, otherwise cross ditch good, preserve.
EA1000	JK 64	No recommendation	Stream draw is slide, other edge here.
EA1000	JK 65	Pull woodbox culvert and install cross ditch.	Collapsed 4m woodbox culvert, erosion on road surface, partly functioning, overflow eroding to next stream.
EA1000	JK 66	Pull woodbox culvert and install cross ditch.	3m woodbox culvert, functioning, eroding cutslope.
EA1000	JK 67	Install cross ditch.	Seepage accumulating, benches below, bit bermed below, sort of break here.
EA1000	JK 68	Preserve cross ditch.	cross ditch in good condition.
EA1000	JK 69	Pull sill logs. Enhance cross ditch.	10m wide draw, 1m deep, slide path, one toe log in place still, water through and over, slide debris on road.
EA1000	JK 70	Install cross ditch.	Seepage from cut.
EA1000	JK 71	Pull woodbox culvert and install cross ditch.	collapsed woodbox culvert 3m, still flow through though, old slide path.
EA1000	JK 72	Preserve cross ditch.	Stream with cross ditch, good.
EA1000	JK 74	Start moderate pullback and spoil in ditch.	settling on outer fill edge, slopes inc from -50% to -70%, would enter stream probably, minor tension cracks.
EA1000	JK 75	Continue moderate pullback and preserve conifers where possible.	Fills up on bench again, but then more fill on steep slopes, mature alder will have to be felled.
EA1000	JK 76	Install cross ditch and continue moderate pullback.	Seepage from cut, minor erosion.
EA1000	JK 77	End moderate pullback and start heavy pullback.	Shift to big fill on steep, salmon berry covered fill, settling is minor 2m back from fill edge.
EA1000	JK 78	No recommendation	Fill slope landslide is 10m wide, eroded to till surface.
EA1000	JK 79	Deepen existing cross ditch.	Stream with cross ditch, shallow, but okay.
EA1000	JK 80	End heavy pullback.	Road onto benches.
EA1000	JK 81	Pull woodbox culvert and install cross ditch.	3m woodbox culvert, functioning.
EA1000	JK 82	No recommendation	Over rise of land, benched, no water.
EA1000	JK 83	No recommendation	Spur road, hoe trail gentle with no water, looks fine.
EA1000	JK 84	Pull woodbox culvert and install cross ditch. Maybe need assess by P.Eng.	5m woodbox culvert, functioning, 4-5m w creek.
EA1000	JK 85	Pull bridge and install cross ditch. Maybe need assess by P.Eng..	Bridge crossing, 5.5m wide, still looks okay, 3m high at outlet, substrate bouldery, but sill a little undercut.
EA1000	JK 86	No recommendation	Rock quarry 20x20, with standing water, overflows through 0.4m deep cross ditch, good.

EA1000	JK 87	Deepen existing cross ditch.	shallow cross ditch.
EA1000	JK 88	Pull woodbox culvert and install cross ditch.	4m w woodbox culvert, functioning, seepage from bush side cut slope.
EA1000	JK 89	Pull woodbox culvert and install cross ditch.	2m woodbox culvert, functioning.
EA1000	JK 40	Pull woodbox culvert and install cross ditch.	2m woodbox culvert seepage only here.
EA1000	JK 39	Install cross ditch.	creek is 0.5m seeps into ground.
EA1000	JK 38	Deepen existing cross ditch.	Shallow cross ditch.
EA1000	JK 37	Pull woodbox culvert and install cross ditch.	Functioning 3m woodbox culvert.
EA1000	JK 36	Pull woodbox culvert and install cross ditch.	4m woodbox culvert functioning, stream here, 1.5m.
EA1000	JK 35	Preserve cross ditch.	Existing functioning shallow cross ditch.
EA1000	JK 34	Pull woodbox culvert and install cross ditch.	3m woodbox culvert, functioning, at Karst spring.
EA1000	JK 33	Install cross ditch.	Water in ditch.
EA1000	JK 32	Preserve cross ditch.	Existing functioning cross ditch.
EA1000	JK 31	Install cross ditch.	Water in ditch from seep, down ditch to 2 m woodbox culvert, functioning.
EA1000	JK 30	Pull woodbox culvert and install cross ditch.	Small creek, 2m woodbox culvert, partly functioning, shallow backup cross ditch.
EA1001	JK 29	No recommendation	Existing cross ditch.
EA1000	JK 28	Install cross ditch.	Water up grade, seeps into ground mostly.
EA1000	JK 27	Install cross ditch.	Wet site.
EA1000	JK 26	No recommendation	Decent cross ditch.
EA1000	JK 25	Install cross ditch.	Wet road, subtle swale no ditch.
EA1000	JK 24	No recommendation	Shallow but functioning cross ditch.
EA1000	JK 23	Pull bridge, install large swale *P.Eng. to look at*	Bridge 7m wide, clear and functioning.
EA1000	JK 22	No recommendation	Existing cross ditch in good condition.
EA1000	JK 21	Install cross ditch.	Old creeks draw below.
EA1000	JK 20	Install cross ditch.	Good spot to Install cross ditch, seem stable below.
EA1000	JK 19	Pull woodbox culvert and install cross ditch.	Existing functioning woodbox culvert 3 m, erosion underneath.
EA1000	JK 18	Deepen existing cross ditch.	Existing cross ditch.
EA1000	JK 17	Install cross ditch.	Relict draw below road, leads to cross ditch down slope.
EA1000	JK 16	Install cross ditch.	Small seep, benched below, leads to cross ditch.
EA1000	JK 15	Pull woodbox culvert and install cross ditch.	Woodbox culvert functioning 3m, good ditch block.
EA1000	JK 6	Pull woodbox culvert and install cross ditch.	Existing woodbox culvert 4m, still functioning.

EA1000	JK 5	Deepen existing cross ditch	Existing cross ditch, opens to road, needs to be deeper, little to no flow.
EA1000	JK 4	No recommendation	Existing cross ditch is good, road below sloped to ditch line is good.
EA1000	JK 3	Clean ditchline, spoil on road centre to form berm.	Infilled ditch water over Sulphur Mainline.

Table 10: EA1200 Road Deactivation *not assessed beyond (upchain) JK97

Road	Sta.	Recommendation	Comments
EA1200	JK 97	No action required.	No slide visible, benchy below and above
EA1200	JK 96	Difficult access, requires fill to cross creek.	4m ck has good ditch, 3m d by 10m w, water from bush side eroding ditch a bit.
EA1200	JK 95	Preserve cross ditch.	Okay cross ditch, shallow.
EA1200	JK 94	Preserve cross ditch.	Shallow cross ditch, okay, minor water through it.
EA1200	JK 93	Preserve cross ditch.	Shallow cross ditch, no water, okay.
EA1200	JK 92	Preserve cross ditch.	Existing cross ditch, good, no water but good place for cross ditch.
EA1200	JK 91	No recommendation	Old channel, no water, shallow swale at road.



1:10,000 Overview Map 1:5,000 Overview Map Road		Waterbody Contour 10m Index Intermediate		Atleo Road Deactivation Overview Map AREA: Atleo River Watershed CLIENT: Redd Fish Restoration Society PROJECT #1681-2-2 DATE:2023-03-22 DESIGNED BY: David Kallai, GIT REVIEWED BY: Jamie Eggers, P.Geo		MAP NOTES: 1. IMAGERY / DATA SOURCE: Geogradis 2. CONTOUR INTERVAL: 10 m. 3. THIS MAP IS MEANT TO BE READ WITH THE ACCOMPANYING ROAD DEACTIVATION ASSESMENT REPORT.	
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