



MEMORANDUM

To: Lisa Vandiver (NOAA)
From: Geoffrey Glover and Brian Daley (HW)
Date: March 8, 2019
Re: Green Cay Headcut Stabilization Project Repair
cc: May Cornwall Adams, Rudy O'Reilly (NRCS), Julie Wright (NRCS), JP Oriol (CZM), Marlon Hibbert (NOAA), Rob Ferguson (NOAA)

The purpose of this memorandum is to summarize elements of the repair plan for the Green Cay Headcut stabilization project (see attached design plans, dated March 2019). The repair plan is intended to address the immediate and short-term recommended actions (in bold) that were presented in the December 13, 2018 Field Assessment Memo.

- 1. Fix cattle exclusion fencing (immediate, minor cost).**
- 2. Reset and reinforce the top of headcut (immediate, minor cost).**
- 3. Repair the two uppermost stone step-pools and extend wiers (short-term, minor cost).**
- 4. Fill and revegetate eroded or bare slopes (short-term, minor cost).**
5. Evaluate conditions along the remaining downstream gut channel and develop a comprehensive restoration plan in conjunction with DPW culvert replacement planning (mid-term, medium cost).
6. Implement complete gut restoration project (long-term, high cost).

On January 24, 2019, HW repaired the cattle exclusion fencing by adding barbed-wire strands to close gaps in existing fencing at the bottom of the project site, as well as adding an additional post and strands to keep cows out at the top of the site (Figure 1). The design plans call for removal and relocation of the fencing at the top of the headcut.

Figure 1. Fence at lower end of project site (left); fencing at top of project site (right).

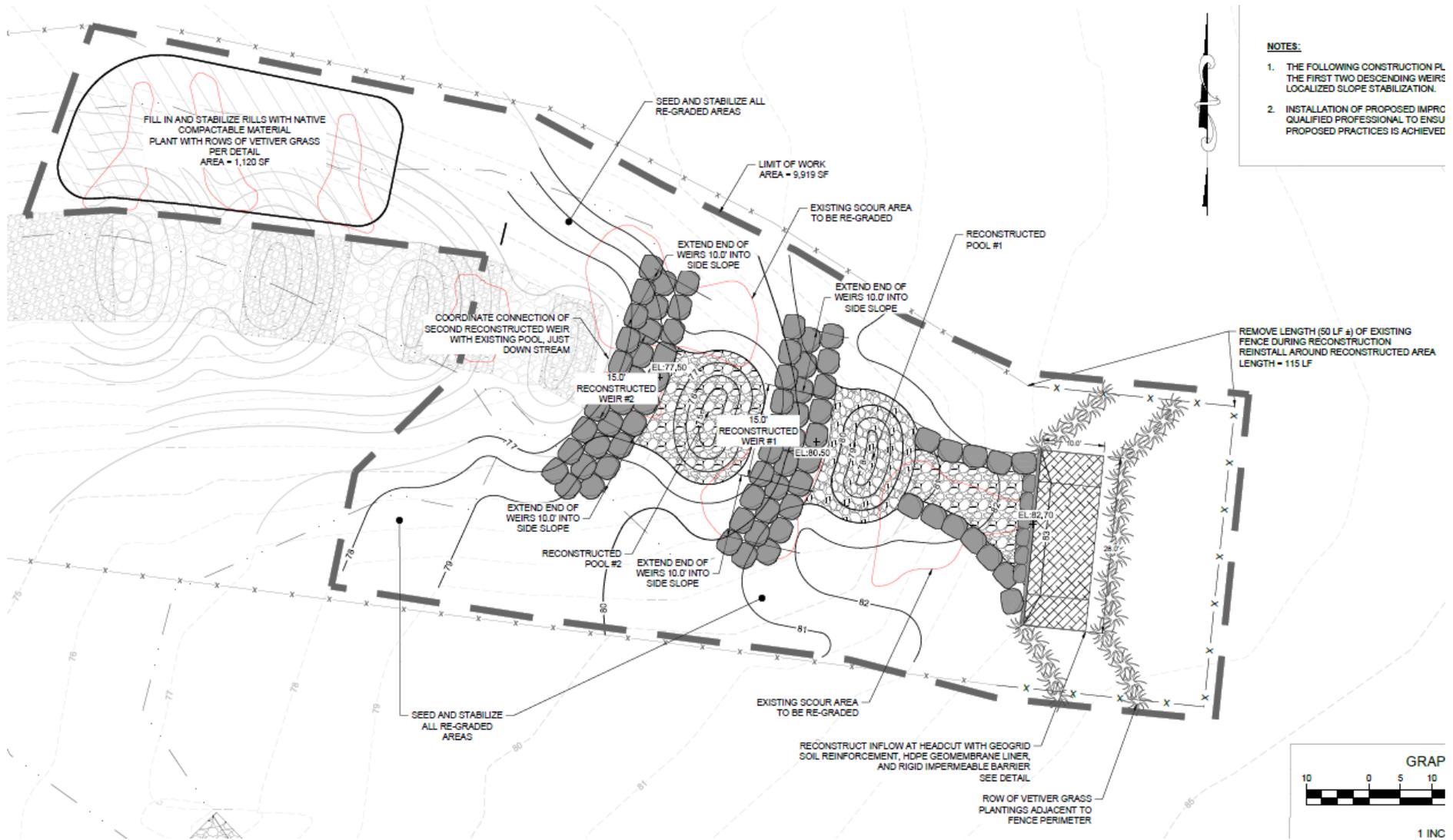


The repairs include three key repair elements: step-pool/wier extensions, inflow pad, and slope stabilization. See the attached plan for grading and layout, or refer to Figure 2 below, which is an excerpt from the plans. The key elements and proposed construction sequence are described below:

1. Remove and stockpile ~50 ft of fencing at the top of the headcut in order to access the upper reaches of site. Preferred equipment is a mini-excavator that is capable of hauling boulders (3' diameter) and hand labor to minimize disturbance to the rest of the project site. Carefully remove and store (or relocate) trees and shrubs from this area.
2. Clear and stockpile stone and boulders used in the upper two step-pool structures as needed to reset weirs per plan. Excavate side slopes as needed to properly embed boulders when extending two weirs up slopes (~10 ft on each side). Boulders should be properly keyed in to prevent runaround and erosion. Place boulders to reconstruct weirs, starting with the lower weir #2. Use smaller stone to reshape pools and to establish the 2-ft elevational difference between the bottom of pool and top of weir notch. While laborers and equipment are on site, and if there is leftover stone, consider adding to or reshaping any downstream weirs where boulders were dislodged. Regrade side slopes around weir boulders and stabilize with grass seed and mulch. Use vetiver plugs next to wier boulders.
3. Excavate and install stone inlet channel and inflow pad (Figure 3). Separate inflow pad and stone channel with a 4-ft vertical, rigid barrier (sheet metal or concrete barrier wrapped in an impermeable geomembrane liner). Ensure a constant slope from start of stone channel to start of reconstructed pool #1. Behind the barrier, install a 6-inch deep and 10-ft wide stone inflow pad with an embedded geogrid layer. The stone pad should be separated from native underlying soils with an impermeable liner that is properly keyed in along each side. Upland of the bed, install two rows of vetiver grass. Use large plugs (5 gallon pot).
4. Install approximately 150 ft of fencing at the top of the headcut stabilization (fencing can be reused if needed). Be sure fencing is a minimum of 15 ft beyond the vetiver planting. Replant any trees or shrubs that were removed. Seed and mulch any remaining disturbed areas.
5. Remove section of barbed-wire above side slopes where rills and gullies were noted downstream (on the right bank facing downstream) to provide access. Fill in gullies with soil excavated from top of site, or use approved material from offsite. By hand, dig furrows and plant large (5 gallon) vetiver plugs in rows along slopes (extend rows continuously across all three former gullies). Mulch and seed disturbed area. Replace fencing when finished. Any remaining plugs can be installed along the top of the channel slope at locations where runoff from upland areas appears to enter channel.

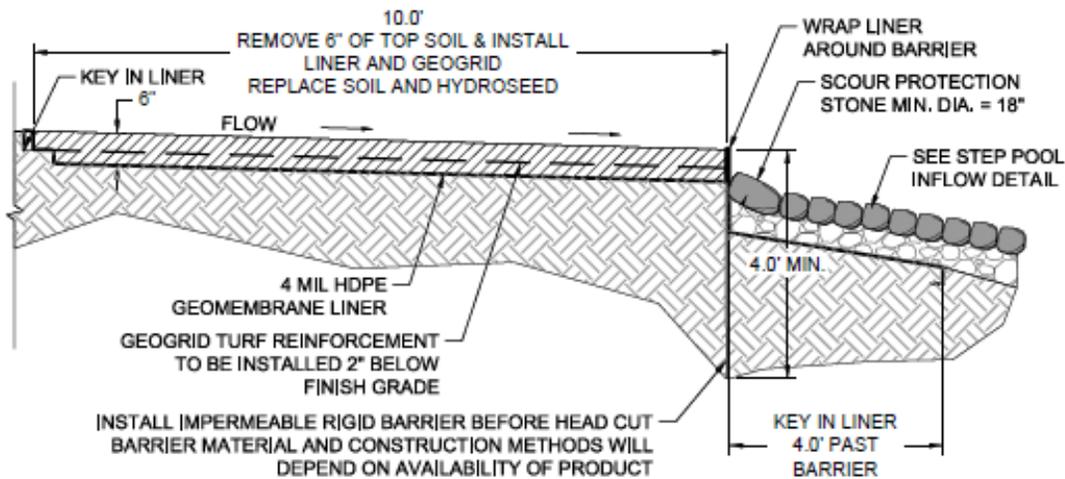
Once installed, we recommend monitoring of the site during a rain event to observe runoff patterns above the project site, identify locations where sheet flow becomes concentrated, and how runoff enters and flows through the stabilized gut.

Figure 2. Design plan for immediate and short-term repairs (see attached plans)



- NOTES:**
1. THE FOLLOWING CONSTRUCTION PL THE FIRST TWO DESCENDING WEIRS LOCALIZED SLOPE STABILIZATION.
 2. INSTALLATION OF PROPOSED IMPRC QUALIFIED PROFESSIONAL TO ENSU PROPOSED PRACTICES IS ACHIEVED

Figure 3. Stone inlet and inflow pad detail



NOTES:

1. ALTERNATE BARRIER TO BE A CAST - IN - PLACE CONCRETE BARRIER. POUR TO BE SAME 4.0' DEPTH FROM FROM TOP OF BARRIER AS SHOWN IN THE DETAIL.
2. LINER TO BE INSTALLED BEFORE INFLOW CHANNEL INSTALLATION.
3. TOP OF REINSTALLED SOIL TO BE FLUSH WITH TOP OF BARRIER AS SHOWN IN THE DETAIL.
4. GEOGRID TO BE MIRAGRID 2XT BY MIRIFI, OR APPROVED EQUAL.

INFLOW AT HEADCUT

NOT TO SCALE

We recommend that the landowner make every effort to complete this work as soon as possible to avoid worsening conditions. We also recommend that the owner address the active erosion and gully formation occurring immediately downstream of the project site (on the left bank facing downstream), which was aggravated by clearing and grading activities conducted beyond the headcut stabilization project boundary.

We estimate that the materials and installation cost for repair work could be completed for \$25,000 or less, depending on the contractor. Table 1 provides an engineer's cost estimate based on material quantities and assumed unit costs. The unit cost assumptions should be reviewed by NRCS, but are based on previous project estimates. Costs to replace trees and shrubs is not accounted for, nor is watering of of any seed, grass, or replanted materials.

Table 1. Cost estimate*

BID ITEM	DESCRIPTION	Estimated Quantity	UNITS	Estimated COST	TOTAL
1.01	MOBILIZATION / DEMOBILIZATION	1	LUMP SUM	\$5,000.00	\$5,000.00
1.03	EXCAVATION	60	CUBIC YARD	\$13.00	\$780.00
1.04	FINE GRADING AND COMPACTION	700	SQUARE YARD	\$4.00	\$2,800.00
1.05	WASHED 3/4" STONE	10	TONS	\$51.00	\$510.00
1.06	12" STONES	20	TONS	\$60.00	\$1,200.00
1.07	BOULDERS FOR STEP POOL	40	TONS	\$68.00	\$2,720.00
1.09	CATTLE FENCING	65	LINEAR FOOT	\$6.00	\$390.00
1.11	FILTER FABRIC/GEOTEXTILE	400	SQUARE YARD	\$2.00	\$800.00
1.12	GEOMEMBRANE LINER	280	SQUARE FOOT	\$3.50	\$980.00
1.13	GEOGRID	280	SQUARE FOOT	\$6.00	\$1,680.00
1.14	IMPERMEABLE BARRIER	115	SQUARE FOOT	\$10.00	\$1,150.00
1.16	SILT FENCE	100	LINEAR FOOT	\$9.00	\$900.00
1.17	SEED / MULCH	3,000	SQUARE FOOT	\$0.75	\$2,250.00
1.18	VETIVER GRASS PLUGS	300	GALLON	\$5.00	\$1,500.00
				<i>SUB-TOTAL</i>	\$22,660.00
	Contingencies (10%)				\$2,266.00
	<i>ESTIMATED CONSTRUCTION CONTRACT</i>				\$24,926.00

*does not include replacement of existing plantings or watering.