Upper White Pine Review Comment Responses (red text)

1. Executive Summary of Comment Responses

There have been concerns about project cost. Channel reconstruction and relocation projects range from as little as $20 to well over $1000 per foot of channel depending upon the size of the channel, complexity of modification techniques, and site constraints (WDFW, 2004 Stream Habitat Restoration Guidelines page 31). If those numbers are translated to this project with 1,500 feet of channel re-location, the cost could range from $30,000 to well over 1.5 million.

This is the first mainstem tributary re-location project in the Upper Columbia (funded by salmon recovery dollars). Thus, project costs will be higher than other projects due to the type of bed and bank treatments necessary to accommodate the flow velocity and shear forces associated with mainstem tributary re-location. In addition, the proposed design must accommodate channel re-location with the following site constraints:

- silty-sand soils,
- an existing corridor with cleared vegetation (that could be captured), and
- significant nearby infrastructure (Hwy 2, CPUD corridor, BNSF corridor) immediately downstream of the project area. A large sediment pulse from the project area could initiate stream instability and mobility immediately downstream.

Two construction contractors have provided verbal cost estimates to build the project based upon the 60% plan set. Their cost estimates ranged from 1.2-1.5 million which is pretty close to the $1,585,586 engineer estimate given that the contractors have not reviewed project specification documents which describe constraints (de-watering, work isolation, vegetation protection, erosion control, temporary stockpile areas, etc) that increase construction cost. Total construction cost also includes sales tax, construction management (3 seasons), and a separate contract for powerline tree removal. CCNRD and BOR evaluated line item costs for several recent projects to ensure that line item costs in the engineer cost estimate were not elevated. That line item cost review has been uploaded to PRISM as an attachment.

Final proposal changes –

- The project cost and Tributary Committee funding request have been reduced in the final proposal by removing the request to fund the construction contingency cost line item.
- The final cost estimate also clarifies that the line item for “tree salvage” is truly the cost to clear the powerline corridor. Trees removed will be available for use in the restoration project for free.

2. SRFB Review Panel Comments and Responses in red below numbered questions

The 60% Design Report that is included in the PRISM attachments is useful for explaining the rationale for the various design elements. In particular, the report justifies the use of "fabric encapsulated soil lifts" to temporarily stabilize the new channel from lateral migration for the first several years after construction while riparian plantings establish themselves. The review panel believes that the use of biodegradable coir fabric for encasing the soil lifts is a critical design feature for ensuring that the project is consistent with the "design criterion" of "restor(ing) natural rates of channel migration … consistent with reference/historical conditions." In this regard, the review panel would consider the use of more permanent bank stabilization methods such as rock armoring or gabions to be unacceptable.

1. First, how much forest clearing along White Pine Road is anticipated for installing the new power lines?
   The total length of the proposed CPUD re-alignment is ~4600' long. At 100' wide, the cleared area is 10.6 acres. However, ~3000' overlaps the existing Upper White Pine road cleared area which ranges from 15-25' wide (~1.3 acres). Thus, the tree clearing corridor is ~9.3 acres. In addition to the 100' wide cleared corridor, any dead or diseased trees (hazard trees) located within 50' of that corridor will also be removed.

   The following measures are proposed as mitigation for powerline re-location tree removal:

- The existing cleared area in the powerline corridor is ~60' wide and 3594' long (including the pole across Nason Creek at the downstream end). Cessation of vegetation maintenance in this area would result in ~ 5 acres of riparian forest re-vegetation.
- As much as possible, the lower portion of hazard trees removed would remain standing as habitat trees and/or remain as down wood.
- Trees removed within 300' of Nason Creek would remain as down wood on the ground. Trees to remain as down wood will meet final specifications provided by USFS for species and diameter to minimize invasion and spread of invasive beetles.
- All in-stream large wood for the Upper White Pine project will be salvaged from the powerline re-location corridor.
- A tree survey of the powerline re-location corridor will be completed this summer to identify the species, size, and quantity of wood in the powerline re-location corridor. All coniferous trees >12" DBH that are not used for the Upper White Pine restoration project, will be available for sale and use in other restoration projects. CCNRD will secure as much wood as possible from this project for use in Entiat 2016-2017 restoration projects.

2. Has the visual impact of this clearing, for example on users of the USFS camp ground, been accounted for?
   USFS Resource Specialists, including scenic resources and recreation, have reviewed the proposed project and drafted their resource reports for the Environmental Assessment. The design criteria (similar to mitigation measures) that pertain to the dispersed camp site include: maintain vegetation screening as much as feasible, restore dispersed camp area by

removing, chipping or burning all slash, re-grade camp area and access , re-construct fire rings, re-vegetate and re-construct trails.

3. Second, because of the high cost estimate of tree salvage and placing LWD (apparently about $341,000), has the design considered using less LWD for purposes such as bank stabilization on channel meanders and floodplain roughening? The design report would be improved by documenting the technical reasons for the relatively high density of LWD placed along banks and floodplain.

   The tree salvage line item in the restoration budget is the estimated cost to remove the trees from the powerline re-location corridor (~$470/tree) and those trees will be used free of cost in the restoration project. The stream restoration cost estimate includes $200 and $100 per log to haul and place wood in the channel and in the floodplain, respectively. Since the trees are free and we have to remove them anyway, reducing the amount of wood by ~30% (say from 300 to 200 trees) would save around $20,000. The numbers of logs will be revisited at the next phase of design. The Design Report will be edited at the next phase to expand upon the rationale of log placement.

   Streambank stability is comprised of two zones: 1) below OHW and 2) above OHW; with OHW defining the lower elevation of persistent riparian woody vegetation. Riparian vegetation is planned to provide long term stability of the banks above OHW. In the short term as vegetation establishes, banks above OHW (approximately top 3 feet) will be stabilized with biodegradable Fabric Encapsulated Soil Lifts (FESL). Below the ordinary high water elevation, the bed and banks will consist of stream bed substrate and large wood (Sheet 37). The final plans will include more detailed elevations but will be consistent with the typical drawings. The density of wood placed along the banks is required to establish temporary bank stability below the OHW mark along zones of higher shear, deeper pool depths and steeper stream banks until riparian vegetation (and associated root structure) is established forming a flexible organic mantle. The wood also provides valuable habitat complexity along the bank.

   The density of wood placed in the floodplain is intended to some degree mimic naturally occurring hydraulic roughness over the floodplain and diffuse concentrated surface flow to reduce the risk of unanticipated overland erosion, scour, and/or avulsion until riparian vegetation can be established. The specifications for floodplain roughness wood include smaller diameter wood that will be readily available from clearing the powerline corridor and/or levee removal at half the cost of the in-stream wood.

4. Similarly, since the LWD placement appears to be driven primarily for promoting hydraulic roughness and less for fish habitat purposes, could some of the LWD be placed mid-channel, where it would provide more direct habitat complexity at low flows?

   Given the native fine soils, placing large wood mid channel may compromise short term bank stability resulting in increased risk of near term failure of the stream banks. The project is designed to allow future channel dynamics and deformation. Over time, as riparian vegetation becomes established and sediment conveyance is matured – natural accumulations of large wood mid channel will occur.

5. Third, please provide more explanation justifying the relatively high unit costs of importing, stockpiling and placing the new channel substrate (apparently $65/cy). Besides basic mixing of the various size classes of substrate, why is washing required?

   The channel substrate design follows Roughened Channel methods for fish passage. The stone gradation is designed to provide: 1) a desired level of stability using a larger stone fraction of the gradation and 2) permeability control using a smaller stone fraction of the gradation. For desired stability, the larger stone is designed using traditional engineering methods to be stable for flows up to a 25-year event. This event was selected considering it would provide sufficient stability for near term conditions yet be sufficiently mobile for a large flood to move the material. (It should be noted, that there is risk of a large flood occurring in the near term as the project vegetative and sediment conveyance conditions mature.) To limit low flows flowing through the larger stone and going subsurface, the smaller stone to provide permeability control is designed using methods that are best documented in "Fish-Friendly Culverts" (Ken Bates, 2004). Comparison of design gradations to native substrates on other projects suggest this method maintains a coefficient of uniformity similar to native soils – the size distributions are similar, albeit shifted towards a larger size one might expect from a higher energy system. In mimicking native substrate grain size distributions, hyporheic conditions are provided for to the best of the current science.

   From numerous Interfluve past projects spanning nearly fifteen years, experience has shown that $80-100/cy is not uncommon for installed roughened channel stone. This cost includes procuring, delivering, installing and washing of the stone for completed installation measured in place. The stone is a dense placement whereby the larger stone occupies the placed volume – and the smaller stone is washed into the voids of the larger stone. Volume of smaller stone to fill voids of the larger stone is generally 30-35% that of the larger stone. Thus for a 100-cy installation – 100-cy of larger stone plus 35-cy of smaller stone are used and measured as a 100-cy pay item. There are cost savings on this project in salvage of stone from nearby sources as well as reuse of stone encountered on site. Unit costs includes transport of stone from stockpile to location of placement, on site mixing of stone sizes and continuous washing.

   Washing accomplishes a number of beneficial items: 1) it settles smaller stones and fines into the voids of the larger sized stone, 2) it provides an ongoing performance check of permeability control by observing the rate water drains into the stone pack (construction from upstream to downstream allows the stone placement to drain and facilitate a realistic evaluation), 3) a portion of the fine particles that cause turbidity are injected into the stone mass as part of the design gradation or flushed and discharged to an upland treatment area, and 4) fine particles (e.g. small gravel and smaller) will be winnowed from the surface of the stone with flows, washing to some degree begins this process. Washing is an important component of successful placement.

RTT Comments and Responses

Category	Question	RTT response
Technical Review	Do you believe the proposal will obtain the biological benefits that are discussed in the goals and objectives? Why or why not?	Yes, the project will provide biological benefit as proposed.
	Is the proposal focused on the correct ecological concerns in the project area? Why or why not?	Yes, currently the area is not functioning well.
	Are the potential methods and scale described within the proposal appropriate? Why or why not?	Yes, however, there are bank protection treatments that may not be necessary and will provide no additional biological benefit. The project sponsor should consider reducing some of these treatments.
Improvement to Proposals	Is there any feedback we can give project sponsors to improve the proposal? Please explain.	Consider scaling back some of the less important aspects as noted in other portions of the comments.
	Are there any alternatives that you would suggest to the project sponsor that may still (or better) achieve the biological benefits? Please explain.	Reduce the use of soil lifts and instead, re-slope those areas and cover exposed banks with erosion-resistant material. This would reduce the extent of excavation (no over-excavation to accommodate FESLs) and minimize damage to the riparian area without compromising biological benefit. One aspect of the project removes trees displaced by relocating the power line. Perhaps it would be more efficient to leave the trees on site. Tree salvage appears unnecessary and does not achieve any biological benefit. These trees could be staged on site for other projects, or placed in the floodplain. Please explain if this is not feasible (e.g., the USFS will not permit).
Non-Technical Issues	Do you believe the potential biological benefits justify the proposed project? Please explain.	Yes, but a reduced scope would still achieve the desired biological benefit.
	Are there other issues regarding a proposed project that we should make the project sponsor aware of?	No

Sponsor Response:

The velocity in the proposed channel can exceed 10 feet/second (see attached graphics). Bank treatments suitable for these flows include: rip rap (>9" diameter), gabions, concrete, woody vegetation (once established), and non-degradable rolled erosion control products (RECP's) (Fischenich 2001 Table 2 attached).

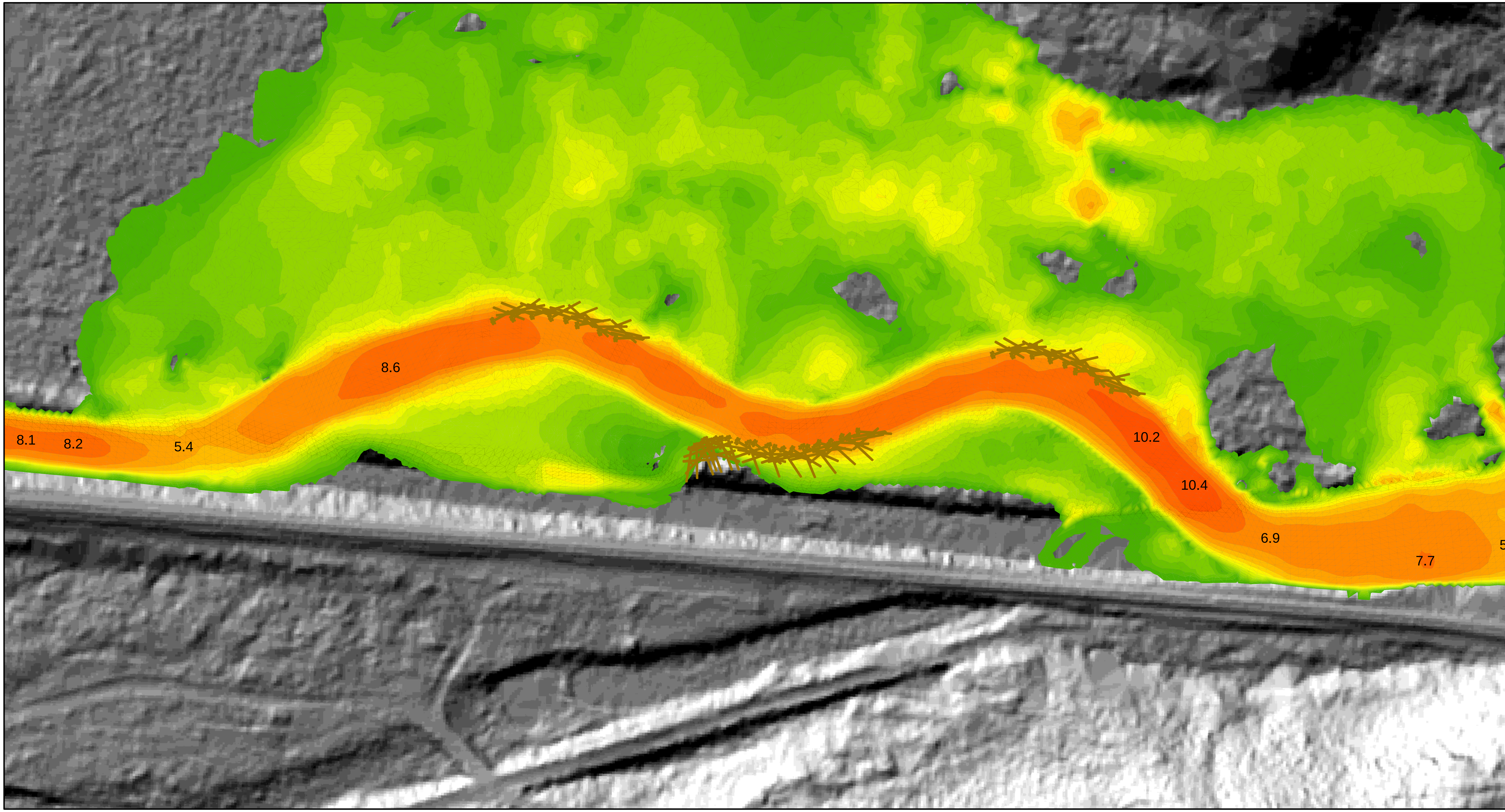
The purpose of the FESL treatment is to accomplish interim stability but to allow for long-term natural channel deformation once vegetation becomes established. Early on, we discussed relying on wood to provide stability, but there were a few reasons we did not choose this route, including the following considerations:

- The use of logs as the primary bank stabilization in fine soils is not a viable bank stabilization strategy. The risk is local scour of fine soils occuring around rigid structures and the lack of flexibility of bank stabilization leading to flanking and possible failure.
- To achieve the necessary short-term stability, relying on wood in these conditions would require more wood keyed into the banks and the import of additional coarse material for ballast, and/or ferrous anchoring.
- Using this wood approach to achieve the required short-term stability would also result in longer-term stability, which is less desirable from a stream dynamic flexibility perspective.

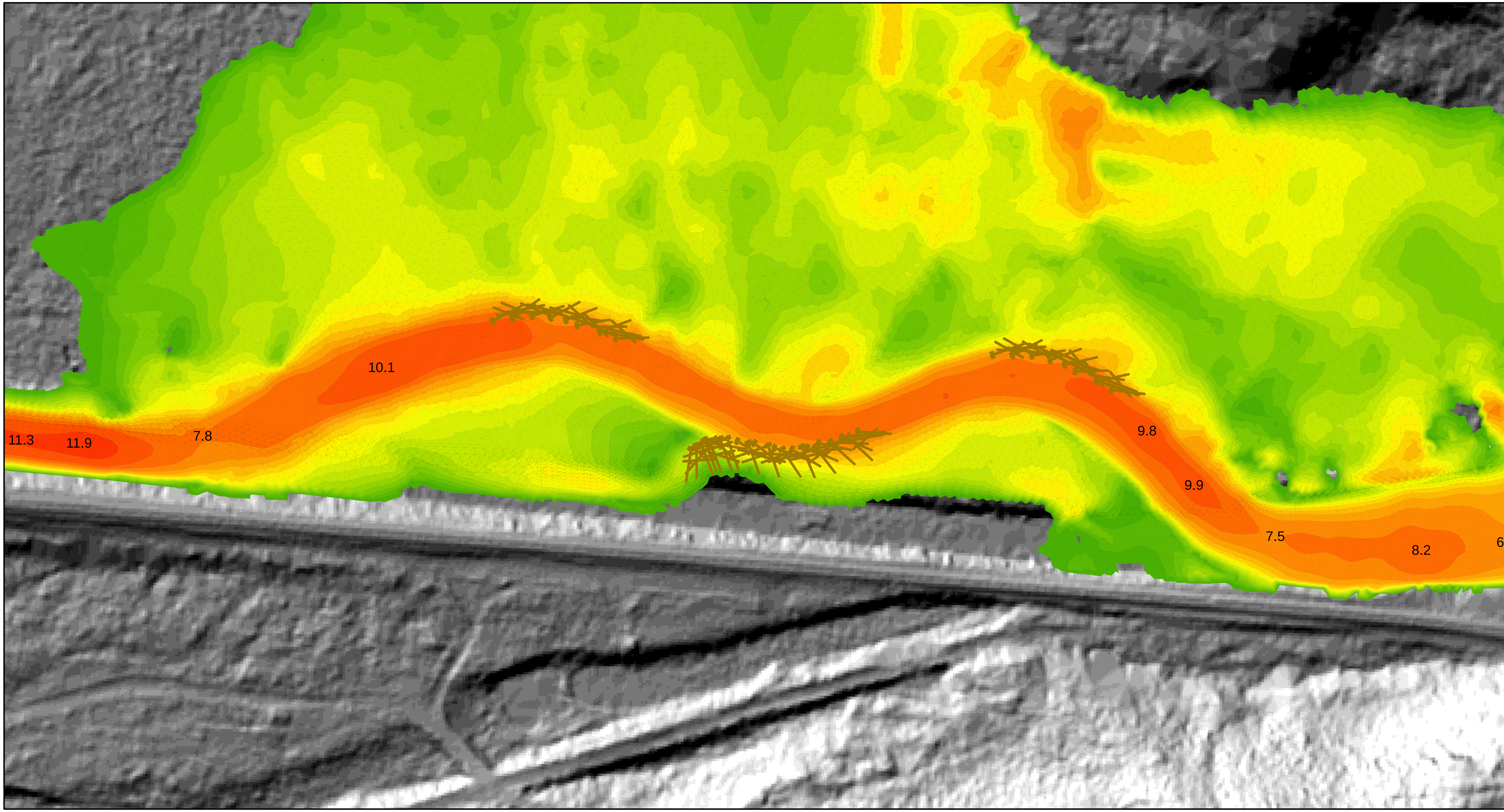
We have selected FESL's as opposed to biodegradable erosion control fabric because covering cut surfaces with only erosion control fabric is unlikely to succeed because the duration and shear/velocity exceed its capabilities. In other words, spreading erosion control fabric over a cut bank surface of fine soils would likely result in bank failure. Longevity is also a consideration; for example, North American Green (NAG C125BN), which is a standard biodegradable erosion control fabric made of non-woven coir lasts about one year. Whereas, FESL's are generally in place 3-5years and the FESL's also include a designed fill to combat the mobility of native soils.

Overall, the design that's been proposed is a combination of wood and flexible/vegetative bank treatments that we believe is the best approach for accomplishing the project design criteria. Despite this response, it may not be out of the question to try to reduce the extent of FESLs in some areas based on a closer look at the modeling details, but it may not result in a significant enough savings to warrant the risk.

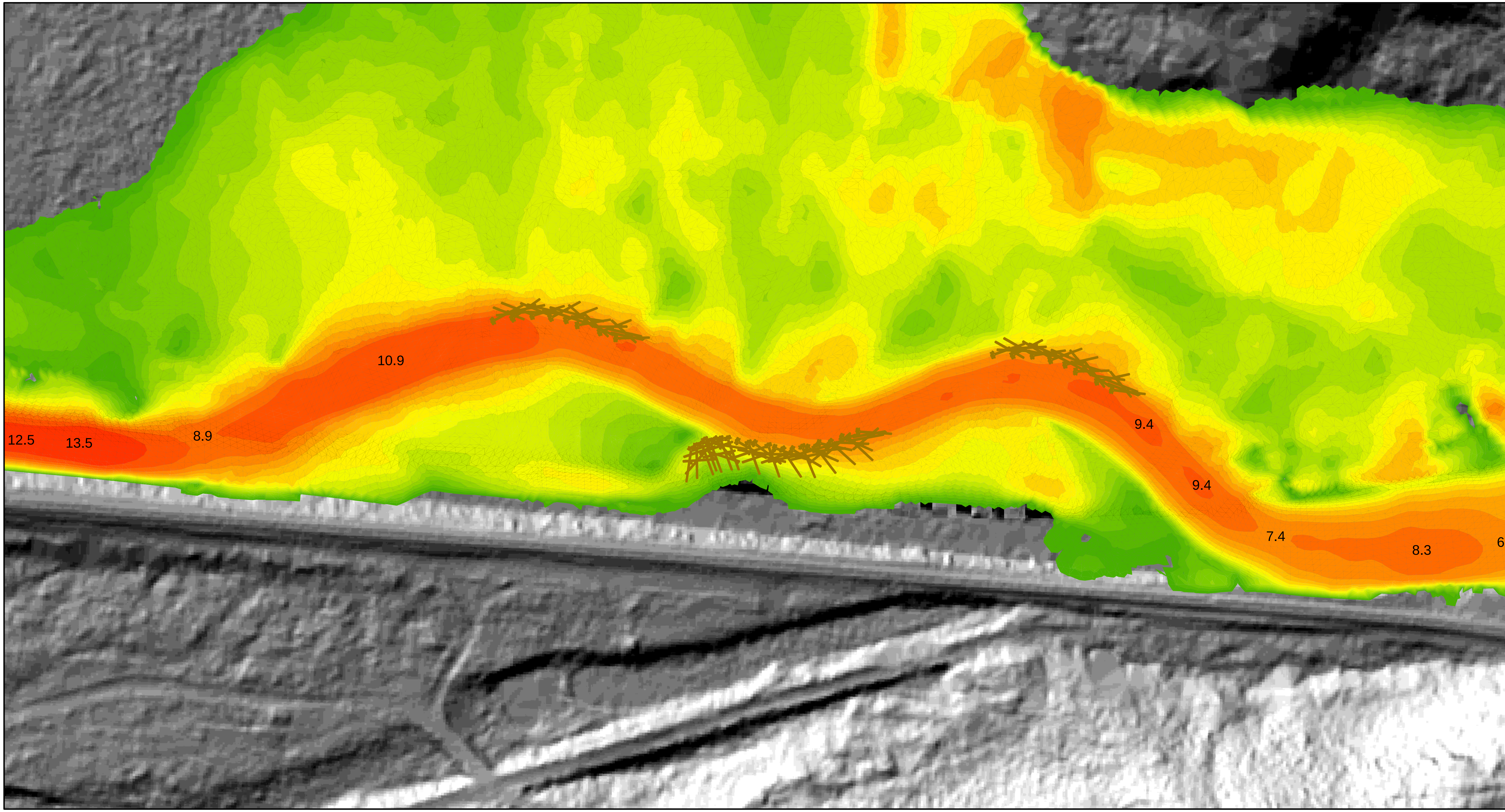
Re. "Tree Salvage" costs - Apparently, I have caused confusion by calling the powerline corridor clearing tree salvage. We have to clear the powerline corridor in order to re-locate the powerlines. The line item for tree salvage is an estimated cost to clear the powerline corridor. Then, the trees salvaged from that area come to the restoration project for free. If there are more large trees than what this restoration project can use, those will be available for sale for other restoration projects.



Proposed Velocity (ft/s) 10-year event



Proposed Velocity (ft/s) 50-year event



Proposed Velocity (ft/s) 100-year event

Table 2. Permissible Shear and Velocity for Selected Lining Materials[1]

Boundary Category	Boundary Type	Permissible Shear Stress (lb/sq ft)	Permissible Velocity (ft/sec)	Citation(s)
Soils	Fine colloidal sand	0.02 - 0.03	1.5	A
	Sandy loam (noncolloidal)	0.03 - 0.04	1.75	A
	Alluvial silt (noncolloidal)	0.045 - 0.05	2	A
	Silty loam (noncolloidal)	0.045 - 0.05	1.75 – 2.25	A
	Firm loam	0.075	2.5	A
	Fine gravels	0.075	2.5	A
	Stiff clay	0.26	3 – 4.5	A, F
	Alluvial silt (colloidal)	0.26	3.75	A
	Graded loam to cobbles	0.38	3.75	A
	Graded silts to cobbles	0.43	4	A
	Shales and hardpan	0.67	6	A
Gravel/Cobble	1-in.	0.33	2.5 – 5	A
	2-in.	0.67	3 – 6	A
	6-in.	2.0	4 – 7.5	A
	12-in.	4.0	5.5 – 12	A
Vegetation	Class A turf	3.7	6 – 8	E, N
	Class B turf	2.1	4 - 7	E, N
	Class C turf	1.0	3.5	E, N
	Long native grasses	1.2 – 1.7	4 – 6	G, H, L, N
	Short native and bunch grass	0.7 - 0.95	3 – 4	G, H, L, N
	Reed plantings	0.1-0.6	N/A	E, N
	Hardwood tree plantings	0.41-2.5	N/A	E, N
Temporary Degradable RECPs	Jute net	0.45	1 – 2.5	E, H, M
	Straw with net	1.5 – 1.65	1 – 3	E, H, M
	Coconut fiber with net	2.25	3 – 4	E, M
	Fiberglass roving	2.00	2.5 – 7	E, H, M
Non-Degradable RECPs	Unvegetated	3.00	5 – 7	E, G, M
	Partially established	4.0-6.0	7.5 – 15	E, G, M
	Fully vegetated	8.00	8 – 21	F, L, M
Riprap	6 – in. d_{50}	2.5	5 – 10	H
	9 – in. d_{50}	3.8	7 – 11	H
	12 – in. d_{50}	5.1	10 – 13	H
	18 – in. d_{50}	7.6	12 – 16	H
	24 – in. d_{50}	10.1	14 – 18	E
Soil Bioengineering	Wattles	0.2 – 1.0	3	C, I, J, N
	Reed fascine	0.6-1.25	5	E
	Coir roll	3 - 5	8	E, M, N
	Vegetated coir mat	4 - 8	9.5	E, M, N
	Live brush mattress (initial)	0.4 – 4.1	4	B, E, I
	Live brush mattress (grown)	3.90-8.2	12	B, C, E, I, N
	Brush layering (initial/grown)	0.4 – 6.25	12	E, I, N
	Live fascine	1.25-3.10	6 – 8	C, E, I, J
	Live willow stakes	2.10-3.10	3 – 10	E, N, O
Hard Surfacing	Gabions	10	14 – 19	D
	Concrete	12.5	>18	H

[1] Ranges of values generally reflect multiple sources of data or different testing conditions.

A. Chang, H.H. (1988).
B. Florineth. (1982)
C. Gerstgraser, C. (1998).
D. Goff, K. (1999).
E. Gray, D.H., and Sotir, R.B. (1996).
F. Julien, P.Y. (1995).
G. Kouwen, N.; Li, R. M.; and Simons, D.B., (1980).
H. Norman, J. N. (1975).
I. Schiechtl, H. M. and R. Stern. (1996).
J. Schoklitsch, A. (1937).
K. Sprague, C.J. (1999).
L. Temple, D.M. (1980).
M. TXDOT (1999)
N. Data from Author (2001)
O. USACE (1997).

Nason Creek Upper White Pine Construction Cost Estimate

Item	Quantity	Units	Unit cost	Item cost	Notes/assumptions
Mobilization			8%	$ 117,000	Project compliance paperwork (prevailing wage, bonding, contracting, etc), hiring employees, purchasing materials, prep and submittal of construction plans, pre-construction meetings, notifications, moving equipment to/from the site
Access/clearing grubbing	1	LS	$ 40,000	$ 40,000	Construction entries, tree removal from levee, road maintenance/cleaning, etc. - includes slash salvage & stockpile
Diversion	1	LS	$ 40,000	$ 40,000	Includes moving flows into the new channel, rinsing, etc see design report for details
Fish rescue	1	LS	$ 15,000	$ 15,000	Assume 3-5 initial fish salvage operations plus additional as needed
Dewatering	1	LS	$ 50,000	$ 50,000	Includes 6" pump, screens, overland disposal, 2 cofferdams across Nason
Erosion and Sediment control	1	LS	$ 40,000	$ 40,000	Prep of plan, materials,installation, and maintenance of silt fence, straw wattles Sheets 10-11
			Task subtotal =	**$ 185,000**	
Meander Channel					
Channel excavation to finished grade	15680	CY	$ 6	$ 94,080	CADD EG:FG volume est. - excavate and stockpile in utility corridor
Channel excavation to streambed subgrade (3840cy salvage, 3000cy fill)	6840	CY	$ 6	$ 41,040	Over excavate bed for designed gradation: L*66'wide*2'thick
Channel excavation to FESL subgrade	1560	CY	$ 6	$ 9,360	Over excavate bank: L(FESL)*8'wide*1' thick
Substrate import to site staging area	3000	CY	$ 20	$ 60,000	Material re-use from YN project will be stockpiled, re-used, and transported back to the site to reduces this cost from 60/cy to 20/cy for sort and haul
Substrate haul from on site stockpile and place	6840	CY	$ 45	$ 307,800	Haul from site stockpile and place (mix & wash insitu).
FESL	5250	LF	$ 40	$ 210,000	2-3 tiers-both sides, graded fill, vegetated - along 75% of total bank length
LWM incorporated into FESL's and whole trees placed	282	Ea	$ 200	$ 56,400	See cost of logs below and log summary table - this cost is to place the logs
Floodplain roughness log placement	140	Ea	$ 100	$ 14,000	See cost of logs below and log summary table - this cost is to place the logs
Temporary bridge crossing	1	LS	$ 50,000	$ 50,000	Temporary bridge over inlet to new channel to access mainstem
			Task subtotal =	**$ 842,680**	
Levee Removal and Mainstem Fill					
Riprap removal - salvage - reuse	1467	CY	$ 10	$ 14,670	V ~ 1/3-mile, 2.5'th, 10'bank height. Salvage and place in main stem obstructions
Levee removal - placement in mainstem fill	9044	CY	$ 6	$ 54,264	CADD EG:FG volume est.
Channel fill	29284	CY	$ 8	$ 234,272	Haul from temp stockpile, place in mainstem channel in controlled lifts, MC, compaction.
Large woody material and while trees placed	72	Ea	$ 200	$ 14,400	See cost of logs below and log summary table - this cost is to place the logs
Floodplain roughness log placement	72	Ea	$ 100	$ 7,200	See cost of logs below and log summary table - this cost is to place the logs
			Task subtotal =	**$ 324,806**	
Vegetation					
Seed and mulch	0.6	Ac	$ 2,500	$ 1,500	All plant, seed, etc. No-minimal irrigation. Includes fabric if applicable
Seed, mulch riparian plantings	4.7	Ac	$ 10,000	$ 47,000	All plant, seed, etc. No-minimal irrigation. Includes fabric if applicable
Seed, mulch upland plantings	6.76	Ac	$ 10,000	$ 67,600	All plant, seed, etc. No-minimal irrigation. Includes fabric if applicable
			Task subtotal =	**$ 116,100**	
Stream Restoration Construction Contractor Sub-total =				**$ 1,585,586**	
Taxes			8.2%	$ 130,000	Stream restoration construction tax (typically not included in contractor bid)
Powerline Corridor Tree Removal	544	Each	470	$ 255,680	Tree removal (170 trees removed with rootwads) preliminary estimate
CCNRD Construction Management	3	Seasons	43,333	$130,000	2016-2018 = 3 Construction Seasons
		Project Cost		**$ 2,101,266**	