

Upper San Juan River Improvement Project Design Narrative

Riverbend Engineering, LLC (Riverbend) was contracted by the San Juan Watershed Enhancement Partnership (SJWEP) for to develop a concept level plan and cost estimate for a multi-faceted river improvement project located near San Juan River Village on the upper San Juan River. This location was identified to address water needs for a variety of user groups including agricultural, recreational, environmental, and municipal. The key components of the project include:

- Landslide Bank Stabilization and Park Ditch Diversion Improvements
- Flood Conveyance Improvements and Habitat Improvements @ San Juan River Village
- River Access and Parking Improvements @ South Property Boundary

Park Ditch Diversion Improvements

The existing diversion structure at the Park Ditch diversion consists of a combination of imported large rock, concrete rubble, wire mesh, and native river rock. Large annual flows can move portions of the diversion material requiring large machinery to enter the river and rebuild the structure. The existing configuration of material can create a significant hazard for boaters, fisherman, and swimmers, and in addition, the existing diversion may be a barrier to migration of native and nonnative fish species. Recent landslide events upstream of the structure could also contribute to changes in the main river channel alignment which would lead to difficulty in maintaining water delivery to the Park Ditch headgate.

The major goals of the proposed design are:

- 1) Remove all dangerous steel and concrete rubble from the river bottom;
- 2) Minimize the future required maintenance in the river channel by creating a stable diversion structure
- 3) Create interstitial space at the appropriate slope between large rocks adequate for fish passage;
- 4) Stabilize and revegetate the river banks near the diversion to maintain the bank integrity; and
- 5) Create a safe low flow channel for boater passage sediment transport through the diversion structure.

The existing diversion structure will be removed and a large rock and grout diversion structure will be installed at the diversion location. Adequate existing native material and imported large rocks will be used in the construction of the new diversion structure and the newly vegetated bench on the sides of the river bank. Non-native and potentially hazardous material excavated from the existing structure will be hauled away and disposed of properly.

As a result of saturated soils from a wetter than average winter in 2019, a significant soil failure occurred in the spring just upstream of the diversion on the southside of the river. As opposed to trying to remove the recently deposited soil and reestablish the previous river alignment the concept design advocates stabilizing the new land slide depositions in place, and make adjustments to the river's alignment and width, so that the system can be more self-sustaining over time. Rock sills and deflectors would be utilized to stabilize the new banks and to protect bankful bench floodplain areas from erosion.

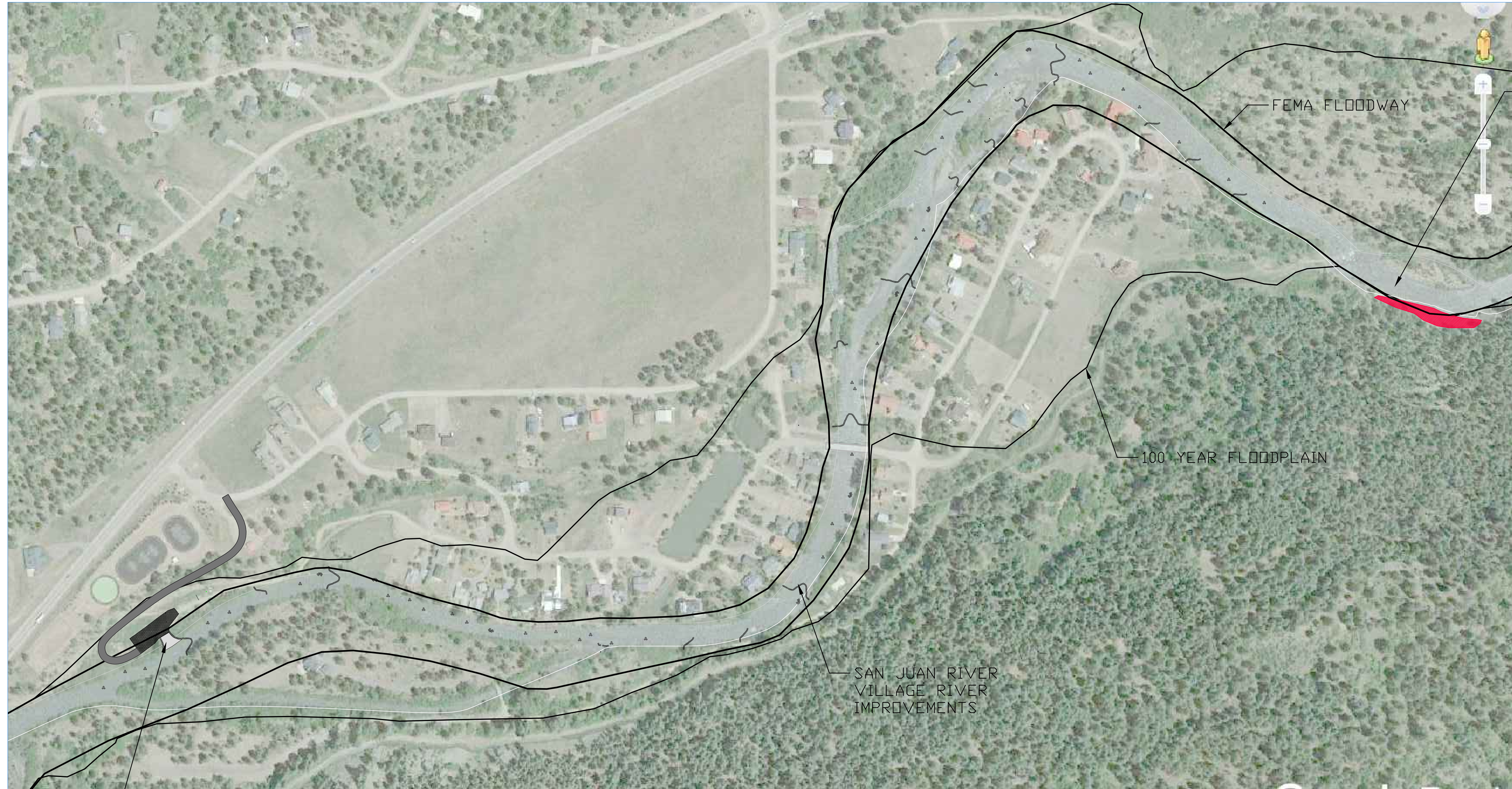
San Juan River Village River Flood Conveyance and Habitat Improvements

The proposed design approach is focused on two primary goals for restoration of this section of the San Juan River. The first is to restore the flood capacity that was significantly reduced during recent large sediment deposition events within the active channel. The second is to enhance the habitat component of the low flow channels. The foundation for success in aquatic and riparian restoration work is a functioning river system. This means transporting pulses of sediment, accommodating overbank floods, sustaining vigorous populations of fish, aquatic insects, and riparian vegetation. Riverbend's design encourages the river to maintain a stable condition, and we try to do this with limited amounts of obvious man-made structure. Our goal is to leave behind a naturally aesthetic and functioning riverine ecosystem, where natural channel evolution can proceed. In this location, where there is significant infrastructure near the river, we must balance the natural systems with protection of property and structures. The associated cost estimate for this portion is broken into two phases. The first phase would be focused on restoring flood conveyance and channel efficiency and the second phase would be directed at enhanced fish habitat.

River Access Improvements

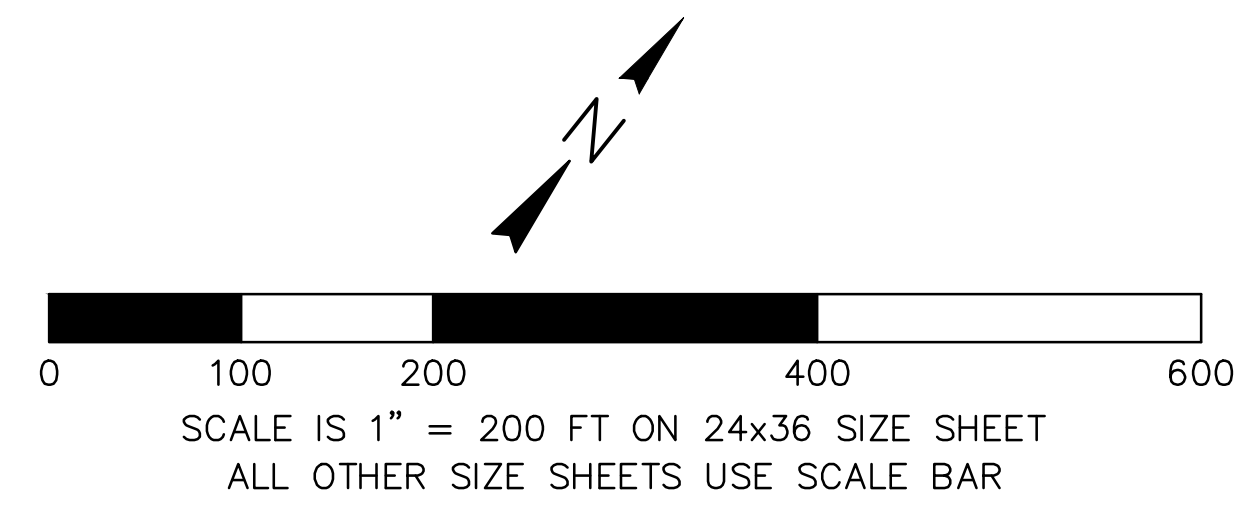
The proposed new access portion of the project involves construction of approximately 1000 feet of a new two-lane gravel access road, 10,000 square foot parking area, and new boat ramp into the San Juan River. The access road would be entirely located on existing San Juan River Village Metro District property and would be constructed in accordance with Archuleta County Road and Bridge Design Standards. The overall road slope would be 8% or less and would be design to try and balance the amount of soil cut and fill required. The access road would also create an additional ingress/egress for the over 50 properties located in the valley bottom.

The parking area would be a gravel surface directly connected to the boat ramp. The boat ramp would be orientated to the river to allow ease of use at a variety of river flows. The ramp would be defined by large boulders extending into the river with a compacted crushed rock surface.



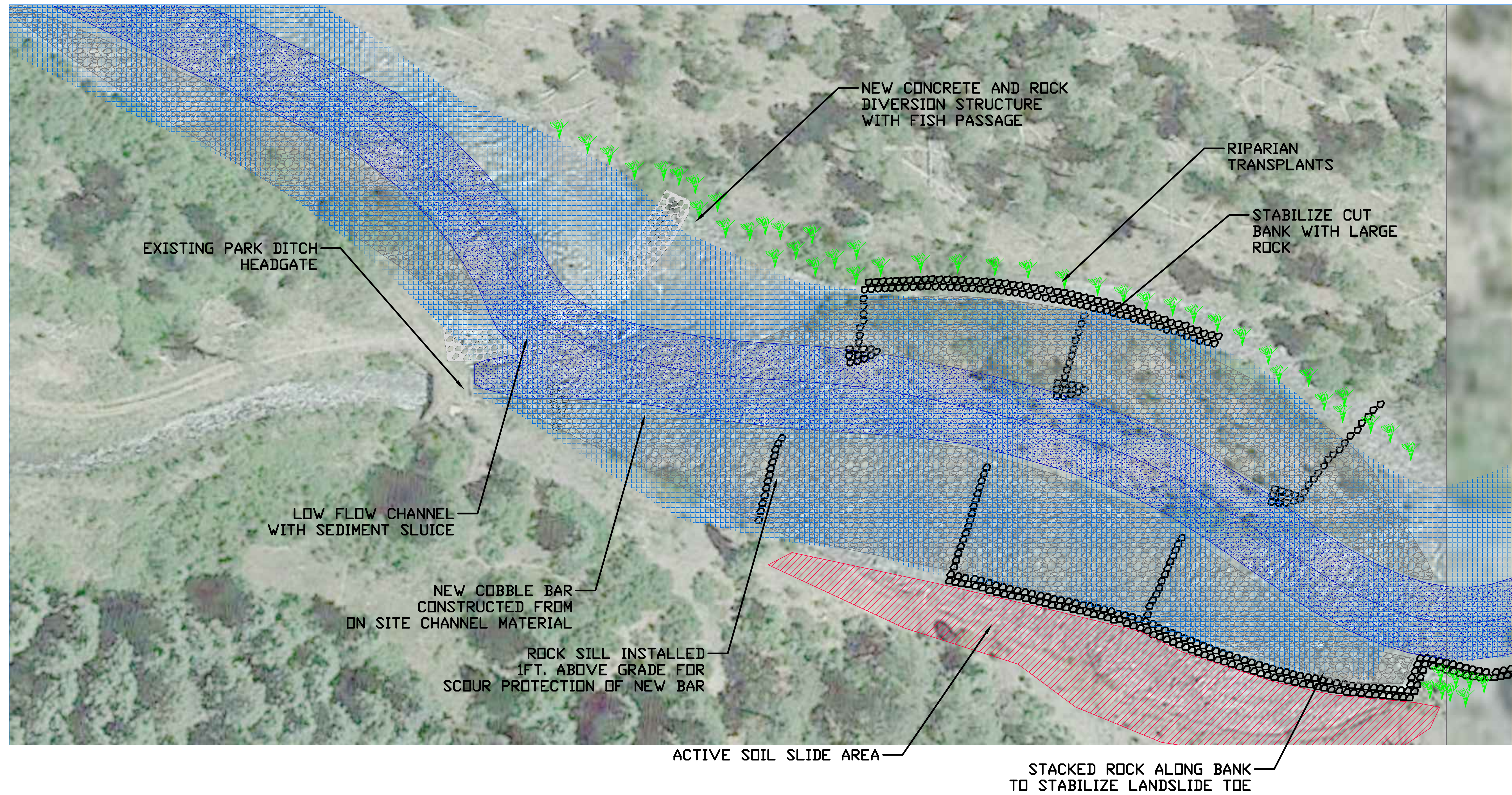
RIVER
ACCESS IMPROVEMENTS

**PRELIMINARY
NOT FOR CONSTRUCTION**



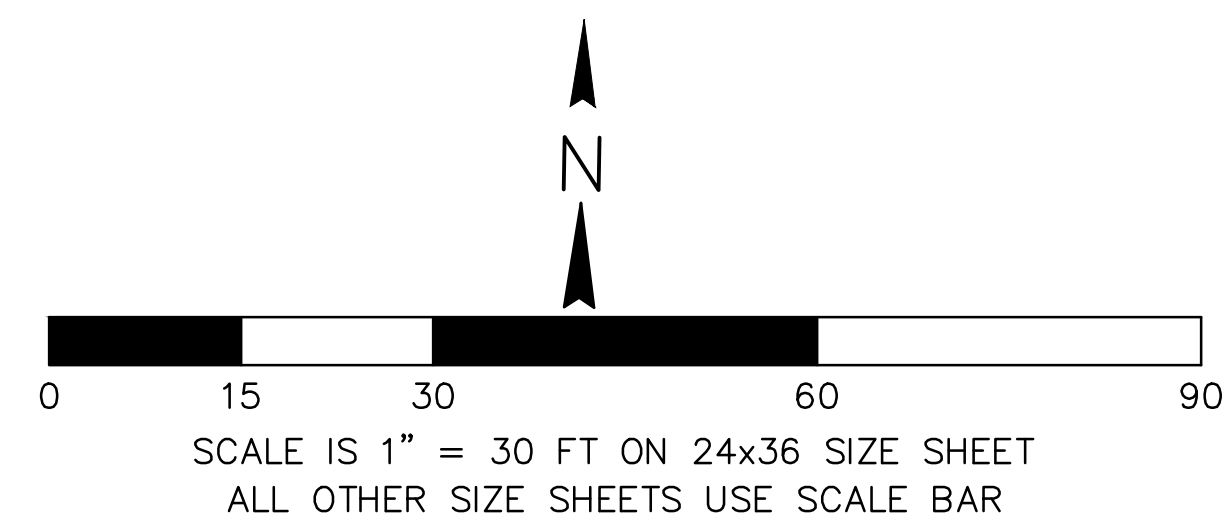
RIVERBEND ENGINEERING, LLC
102 3RD STREET PAGOSA SPRINGS CO 81147
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WEP SAN JUAN RIVER PROJECT		Sheet
SAN JUAN RIVER @SJRIV CONCEPT PLAN OVERVIEW		1
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SCALE 1"=200 FT	1/17/20	



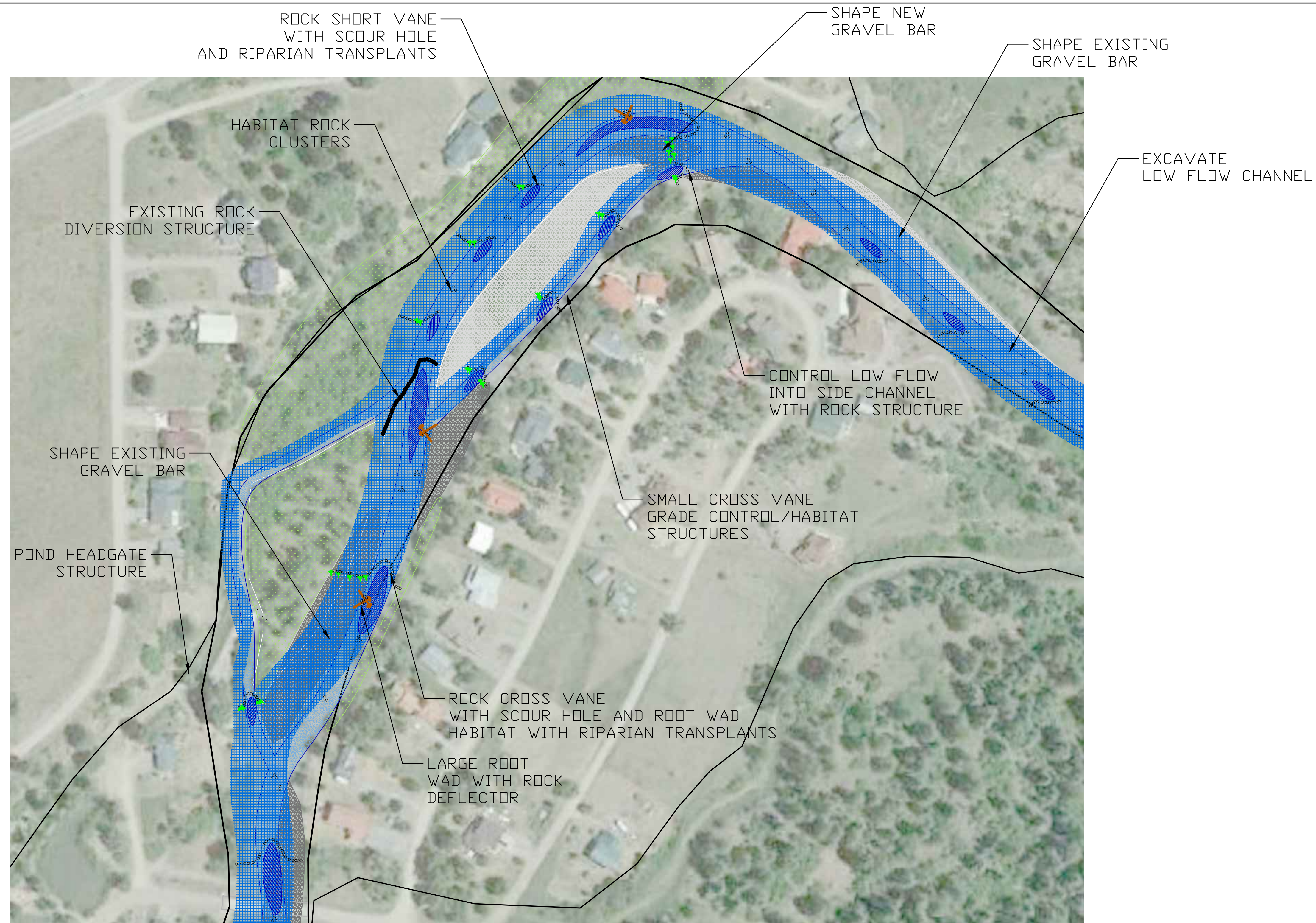
PARK DITCH DIVERSION IMPROVEMENT PLAN

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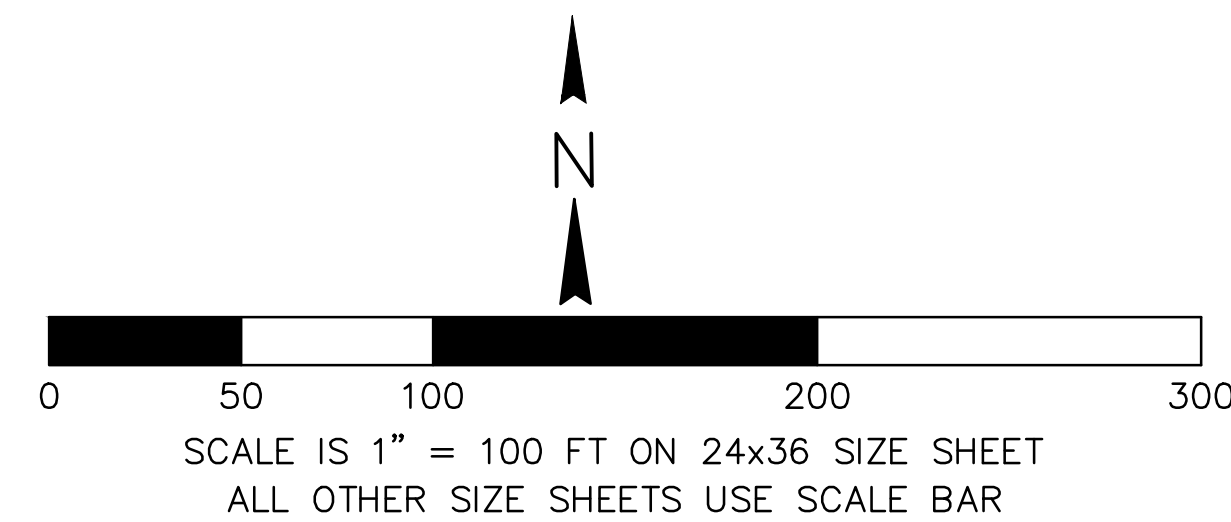
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WEP UPPER SAN JUAN RIVER	Sheet
PARK DITCH DIVERSION CONCEPT PLAN	1
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SCALE 1"=30 FT	1/17/20



SAN JUAN RIVER VILLAGE RIVER IMPROVEMENT PLAN

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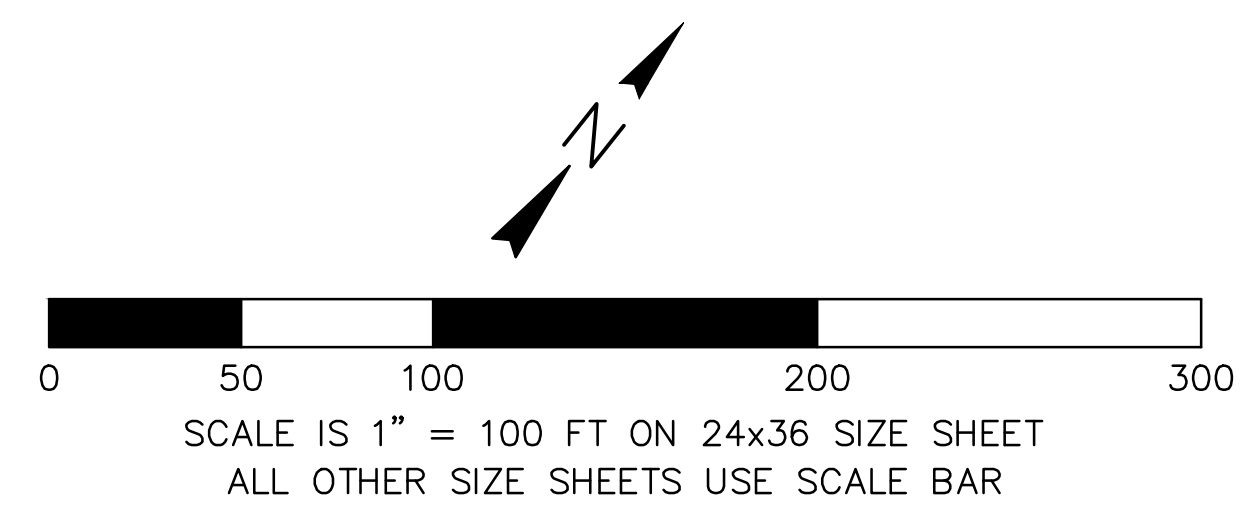
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WEP UPPER SAN JUAN RIVER	Sheet
SJR V RIVER HABITAT/FLOOD CAPACITY IMPROVEMENT PLAN UPPER SECTION	3
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SCALE 1"=200 FT	1/17/20



SAN JUAN RIVER VILLAGE RIVER IMPROVEMENT PLAN LOWER SECTION

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WEP UPPER SAN JUAN RIVER

SJRV RIVER HABITAT/FLOOD
CAPACITY IMPROVEMENT
PLAN
LOWER SECTION

SCALE 1"=200 FT

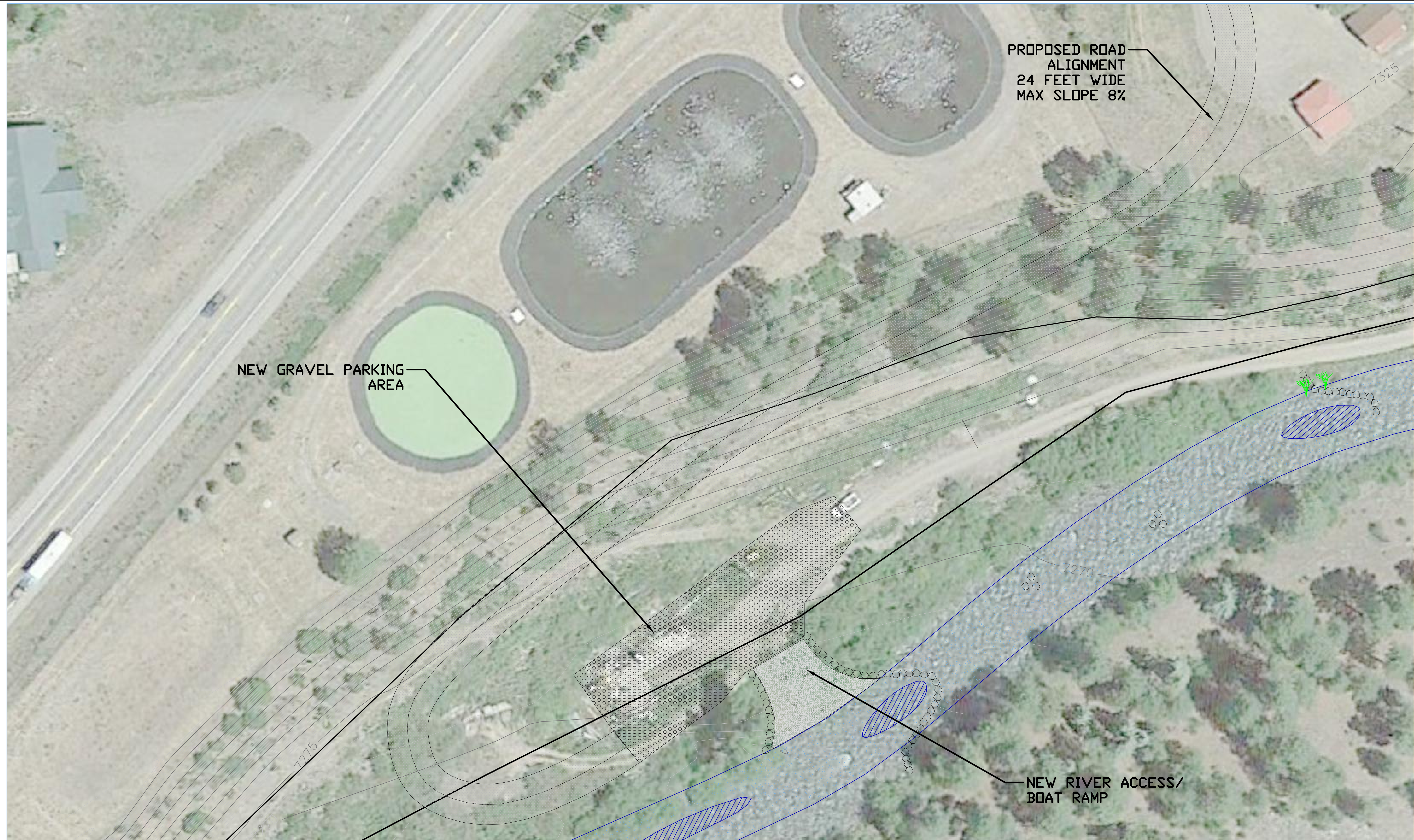
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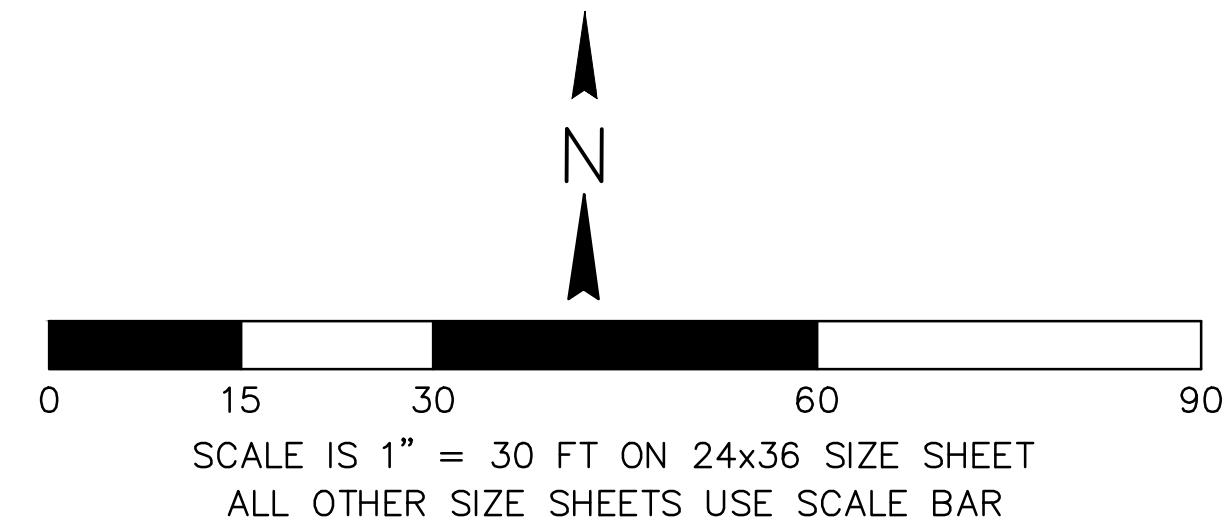
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RIVER ACCESS PLAN

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WEP SAN JUAN RIVER PROJECT		Sheet
PARK DITCH DIVERSION CONCEPT PLAN RIVER ACCESS		5
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SCALE 1"=30 FT		1/17/20

Upper San Juan River Improvement Project

Park Ditch Diversion Improvements	Materials	UNIT	Estimated Quantity	Estimated Cost per Unit	COST (\$)	
	Large Rocks 4-5 ft	Each	600	300	\$180,000.00	
	Concrete	Cubic Yards	150	200	\$30,000.00	
	Willow Transplants	EA	100	40	\$4,000.00	
	Large Rock Rip Rap	CY	150	90	\$13,500.00	
	Small Rock Rip Rap	CY	200	70	\$14,000.00	
	80 mil Geomembrane	SF	1200	3	\$3,600.00	
					Subtotal	\$214,000.00
	Construction					
	Remove and Dispose of existing diversion	Cubic Yard	1000	45	\$45,000.00	
Place Concrete around large boulders	Cubic Yard	150	300	\$45,000.00		
Place large boulders with excavator with thumb	Each	600	150	\$90,000.00		
Subgrade Prep	Cubic Yard	1000	10	\$10,000.00		
Install Membrane	Square Foot	1200	3	\$3,600.00		
Install Rock Rip Rap	Cubic Yard	500	65	\$32,500.00		
Channel shaping up and downstream	Cubic Yard	1000	10	\$10,000.00		
Dewatering Cost During Construction	Lump Sum	1	50000	\$50,000.00		
Transplant Willows	Each	100	40	\$4,000.00		
Mobilization	Lump Sum	1	10000	\$10,000.00		
				Construction Subtotal	\$300,100.00	
				Subtotal:	\$514,100.00	
				Final Design/Permitting /Environmental (15%)	\$77,115.00	
				Contingency (10%)	\$59,121.50	
				Total	\$650,336.50	

Upper San Juan River Improvement Project

San Juan River Village Phase I River Improvements (6000)	Materials	UNIT	Estimated Quantity	Estimated Cost per Unit	COST (\$)	
	Willow Transplants	EA	100	20	\$2,000.00	
					Materials Subtotal	\$2,000.00
	Construction					
	Channel shaping up and downstream	Cubic Yard	1500	8	\$12,000.00	
	Remove excess channel material	Cubic Yard	5000	10	\$50,000.00	
	Transplant Willows	Each	100	40	\$4,000.00	
					Construction Subtotal	\$66,000.00
					Subtotal:	\$68,000.00
					Final Design/Permitting /Environmental (15%)	\$10,200.00
				Contingency (10%):	\$7,820.00	
				Total	\$86,020.00	

Upper San Juan River Improvement Project

San Juan River Village Phase II River Improvements (6000)	Materials	UNIT	Estimated Quantity	Estimated Cost per Unit	COST (\$)	
	Large Rocks 5 ft	Each	1200	200	\$240,000.00	
	Medium size rocks 3-4'	Each	100	100	\$10,000.00	
	Large tree root wads	Each	20	150	\$3,000.00	
					Materials Subtotal	\$253,000.00
	Construction					
	Place large boulders with excavator with thumb	Each	1600	100	\$160,000.00	
	Remove excess channel material	Cubic Yard	5000	10	\$50,000.00	
					Construction Subtotal	\$210,000.00
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				Subtotal:	\$463,000.00	
				Final Design/Permitting /Environmental (15%)	\$69,450.00	
				Contingency (10%):	\$53,245.00	
				Total	\$585,695.00	

Upper San Juan River Improvement Project

River Access Improvements	Materials	UNIT	Estimated Quantity	Estimated Cost per Unit	COST (\$)	
	Large Rocks 5 ft	Each	50	200	\$10,000.00	
	Road Base (6" thick)	Cubic yards	650	50	\$32,500.00	
	Road Gravel 3/4 - (3" thick)	Cubic Yards	300	60	\$18,000.00	
	Boat Ramp 4" screened	Cubic Yards	50	50	\$2,500.00	
					Materials Subtotal	\$63,000.00
	Construction					
	Construct Access Road (25' wide)	Linear ft	1000	40	\$40,000.00	
	Place large boulders with excavator with thumb	Each	50	150	\$7,500.00	
	Clear and Grub (road and parking area)	Linear ft	1100	12	\$13,200.00	
Spread and compact base material	Linear ft	1100	10	\$11,000.00		
Spread and compact 3/4 gravel	Linear ft	1100	10	\$11,000.00		
Construct Boat Ramp	Lump sum	1	15000	\$15,000.00		
				Construction Subtotal	\$97,700.00	
				Subtotal:	\$160,700.00	
				Final Design/Permitting /Environmental (15%)	\$24,105.00	
				Contingency (10%)	\$18,480.50	
				Total	\$203,285.50	