

APPENDIX K

Capital Improvement Project (CIP) Cost Estimates

Project Name: <u>Red Salmon Slough Estuary Restoration Phase III</u>				Project Number: <u>CIP08-RED-RST01</u>						
Project Type: <u>Restoration</u>				Sub-Basin: <u>Red Salmon Creek</u>						
<p>Existing Conditions: An old defunct bridge and long bridge approach / access dike cut off the entrance to Red Salmon slough of the Nisqually Estuary and therefore hinder tidal exchange in the slough. An over 4,000-ft-long river dike also prevents a surface water connection between the slough and the river except for flooding events or the rare ultra-high tides. This isolation has led to degraded conditions on both sides of the dikes, eroding salt marshes, and reductions in nutrient and sediment exchange. It also slows the recovery of recently restored salt marsh areas and restricts access to emigrating juvenile salmonids.</p> <p>Analysis: This project has been identified by the Nisqually Indian Tribe with the help of estuary scientists and professionals.</p> <p>Proposed Solution/ Project Description: Remove the last remaining dikes on Nisqually Tribe's estuary property.</p> <p>Design Assumptions: Three different dike cross-section dimensions have been used: lower river dike@ barn 18 sq. ft.; temporary river dike and northern spur dike 30 sq. ft.; and river dike at Phase 1: 48 sq. ft. On the east side of the dike the fill material gets hauled less than 1,000 ft. (one-way). On the west side the hauling is 2 miles (one-way). It is assumed that the bridge removal can be accomplished by land.</p>										
Land Costs¹				Construction Costs¹						
Item	Unit	Unit Cost	Quantity	Cost	Item	Unit	Unit Cost	Quantity	Cost	
				\$ -	Mobilization	LS	\$ 20,000	1	\$ 20,000	
				\$ -	Clearing and Grubbing	acre	\$ 4,000	3	\$ 10,000	
				\$ -	Excavation plus haul	cy	\$ 12	8,950	\$ 109,190	
				\$ -	Cresote bridge removal	LS	\$ 25,000	1	\$ 25,000	
				\$ -	Project Maintenance	LS	\$ 20,000	1	\$ 20,000	
				\$ -	Riparian Replanting	acre	\$ 10,000	2	\$ 20,000	
				\$ -	Permitting	LS	\$ 5,000	1	\$ 5,000	
			Total	\$ -						
			Contingency (20%)	\$ -						
			Total Land Costs	\$ -						
Project Prioritization Summary										
Flood Hazard Reduction				Cost/Benefit Ratio: (Cost/Priority Score)				Total		\$ 209,190
Water Quality Improvement								Contingency (**%)		\$ 94,136
Natural Resource Protection								Taxes (8.9%)		\$ 18,618
Other Factors								Sub-Total		\$ 321,943
Total Score		0						Engineering and Administration (**%)		\$ 64,389
								Total Land Costs		\$ -
								Cost Escalation to 2008 dollars (4%)		\$ 15,453
								Total Project Cost		\$ 401,800
								Project Cost (15% County share)		\$ 60,270

1. The estimated costs are based on year 2007 dollars and are escalated to year 2008 dollars.

Project Name: <u>Upper Brighton Creek Culvert Replacements</u>	Project Number: <u>CIP11-BRI-C01</u>
Project Type: <u>Culvert Replacement</u>	Sub-Basin: <u>Brighton Creek</u>

Existing Conditions: A large depression in the vicinity of 4th Avenue East, 336th Street East, and Kinsman Road becomes inundated for long periods during wet season. Various flooding-related problems have been reported in the area including: (1) New culvert installed at Kinsman Road exacerbated downstream flooding (BRI-21). (2) Flooding of private property after new culvert installed at Kinsman Road (BRI-19). (3) Flooding over the roadway at 4th Avenue East, flooding of private property (BRI-18). (4) Saturated ground has degraded conditions for livestock (discussions with residents).

Analysis: An analysis of the drainage system found that the Kinsman Road culvert (upstream of the depression) is adequately sized to pass the 100-year discharge without overtopping Kinsman Road. A group of 4 culverts under 341st Street East (private road upstream of the depression) are not adequately sized to convey the 25-year discharge. The culvert at 8th Avenue East (private road downstream of the depression) also does not have adequate capacity to convey the 25-year discharge without overtopping the road.

Project Description: The Kinsman Road culvert should remain in place. The four culverts under 341st Street East should be replaced with a 10-foot by 3-foot concrete box culvert. The culvert under 8th Avenue East should be replaced with a 9-foot by 6-foot concrete box culvert. A hydrologic analysis should be completed prior to implementing the recommended culvert replacements to determine if there will be any downstream flooding effects. Available 5-foot contour data suggests that there may be a drop in bed elevation 200 to 600 feet downstream of 8th Avenue East, which should be verified with detailed survey. If so, the bed elevation of the channel could be lowered to improve drainage out of the depression. An evaluation of wetlands should also be conducted prior to implementation to determine if any habitat mitigation would be required. This project is based on field observations and existing information (e.g. 5-ft contours), therefore, prior to detailed design a survey should be conducted to confirm the assumed channel and culvert geometry (e.g. bed slope, culvert invert elevations, channel depth, and roadway elevations).

Design Assumptions: Hydrologic analysis pre-design study estimated at a lump sum cost of \$25,000. Wetland evaluation pre-design study estimated at a lump sum cost of \$15,000. Site survey estimated at \$10,000. Unit cost estimates are based on a review of Pierce County bid tabs, WSDOT historical unit bid costs, Utility vault estimates, and engineering judgment.

Land Costs ¹					Construction Costs ¹				
Item	Unit	Unit Cost	Quantity	Cost	Item	Unit	Unit Cost	Quantity	Cost
				\$ -	Hydrologic study	LS	\$ 25,000	1	\$ 25,000
				\$ -	Wetland evaluation	LS	\$ 15,000	1	\$ 15,000
				\$ -	Mobilization	10%	-	-	\$ 19,000
				\$ -	Erosion and sediment control	LS	\$ 1,000	2	\$ 2,000
				\$ -	SPCC Plan	LS	\$ 1,000	2	\$ 2,000
				\$ -	Traffic control	LS	\$ 1,000	2	\$ 2,000
				\$ -	Survey	LS	\$ 10,000	2	\$ 20,000
				\$ -	9' x 6' box culvert installed	LF	\$ 1,600	40	\$ 64,000
				\$ -	10' x 3' box culvert installed	LF	\$ 2,000	40	\$ 80,000
				\$ -	Wing walls	Each	\$ 2,000	8	\$ 16,000
				\$ -	Roadway reconstruction	LS	\$ 3,000	2	\$ 6,000
				\$ -				Total	\$ 251,000
				\$ -				Contingency (**%)	\$ 87,850
				\$ -				Taxes (8.9%)	\$ 30,158
				\$ -				Sub-Total	\$ 369,008
				\$ -				Engineering and Administration (**%)	\$ 62,040
				\$ -				Total Land Costs	\$ -
				\$ -				Cost Escalation to 2008 (4%)	\$ 17,242
				\$ -				Project Cost	\$ 448,300

Project Prioritization Summary	
Flood Hazard Reduction	
Water Quality Improvement	
Natural Resource Protection	
Other Factors	
Total Score	0

<p>Cost/Benefit Ratio: (Cost/Priority Score)</p> <p>** 35% for construction costs up to \$100,000 25% for construction cost between \$100,000 - \$250,000 20% for construction cost above \$250,000</p>	<p>* 45% habitat projects 35% all other projects</p>
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1. The estimated costs are based on year 2007 dollars and are escalated to year 2008 dollars.

Project Name: <u>West Clear Lake Road Drainage Construction</u>				Project Number: <u>CIP11-CLR-C01</u>						
Project Type: <u>Culvert Construction</u>				Sub-Basin: <u>Clear Lake</u>						
<p>Existing Conditions: Stormwater runoff flows over West Clear Lake Road and onto the driveway of a private residence, flowing toward the house. The County's drainage database shows a ditch along West Clear Lake Road, but the ditch appears to be overgrown and may have accumulated sediment.</p> <p>Analysis: Field observations confirmed that runoff flows over West Clear Lake Road and onto the driveway of a private residence, flowing toward the house. Examination of available topographic data (5-foot contours from the County's GIS data library) indicated that a small area (< 0.5 acres) of State Route 161 and West Clear Lake Road potentially drain toward the problem site. The peak 100-year flow rate for this drainage area was estimated to be approximately 1.5 cfs.</p> <p>Project Description: Maintenance of the existing drainage ditch along the west side of West Clear Lake Road is proposed to improve conveyance (to allow stormwater runoff to flow south to the culvert that drains west toward Twenty-seven Lake). In addition, 35 lineal feet of trench drain should be installed in front of the problem site to intercept surface flows. The trench drain will be connected to the existing County drainage ditch with 25 lineal feet of 6-inch diameter pipe. The drainage ditches along the west side of State Route 161 should also be checked for sediment and debris. These proposed projects solve flooding problem CLR-01. This project is based on field observations and existing information (e.g. 5-ft contours), therefore, prior to detailed design a survey should be conducted to confirm the assumed area contributing to the flooding problem and viability (i.e. adequate grade) for connecting a pipe from the trench drain to drainage ditch</p> <p>Design Assumptions: Cost estimates are based on a review of Pierce County bid tabs, WSDOT historical unit bid costs, Contech estimates, and engineering judgment. The site will be surveyed for 1 day to improve/verify design specifications. Trench drain assumed to be \$400 per lineal foot, installed. Storm drain (6-inch pipe) assumed to be \$400 per lineal foot, installed. Ditch maintenance assumed to be \$25 per linear foot for approximately 1000 feet based on engineering judgment.</p>										
Land Costs¹				Construction Costs¹						
Item	Unit	Unit Cost	Quantity	Cost	Item	Unit	Unit Cost	Quantity	Cost	
				\$ -	Mobilization	10%	-	-	\$ 4,950	
				\$ -	Erosion and sediment control	LS	\$ 1,000	1	\$ 1,000	
				\$ -	SPCC Plan	LS	\$ 1,000	1	\$ 1,000	
				\$ -	Traffic control	LS	\$ 1,000	1	\$ 1,000	
				\$ -	Survey	LS	\$ 500	1	\$ 500	
			Total	\$ -	Trench drain	LF	\$ 400	35	\$ 14,000	
			Contingency (20%)	\$ -	6-inch diameter storm drain	LF	\$ 200	25	\$ 5,000	
			Total Land Costs	\$ -	Ditch maintenance and excavation	LF	\$ 25	1000	\$ 25,000	
					Misc. site restoration	LS	\$ 2,000	1	\$ 2,000	
									\$ -	
									\$ -	
Project Prioritization Summary								Total	\$ 54,450	
Flood Hazard Reduction				<p>Cost/Benefit Ratio: (Cost/Priority Score)</p> <p>* 45% habitat projects 35% all other projects</p> <p>** 35% for construction costs up to \$100,000 25% for construction cost between \$100,000 - \$250,000 20% for construction cost above \$250,000</p>				Contingency (**%)		\$ 19,058
Water Quality Improvement								Taxes (8.9%)		\$ 6,542
Natural Resource Protection								Sub-Total		\$ 80,050
Other Factors								Engineering and Administration (**%)		\$ 28,017
Total Score		0						Total Land Costs	\$ -	
								Project Cost	\$ 108,100	

1. The estimated costs are based on year 2007 dollars and are escalated to year 2008 dollars.

Project Name: 364th Street East Culvert Replacement	Project Number: CIP11-HRN-C01
Project Type: Culvert Replacement	Sub-Basin: Horn Creek

Existing Conditions: This problem area is relatively flat, but surrounded by a large, steep drainage basin. There is a 12" concrete culvert under 8th Ave South and another 12" concrete culvert under 364th Street East. To the east of this intersection, there is a culvert under a private driveway. The hydraulic analyses show that the ditches along 364th Street, west of the culverts, are slightly undersized for larger, infrequent flow events. The analyses also show that all three 12" culverts in the area do not have sufficient capacity to convey the runoff from the 25-year design event.

Analysis: The drainage basin was delineated in GIS using 5-ft contour data. Land use was estimated using aerial photography and tax parcel information. Discharges were calculated using WWHM3 for the 2-, 5-, 10-, 25-, and 100-year storm events. The 25-year event was then modeled in HY-8.0 to determine sizing for the passage under 364th Street East. The existing 12" culvert was found to be undersized. The ditches were analyzed using Manning's Equation and were found to convey the 25-year event.

Project Description: The 12-inch culvert at the intersection of 364th Street East should be replaced with an 11-foot wide by 3-foot high, 3-sided concrete box culvert to convey the 100-year flow. The 12-inch culvert at 8th Ave South should be replaced with a 3-foot wide by 2-foot high concrete box culvert to pass the 100-year flow rate. The culvert to the east of the intersection also requires a 3-foot wide by 2-foot high concrete box culvert in order to pass the 100-year event; however, the purpose of this culvert is unclear because there is no road or driveway at that location. The area downstream of the culvert under 364th Street East should be cleared. This project is based on field observations and existing information (e.g. 5-ft contours), therefore, prior to detailed design a survey should be conducted to confirm the assumed channel and culvert geometry (e.g. bed slope, culvert invert elevations, channel depth, and roadway elevations)

Design Assumptions: One day of survey will be required before project construction to improve/verify design. Ditch maintenance cost is included in the 'Misc. site restoration' line item. The driveway culvert is not replaced as part of this project until it is decided upon by the County. Box culverts are proposed due to limited ground cover.

Land Costs ¹				
Item	Unit	Unit Cost	Quantity	Cost
				\$ -
				\$ -
				\$ -
				\$ -
				\$ -
Total				\$ -
Contingency (20%)				\$ -
Total Land Costs				\$ -

Construction Costs ¹				
Item	Unit	Unit Cost	Quantity	Cost
Mobilization	10%	-	-	\$ 20,170
Erosion and sediment control	LS	\$ 1,000	1	\$ 1,000
SPCC Plan	LS	\$ 1,000	1	\$ 1,000
Traffic control	LS	\$ 1,000	1	\$ 1,000
Survey	LS	\$ 500	3	\$ 1,500
11' x 3' concrete box culvert installed	LF	\$ 2,200	52	\$ 114,400
3' x 2' concrete box culvert installed	LF	\$ 800	40	\$ 32,000
3' x 2' concrete box culvert installed	LF	\$ 800	46	\$ 36,800
Wing walls	Each	\$ 2,000	4	\$ 8,000
Misc. site restoration	LS	\$ 2,000	3	\$ 6,000

Project Prioritization Summary	
Flood Hazard Reduction	
Water Quality Improvement	
Natural Resource Protection	
Other Factors	
Total Score	0

Cost/Benefit Ratio:
(Cost/Priority Score)

** 35% for construction costs up to \$100,000
25% for construction cost between \$100,000 - \$250,000
20% for construction cost above \$250,000

	Total	\$ 221,870	
* 45% habitat projects	Contingency (**%)	\$ 77,655	
35% all other projects	Taxes (8.9%)	\$ 26,658	
	Sub-Total	\$ 326,182	
	Engineering and Administration (**%)	\$ 65,236	
	Cost Escalation to 2008 (4%)	\$ 19,829	
	Total Land Costs	\$ -	
	Project Cost	\$ 411,300	

1. The estimated costs are based on year 2007 dollars and are escalated to year 2008 dollars.

Project Name: <u>Horn Creek Barrier Removal (waterfall at RM 1.0)</u>				Project Number: <u>CIP11-HRN-FP01</u>					
Project Type: <u>Restoration</u>				Sub-Basin: <u>Horn Creek</u>					
<p>Existing Conditions: A man-made waterfall at river mile 1.0 severely limits upstream migration of salmon. Minor alterations have been made to the waterfall to allow some limited upstream migration, but most salmon species still do not migrate above this barrier.</p> <p>Analysis: Pierce Conservation District analyzed the waterfall during the 2002 Nisqually basin barrier assessment and determined that it is a partial barrier. The estimated 4-foot drop excludes large numbers of chum salmon, which have been observed to stack up at this barrier.</p> <p>Proposed Solution/ Project Description: The project will create a bypass cascade to the east of the waterfall. This will be built with a series of 18" to 24" log and rock weirs.</p> <p>Design Assumptions: The landowner will not agree to full removal of waterfall.</p>									
Land Costs¹				Construction Costs¹					
Item	Unit	Unit Cost	Quantity	Cost	Item	Unit	Unit Cost	Quantity	Cost
				\$ -	Mobilization	LS	\$ 10,000	1	\$ 10,000
				\$ -	Water diversion	LS	\$ 2,433	1	\$ 2,433
				\$ -	Clearing and grubbing	acre	\$ 3,042	1	\$ 1,521
				\$ -	Erosion control	LS	\$ 2,433	1	\$ 2,433
				\$ -	Channel excavation plus haul	cy	\$ 12	500	\$ 6,100
				\$ -	Streambed material plus rocks	tons	\$ 25	104	\$ 2,600
				\$ -	Large wood debris plus delivery	each	\$ 850	12	\$ 10,200
				\$ -	Placement of material	cy	\$ 15	104	\$ 1,560
				\$ -	Project maintenance	LS	\$ 10,000	1	\$ 10,000
				\$ -	Riparian replanting	acre	\$ 10,000	0.5	\$ 5,000
				\$ -	Permitting	LS	\$ 5,000	1	\$ 5,000
				\$ -					\$ -
			Total	\$ -				Total	\$ 56,847
			Contingency (20%)	\$ -				Contingency (**%)	\$ 25,581
			Total Land Costs	\$ -				Taxes (8.9%)	\$ 7,336
								Sub-Total	\$ 89,764
								Engineering and Administration (**%)	\$ 31,417
								Total Land Costs	\$ -
								Cost Escalation to 2008 dollars (4%)	\$ 4,847
								Project Cost	\$ 126,100

Cost/Benefit Ratio:
(Cost/Priority Score)

* 45% habitat projects
35% all other projects

** 35% for construction costs up to \$100,000
25% for construction cost between \$100,000 - \$250,000
20% for construction cost above \$250,000

Project Prioritization Summary	
Flood Hazard Reduction	
Water Quality Improvement	
Natural Resource Protection	
Other Factors	
Total Score	0

1. The estimated costs are based on year 2007 dollars and are escalated to year 2008 dollars.

Project Name: <u>Horn Creek Barrier Removal (Harts Lake Loop Rd.)</u>				Project Number: <u>CIP11-HRN-FP02</u>					
Project Type: <u>Restoration</u>				Sub-Basin: <u>Horn Creek</u>					
Existing Conditions: Harts Lake Loop Road, a county-owned road, crosses Horn Creek at river mile 1.2. The 4-foot-diameter concrete culvert poses a passage problem to upstream migrating salmon									
Analysis: Pierce Conservation District analyzed the road crossing during the 2002 Nisqually basin barrier assessment and determined that it a partial barrier and only 33% passable. The barrier excludes salmon from over 1.5 miles of salmon spawning and rearing habitat.									
Proposed Solution/ Project Description: The project will replace a concrete culvert with a 19-foot by 6-foot 4-inch aluminum bottomless arch culvert with 2 feet of cover.									
Design Assumptions: Complete detour for Harts Lake Loop Road for several days to replace the culvert. No utilities in road fill and no adjustment of the approach.									
Land Costs¹				Construction Costs¹					
Item	Unit	Unit Cost	Quantity	Cost	Item	Unit	Unit Cost	Quantity	Cost
				\$ -	Mobilization and traffic control	LS	\$ 15,000	1	\$ 15,000
				\$ -	Water diversion, erosion control, clearing	LS	\$ 6,000	1	\$ 6,000
				\$ -	Culvert	LS	\$ 34,000	1	\$ 34,000
				\$ -	Installation of culvert	LS	\$ 26,000	1	\$ 26,000
				\$ -	Excavation/backfill	cy	\$ 20	500	\$ 10,000
				\$ -	Streambed material and rip rap	LS	\$ 6,000	1	\$ 6,000
				\$ -	Large wood debris plus delivery	each	\$ 850	6	\$ 5,100
				\$ -	Placement of material	LS	\$ 2,000	1	\$ 2,000
				\$ -	Road resurfacing	feet	\$ 90	150	\$ 13,500
				\$ -	Project maintenance	LS	\$ 10,000	1	\$ 10,000
				\$ -	Riparian replanting	acre	\$ 10,000	1	\$ 5,000
				\$ -	Permitting	LS	\$ 5,000	1	\$ 5,000
			Total	\$ -				Total	\$ 137,600
			Contingency (20%)	\$ -				Contingency (**%)	\$ 61,920
			Total Land Costs	\$ -				Taxes (8.9%)	\$ 17,757
								Sub-Total	\$ 217,277
								Engineering and Administration (**%)	\$ 54,319
								Total Land Costs	\$ -
								Cost Escalation to 2008 dollars (4%)	\$ 10,864
								Project Cost	\$ 282,500

Project Prioritization Summary	
Flood Hazard Reduction	
Water Quality Improvement	
Natural Resource Protection	
Other Factors	
Total Score	0

Cost/Benefit Ratio: (Cost/Priority Score)	* 45% habitat projects 35% all other projects
** 35% for construction costs up to \$100,000 25% for construction cost between \$100,000 - \$250,000 20% for construction cost above \$250,000	

1. The estimated costs are based on year 2007 dollars and are escalated to year 2008 dollars.

Project Name: Hart's Lake Loop Road Culvert Replacement				Project Number: CIP11-HRT-C01	
Project Type: Culvert Replacement				Sub-Basin: Hart's Lake	
<p>Existing Conditions: There is a 24" concrete culvert that passes Harts Creek under Harts Lake Valley Road. The analysis shows that the 24" concrete culvert is undersized. During a site visit on May 16, 2007, vegetation was noted at the inlet and outlet of the culvert.</p> <p>Analysis: The drainage basin was delineated in GIS using 5-ft contour data. Land use was estimated using aerial photography and tax parcel information. Discharges were calculated using WWHM3 for the 2-, 5-, 10-, 25-, and 100-year storm events. The 25-year event was then modeled in HY-8.0 to determine capacity. Several different culvert sizes were analyzed in FEQUTL to identify the size necessary for hydraulic capacity and fish passage. No channel analysis was required.</p> <p>Project Description: A hydraulic analysis showed that an 11-foot wide by 6-foot high, 3-sided concrete box culvert would provide adequate conveyance capacity to pass the 100-year discharge while providing for fish passage. The distance from the top of the road to the ditch invert is approximately 5 feet; a 6-foot box culvert which is countersunk will fit with 1 foot of cover. This projects solves flooding problem HRT-10. This project is based on field observations and existing information (e.g. 5-ft contours), therefore, prior to detailed design a survey should be conducted to confirm the assumed channel and culvert geometry (e.g. bed slope, culvert invert elevations, channel depth, and roadway elevations).</p> <p>Design Assumptions: Cost estimates are based on a review of Pierce County bid tabs, WSDOT historical unit bid costs, Utility vault estimates, and engineering judgment. Inlet and outlet cleanout costs are included within the 'Misc. site restoration' line item. Site will be surveyed for 1 day to improve/verify design specifications. Project is within the right-of-way and will not require the acquisition of additional land.</p>					
Land Costs¹			Construction Costs¹		
Item	Unit	Unit Cost	Quantity	Cost	
				\$ -	
				\$ -	
				\$ -	
				\$ -	
				\$ -	
			Contingency (20%)	\$ -	
			Total Land Costs	\$ -	
					Total \$ 150,810
					Contingency (**%) \$ 52,784
					Taxes (8.9%) \$ 18,120
					Sub-Total \$ 221,713
					Engineering and Administration (**%) \$ 55,428
					Total Land Costs \$ -
					Cost Escalation to 2008 (4%) \$ 11,086
					Project Cost \$ 288,300

Project Prioritization Summary	
Flood Hazard Reduction	0
Water Quality Improvement	0
Natural Resource Protection	0
Other Factors	0
Total Score	0

<p>Cost/Benefit Ratio: (Cost/Priority Score)</p> <p>** 35% for construction costs up to \$100,000 25% for construction cost between \$100,000 - \$250,000 20% for construction cost above \$250,000</p>	<p>* 45% habitat projects 35% all other projects</p>
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1. The estimated costs are based on year 2007 dollars and are escalated to year 2008 dollars.

Project Name: Tisch Road Culvert Replacement				Project Number: CIP11MUR-C01					
Project Type: Culvert Replacement				Sub-Basin: Murray Creek					
<p>Existing Conditions: Roadway flooding was reported along Tisch Road South near 324th Street South. A drainage ditch flows from south to north along Tisch Road South and then crosses under Tisch Road through a 12-inch CMP culvert. Roadway flooding was observed on the upstream side of the culvert and in the upstream ditch along the road. During a site visit on May 16, 2007, it was noted that the channels are overgrown with vegetation.</p> <p>Analysis: The drainage basin was delineated in GIS using 5-ft contour data. Land use was estimated using aerial photography and tax parcel information. Discharges were calculated using WWHM3 for the 2-, 5-, 10-, 25-, and 100-year storm events. The area draining to this ditch and culvert was estimated to be about 185 acres. The drainage is mostly flat with mixed pasture, forest and rural residential land use. The 100-year flow rate was estimated to be 29 cfs.</p> <p>Project Description: The analyses show that a 3-sided, 10-foot wide by 3-foot high concrete box culvert would convey the 100-year design event. The proposed culvert also provides fish passage per WDFW's "Stream Simulation" design methodology. The box culvert is used to account for limited cover. This project is based on field observations and existing information (e.g. 5-ft contours), therefore, prior to detailed design a survey should be conducted to confirm the assumed channel and culvert geometry (e.g. bed slope, culvert invert elevations, channel depth, and roadway elevations).</p> <p>Design Assumptions: Cost estimates are based on a review of Pierce County bid tabs, WSDOT historical unit bid costs, Contech estimates, and engineering judgment. The site will be surveyed for 1 day to improve/verify design specifications. The project is within the right-of-way and will not require acquisition of additional land.</p>									
Land Costs¹				Construction Costs¹					
Item	Unit	Unit Cost	Quantity	Cost	Item	Unit	Unit Cost	Quantity	Cost
				\$ -	Mobilization	10%	-	-	\$ 11,411
				\$ -	Erosion and sediment control	LS	\$ 1,000	1	\$ 1,000
				\$ -	SPCC Plan	LS	\$ 1,000	1	\$ 1,000
				\$ -	Traffic control	LS	\$ 1,000	1	\$ 1,000
				\$ -	Survey	LS	\$ 500	1	\$ 500
			Total	\$ -	10' x 3' concrete box culvert installed	LF	\$ 2,000	50	\$ 100,000
			Contingency (20%)	\$ -	Wing walls	Each	\$ 2,000	4	\$ 8,000
			Total Land Costs	\$ -	Trash rack	Each	\$ 305	2	\$ 610
					Misc. site restoration	LS	\$ 2,000	1	\$ 2,000
									\$ -
									\$ -
									Total \$ 125,521
									Contingency (**%) \$ 43,932
									Taxes (8.9%) \$ 15,081
									Sub-Total \$ 184,535
									Engineering and Administration (**%) \$ 46,134
									Total Land Costs \$ -
									Project Cost \$ 230,700

Project Prioritization Summary	
Flood Hazard Reduction	
Water Quality Improvement	
Natural Resource Protection	
Other Factors	
Total Score	0

<p>Cost/Benefit Ratio: (Cost/Priority Score)</p> <p>** 35% for construction costs up to \$100,000 25% for construction cost between \$100,000 - \$250,000 20% for construction cost above \$250,000</p>	<p>* 45% habitat projects 35% all other projects</p>
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1. The estimated costs are based on year 2007 dollars and are escalated to year 2008 dollars.

Project Name: <u>Nisqually Wilcox side-channel</u>				Project Number: <u>CIP11-NIS-RST01</u>					
Project Type: <u>Restoration</u>				Sub-Basin: <u>Nisqually River</u>					
<p>Existing Conditions: Due to floodplain restrictions by large channel-redirecting riprap levees, there is a lack of side-channels and off-channel wetlands. These levees ensure that the river maintains its course and flows over the Centralia Diversion Dam on the west side of the valley. In addition, the dam blocks some upstream salmon migration, especially chum salmon. Annual flooding breaks through a weak dike along a connected oxbow channel and bypasses the dam by flowing into lower Horn Creek.</p> <p>Analysis: The 2003 South Puget Sound Salmon Enhancement Off-channel Habitat Assessment has identified this area in need of off-channel habitat restoration. This site has been assessed by the Nisqually Tribe and an engineer for potential restoration. The Centralia Dam fish ladder usually excludes chum salmon from migrating upstream as has been noticed by biologists over many years.</p> <p>Proposed Solution/ Project Description: The project would create an artificial year-round side channel of the Nisqually River that would bypass the Centralia Diversion Dam and increase the off-channel rearing and spawning habitat on Wilcox Farms. Some year-round flow from the Nisqually River would seep into Harts Lake outlet and Horn Creek and return back into the river approximately 1 mile downstream. The connection would allow for up to 300 cfs of flow in the winter and would reduce flooding potential by controlling the outflow.</p> <p>Design Assumptions: The design is still in its conceptual stage. It is envisioned a 9-ft by 5-ft concrete box culvert would be sufficient to connect the wetland/mainstem through an artificial dike and under an access road to the Harts Creek/Horn Creek complex.</p>									
Land Costs¹				Construction Costs¹					
Item	Unit	Unit Cost	Quantity	Cost	Item	Unit	Unit Cost	Quantity	Cost
				\$ -	Mobilization	LS	\$ 10,000	1	\$ 10,000
				\$ -	Erosion control, clearing	LS	\$ 3,000	1	\$ 3,000
				\$ -	Concrete box culvert	ft	\$ 525	60	\$ 31,500
				\$ -	Installation of culvert and rip rap	LS	\$ 26,000	1	\$ 26,000
				\$ -	Excavation/backfill	cy	\$ 20	500	\$ 10,000
				\$ -	Streambed material and rip rap	LS	\$ 6,000	1	\$ 6,000
			Total	\$ -	Large wood debris plus delivery	each	\$ 850	15	\$ 12,750
			Contingency (20%)	\$ -	Placement of material	LS	\$ 8,000	1	\$ 8,000
			Total Land Costs	\$ -	Project maintenance	LS	\$ 15,000	1	\$ 15,000
					Riparian replanting and clean-up	acre	\$ 10,000	2	\$ 20,000
					Permitting	LS	\$ 5,000	1	\$ 5,000
Project Prioritization Summary								Total	\$ 147,250
Flood Hazard Reduction								Contingency (**%)	\$ 66,263
Water Quality Improvement								Taxes (8.9%)	\$ 19,003
Natural Resource Protection								Sub-Total	\$ 232,515
Other Factors								Engineering and Administration (**%)	\$ 58,129
Total Score								Total Land Costs	\$ -
								Cost Escalation to 2008 dollars (4%)	\$ 11,626
								Project Cost	\$ 302,300

1. The estimated costs are based on year 2007 dollars and are escalated to year 2008 dollars.

Project Name: <u>Wilcox Flats Off-Channel Restoration</u>				Project Number: <u>CIP11-NIS-RST02</u>					
Project Type: <u>Restoration</u>				Sub-Basin: <u>Nisqually River</u>					
<p>Existing Conditions: The Nisqually Land Trust owns several dozen vacation lots abandoned after the floods of 1996/97. Various alterations were made to the lots before they were transferred to the Land Trust. The alterations include, but are not limited to, forest clearing, road building, and introduction of invasive plants. The alterations have limited the benefits the riparian and floodplain forest can provide to salmonids and other aquatic wildlife.</p> <p>Analysis: The Nisqually Land Trust has identified this project as a high priority restoration project on their lands.</p> <p>Proposed Solution/ Project Description: Restore Wilcox Flats through revegetation projects between river miles 28 and 29.5. Sub-projects would include riparian enhancement along 3/4 miles of mainstem, at least 1/2 mile of side channels, and all areas within the river's channel migration zone. The revegetation in these areas will cover 170 acres.</p> <p>Design Assumptions: The installation is completed with the help of a Washington Conservation Corps field crew. Contingency is 35% based on engineering estimates. No chemical herbicide application is needed for site preparation.</p>									
Land Costs¹				Construction Costs¹					
Item	Unit	Unit Cost	Quantity	Cost	Item	Unit	Unit Cost	Quantity	Cost
				\$ -	Mobilization	LS	\$ 5,000	1	\$ 5,000
				\$ -	Riparian Plants (average cost)	each	\$ 3	28,000	\$ 70,000
				\$ -	Plant Protection tubes and stakes	each	\$ 3	20,000	\$ 60,000
				\$ -	Installation and site prep	LS	\$ 40,000	1	\$ 40,000
				\$ -	Incidentals	acre	\$ 40	170	\$ 6,800
				\$ -	Project Monitoring and maintenance (3 yrs)	LS	\$ 20,000	1	\$ 20,000
			Total	\$ -					
			Contingency (20%)	\$ -					
			Total Land Costs	\$ -					
Project Prioritization Summary									
Flood Hazard Reduction									
Water Quality Improvement									
Natural Resource Protection									
Other Factors									
Total Score					0				
					Total \$ 201,800				
					Contingency (**%) \$ 70,630				
					Taxes (8.9%) \$ 24,246				
					Sub-Total \$ 296,676				
					Engineering and Administration (**%) \$ 59,335				
					Total Land Costs \$ -				
					Cost Escalation to 2008 through 2010 dollars (8%) \$ 28,481				
					Project Cost \$ 384,500				

1. The estimated costs are based on year 2007 dollars and are escalated to year 2008 dollars.

Project Name: <u>Mainstem Off-Channel Restoration</u>				Project Number: <u>CIP11-NIS-RST03</u>					
Project Type: <u>Restoration</u>				Sub-Basin: <u>Nisqually River</u>					
<p>Existing Conditions: An off-channel habitat assessment completed by the South Puget Sound Salmon Enhancement Group (SPSSEG) and the Tribe in 2004 evaluated the presence and condition of off-channel habitat throughout the Nisqually mainstem. Off-channel habitat modifications have led to a reduction in habitat diversity. These changes and simplification of the channel, along with the lack of large wood in the river, have a negative effect on fry, juvenile, and prespawners because there are fewer places for fish to find refuge from high flows. The report identified high priority sites for restoration of off-channel habitat.</p> <p>Analysis: The Tribe and SPSSEG have identified various sites for restoration from the off-channel habitat assessment.</p> <p>Proposed Solution/ Project Description: Existing off-channel habitat should be incorporated into the active river ecosystem as much as possible. The order of priority for restoration actions at these sites should be: 1) restoring the channel migration zone (i.e., removing impediments to allow the river to maintain the sites), 2) restoring fish access to the site, and 3) restoring native vegetation surrounding the off-channel habitat areas. Also, there is a need for additional landowner outreach, identifying new willing landowners, and then designing and implementing ke projects.</p> <p>Design Assumptions: We assumed three projects: (1) a dike setback project with a log jam placement, (2) a culvert replacement, and (3) a pond creation/restoration project. Since these are three smaller projects with three separate engineering and administration need, we used the 35% engineering cost estimate to cover the increase.</p>									
Land Costs¹				Construction Costs¹					
Item	Unit	Unit Cost	Quantity	Cost	Item	Unit	Unit Cost	Quantity	Cost
				\$ -	Mobilization	LS	\$ 7,500	3	\$ 22,500
				\$ -	Erosion control, clearing	LS	\$ 3,000	3	\$ 9,000
				\$ -	Bridge/culvert plus installator	LS	\$ 1	34,000	\$ 34,000
				\$ -	Pond excavation + haul + shaping	cy	\$ 12	5,500	\$ 66,000
				\$ -	Culvert removal	LS	\$ 1,500	1	\$ 1,500
				\$ -	Riprap and streambed material + placement	LS	\$ 6,000	1	\$ 6,000
				\$ -	Large wood debris + delivery	each	\$ 850	60	\$ 51,000
				\$ -	Dike set back / removal	cy	\$ 12	6,000	\$ 72,000
				\$ -	LWD placement	jam	\$ 10,000	2	\$ 20,000
				\$ -	Project maintenance	LS	\$ 10,000	3	\$ 30,000
				\$ -	Riparian replanting and clean-up	acre	\$ 10,000	3	\$ 25,000
				\$ -	Permitting	LS	\$ 5,000	3	\$ 15,000
			Total	\$ -				Total	\$ 337,000
			Contingency (20%)	\$ -				Contingency (**%)	\$ 151,650
			Total Land Costs	\$ -				Taxes (8.9%)	\$ 43,490
								Sub-Total	\$ 532,140
								Engineering and Administration (**%)	\$ 186,249
								Total Land Costs	\$ -
								Cost Escalation to 2008 dollars (4%)	\$ 28,736
								Project Cost	\$ 747,200

1. The estimated costs are based on year 2007 dollars and are escalated to year 2008 dollars.

Project Name: <u>Lower Tanwax Riparian Enhancement</u>				Project Number: <u>CIP11-TWL-RST01</u>																			
Project Type: <u>Restoration</u>				Sub-Basin: <u>Lower Tanwax Creek</u>																			
<p>Existing Conditions: The lower Tanwax Creek flows for 4.5 miles through a 98-acre riparian wetland that has been cleared and now consists of small shrubs and large amounts of reed canary grass. The reduced amount of large wood in the creek and the loss of streamside and overhanging vegetation have had numerous impacts. The lack of riparian vegetation available to provide shade has likely led to higher peak summer water temperatures throughout the subbasin, reducing the productivity of juvenile coho and steelhead that rear in the creek. The loss of streamside vegetation is also associated with reduced nutrient input to the creek, opportunities for fish concealment, and shade to prevent the growth of non-native</p> <p>Analysis: The Tribe has identified this wetland as the number two priority for wetland restoration in a 1996 inventory of commercial forestry land owned wetlands. Now it is owned by several dozen private landowners.</p> <p>Proposed Solution/ Project Description: Streamside vegetation plantings in selected reed canary grass dominated areas and along the creek between RM 1.75 and RM 3.5.</p> <p>Design Assumptions: We are assuming only 78 acres of the 98-acre wetland can be re-planted due to wetland conditions. The majority will be live stakes (85%) and some (15%) bareroot plants. Density is 1,000 livestakes per acre plus 200 potted plants. Contingency was reduced to 35%, and cost escalation was increased to 8% due to 3-year length of project.</p>																							
Land Costs¹				Construction Costs¹																			
Item	Unit	Unit Cost	Quantity	Cost	Item	Unit	Unit Cost	Quantity	Cost														
				\$ -	Mobilization	LS	\$ 7,500	1	\$ 7,500														
				\$ -	Riparian plants (live stakes)	each	\$ 1	78,000	\$ 66,300														
				\$ -	Riparian plants (potted)	each	\$ 4	15,600	\$ 54,600														
				\$ -	Installation	hours	\$ 18	1,664	\$ 29,120														
				\$ -	Site prep	acre	\$ 1,500	78	\$ 117,000														
				\$ -	Incidentals	acre	\$ 250	78	\$ 19,500														
				\$ -	Project maintenance	3 year	\$ 1,200	78	\$ 93,600														
			Total	\$ -																			
			Contingency (20%)	\$ -																			
			Total Land Costs	\$ -																			
Project Prioritization Summary																							
Flood Hazard Reduction																							
Water Quality Improvement																							
Natural Resource Protection																							
Other Factors																							
Total Score				0																			
				<p>Cost/Benefit Ratio:</p> <p>(Cost/Priority Score)</p> <p>* 45% habitat projects 35% all other projects</p> <p>** 35% for construction costs up to \$100,000 25% for construction cost between \$100,000 - \$250,000 20% for construction cost above \$250,000</p>																			
				<table border="0" style="width:100%;"> <tr> <td>Total</td> <td>\$ 387,620</td> </tr> <tr> <td>Contingency (**%)</td> <td>\$ 135,667</td> </tr> <tr> <td>Taxes (8.9%)</td> <td>\$ 46,573</td> </tr> <tr> <td>Sub-Total</td> <td>\$ 569,860</td> </tr> <tr> <td>Engineering and Administration (**%)</td> <td>\$ 113,972</td> </tr> <tr> <td>Total Land Costs</td> <td>\$ -</td> </tr> <tr> <td>Cost Escalation to 2008 through 2010 dollars (8%)</td> <td>\$ 54,707</td> </tr> <tr> <td>Project Cost</td> <td>\$ 738,600</td> </tr> </table>				Total	\$ 387,620	Contingency (**%)	\$ 135,667	Taxes (8.9%)	\$ 46,573	Sub-Total	\$ 569,860	Engineering and Administration (**%)	\$ 113,972	Total Land Costs	\$ -	Cost Escalation to 2008 through 2010 dollars (8%)	\$ 54,707	Project Cost	\$ 738,600
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Total Land Costs	\$ -																						
Cost Escalation to 2008 through 2010 dollars (8%)	\$ 54,707																						
Project Cost	\$ 738,600																						

1. The estimated costs are based on year 2007 dollars and are escalated to year 2008 dollars.

Project Name: <u>Benbow Drive Culvert Replacement</u>		Project Number: <u>CIP11-TWU-C01</u>		
Project Type: <u>Culvert Replacement</u>		Sub-Basin: <u>Upper Tanwax</u>		
<p>Existing Conditions: Benbow Drive East is located between Twin Lakes and Whitman Lake, and crosses the low area where overflow from the Twin Lakes drains into Whitman Lake. Field observations noted debris at the culvert inlet and signs of roadway overtopping. The existing crossing consists of two 24-inch concrete culverts with a debris cage surrounding both inlets. During a site visit on May 16, 2007, it was noted that the debris cage had collected a considerable amount of debris, and that is could be restricting flow into the culverts. Also, the downstream ends of the culverts were completely submerged.</p> <p>Analysis: A hydrologic analysis was completed to verify sufficient capacity of the roadway culverts. The area draining to the culverts was estimated to be about 235 acres of mixed forest and agricultural land use. The 100-year flow rate was estimated to be 69 cfs. Hydraulic calculations found that the existing parallel 24-inch culverts are not adequately sized to convey the 100-year flow rate without overtopping the road.</p> <p>Project Description: The hydraulic analyses indicated a 9-foot wide by 5-foot high concrete box culvert would convey the 100-year flood event flow with no overtopping. Road raising is avoided by placing the top of the box culvert, which is designed for H-20 loading, at the roadway grade with no cover. The box culvert also provides fish passage per the WDFW "No Slope" requirements. The debris barrier should be reinstalled and cleared with routine maintenance. Alternatively, a debris barrier or trash rack requiring less maintenance could be installed. This project is based on field observations and existing information (e.g. 5-ft contours), therefore, prior to detailed design a survey should be conducted to confirm the assumed channel and culvert geometry (e.g. bed slope, culvert invert elevations, channel depth, and roadway elevations).</p> <p>Design Assumptions: Cost estimates are based on a review of Pierce County bid tabs, WSDOT historical unit bid costs, Contech estimates, and engineering judgment. The site will be surveyed for 1 day to improve/verify design specifications. Assumed cost of trash racks is \$1000 per inlet/outlet. Project is within the right-of-way and will not require the acquisition of additional land.</p>				
Land Costs¹		Construction Costs¹		
Item	Unit	Unit Cost	Quantity	Cost
				\$ -
				\$ -
				\$ -
				\$ -
				\$ -
			Total	\$ -
			Contingency (20%)	\$ -
			Total Land Costs	\$ -

Item	Unit	Unit Cost	Quantity	Cost
Mobilization	10%	-	-	\$ 9,350
Erosion and sediment control	LS	\$ 1,000	1	\$ 1,000
SPCC Plan	LS	\$ 1,000	1	\$ 1,000
Traffic control	LS	\$ 1,000	1	\$ 1,000
Survey	LS	\$ 500	1	\$ 500
9' x 5' concrete box culvert installed	LF	\$ 1,600	45	\$ 72,000
Wing walls	Each	\$ 2,000	4	\$ 8,000
Trash rack	Each	\$ 1,000	2	\$ 2,000
Misc. site restoration	LS	\$ 8,000	1	\$ 8,000
				\$ -
				\$ -
			Total	\$ 102,850
			Contingency (**%)	\$ 35,998
			Taxes (8.9%)	\$ 12,357
			Sub-Total	\$ 151,205
			Engineering and Administration (**%)	\$ 37,801
			Cost Escalation to 2008 (4%)	\$ 9,494
			Total Land Costs	\$ -
			Project Cost	\$ 198,600

Project Prioritization Summary	
Flood Hazard Reduction	
Water Quality Improvement	
Natural Resource Protection	
Other Factors	
Total Score	0

<p>Cost/Benefit Ratio: (Cost/Priority Score)</p> <p>** 35% for construction costs up to \$100,000 25% for construction cost between \$100,000 - \$250,000 20% for construction cost above \$250,000</p>	<p>* 45% habitat projects 35% all other projects</p>
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1. The estimated costs are based on year 2007 dollars and are escalated to year 2008 dollars.

Project Name: <u>Webster Road Culvert Replacement</u>		Project Number: <u>CIP11-TWU-C02</u>		
Project Type: <u>Culvert Repair and Channel Excavation</u>		Sub-Basin: <u>Upper Tanwax</u>		
<p>Existing Conditions: Roadway flooding was reported at Webster Road near the intersection with State Route 161. Field observations noted that the culvert under Webster Road, approximately 1200 feet northwest of State Route 161, is damaged at the inlet. The 18-inch CMP culvert is bent at the inlet in a way that is an obvious hindrance to conveyance. It was noted during a site visit that the cover over the culvert does not meet the minimum 2-foot requirement. The culvert also had rusted along the bottom, which may indicate standing water for a long period of time. Local residents suggested that there are beavers in the area and that they may have contributed to backups.</p> <p>Analysis: The drainage basin was delineated in GIS using 5-ft contour data. Land use was estimated using aerial photography and tax parcel informaton. Discharges were calculated using WWHM3 for the 2-, 5-, 10-, 25-, and 100-year storm events. The 25-year event was then modeled in HY-8.0 to determine capacity of the culvert under Webster Drive. FEQUTL was used for proposed culvert sizing. Manning's analysis on the surrounding channels showed that they were adequately sized as well.</p> <p>Project Description: Since the culvert is damaged and rusted, it should be replaced. A 5-foot wide by 3-foot high concrete box culvert would adequately convey the 100-year flow rate without a submerged inlet. Limitations in cover are addressed by the top of the box culvert assumed to set at the existing roadway grade. The box culvert design meets WDFW requirements for fish passage using the "Stream Simulation" methodology. It is also recommended that the 12-inch culvert to the east be removed or repaired and cleaned out. This project is based on field observations and existing information (e.g. 5-ft contours), therefore, prior to detailed design a survey should be conducted to confirm the assumed channel and culvert geometry (e.g. bed slope, culvert invert elevations, channel depth, and roadway elevations).</p> <p>Design Assumptions: Cost of ditch maintenance and cleanout of the 12" driveway culvert is including in the 'Misc. site restoration' line item. No survey is required because the project is small. This project will be constructed within the right-of-way and will not require acquisition of additional land.</p>				
Land Costs¹		Construction Costs¹		
Item	Unit	Unit Cost	Quantity	Cost
				\$ -
				\$ -
				\$ -
				\$ -
				\$ -
			Total	\$ -
			Contingency (20%)	\$ -
			Total Land Costs	\$ -

Item	Unit	Unit Cost	Quantity	Cost
Mobilization	10%	-	-	\$ 5,960
Erosion and sediment control	LS	\$ 1,000	1	\$ 1,000
SPCC Plan	LS	\$ 1,000	1	\$ 1,000
Traffic control	LS	\$ 1,000	1	\$ 1,000
5' x 3' concrete box culvert installed	Each	\$ 1,000	45	\$ 45,000
Wing walls	Each	\$ 2,000	4	\$ 8,000
Trash rack	Each	\$ 800	2	\$ 1,600
Misc. site restoration	LS	\$ 2,000	1	\$ 2,000
				\$ -
				\$ -
				\$ -
			Total	\$ 65,560
			Contingency (**%)	\$ 22,946
			Taxes (8.9%)	\$ 7,877
			Sub-Total	\$ 96,383
			Engineering and Administration (**%)	\$ 33,734
			Cost Escalation to 2008 (4%)	\$ 6,438
			Total Land Costs	\$ -
			Project Cost	\$ 136,600

Project Prioritization Summary	
Flood Hazard Reduction	
Water Quality Improvement	
Natural Resource Protection	
Other Factors	
Total Score	0

Cost/Benefit Ratio:
(Cost/Priority Score)

* 45% habitat projects
35% all other projects

** 35% for construction costs up to \$100,000
25% for construction cost between \$100,000 - \$250,000
20% for construction cost above \$250,000

1. The estimated costs are based on year 2007 dollars and are escalated to year 2008 dollars.

Project Name: <u>Thomas Road Culvert Replacement</u>				Project Number: <u>CIP11-TWU-C04</u>						
Project Type: <u>Culvert Replacement</u>				Sub-Basin: <u>Upper Tanwax</u>						
<p>Existing Conditions: Roadway flooding problems leading to flooding of private property were reported near 34328 Thomas Road East. A property owner reported frequent flooding of the roadway and overflow of ditches, which causes runoff to wash out the road and flow into the dwelling. Residents also reported that the drainage ditches have not been adequately maintained. Field observations noted that construction and improper sediment control could be causing sediment build up in ditches and conveyance structures.</p> <p>Analysis: The drainage basin was delineated in GIS using 5-ft contour data. Land use was estimated using aerial photography and tax parcel information. Discharges were calculated using WWHM3 for the 2-, 5-, 10-, 25-, and 100-year storm events. The 25-year event was then modeled in HY-8.0 to determine capacity of culvert under Thomas Road East. The culvert was found to be undersized. The ditches along Thomas Road were analyzed using Manning's Equation and found to be adequately sized.</p> <p>Project Description: Maintenance should be conducted at the site to clean out sediment and debris buildup in conveyance structures. It is recommended that the 12-inch culvert be replaced with a 3-sided concrete box culvert, 6-foot wide by 5-foot high to allow for conveyance of the 100-year flow rate and provide the necessary geometry for fish passage. The top of the box culvert is assumed to be set at the elevation of the existing roadway with no cover. Field survey and detailed hydraulic analyses should be performed before project implementation. Inlet conditions at the storm drain downstream of the culvert should be inspected to ensure proper capture of flow. This project is based on field observations and existing information (e.g. 5-ft contours), therefore, prior to detailed design a survey should be conducted to confirm the assumed channel and culvert geometry (e.g. bed slope, culvert invert elevations, channel depth, and roadway elevations)</p> <p>Design Assumptions: Cost estimates are based on a review of Pierce County bid tabs, WSDOT historical unit bid costs, Contech estimates, and engineering judgment. The site will be surveyed for 1 day to improve/verify design specifications. The project is within the right-of-way and will not require acquisition of additional land.</p>										
Land Costs¹				Construction Costs¹						
Item	Unit	Unit Cost	Quantity	Cost	Item	Unit	Unit Cost	Quantity	Cost	
				\$ -	Mobilization	10%	-	-	\$ 9,010	
				\$ -	Erosion and sediment control	LS	\$ 1,000	1	\$ 1,000	
				\$ -	SPCC Plan	LS	\$ 1,000	1	\$ 1,000	
				\$ -	Traffic control	LS	\$ 1,000	1	\$ 1,000	
				\$ -	Survey	LS	\$ 500	1	\$ 500	
			Total	\$ -	6' x 5' concrete box culvert installed	LF	\$ 1,500	50	\$ 75,000	
			Contingency (20%)	\$ -	Wing walls	Each	\$ 2,000	4	\$ 8,000	
			Total Land Costs	\$ -	Trash rack	Each	\$ 800	2	\$ 1,600	
					Misc. site restoration	LS	\$ 2,000	1	\$ 2,000	
									\$ -	
									\$ -	
				Total					\$ 99,110	
				Contingency (20%)					\$ 34,689	
				Total Land Costs					\$ 11,908	
									Sub-Total	\$ 145,707
									Engineering and Administration (**%)	\$ 50,997
									Total Land Costs	\$ -
									Project Cost	\$ 196,800

Project Prioritization Summary	
Flood Hazard Reduction	
Water Quality Improvement	
Natural Resource Protection	
Other Factors	
Total Score	0

<p>Cost/Benefit Ratio: (Cost/Priority Score)</p> <p>** 35% for construction costs up to \$100,000 25% for construction cost between \$100,000 - \$250,000 20% for construction cost above \$250,000</p>	<p>* 45% habitat projects 35% all other projects</p>
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1. The estimated costs are based on year 2007 dollars and are escalated to year 2008 dollars.

Project Name: <u>Lower Ohop Valley Restoration Phase 1 (Segements D, E, and F)</u>				Project Number: <u>CIP14-OHL-RST01</u>					
Project Type: <u>Restoration</u>				Sub-Basin: <u>Lower Ohop Creek</u>					
<p>Existing Conditions: Ohop Creek is the second largest Nisqually tributary below LaGrande Dam. It is an area of historic agricultural use that is being converted to rural residential use. The area has undergone many changes that have resulted in the decline of salmon productivity. Channel confinement modifications such as ditching and channelization have occurred. There has been a decline in the amount of key habitat and habitat diversity, including loss of large woods, streamside vegetation, pools, and riffle habitat. These factors have led to reduced channel stability, increased summer stream temperatures, increased fine sediment levels, and reduced food availability. There has also been an increase in predation by</p> <p>Analysis: Assessments and analyses have identified several alternatives for restoration. The full restoration alternative has been selected as the preferred alternative.</p> <p>Proposed Solution/ Project Description: The project will re-elevate the 4.0 miles of severely channelized creek back into its original floodplain, recreating a 5.2- mile-long stream. The creek's original meander pattern and its connection to the adjacent floodplain and wetland areas will be restored. The project will also re-vegetate approximately 490 acres of the surrounding valley floor, which is dominated by wetlands. Due to the large size of the project, it is split into three phases (1, 2, and 3). This first phase will restore approximately 1 mile of creek and will be the pilot project to the other phases. It focuses on the Land Trust properties, around Highway 7, which are visible to the tens of thousands of travelers to Mount Rainier National Park every year. It will be the demonstration project for the remaining phases.</p> <p>Design Assumptions: Design assumptions include excavation of 1.05 miles of new creek channel, filling ~0.5 miles of old channel, replanting 92 acres of the valley floor, and installing 7 pieces of large wood per 100 feet of new channel. Mobilization (10%), incidentals (10%), and contingency (20%) have been included in the line items. Engineering and Administration are estimated at 25%.</p>									
Land Costs¹				Construction Costs¹					
Item	Unit	Unit Cost	Quantity	Cost	Item	Unit	Unit Cost	Quantity	Cost
				\$ -	Channel reconnection	LS	\$ 551,146	1	\$ 551,146
				\$ -	Large woody debris (inc. installation)	LS	\$ 483,277	1	\$ 483,277
				\$ -	Dike removal	LS	\$ 40,957	1	\$ 40,957
				\$ -	Off-channel habitat creation	LS	\$ 42,000	1	\$ 42,000
				\$ -	Plant removal and salvage	LS	\$ 62,580	1	\$ 62,580
			Total	\$ -	Plant installation	LS	\$ 155,494	1	\$ 155,494
			Contingency (20%)	\$ -	Plant material	LS	\$ 273,000	1	\$ 273,000
			Total Land Costs	\$ -	Roughened channel	LS	\$ 98,000	1	\$ 98,000
					Site maintenance	LS	\$ 198,800	1	\$ 198,800
									\$ -
									\$ -
Project Prioritization Summary				Cost/Benefit Ratio:					
Flood Hazard Reduction				(Cost/Priority Score)	* 45% habitat projects	Total		\$ 1,905,254	
Water Quality Improvement					35% all other projects	Contingency (**%)		already incl.	
Natural Resource Protection						Taxes (8.9%)		\$ 169,568	
Other Factors						Sub-Total		\$ 2,074,821	
Total Score			0		** 35% for construction costs up to \$100,000	Engineering and Administration (**%)		\$ 518,705	
					25% for construction cost between \$100,000 - \$250,000	Total Land Costs		\$ -	
					20% for construction cost above \$250,000	Cost Escalation to 2008 dollars (4%)		\$ 103,741	
						Total Project Cost		\$ 2,697,300	
						Project Cost (15% County share)		\$ 404,595	

1. The estimated costs are based on year 2007 dollars and are escalated to year 2008 dollars.

Project Name: <u>Lower Ohop Valley Restoration Phase 2 (Segments A, B, and C)</u>				Project Number: <u>CIP14-OHL-RST02</u>						
Project Type: <u>Restoration</u>				Sub-Basin: <u>Lower Ohop Creek</u>						
<p>Existing Conditions: Ohop Creek is the second largest Nisqually tributary below LaGrande Dam. It is an area of historic agricultural use that is being converted to rural residential use. The area has undergone many changes that have led to the decline of salmon productivity. Channel confinement modifications such as ditching and channelization have occurred. There has been a decline in the amount of key habitat and habitat diversity, including loss of large woods, streamside vegetation, pools, and riffle habitat. These factors have led to reduced channel stability, increased summer stream temperatures, increased fine sediment levels, and reduced food availability. There has also been an increase in predation by non-</p> <p>Analysis: Assessments and analyses have identified several alternatives for restoration. The full restoration alternative has been selected as the preferred alternative.</p> <p>Proposed Solution/ Project Description: The project will re-elevate the 4.0 miles of severely channelized creek back into its original floodplain, recreating a 5.2- mile-long stream. The creek's original meander pattern and its connection to the adjacent floodplain and wetland areas will be restored. The project will also re-vegetate approximately 490 acres of the surrounding valley floor, which is dominated by wetlands. Due to the large size of the project, it is split into three phases (1, 2, and 3). This second phase will restore approximately 2.1 miles of creek and includes reforestation of 110 acres of floodplain forest. This phase will connect the first phase of the project to the mouth of the creek and therefore will make both projects even more effective by providing 3.1 miles of uninterrupted restored habitat.</p> <p>Design Assumptions: Design assumptions include excavating 2.1 miles of new creek channel, filling 1.1 miles of old channel, replanting 110 acres of the valley floor, and installing 7 pieces of large wood per 100 feet of new channel. Mobilization (10%), incidentals (10%), and contingency (20%) have been included in the line items. Engineering and Administration are estimated at 25%.</p>										
Land Costs¹				Construction Costs¹						
Item	Unit	Unit Cost	Quantity	Cost	Item	Unit	Unit Cost	Quantity	Cost	
				\$ -	Channel reconn	LS	\$ 943,327	1	\$ 943,327	
				\$ -	Wood delivery and placement	LS	\$ 737,990	1	\$ 737,990	
				\$ -	Plant removal and salvage	LS	\$ 42,242	1	\$ 42,242	
				\$ -	Plant installation	LS	\$ 450,982	1	\$ 450,982	
				\$ -	Plant material	LS	\$ 528,000	1	\$ 528,000	
				\$ -	Site maintenance	LS	\$ 154,000	1	\$ 154,000	
			Total	\$ -					\$ -	
			Contingency (20%)	\$ -					\$ -	
			Total Land Costs	\$ -					\$ -	
Project Prioritization Summary										
Flood Hazard Reduction				Cost/Benefit Ratio: (Cost/Priority Score)		* 45% habitat projects 35% all other projects		Total		\$ 2,856,541
Water Quality Improvement								Contingency (**%)		already incl.
Natural Resource Protection								Taxes (8.9%)		\$ 254,232
Other Factors								Sub-Total		\$ 3,110,773
Total Score		0		** 35% for construction costs up to \$100,000 25% for construction cost between \$100,000 - \$250,000 20% for construction cost above \$250,000		Engineering and Administration (**%)		\$ 777,693		
						Total Land Costs		\$ -		
						Cost Escalation to 2008 dollars (4%)		\$ 155,539		
						Total Project Cost		\$ 4,044,100		
						Project Cost (15% County share)		\$ 606,600		

1. The estimated costs are based on year 2007 dollars and are escalated to year 2008 dollars.

Project Name: <u>Culvert Replacement at 278th Avenue East</u>				Project Number: <u>CIP19-ASH-C01</u>					
Project Type: <u>Culvert Replacement</u>				Sub-Basin: <u>Ashford Reach</u>					
<p>Existing Conditions: There are two parallel culverts that convey the Ashford Reach under 278th Avenue East. One is a 48" diameter CMP and the other is a 24" diameter CMP. A large drainage area (approximately 1,200 acres) drains to this crossing.</p> <p>Analysis: The drainage basin was delineated in GIS using 5-ft contour data. Land use was estimated using aerial photography. Discharges were calculated using WWHM. The 100-year flow was estimated at 810 cfs, the 25-year flow was estimated at 510 cfs, and the 5-year flow was estimated at approximately 265 cfs.</p> <p>Project Description: The streambed should be cleared of the large boulders at the outlets and an energy dissipation device and channel stabilization are considered for the culvert inlets. Replace two existing culverts with a single 12' wide by 5' high concrete box to convey the 5-year discharge. It is also recommended that a trash rack be added to reduce the amount of vegetation blocking the culvert inlet. Project solves flooding problems ASH-01 and ASH-02. This project is based on field observations and existing information (e.g. 5-ft contours), therefore, prior to detailed design a survey should be conducted to confirm the assumed channel and culvert geometry (e.g. bed slope, culvert invert elevations, channel depth, and roadway elevations).</p> <p>Design Assumptions: Cost estimates are based on a review of Pierce County bid tabs, WSDOT historical unit bid costs, utility vault estimates, and engineering judgment. The site will be surveyed for 1 day to improve/verify design specifications. The project is within the right-of-way and will not require acquisition of additional land.</p>									
Land Costs¹				Construction Costs¹					
Item	Unit	Unit Cost	Quantity	Cost	Item	Unit	Unit Cost	Quantity	Cost
				\$ -	Mobilization	10%	-	-	\$ 14,250
				\$ -	Erosion and sediment control	LS	\$ 1,000	1	\$ 1,000
				\$ -	SPCC Plan	LS	\$ 1,000	1	\$ 1,000
				\$ -	Traffic control	LS	\$ 1,000	1	\$ 1,000
				\$ -	Survey	LS	\$ 500	1	\$ 500
			Total	\$ -	12' x 5' box culvert installed	LF	\$ 2,500	50	\$ 125,000
			Contingency (20%)	\$ -	Wing walls	Each	\$ 2,000	4	\$ 8,000
			Total Land Costs	\$ -	Energy dissipation/trash rack	Each	\$ 2,000	2	\$ 4,000
					Misc. site restoration	LS	\$ 2,000	1	\$ 2,000
									\$ -
									\$ -
				Total					\$ 156,750
				Contingency (**%)					\$ 54,863
				Taxes (8.9%)					\$ 18,834
				Sub-Total					\$ 230,446
				Engineering and Administration (**%)					\$ 57,612
				Total Land Costs					\$ -
				Project Cost					\$ 288,100

Project Prioritization Summary		<p>Cost/Benefit Ratio: (Cost/Priority Score)</p> <p>* 45% habitat projects 35% all other projects</p> <p>** 35% for construction costs up to \$100,000 25% for construction cost between \$100,000 - \$250,000 20% for construction cost above \$250,000</p>
Flood Hazard Reduction		
Water Quality Improvement		
Natural Resource Protection		
Other Factors		
Total Score	0	

1. The estimated costs are based on year 2007 dollars and are escalated to year 2008 dollars.

