

ENVIRONMENTAL FLOW STANDARD RECOMMENDATION FOR LLANO RIVER AT LLANO

A. BBEST RECOMMENDATION

The Stakeholder Committee carefully considered the recommendations from the BBEST regarding instream flow protections at the Llano River at Llano location. That BBEST recommendation, as summarized in a table on page 2-98 of the BBEST Report, is reproduced immediately below.

Recommended Environmental Flow Regime

Llano River at Llano, USGS Gage 08151500, Recommended Environmental Flow Regime

	Winter	Spring	Summer	Fall
No-flow periods 1923-2009	0 periods Max duration: 0 days	2 periods Max duration: 67 days	5 periods Max duration: 31 days	0 periods Max duration: 0 days
Subsistence	55 cfs	55 cfs	55 cfs	55 cfs
Base Low	100 cfs	100 cfs	67 cfs	87 cfs
Base Medium	150 cfs	150 cfs	92 cfs	120 cfs
Base High	190 cfs	190 cfs	130 cfs	190 cfs
2 Pulses per season	Trigger: 390 cfs Volume: 2,500 af Duration: 13 days	Trigger: 1,800 cfs Volume: 8,500 af Duration: 10 days	Not applicable	Trigger: 370 cfs Volume: 1,600 af Duration: 8 days
1 Pulse per season	Trigger: 1,100 cfs Volume: 6,800 af Duration: 16 days	Trigger: 4,800 cfs Volume: 23,200 af Duration: 13 days	Trigger: 560 cfs Volume: 2,600 af Duration: 9 days	Trigger: 1,400 cfs Volume: 6,300 af Duration: 11 days
1 Pulse per year	Trigger: 9,100 cfs Volume: 46,100 af Duration: 18 days			
1 Pulse per 2 years (Overbank)	Trigger: 17,400 cfs Volume: 89,300 af Duration: 22 days			
1 Pulse per 5 years (Overbank)	Trigger: 41,100 cfs Volume: 214,000 af Duration: 27 days			
Channel Maintenance Flow	A quantity of flow in addition to flows provided by subsistence, base, pulse and overbank flows proposed here would be needed to maintain channel morphology. Analysis by the BBEST at 3 sites across the basins (upper Colorado, lower Colorado, and Lavaca) and within the bounds of the analysis in this report indicates a range of average annual flows on the order of 77-93% of the average annual flow from 1940-1998 with the variability characteristic of the period of record maintains existing channel morphology. The specific flow needed to maintain the channel and its ecological functions will need to be determined on a project and site-specific basis.			
Long-term Engagement Frequencies	Base-high 25%, Base-medium 50%, Base-low 25%, Subsistence 100%, and Pulses 100%. The goal of the engagement frequencies is to produce an instream flow regime that mimics natural patterns by providing the target base flows at frequencies which closely approximate historical occurrences.			

cfs = cubic feet per second
af = acre-feet

B. STAKEHOLDER COMMITTEE CONSIDERATION OF BBEST RECOMMENDATION

As discussed further below, the Committee generally decided that, to the extent reasonably possible, it would include the basic components of the BBEST flow regime recommendations in the stakeholder committee recommendations. However, based on a balancing of various factors, the Stakeholder Committee recommendations do vary from the BBEST recommendations in a number of ways, as described below.

The Stakeholder Committee, with the assistance of the BBEST, evaluated the availability of unappropriated water at this location and found it to be extremely limited. An overview of availability of unappropriated water, by location, is included as Appendix _____. Generally, water is available at this location only during brief periods of very high flows. Because water availability is very similar throughout the Upper Colorado River Basin, the Committee, again with the assistance of the BBEST, evaluated a hypothetical aquifer storage and recovery project at a single location upstream of the Highland Lakes in order to gain a better understanding of the potential impact of recommended flow standards on water availability in this portion of the basin. That evaluation is discussed in the section of the report dealing with environmental flow standard recommendations for the Pedernales River near Johnson City. The evaluation indicated that imposition of the full flow regime, as recommended by the BBEST, would have little impact on water availability.

At this location, the Committee adjusted the subsistence flows downward from the TCEQ critical low flow levels recommended by the BBEST to the 95th percentile flows. The Committee considered that adjustment based on observations by some individual members that the critical low flow values at various locations seemed quite high when compared to conditions commonly observed. The Committee sought feedback from the BBEST about the implications of that adjustment and, specifically, about the potential impact on the likelihood of having flow recommendations that would protect a sound ecological environment. The BBEST indicated that, if the Stakeholder Committee used an implementation approach that allowed diversions down to, but not lower than, subsistence levels only during the hydrological condition designed to represent the driest 5% of the time and only at times during that hydrological condition when flows were below the corresponding dry base flow level, those adjusted subsistence levels were likely to support a sound ecological environment. The Committee decided to recommend the use of the 95th percentile flow levels with the implementation approach as suggested by the BBEST.

The Committee also adjusted some of the pulse flow values recommended by the BBEST. Specifically, the one-per-two-year and the one-per-five-year pulse flows, as recommended by the BBEST, were identified as overbank flows. As discussed above, in the section of the report dealing with overbank flows, although the Stakeholder Committee believes it is critically important that overbank flows continue to occur, the Committee decided not to recommend flow conditions to protect overbank flows. Accordingly, the Stakeholder Committee requested input from the BBEST in evaluating pulse flow levels that would achieve as much of the value of the BBEST recommendations for pulse flows above overbank levels as could be reasonably achieved with a peak flow that does not produce overbank conditions. Based on that input, the Stakeholder Committee recommendations for one-per-two-year and the one-per-five-year pulse flows differ from the BBEST recommended levels as follows.

The one-per-two-year pulse trigger value was adjusted downward from the 17,400 cfs level recommended by the BBEST to 15,000 cfs in order to define a pulse flow level that is not an overbank flow. The other

aspects of the one-per-two-year pulse flow continue to reflect the BBEST recommendations. The Stakeholder Committee decided not to recommend a one-per-five-year pulse or any pulse with a magnitude larger than the one-per-two-year pulse, as adjusted.

The BBEST recommendations also included an unquantified channel maintenance flow component for this location. In the absence of more definitive information and after significant discussion, the Stakeholder Committee decided not to include specific recommendations for addressing the channel maintenance issue at this location.

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C. CONSENSUS STAKEHOLDER COMMITTEE RECOMMENDATION FOR ENVIRONMENTAL FLOW STANDARD

USGS Gage 08151500, Llano River at Llano

Season	Hydrologic Condition	Subsistence	Base	Small Pulse (2 per season)	Large Pulse (1 per season)	Annual Pulse*
Winter	Severe	44 cfs	100 cfs	Trigger: 390 cfs Volume: 2,500 af Duration: 13 days	Trigger: 1,100 cfs Volume: 6,800 af Duration: 16 days	Trigger: 9,100 cfs Volume: 46,100 af Duration: 18 days
Winter	Dry	N/A	100 cfs			
Winter	Average	N/A	150 cfs			
Winter	Wet	N/A	190 cfs			
Spring	Severe	35 cfs	100 cfs	Trigger: 1,800 cfs Volume: 8,500 af Duration: 10 days	Trigger: 4,800 cfs Volume: 23,200 af Duration: 13 days	
Spring	Dry	N/A	100 cfs			
Spring	Average	N/A	150 cfs			
Spring	Wet	N/A	190 cfs			
Summer	Severe	3 cfs	67 cfs	N/A	Trigger: 560 cfs Volume: 2,600 af Duration: 9 days	
Summer	Dry	N/A	67 cfs			
Summer	Average	N/A	92 cfs			
Summer	Wet	N/A	130 cfs			
Fall	Severe	20 cfs	87 cfs	Trigger: 370 cfs Volume: 1,600 af Duration: 8 days	Trigger: 1,400 cfs Volume: 6,300 af Duration: 11 days	
Fall	Dry	N/A	87 cfs			
Fall	Average	N/A	120 cfs			
Fall	Wet	N/A	190 cfs			

cfs = cubic feet per second

af = acre-feet

N/A = not applicable

*Although not necessarily imposed as a permit limit, compliance with pulse flow standards for pulses larger than the annual pulse, as set out in the table immediately below, shall be ensured prior to approval of a permit or permit amendment to which that requirement applies as described above in Section ____.

Llano River at Llano; Pulses Larger Than Annual Pulse					
Frequency	Trigger	Volume	Duration	Ten Percent of Trigger Value	On-channel Impoundment capacity
1 per 2 years	15,000 cfs	89,300 af	22 days	1,500 cfs	4,465 af

The value of a 1-per-5-year pulse with a trigger of 41,100 cfs, a volume of 214,000 af, and a duration of 27 days is recognized, but no permit review or conditions to protect such a pulse are recommended.