

Elk Stream Ranch Drainage Improvement Plan 2/24/2014

On February 13, 2014, Philip Walters and Odie Christensen joined Dr. Chris Rasmussen, fluvial geomorphologist and river restoration ecologist with Eco Mainstream Contracting LLC to review the condition of Road 46 and discuss effective road drainage modifications to minimize future flooding impacts. Numerous storm-related flood events have severely damaged Road 46 since the Weber fire of 2012, with repair costs to Elk Stream Ranch Property Owners Association exceeding \$60,000.

The ultimate cause of the problem is that subdivision road development disrupted the existing natural drainage pattern. At this point, the most effective solutions to our problems will be to, as much as possible, restore pathways for floodwaters to follow natural drainage paths. Where diversion is necessary, we need to minimize the length of the diversion and take measures to reduce flow velocity.

We recognize that the Association must commit considerable financial resources to this issue in 2014. Either we commit the funds early to permanent road drainage improvements or pay equally later for damage repair.

In general terms, work recommended includes:

- **CULVERTS:** new culverts or replacement of inadequate culverts to conduct water beneath the road;
- **BACKSTOPS:** gabions or rock rip-rap placed immediately below culverts to direct flow into the culvert;
- **CLEANING and REPAIR:** removal of accumulated sediment and debris, which is likely to plug culverts, from a few sections of bar ditch; there remain a few deep ditches that must be filled;
- **SWALES:** low spots in the road where low-energy flow can cross the road;
- **FENCES:** fences constructed of t-posts, field fence ± rocks ± geotextile to catch debris, establish an erosional base, and dissipate energy within the bar ditches.

Management: Road repair and maintenance expenses have been very high during the past two years of dealing with the flooding. A lack of experience and information in dealing with flood damage, and a lack of a well-designed plan of attack naturally ran some of these costs up even more. Past efforts have been reactive, dealing with the damage where it is worst, rather than proactively addressing the sources of the damage. This reactive response affected the order of work to be done, allowing vulnerable work to be performed prior to other work that would make it less vulnerable. During 2014, the Property Management Committee should agree upon very clear work priorities and completion standards and communicate these clearly in work-plan-maps and by walk-about with the contractor. It is important that the work be performed in the correct order, and that the Association clearly communicate this order to the contractors and volunteers. When work is in progress, there should be a single responsible individual from the Association present in the canyon, available for guidance, and available for regular progress inspections. Philip is willing to perform this function.

PHASED ACTION PLAN, IN PRIORITY ORDER, HIGHEST TO LOWEST:

Phase 1						
Location	Action by Contractor	CMP installed cost	gabion/riprap \$	Action by Volunteers	Fence fabric	Tee Posts
CL 0.5	New 60 ft 24x35" CMP, riprap inlet, mat outfall	\$4,725	\$1,000	Trash fence overlay on subdivision boundary fence	60	
CL 10	New 40ft 29x42" CMP, mat outfall, mat above	\$3,300	\$1,000	2 trash fences above	80	20
CL 16 large	Additional work (mat) to prevent end around		\$500	lateral trash fence (~40 foot) and 3 trash fences	160	32
CL 8				lateral trash fence (~30 foot), ditch trash fence (~20 ft) & diversion fence (~20 ft)	70	20
CL 17				Trash fence above (~30ft) and diversion fence (~30ft)	60	16
CL 18 large	Additional work (mat) to prevent end around		\$500	30ft trash fences 50 ft above and halfway to CL17	60	16
CL 19 large	New Gabions installed to prevent end around		\$1,500	trash fence 50 foot above	40	10
CL 20				30 ft trash fence above	30	8
CL 1	New Gabion backstop		\$500	trash fence 25 foot above	40	10
CL 9				Trash fence above (~30ft) and diversion fence (~30ft)	60	16
CL 18small				Trash fence above (~30ft) and diversion fence (~30ft)	60	16
CL 19small				Trash fence above (~30ft) and diversion fence (~30ft)	60	16
CL 2				Trash fence above (~30ft) and	60	16

				diversion fence (~30ft)		
CL 5				Trash fence above (~30ft) and diversion fence (~30ft)	60	16
totals		\$8,025	\$5,000		\$513.00	\$896.76
Phase 1 physical and financial review						
Phase 2						
Location	Action by Contractor	CMP installed cost	gabion/riprap \$	Action by Volunteers	Fence fabric	Tee Posts
CL 13	New 40ft 29x42" CMP, mat outfall	\$3,300	\$500	3 trash fences to north, 1 to south (~30ft)	120	30
CL 4				diversion fence (~30ft)	30	8
CL 6				30 ft trash fence above	30	8
CL 11				40 ft trash fence 1/3 toward CL10	40	10
CL 19.5	new 40ft 24x35" CMP with gabion backstop	\$3,150	\$1,000	40 ft trash fence above	40	10
CL 15				40 foot trash fence inlet	40	10
totals		\$6,450	\$1,500		\$148.20	\$279.18
Phase 2 physical and financial review						
Phase 3						
Location	Action by Contractor	CMP installed cost	gabion/riprap \$	Action by Volunteers	Fence fabric	Tee Posts
CL 16.5	new 40ft 24x35" CMP with gabion backstop	\$3,150	\$1,000	40 ft trash fence above	40	10
CL 22	new 40ft 24" CMP	\$2,540		diversion fence (~30ft)	30	8
CL 4&5	evaluate					
CL 8&9	evaluate					
CL 21	evaluate					
Road Surface	begin repairs of surface	?				
totals		\$5,690	\$1,000		\$39.90	\$76.14

FINANCIAL:

We do not have estimates from Cecil yet on Gabion installation, so the gabion figures above are a guesstimate. The table will be revised when we have more information. Culvert installation estimates are from Cecil. Fence material costs are based upon Home Depot pricing.

The Weber Fire Expense budget has \$15,904 in it for spring work, and \$16,000 for work in July to deal with monsoons. (the projection for the next budget year also anticipates \$13,500 for August)The July money should be left in the bank in case we have major repairs when monsoons come. Phase 1 total estimate is \$14,435, Phase 2 total estimate is \$8,377 and Phase 3 is at least \$6,806 (no figure has been put in Phase three for road surface repairs).

Phase 1 & 2 combined total to \$22,812, which is \$6908 more than the spring portion of the Weber Fire Expense budget. We recommend that the Road Reserve Study be amended to cover a portion of the anticipated cost of corrugated metal pipe, on the order of \$10,000.

It will be very important to keep tracking costs on this effort so we do not overrun. Also, it may be prudent to hold off on road surface repairs until after monsoon season. We hope that all of this drainage work will reduce the amount of expenditure in July and August, but it would be prudent to expect that the money budgeted for that period will be needed then.

CONSTRUCTION NOTES:

Debris that is presently in ditches that threatens to plug a culvert should be cleaned out and moved east of the road.

Culverts should be sized to accommodate expected water flows, but never less than 24" diameter. Where possible, culverts should be sloped as much as possible to reduce potential for sediment loading. Where culvert discharge will be great, as at CL-10, we should place a rip-rap splash pad at the culvert discharge to reduce erosion. Any culvert without an adequate durable backstop is wasted.

Backstop gabions should extend from the road to the bank. Gabions should be placed with their long dimension across the ditch. The top elevation of the gabion should be 2-3 inches lower than the top of the culvert. Any culvert without a bomb-proof backstop is wasted.

The purpose of the fences is to catch debris, dissipate energy and establish a local erosional base, not to dam the water. They must permit passing flow and be cleaned if they become jammed with junk to a level that will divert water onto the road.

However, Chris noted that fences can also be used as diversion/backstops, in which case a filter fabric is used on the fence to set a diversion depth, and any bypass water flows through the fence above the fabric. This is appropriate in lower velocity areas. These can also be used to supplement gabions to discourage end-around erosion.