ATTACHMENT 2

North Fork White River Raw Water Quality, IHS

The following is an excerpt from the “Amendment to the Final Feasibility Study, Water Supply Facilities for the Greater Whiteriver Area, Indian Health Service, October 2004”, included in the “Preliminary Engineering Report for the Whiteriver Surface Water Diversion and Treatment Facility, Indian Health Service, June 2005”. Also included are the raw water testing results sampled just north of the current diversion site.

3.0 RAW WATER QUALITY (NORTH FORK WHITERIVER)

Because raw water quality can have a significant impact on the treatment capability of the treatment facility, raw water quality is a primary design consideration for selection of treatment types. Several raw water quality parameters were considered when evaluating the treatment types including turbidity, natural organic matter (NOM) as measured by TOC, alkalinity, and Cryptosporidium. Historical raw water quality data was compiled and a present raw water quality-testing plan was developed and commenced. A comprehensive summary of testing results to date is included in Appendix 1, and the more applicable data are repeated herein:

3.1 Turbidity:

Turbidity is a measure of the refraction of light caused by particulate matter in water. Turbidity is the common measure of water quality used on the effluent side of a water treatment facility. Frequently, total suspended solids (TSS) is used as the measure of the source water quality of particulates measured in mg/l. Historical seasonal turbidity data for a 20 month period of data collected at Lower Log Road on the North Fork (upstream of Alchesay Fish Hatchery) by Wayne Curry between 1982 and 1984 showed the results shown in Table 2.

Table 2: Historical North Fork Whiteriver Turbidity Concentrations

Flow Date	Discharge (cfs)	Suspended Sediment (mg/l)
12/3/1982	28	9
1/19/1983	53.4	4
2/7/1983	60.1	9
3/6/1983	205	238
4/4/1983	356	17
5/4/1983	529	19
6/18/1983	192	9
7/7/1983	70.7	7
8/5/1983	84.0	22
9/7/1983	62.1	5
11/11/1983	55.5	2
12/9/1983	68.6	2
2/8/1984	46.8	7
4/11/1984	149	7
6/19/1984	32.5	8
7/25/1984	84.3	23
8/28/1984	131	315

Recent raw water turbidity quality data collection of the proposed source commenced in late 2003. The results to date are shown in Table 3.

Table 3: Recent North Fork Whiteriver Turbidity Concentrations

Date	TSS	NTU
11/10/2003		.46
2/23/2004	ND	.3
3/2/2004	ND	2.5
4/6/2004	ND	1.9
5/4/2004	11	3.4
6/1/2004	<5	1.3
7/15/2004		254
8/3/2004	9	20
9/7/2004	9	7.3

3.2 TOC

The results of the data indicate that the water is of a low organic concentration (Natural Organic Matter (NOM)) as measured by TOC. TOC requirements for source water were discussed under section 2.1.2, Stage 1 D/DBPR. Results of TOC and alkalinity are shown in Table 4.

Table 4: Recent North Fork Whiteriver TOC and Alkalinity

Date	TOC (mg/l)	Alkalinity (mg/l)
11/10/2003		130
2/23/2004	.9	114.6
3/2/2004	1.5	105.9
4/6/2004	2.6	51.7
5/4/2004	2.3	56.3
6/1/2004	1.7	93.9
8/3/2004	1.5	143.9
9/7/2004	2.5	115.6

The average annual running TOC concentration is less than 2.0, hence the Enhanced Coagulation requirements for TOC reduction in conventional plants do not apply to the North Fork Whiteriver based upon the results received thus far.

3.3 Cryptosporidium:

If promulgated, the proposed LT2ESWTR will require testing of Cryptosporidium as discussed above under section 2.2.1 titled Proposed Safe Drinking Water Act Rules, LT2ESWTR. The proposed rule will require that the laboratory be certified by the EPA for testing, and a list of laboratories with approval pending by the EPA is listed on the web. We selected the nearest lab from the list, CH Diagnostics and Consulting Services, and are following their protocol for testing in compliance with the proposed rule. Our intent would be to submit the data to EPA for acceptance under the “Grand-fathering” section of the rule once the rule is promulgated and we have completed the testing. Testing for Cryptosporidium in conformance with the proposed rule commenced in March 2004. To date no Cryptosporidium have been detected from the North Fork Whiteriver source water.

5.1 Raw Water Quality Summary

Generally, the raw water quality is consistently high throughout the year with the exception of the springtime when the snowmelt occurs, and during the monsoon season when thunderstorms occur along with large rain showers that cause high turbidity spikes. The historical data reviewed and seasonal data collected to date predict spikes in the turbidity during the higher river flow seasons typically associated with spring runoff and the monsoon seasons. The spring runoff season is a function of the winter precipitation and is estimated at between 1-2 months in March and April. The monsoon season and associated high turbidity typically occurs for a period of approximately 6 weeks beginning in July.

Cryptosporidium oocysts have not been detected in sampling to date. Sampling will continue to determine the 2-year average and confirm the proposed LT2ESWTR bin requirement of the proposed facility. Presently the assumption is that the average 2 year Cryptosporidium concentrations will be less than the .075 oocysts per liter, resulting in Bin 1 design. If this assumption does not prevail during the testing period, then higher-level treatment will be required in conjunction with higher bin levels under the proposed LT2ESWTR.

Whiteriver Water Treatment Plant

Raw Water Testing Results

								Storm		Storm									Storm														
	L. Lacher	J. Garcia	J. Garcia	J. Garcia	J. Garcia	J. Garcia	J. Garcia	J. Garcia	J. Garcia	M. Stover	J. Garcia	J. Garcia	J. Garcia	J. Garcia	J. Garcia	J. Garcia	J. Garcia	J. Garcia	M. Stover	J. Garcia	J. Garcia	J. Garcia	J. Garcia	J. Garcia	J. Garcia	J. Garcia	J. Garcia	J. Garcia	J. Garcia	J. Garcia	J. Garcia	J. Garcia	J. Garcia
	11/10/2003	2/3/2004	3/2/2004	4/6/2004	5/4/2004	6/1/2004	7/6/2004	7/15/2004	8/3/2004	8/4/2004	9/7/2004	9/21/2004	10/5/2004	11/2/2004	12/6/2004	1/4/2005	1/12/2005	2/8/2005	2/13/2005	3/8/2005	4/5/2005	5/3/2005	6/7/2005	7/5/2005	8/2/2005	8/16/2005	9/6/2005	10/4/2005	11/8/2005	12/6/2005	1/3/2006	2/7/2006	3/7/2006
Parameter	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Conductivity (umhos/cm)		363	329	146	172.7	281	537		454		377		428	334	311	145.8		208		100.3	125.8	110	160	350	330		280	410	420	600	420		
Total Dissolved Solids (TDS) (mg/L)	256.0	231.0	201.0	99	113	187	308		290		216		286	201	204	176		150		130	86	90	100	220	200		180	250	270	380	250		
Total Suspended Solids (TSS)		ND	ND	ND	11	<5	<5		9		9		6	ND	ND	304		ND		10	26	11	ND	ND	18		27	ND	ND	ND	ND		
Turbidity (NTUs)	0.46	0.3	2.5	1.9	3.4	1.3	1.4	254	20	17.6	7.3		2.7	3.1	1.7	217		8.9	61	7.3	5	2.9	2	1.3	12		14	3	ND	ND	2.8		
Alkalinity (mg/L)	130.3	114.6	105.9	51.7	56.29	93.9	157		143.5		115.6		132.2	103.1	97.9	64.5		70		58	44	42	54	120	110		94	130	130	200	130		
Color (c.u.)		5	10	15	10	10			15		15		10	10	10	1		20		20	20	15	15	10			15	8		2	5		
pH	7.7	7.4	7.7	7.9	7.8	8.5	7.9		7.7		8		8.2	7.9	7.8	7.6		7.7		7.7	7.5	7.6	7.6	8.1	8.2		8.2	8.2	8	8.1	8		
TOCs (mg/L)		0.9	1.5	2.6	2.3	1.7	1.5		1.5		2.5		0.9	2.4	1.6	15		3.6		3.6	2.9	2.7	2.3	1.3		3.8	2.5	2	1.5	1.3	0.8		
Calcium (mg/L)	140	52.89	55.95	17.97	22.45	45.85	82.35		71.33		67.06		65.35	44.09	44.64	30.82		26.58		20.22	12.92	14	19	47	42		34	49	53	89	64		
Magnesium (mg/L)	ND	10.95	9.5	4.25	4.76	8.92	15.52		13.22		12.28		12.13	9.12	8.76	4.66		5.95		5.31	3.43	ND	ND	9.7	9.9		7.9	12	14	34	16		
Hardness (mg/L)	140	177.13	178.85	62.37	75.66	151.22	269.54		232.55		218.02		213.3	147.65	147.54	96.15		90.87		72.36	46.38	35	47	160	150		120	170	190	360	230		
Ammonia (mg/L)		ND	0.394	ND	0.127	ND	<.125		ND		ND		ND	ND	ND	ND		ND		ND	ND	ND	ND	ND	ND		ND	ND	ND	0.146	ND		
Total Coliform (CFU/100mL)	1	0	90	6	0	60	80		0		0		0	0	3	0		0		0	0		1	0	0		4	0	0	0	48.9		
Fecal Coliform	1	<10	<10	<10	<10	<10	<10		10		<10		<10	<10	10	130		<10		<10	20		ND	10	120		80	ND	ND	10	ND		
eColi		<10	<10	<10	<10	<10	<10				<10		<10	<10				<10		<10				20.1			120.1	12	14.6	3.1	7.5		
Temperature (in field) (ºC)	7.2	1.1	3.3	5.6	11.1	15.6	15.6		16.7		21.9		21.4	3	-3.3	2.2		3.3		3.3	4.4	7.8	12.2	17.8	19.4		19.4	15.6	7.2	1.67	6.1		
Cryptosporidium EPA 1623 (#/L)			0	0	0	0	0		0		0		0.1	0	0.2	retaken	0.2	0.09		0	0.09	0	0				0.09	0.2	0.09	0.09	ND	ND	ND
Giardia (#/L)			2	ND	0.3	0.7	0.5		2		2		3	4	3	retaken	0.5	0.7		0.4	0.20	0	0.3				ND	3	3	3	0.4	3	0.5
TTHM Formation Potential Test																																	
Chloroform (ug/L)		54.7			216				147					139				53.1				401				340			15.9				
Bromoform (ug/L)		ND			ND				ND					ND				ND				ND				ND			ND				
Bromodichloromethane (ug/L)		6.1			9				9					6				2.8				7				11.7			1.4				
Dibromochloromethane (ug/L)		ND			0.8				ND					ND				ND				ND				ND			ND				
Total THMs (ug/L)		60.8			226				156					145				55.9				408				352			17.3				
HAA9 Formation Potential Test																																	
Bromochloroacetic acid (ug/L)		ND			ND							ND		1.6				ND				2.2				2.4			4.6				
Dibromoacetic acid (ug/L)		ND			ND							ND		8.7				ND				ND				ND			ND				
Dichloroacetic acid (ug/L)		40.9			100							130		ND				34.5				76.2				19.9			15.7				
Monobromoacetic acid (ug/L)		ND			ND							ND		ND				ND				ND				ND			ND				
Monochloroacetic acid (ug/L)		ND			5.7							ND		ND				ND				2.8				3.3			ND				
Trichloroacetic acid (ug/L)		43.9			120							230		15.7				46.3				160				5.9			2.8				
Total HAAFP (ug/L)		84.8			230							370		26				80.8				240				31.5			19.1				
HAA5 (ug/Ll)		56.53			113.93									16.80				53.87				119.75				15.15			12.53				
Chlorine Demand (mg/L)														16				10				<1.0				18			39				
TOX (Total Organic Halides) (ug/L)		6.3			ND				ND					13				8.3				17			0	ND							
Langlier Index	-0.4	-0.50		-0.69																													
Metals & Inorganics:																																	
Antimony	ND			ND																													
Arsenic	ND			ND																													
Barium	ND			ND																													
Beryllium	ND			ND																													
Cadmium	ND			ND																													
Chromium	ND			ND																													
Cyanide (mg/L)	ND			ND																													
Fluoride (mg/L)	0.2			ND																													
Mercury	ND			ND																													
Nickel	ND			ND																													
Selenium	ND			ND																													
Sodium	7.60			3.53																													
Thallium	ND			ND																													
Copper	ND			0.06																													
Cyanide																																	
Nitrate	ND			0.14																													
Nitrite	ND			ND																													
Sulfate	77.3			16.2																													
Lead	ND			ND																													
Asbestos				ND																													
Dioxin (pg/L)				10																													
Radiological Analyses:																																	
Gross Alpha (pCi/L)	1.3+/-0.6			0.6+/-0.4																													
Gross Beta (pCi/L)				<3.0																													
Radium 226 (pCi/L)				<0.3																													
Radium 228 (pCi/L)				<0.4																													
Uranium (pCi/L)				<0.6																													
Perchlorate (ug/L)				ND																													
Radon (pCi/L)				<17																													
Volatile Organic Compounds (VOCs) (Method 524.2)	ND			ND																													
Synthetic Organic Compounds (SOCs)																																	
Microextractables (Method 504.1)	ND			ND																													
Pesticides & PCBs (Method 507, Method 508)	ND			ND																													
Herbicides (Method 515.1)	ND			ND																													
Semivolatiles (Method 525.2)	ND			ND																													
Carbamates (Method 531.1)	ND			ND																													
Glyphosphate (Method 547)	ND			ND																													
Endothall (Method 548.1)	ND			ND																													
Diquat (Method 549.2)	ND			ND																													
Bromate				ND																													
Bromide				ND																													

ND = non detectable