

## Bonneville Second Powerhouse Orifice Improvements Study, Engineering Documentation Report

**Table 6-1. Alternatives Matrix**

**B2 Orifice Improvements - Alternatives Matrix (17 August 2011 FFDRWG comments included in red)**

		Weighting Factors - Used on Top 5 of Initial Scores =													
		3	2.5	2	1	1	1	1	1	1		Top 6 Alternatives	Additional Rated Item - Weighting = 1	Top 3 Alternatives	
Alternatives		Rated Item	Rated Item	Rated Item	Rated Item	Rated Item	Rated Item	Rated Item	Rated Item	Rated Item		Rated Item	Rated Item		
Concept	No.	Description	Orifice Ring Size	Observable Passage Route	Fish Condition With Modification	Alignment With DSM Criteria	Technical Viability	O & M Cost	Ease of Testing Proof of Concept	Construction Timing	Comments	Total Score for all Alternatives - No Weighting	Construction Cost (Added to top 5 scored alternatives only)	Top 5 Total Scores With Construction Cost Added and Weighting Factors Applied	
<b>Alternatives That Allow Observable Passage Route</b>															
Aerate Free Jet to Provide Observable Passage Route Downstream of Orifice	1	Add Compressed Air to Orifice Tube	13"	3	3	3	2	0	3	3	Ability to provide and maintain necessary air would be impractical due to space requirements, O&M costs & risk of compressor outage	17	1	31.5	
	2	Vent Orifice Tube Using Existing Light Tube Ports	13"	2	2	3	2	3	3	3	Not likely enough air could be pulled in through light tubes based on field tests	18	3	31	
	3	Re-Core Orifice Tube to Larger Size	13"	3	4	3	3	3	3	1	Larger orifice ring size with larger diameter tube preferred by several members of FFDRWG - more similar to original design ring to tube diameter ratio and less potential for debris blockage	20	0	35	
Aerate Free Jet to Provide Observable Passage Route Downstream of Orifice + Add More Opportunity for Exposure With Additional Orifices	4	Reduce Orifice Ring Size <= 12" & Open Additional Orifices as Needed	<= 12"	3	3	2	4	2	3	3	Possibly more debris blockage; Concern with increased adult fallback injury with smaller orifice rings	20	2	34.5	
	5	Increase Capacity of DSM, Reduce Orifice Ring Size <= 12" & Open Additional Orifices as Needed and/or Add Gates/Rings to Additional S. Entrances	<= 12"	3	3	2	3	2	3	3	Possibly more debris blockage; Concern with increased adult fallback injury with smaller orifice rings	19	2	33.5	
Provide Observable Passage Route Upstream of Orifice	6	Cameras in Gatewell for Visual Inspection Upstream in Conjunction With Alt. # 9	13"	4	3	3	1	1	3	2	Large O&M cost and interference with existing fish operations, therefore not included in top 5	17	x	x	
	7	Pressure Transducers Across Orifice Openings in Conjunction With Alt. #9	13"	3	3	3	1	1	2	2	Interest in full flow option, but concern with debris jamming inside and whether debris blockage at entrance could be "seen"	15	x	x	
	8	Sonic/Acoustic Sensors Across Orifice Openings in Conjunction With Alt. # 10	13"	3	2	3	1	1	2	2	Would require full pipe/tube flow in conjunction with Alt #10	14	x	x	
<b>Alternatives That Reduce jet Impingement in Conjunction With Alternatives 6-8</b>															
Reduce Jet Impingement in Conjunction With Alts #6-7	9	Tube Insert in Bottom to Support Bottom of Jet to the full length of Tube	-	x	x	x	x	x	x	x	As Alts 6-8 have lowest Ratings - These add-on alternatives are not ranked.				
Reduce Jet Impingement in Conjunction With Alt. # 8	10	Rounded Entrance Tube Insert Flowing Full in conjunction w/ Alt. # 8 only	-	x	x	x	x	x	x	x	As Alt #8 has lowest Rating - This add-on alternative is not ranked. Interest in full flow option, but concern with debris jamming inside and whether a debris blockage at entrance could be "seen"				
<b>Alternatives That <u>will</u> be Included With any Chosen Alternative</b>															
Reduce Potential for Jet Impingement in Conjunction With Chosen Alternative	11	Reduce Effective Orifice Tube Length by Removing Wall Concrete at Exit For ~17 N. Orifices in Units 12-15 as well as all working S. Orifices.	-								Field assessments indicate existing orifice exits with this installation provide better jet hydraulics in S. Orifices especially for low TW. Assumed repositioning existing gates would be extension of current as built design and ancillary to chosen alternative.	x	x	x	
Increase Fish Attraction in Conjunction With Chosen Alternative	12	Replace Orifice Rings with Light Emitting Orifice Rings	-								Testing at McNary Dam in 2010 showed high potential for attraction and deemed ancillary to chosen alternative.	x	x	x	
<b>NOTES:</b>			Alternatives 9-10 not considered viable alternatives as they would only be used in conjunction with alternatives 6-8 that had the lowest ratings.								<b>Criteria for Ranking:</b>				
	<b>X</b>		No ratings for these alternatives as they are paired with alternatives 6 - 8 which were ranked low.								<b>General Scoring:</b>				
			Top 6 Scores for 7 rating categories (no weighting or construction cost)								Poor = 1				
			Of the Top 6 Scores: Top 3 Scores for 8 rating categories and weighting (added construction cost)								Fair = 2				
			Ancillary features to be included in chosen alternative								Good = 3				
	Concern with injury		Comments from FFDRWG, 17 August 2011								Excellent = 4				
											<b>Cost Scoring:</b>				
											high = 0				
											Medium-High = 1				
											Medium = 2				
											Low-Medium = 3				
											Low = 4				