

CALCULATIONS OF NEW MEXICO WATER QUALITY-BASED EFFLUENT LIMITATIONS

NMAC 20.6.4. **2005** (Do Not Change This Field)

Calculations Specifications:

Excel **Revised as August, 2008**

Prepared By:

LEG 4-Feb-09 Run #2 - dissolved aluminum

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STEP 1: REFERENCE IMPLEMENTATION PROCEDURES
INPUT FACILITY AND RECEIVING STREAM DATA
LIST SOURCE OF DATA INPUT

FACT SHEET APPENDIX

IMPLEMENTATION PROCEDURES

The State of New Mexico Standards for Interstate and Intrastate Surface Waters are implemented in this spread sheet by using procedures established in the "Implementation Guidance for State of New Mexico Standards for Interstate and Intrastate streams", May 5, 1995.

FACILITY

Permittee	AZTEC Drinking Water Plant	
NPDES Permit No.	NM0028762	
Outfall No.(s)	001	
Plant Effluent Flow (MGD)	0.33	For industrial and federal facility, use the highest monthly average flow
Plant Effluent Flow (cfs)	0.5115	for the past 24 months. For POTWs, use the design flow.

RECEIVING STREAM

DATA INPUT

Receiving Stream Name	Lower Animas Ditch
Basin Name	San Juan River
Waterbody Segment Code No.	20.6.4.403
Is a publicly owned lake or reservoir (enter "1" if it's a lake, "0" if not)	0
Are acute aquatic life criteria considered (1= yes, 0= no) (MUST enter "1" for 2005 Standards)	1
Are chronic aquatic life criteria considered (1= yes, 0=no)	1
Are domestic water supply criteria considered (1= yes, 0=no)	0
Are irrigation water supply criteria considered (1= yes, 0=no)	1
Livestock watering and wildlife habitat criteria applied to all streams	

USGS Flow Station

WQ Monitoring Station No.	09363500	
Receiving Stream TSS (mg/l)	7.61	For intermittent stream, enter effluent TSS
Receiving Stream Hardness (mg/l as CaCO ₃)	221	For intermittent stream, enter effluent Hardness (If no data, 20 mg/l is used)
Receiving Stream Critical Low Flow (4Q3) (cfs)	183	Enter "0" for intermittent stream and lake.
Receiving Stream Harmonic Mean Flow (cfs)	426	Enter harmonic mean or modified harmonic mean flow data
Avg. Water Temperature (C)	9.1	
pH (Avg)	8.45	
Fraction of stream allowed for mixing (F)	1	Enter 1, if stream morphology data is not available or for intermittent streams.

Fraction of Critical Low Flow

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STEP 2: INPUT AMBIENT AND EFFLUENT DATA
CALCULATE IN-STREAM WASTE CONCENTRATIONS

DATA INPUT

Input pollutant geometric mean concentration as micro-gram per liter (ug/l or ppb)
unless other unit is specified for the parameter.

Effluent value reported as "< detection level" (DL) but the DL is greater than MQL, input "1/2 DL" for calculation.

Effluent value reported as "< detection level" (DL) and the DL is smaller than MQL, input "0" for calculation.

If a less than MQL value is reported, input either the reported value or "0" for calculation.

The following formula is used to calculate the Instream Waste Concentration (Cd)

(Please refer to State Implementation Guidance for details)

$$Cd = [(F \cdot Qa \cdot Ca) + (Qe^2 \cdot 1.13 \cdot Ce)] / (F \cdot Qa + Qe)$$

Where:

Cd = Instream Waste Concentration

F = Fraction of stream allowed for mixing (see NM Implementation Guidance)

Ce = Reported concentration in effluent

Ca = Ambient stream concentration upstream of discharge

Qe = Plant effluent flow

Qa = Critical low flow of stream at discharge point expressed as the 4Q3 or harmonic mean flow for human health criteria

The following formula convert metals reported in total form to dissolved form if criteria are in dissolved form

(Please refer to State Implementation Guidance for details)

$$Kp = Kpo \cdot (TSS)^a$$

Kp = Linear partition coefficient; Kpo and a can be found in table below

$$C/Ct = 1 / (1 + Kp \cdot TSS \cdot 10^{-6})$$

TSS = Total suspended solids concentration found in receiving stream (or in effluent for intermittent stream)

$$\text{Total Metal Criteria (Ct)} = Cr / (C/Ct)$$

C/Ct = Fraction of metal dissolved; and Cr = Dissolved criteria value

Total Metals	Total Value	Stream Linear Partition Coefficient					Lake Linear Partition Coefficient				
		Kpo	alpha (a)	Kp	C/Ct	Dissolved Value in Stream	Kpo	alpha (a)	Kp	C/Ct	Dissolved Value in Lake
Arsenic	0	480000	-0.73	109101.4287	0.546369902	0	480000	-0.73	109101.4287	0.546369902	0
Chromium	0	3360000	-0.93	508922.3766	0.205216636	0	2170000	-0.27	1254543.939	0.094812978	0
Copper	3.04	1040000	-0.74	231637.4062	0.361956797	1.10034866	2850000	-0.9	458773.8644	0.222654216	0.67686882
Lead	0	2800000	-0.8	552141.3921	0.192241295	0	2040000	-0.53	695819.0255	0.158851623	0
Nickel	3.68	490000	-0.57	154101.4857	0.460254216	1.69373552	2210000	-0.76	472650.2964	0.217539385	0.80054494
Zinc	19.6	1250000	-0.7	301953.9765	0.303226044	5.94323045	3340000	-0.68	840242.9944	0.135240235	2.65070861

The following formular is used to calculate hardness dependent criteria

(Please refer to State Water Quality Standards for details)

			Dissolved	
			WQC (ug/l)	
Cadmium (D)	Acute	$e(1.0166[\ln(\text{hardness})]-3.924)*CF1$	4.350828315	$CF1 = 1.136672 - 0.041838*\ln(\text{hardness})$
	Chronic	$e(0.7409[\ln(\text{hardness})]-4.719)*CF2$	0.426521819	$CF2 = 1.101672 - 0.041838*\ln(\text{hardness})$
Chromium (D)	Acute	$0.316 e(0.819[\ln(\text{hardness})]+3.7256)$	1090.816947	
	Chronic	$0.860 e(0.819[\ln(\text{hardness})]+0.6848)$	141.8928738	
Copper (D)	Acute	$0.960 e(0.9422[\ln(\text{hardness})]-1.700)$	28.36984834	
	Chronic	$0.960 e(0.8545[\ln(\text{hardness})]-1.702)$	17.63539627	
Lead (D)	Acute	$e(1.273[\ln(\text{hardness})]-1.46)*CF3$	151.3339968	$CF3 = 1.46203 - 0.145712*\ln(\text{hardness})$
	Chronic	$e(1.273[\ln(\text{hardness})]-4.705)*CF4$	5.897268592	$CF4 = 1.46203 - 0.145712*\ln(\text{hardness})$
Nickel (D)	Acute	$0.998 e(0.846[\ln(\text{hardness})]+2.255)$	915.8418004	
	Chronic	$0.997 e(0.846[\ln(\text{hardness})]+0.0584)$	101.7217492	
Zinc (D)	Acute	$0.978 e(0.8473[\ln(\text{hardness})]+0.884)$	229.4345143	
	Chronic	$0.986 e(0.8473[\ln(\text{hardness})]+0.884)$	231.3112792	
Silver (D)	Acute	$0.85 e(1.72[\ln(\text{hardness})]-6.59)$	12.58267562	

POLLUTANTS	CAS No.	STORET	MQL	Instream Waste Concentration					Domestic	Irrigation	Livestock/	Acute Fish	Chronic Fish	Human Health
				Ambient Conc.	Effluent Conc.	Acute Fshery	Domestic Suq	Chronic Std	Human Health Criteria	Criteria	Wildlife Criteria	Criteria	Criteria	Criteria
			Ca (ug/l)	Ce (ug/l)	2.13*Ce	Cd,dom (ug/l)	Cd (ug/l)	Cd,hh (ug/l)	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
Radioactivity, Nutrients, and Chlorine														
Aluminum, dissolved	7429-90-5	01106	2.5	126	268.38	0.74805323	0.74805323	0.321858543	1E+100	5000	1E+100	750	87	1E+100
Barium, dissolved	7440-39-3	01005	100	73.1	155.703	0.43398961	0.43398961	0.186729044	2000	1E+100	1E+100	1E+100	1E+100	1E+100
Boron, dissolved	7440-42-8	01022	100	54	115.02	0.32059424	0.32059424	0.137939376	1E+100	750	5000	1E+100	1E+100	1E+100
Cobalt, dissolved	7440-48-4	01037	50	0.4	0.852	0.00237477	0.00237477	0.001021773	1E+100	50	1000	1E+100	1E+100	1E+100
Molybdenum, dissolved	7439-98-7	01062	10	1.42	3.0246	0.00843044	0.00843044	0.003627295	1E+100	1000	1E+100	1E+100	1E+100	1E+100
Uranium, dissolved	7440-61-1	22706	0.1	1.69	3.5997	0.01003341	0.01003341	0.004316992	5000	1E+100	1E+100	1E+100	1E+100	1E+100
Vanadium, dissolved	7440-62-2	01087	50	0	0	0	0	0	1E+100	100	100	1E+100	1E+100	1E+100
Ra-226 and Ra-228 (pCi/l)	11503				0	0	0	0	5	1E+100	30	1E+100	1E+100	1E+100
Strontium (pCi/l)	13501				0	0	0	0	8	1E+100	1E+100	1E+100	1E+100	1E+100
Tritium (pCi/l)	04124				0	0	0	0	20000	1E+100	20000	1E+100	1E+100	1E+100
Gross Alpha (pCi/l)	80029				0	0	0	0	15	1E+100	15	1E+100	1E+100	1E+100
Asbestos (fibers/l)					0	0	0	0	7000000	1E+100	1E+100	1E+100	1E+100	1E+100
Total Residual Chlorine	7782-50-5	50060	33	18.6	39.618	0.11042691	0.11042691	0.047512452	1E+100	1E+100	11	19	11	1E+100
Nitrate as N (mg/l)	00620			0.356	0.75828	0.00211355	0.00211355	0.000909378	10	1E+100	1E+100	1E+100	1E+100	1E+100
Nitrite + Nitrate (mg/l)	00630			0.299	0.63687	0.00177514	0.00177514	0.000763775	1E+100	1E+100	132	1E+100	1E+100	1E+100

POLLUTANTS	CAS No.	STORET	MQL	Instream Waste Concentration					Domestic	Irrigation	Livestock/	Acute Fish	Chronic Fish	Human Health	
				Ambient Conc.	Effluent Conc.	Acute Fshery	Domestic Sup	Chronic Std	Human Health Criteria	Criteria	Wildlife Criteria	Criteria	Criteria	Criteria	
				Ca (ug/l)	Ce (ug/l)	2.13*Ce	Cd,dom (ug/l)	Cd (ug/l)	Cd,hh (ug/l)	ug/l	ug/l	ug/l	ug/l	ug/l	
METALS AND CYANIDE															
Antimony, dissolved (P)	7440-36-0	01097	60		0.7	1.491	0.00415585	0.00415585	0.001788103	5.6	1E+100	1E+100	1E+100	1E+100	640
Arsenic, dissolved (P)	7440-38-2	01000	0.5		0	0	0	0	0	2.3	100	200	340	150	9
Beryllium, dissolved	7440-41-7	01012	0.5		0	0	0	0	0	4	1E+100	1E+100	1E+100	1E+100	1E+100
Cadmium, dissolved	7440-43-9	01025	1		0.108	0.23004	0.00064119	0.00064119	0.000275879	5	10	50	4.35082831	0.42652182	1E+100
Chromium, dissolved	18540-29-9	01034	10		0	0	0	0	0	100	100	1000	1090.81695	141.892874	1E+100
Copper, dissolved	7440-50-8	01042	0.5		1.100348663	2.34374265	0.00653269	0.00653269	0.002810767	1300	200	500	28.3698483	17.6353963	1E+100
Lead, dissolved	7439-92-1	01049	0.5		0	0	0	0	0	50	5000	100	151.333997	5.89726859	1E+100
Mercury, dissolved	7439-97-6	71890	0.005		0	0	0	0	0	1E+100	1E+100	1E+100	1.4	0.77	1E+100
Mercury, total	7439-97-6	71900	0.005		0	0	0	0	0	2	1E+100	0.77	1E+100	1E+100	1E+100
Nickel, dissolved (P)	7440-02-0	01065	0.5		1.693735517	3.60765665	0.01005559	0.01005559	0.004326534	100	1E+100	1E+100	915.8418	101.721749	4600
Selenium, dissolved (P)	7782-49-2	01145	5		1.35	2.8755	0.00801486	0.00801486	0.003448484	50	130	50	1E+100	1E+100	4200
Selenium, dis (SO4 >500 mg/l)	01145	01145	5			0	0	0	0	50	250	50	1E+100	1E+100	4200
Selenium, total recoverable	7782-49-2	01147	5		1.35	2.8755	0.00801486	0.00801486	0.003448484	1E+100	1E+100	5	20	5	1E+100
Silver, dissolved	7440-22-4	01077	0.5		0	0	0	0	0	1E+100	1E+100	1E+100	12.5826756	1E+100	1E+100
Thallium, dissolved (P)	7440-28-0	01059	0.5		0	0	0	0	0	1.7	1E+100	1E+100	1E+100	1E+100	6.3
Zinc, Dis.	7440-66-6	01080	20		5.943230455	12.6590809	0.03528455	0.03528455	0.015181583	7400	2000	25000	229.434514	231.311279	26000
Cyanide, dissolved	57-12-5	00720	10		4.71	10.0323	0.02796294	0.02796294	0.012031379	200	1E+100	1E+100	1E+100	1E+100	1E+100
Cyanide, weak acid dissociat	57-12-5	00718	10		0	0	0	0	0	700	1E+100	5.2	22	5.2	220000
DIOXIN															
2,3,7,8-TCDD	1764-01-6	34675	0.00001			0	0	0	0	0.00000005	1E+100	1E+100	1E+100	1E+100	0.000000051
VOLATILE COMPOUNDS															
Acrolein	107-02-8	34210	50			0	0	0	0	190	1E+100	1E+100	1E+100	1E+100	290
Acrylonitrile	107-13-0	34215	20			0	0	0	0	0.51	1E+100	1E+100	1E+100	1E+100	2.5
Benzene	71-43-2	34030	10			0	0	0	0	22	1E+100	1E+100	1E+100	1E+100	510
Bromoform	75-25-2	32104	10			0	0	0	0	43	1E+100	1E+100	1E+100	1E+100	1400
Carbon Tetrachloride	56-23-5	32102	2			0	0	0	0	2.3	1E+100	1E+100	1E+100	1E+100	16
Chlorobenzene	108-90-7	34301	10			0	0	0	0	680	1E+100	1E+100	1E+100	1E+100	21000
Clorodibromomethane	124-48-1	32105	10			0	0	0	0	4	1E+100	1E+100	1E+100	1E+100	130
Chloroform	67-66-3	32106	50			0	0	0	0	57	1E+100	1E+100	1E+100	1E+100	4700
Dichlorobromomethane	75-27-4	32101	10			0	0	0	0	5.5	1E+100	1E+100	1E+100	1E+100	170
1,2-Dichloroethane	107-06-2	34531	10			0	0	0	0	3.8	1E+100	1E+100	1E+100	1E+100	370
1,1-Dichloroethylene	75-35-4	34501	10			0	0	0	0	0.57	1E+100	1E+100	1E+100	1E+100	32
1,2-Dichloropropane	78-87-5	34541	10			0	0	0	0	5	1E+100	1E+100	1E+100	1E+100	150
1,3-Dichloropropylene	542-75-6	34561	10			0	0	0	0	10	1E+100	1E+100	1E+100	1E+100	1700
Ethylbenzene	100-41-4	34371	10			0	0	0	0	3100	1E+100	1E+100	1E+100	1E+100	29000
Methyl Bromide	74-83-9	34413	50			0	0	0	0	47	1E+100	1E+100	1E+100	1E+100	1500
Methylene Chloride	75-09-2	34423	20		2.51	5.3463	0.0149017	0.0149017	0.006411627	46	1E+100	1E+100	1E+100	1E+100	5900
1,1,2,2-Tetrachloroethane	79-34-5	34516	10			0	0	0	0	1.7	1E+100	1E+100	1E+100	1E+100	40
Tetrachloroethylene	127-18-4	34475	10			0	0	0	0	6.9	1E+100	1E+100	1E+100	1E+100	33
Toluene	108-88-3	34010	10			0	0	0	0	6800	1E+100	1E+100	1E+100	1E+100	200000
1,2--trans-Dichloroethylene	156-60-5	34546	10			0	0	0	0	700	1E+100	1E+100	1E+100	1E+100	140000
1,1,2-Trichloroethane	79-00-5	34511	10			0	0	0	0	5.9	1E+100	1E+100	1E+100	1E+100	160

