APPENDIX A-1b: Design Report Addendum

ALISO CREEK MAINSTEM
ECOSYSTEM RESTORATION STUDY
Orange County, California

September 2017

US Army Corps
of Engineers

Orange County Public Works
Environmental Resources
Department

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ALISO CREEK ECOSYSTEM RESTORATION STUDY

ORANGE COUNTY, CALIFORNIA

TSP DRAFT

ADDENDUM 1 FOR

DESIGN APPENDIX

US Army Corps
of Engineers
Los Angeles District

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PART 1 Additional Measures:

1.1 Pacific Park Bypass

The existing alignment of the Aliso Creek aquatic habitat is interrupted by a 600 foot long concrete box culvert that passes under the Pacific Park Drive embankment fill. Introduction of a Pacific Park Drive Bypass Channel would provide aquatic wildlife connectivity at Pacific Park Drive embankment crossing.

1.1.1 Alternative PPB1, Rectangular Channel – This alternative would provide a permanent low flow stream diversion that routes the existing flow around the 600 foot culvert by utilizing an open rectangular channel and gravity flow. (see Figure 1)

1.1.2 Alternative PPB2, Trapezoidal Channel – This alternative would provide a permanent low flow stream diversion that routes the existing flow around the 600 foot culvert by utilizing an open trapezoidal channel and a pump system to provide continuous low flow water supply. (see Figure 2)

1.1.3 Alternative PPB3, Replace embankment and culvert with bridge. This alternative was ruled out due to an estimated cost of $25 million by the sponsor.

1.2 Wood Canyon Connection

The wood canyon creek tributary that feeds into Aliso Creek has lost aquatic connectivity due to major incision at Aliso Creek. The preferred Aliso Creek Mainstem restoration is to increase the invert elevation along most of Aliso Creek. Based upon the profile shown in Figure 3, the connectivity for aquatic species can benefit by removing the existing culverts and grading wood canyon creek invert for 700 feet along the existing creek.

1.2.1 Bridge - The road crossing that exists over the culverts would be replaced by a small bridge and the culverts removed. This would allow aquatic species and other wildlife safer and smoother passage under the bridge.

1.2.2 Culvert – The culverts would be replaced with new ones and road crossing restored

PART 2 Design Constraints:

2.1 Pacific Park Drive Bypass

2.1.1 Existing Hydraulics - The existing Pacific Park Drive embankment and culvert was designed and built to function as a detention basin. The proposed designs cannot alter the hydraulic function of the detention basin.

2.1.2 Existing Riding and Hiking Trail – Aliso Creek Riding and Hiking Trail parallels the existing creek and crosses through the Pacific Park Drive under a bridge that was constructed to allow room for the bike trail, equestrian trail and maintenance vehicles. These trails need to remain functional and continuous.

2.1.3 Existing Baseball fields – There are six baseball fields within the upstream detention basin area. Relocation of these fields are not allowed by the City and access and parking for these fields needs to be unchanged.

2.1.4 Existing water quality control structure – An existing drainage structure used to clean residual summertime water runoff from the adjacent subdivision must remain functional.

2.1.5 Utilities – Some minor utilities exist and can be relocated as necessary.

2.2 Wood Canyon Connection

2.2.1 Existing Hydraulics – The wood canyon creek existing alignment will require steepening and new gradient must prevent head cutting erosion from migrating upstream.

2.2.2 The existing roadway crossing over wood canyon must be maintained

2.2.3 Excavation needs to be minimized to prevent landslides or sloughing of adjacent steep slopes.

2.2.4 Minimize disturbance to existing creek vegetation.

PART 3 Design Features:

3.1 Pacific Park Drive Bypass

3.1.1 Alternative PPB1, Rectangular Channel – This design requires gravity flow which can only be achieved by redirecting the flows through the narrow passage under the bikeway bridge area (see Figure 1). The elevation of the bikeway is significantly higher than the creek's invert and therefore to achieve gravity flow with least amount of impact to the existing features requires minimizing the cut along the alignment. The narrow bikeway underpass must also allow for a future equestrian trail. Based upon the existing elevation differential, the only way to achieve minimal impacts is to raise the upstream invert as much as possible. This can be best done by providing a retention/drop structure to increase the water surface elevation. The maximum grade height for the drop structure is required to be set so that backwater impacts to the existing facilities are negligible. The new channel would reach a depth of 10 feet based on existing topography and factoring in these constraints. The typical cross section shown in Figure 1 shows the new channel with the bike trail and the equestrian trail and joint use of maintenance vehicles would use the bike trail. The permanent retention/drop structure would be required to allow for the backwater to pool up to reach the required elevation for gravity flow through the new alignment. This structure would be designed to permanently force low flows only along this new alignment and any higher flows to pass over the new drop structure and through the existing culvert. The new channel profile would be set to allow for gradients that are non-erosive for typical low flows so that a soft bottom vegetated invert could be established. There may be a need to have a few steeper fish friendly rock lined grades of 5% placed along the new alignment. Realignment of existing maintenance roads would be required with a few small channel bridge crossings.

3.1.2 Alternative PPB2, Vegetated Trapezoidal Channel - This design requires an alignment through the bikeway underpass similar to the PPB1 alternative. This design uses a vegetated trapezoid channel that minimizes impacts and eliminated concrete. The cut is minimized by creating a high point pool near the bikeway underpass and pumping the upstream creek water to the highpoint pool which allows for gravity flow down both sides of the trapezoidal riparian channel. This design may require a smaller retention basin to allow for proper gradients or a longer channel alignment with switchbacks can be used that could eliminate the structure.

3.2 Wood Canyon Connection

3.2.1 Bridge – The existing culvert will be removed and a new horizontal and vertical invert alignment established along wood canyon creek. The new alignment will be steeper and require approximately 700 linear feet to allow for a stable longitudinal slope. It is anticipated that some minor riprap grade control will be required to prevent head-cutting erosion from migrating upstream. Riparian habitat will be planted along the new invert channel. A small wooden bridge will be constructed to allow vehicle and bike traffic to pass over the new wood creek alignment. This measure will provide significant connectivity for aquatic species and wildlife.

3.2.2 Culverts - The existing culvert will be removed and a new culvert established that allows for improved drainage. The advantage of this design over the bridge design is there is less disturbance to the existing riparian habitat and less risk of erosion. This alternative will provide some improved connectivity over baseline but not as much as the bridge alternative. Riparian habitat will be planted along the new invert channel.

PART 4 Quantities and Costs

Table 1 Aliso Creek, Wood Canyon Bridge Measure

Aliso Creek, CA Feasibility Study - Cost Estimate Wood Canyon Bridge Measure					
Item	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Subtotals**
1	Wood Canyon Channel Transition				
	a. Excavation, Hauling, and Compact at Disposal [1.]	31,000	CY	$ 13.00	*$ 403,000.00*
	b. Clearing and grubbing	2	AC	$ 5,200.00	*$ 10,400.00*
	c. Landscaping & Irrigation*				
	i. Riparian Forest	1	AC	$ 8,000.00	*$ 8,000.00*
	ii. Riparian Shrubs	1	AC	$ 6,000.00	*$ 6,000.00*
	iii. Hydroseeding	2	AC	$ 2,000.00	*$ 4,000.00*
2	Prefabricated Bridge	1	LS	$ 125,000.00	*$ 125,000.00*
		Construction			***$ 556,400.00***
		Construction contingency 32.29%			**$ 179,661.56**
		Construction subtotal			**$ 736,061.56**
		PED (incl. EDC) 15.5%			**$ 114,089.54**
		Construction Mgmt. (S&A) 6.5%			**$ 47,844.00**
		Construction Cost			**$ 897,995.10**

[1.] 700 feet in length, avg. width 100, avg. cut 12$13 per CY from Tetra tech (excavate, load and haul, compact onsite disposal area

Table 2 Aliso Creek Pacific Park Re-Align Low Flow

Aliso Creek, CA Feasibility Study - Cost Estimate Aliso Creek Pacific Park Re-Align Low Flow					
Item	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Subtotals**
1	Clearing and grubbing [1.]	3	AC	$ 5,200.00	*$ 15,600.00*
2	Excavation [2.]	3,259	CY	$ 13.00	*$ 42,370.37*
3	Landscaping & Irrigation*				
	i. Riparian Forest [3.]	1	AC	$ 8,000.00	*$ 4,000.00*
	ii. Riparian Shrubs	2	AC	$ 6,000.00	*$ 9,000.00*
	iii. Hydroseeding	2	AC	$ 2,000.00	*$ 4,000.00*
	Irrigation included in landscaping				
4	Aquatic SpeciesTransition Structure	1	LS	$ 40,000.00	*$ 40,000.00*
5	Pumps(included piping, electrical, and controls)	2	LS	$ 40,000.00	*$ 80,000.00*
6	Relocate Bike Trail	350	L.F.	$ 100.00	*$ 35,000.00*
7	Install prefab creek crossings bridges 10' x 20'	5	EA	$ 8,000.00	*$ 40,000.00*
8	Pump intake structure	1	EA	$ 15,000.00	*$ 15,000.00*
9	Discharge Ponds	2	EA	$ 10,000.00	*$ 20,000.00*
10	5 foot retaining wall	650	LF	$ 75.00	*$ 48,750.00*
		Construction			**$ 353,720.37**
		Construction contingency 32.29%			**$ 114,216.31**
		Construction subtotal			**$ 467,936.68**
		PED (incl. EDC) 15.5%			**$ 72,530.19**
		Construction Mgmt (S&A) 6.5%			**$ 30,415.88**
		Construction Cost			**$ 570,882.75**

[1.] Avg. cut 2 feet 20 feet wide, 2200 feet in length

[2.] 11 acres from planimetering in microstation, $5200/acre from Tetra Tech files

[3.] From Derek Walker - Riparian Areas = $6K-$8K per acre.

January 2017

Figure 1 Pacific Park Drive Bypass Rectangular Channel

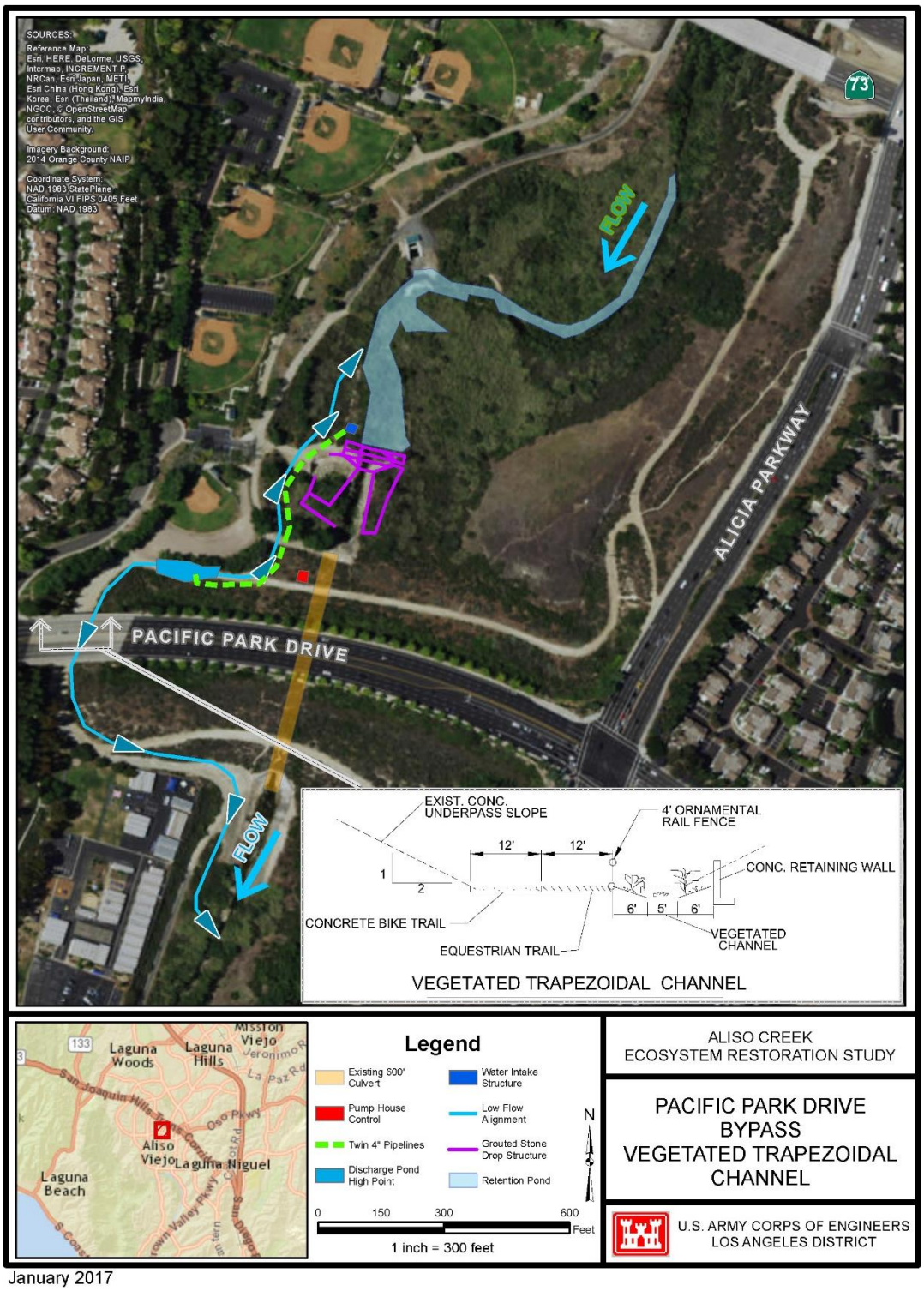

Figure 2 Pacific Park Drive Bypass Vegetated Trapezoidal Channel

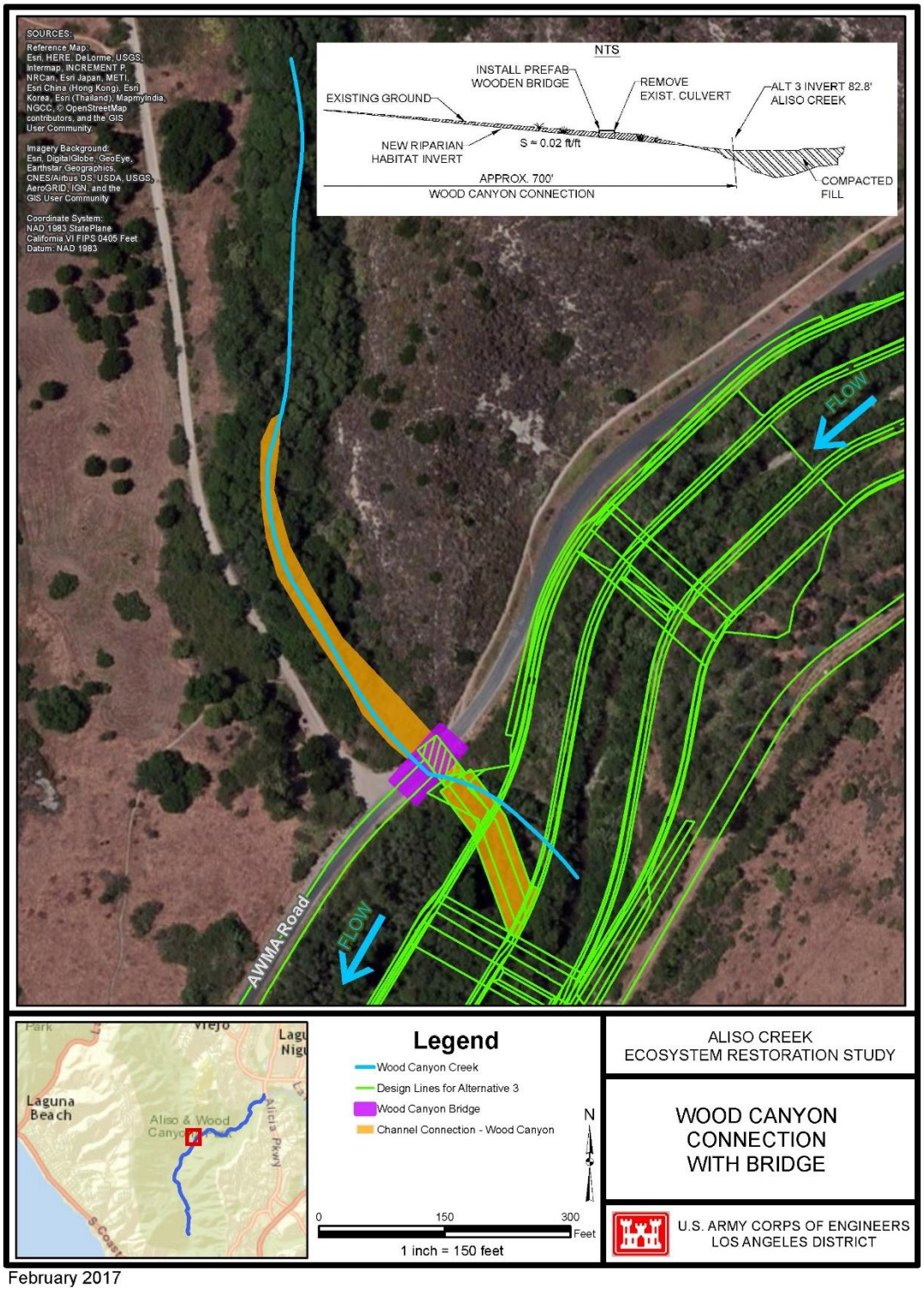

Figure 3 Wood Canyon Connection With Bridge

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