

Utah Division of Water Quality
Salt Lake City, Utah

**WASTELOAD ANALYSIS [WLA]
Addendum: Statement of Basis
SUMMARY**

Discharging Facility: Richmond WWTP
UPDES No: UT-0020907
Current Flow: 0.36 MGD
Design Flow 0.50 MGD

Current flow is intermittent. This value represents an average flow over the

Receiving Water: Cub River
Stream Classification: 2B, 3B, 4

Stream Flows [cfs]:
32.6 Summer (July-Sept) 20th Percentile value used for all seasons
32.6 Fall (Oct-Dec) 20th Percentile
32.6 Winter (Jan-Mar) 20th Percentile
32.6 Spring (Apr-June) 20th Percentile
120.3 Average
Stream TDS Values:
338.4 Summer (July-Sept) 80th Percentile value used for all seasons
338.4 Fall (Oct-Dec) 80th Percentile
338.4 Winter (Jan-Mar) 80th Percentile
338.4 Spring (Apr-June) 80th Percentile

Effluent Limits:

Flow, MGD:	0.50 MGD	Design Flow	
BOD, mg/l:	25.0 Summer	5.0 Indicator	
Dissolved Oxygen, mg/l:	5.0 Summer	5.5 30 Day Average	
TNH3, Chronic, mg/l:	52.6 Summer	Varies	Function of pH and Temperature
TDS, mg/l:	37513.1 Summer	1200.0	

WQ Standard:

Modeling Parameters:

Acute River Width: 50.0%
Chronic River Width: 100.0%

Antidegradation level I complete, Level II antidegradation review NOT required.

Date: 7/2/2013

Permit Writer:

Louis M. Sweeney

7-8-2013

WLA by:

Paul M. [Signature]

7-2-13

WQM Sec. Approval:

TMDL Sec. Approval:

**Utah Division of Water Quality
Salt Lake City, Utah**

**WASTELOAD ANALYSIS [WLA]
Addendum: Statement of Basis**

2-Jul-13
4:00 PM

Facilities: Richmond WWTP
Discharging to: Cub River

UPDES No: UT-0020907

I. Introduction

Wasteload analyses are performed to determine point source effluent limitations necessary to maintain designated beneficial uses by evaluating projected effects of discharge concentrations on in-stream water quality. The wasteload analysis also takes into account downstream designated uses [R317-2-8, UAC]. Projected concentrations are compared to numeric water quality standards to determine acceptability. The anti-degradation policy and procedures are also considered. The primary in-stream parameters of concern may include metals (as a function of hardness), total dissolved solids (TDS), total residual chlorine (TRC), un-ionized ammonia (as a function of pH and temperature, measured and evaluated in terms of total ammonia), and dissolved oxygen.

Mathematical water quality modeling is employed to determine stream quality response to point source discharges. Models aid in the effort of anticipating stream quality at future effluent flows at critical environmental conditions (e.g., low stream flow, high temperature, high pH, etc).

The numeric criteria in this wasteload analysis may always be modified by narrative criteria and other conditions determined by staff of the Division of Water Quality.

II. Receiving Water and Stream Classification

Cub River:	2B, 3B, 4
Antidegradation Review:	Level II Review NOT required

III. Numeric Stream Standards for Protection of Aquatic Wildlife

Total Ammonia (TNH3)	Varies as a function of Temperature and pH Rebound. See Water Quality Standards
Chronic Total Residual Chlorine (TRC)	0.011 mg/l (4 Day Average) 0.019 mg/l (1 Hour Average)
Chronic Dissolved Oxygen (DO)	5.50 mg/l (30 Day Average) 4.00 mg/l (7Day Average) 3.00 mg/l (1 Day Average)
Maximum Total Dissolved Solids	1200.0 mg/l

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Acute and Chronic Heavy Metals (Dissolved)

Parameter	4 Day Average (Chronic) Standard		1 Hour Average (Acute) Standard		
	Concentration	Load*	Concentration		Load*
Aluminum	87.00 ug/l**	0.363 lbs/day	750.00	ug/l	3.127 lbs/day
Arsenic	190.00 ug/l	0.792 lbs/day	340.00	ug/l	1.418 lbs/day
Cadmium	0.61 ug/l	0.003 lbs/day	6.52	ug/l	0.027 lbs/day
Chromium III	211.92 ug/l	0.884 lbs/day	4433.71	ug/l	18.485 lbs/day
ChromiumVI	11.00 ug/l	0.046 lbs/day	16.00	ug/l	0.067 lbs/day
Copper	23.85 ug/l	0.099 lbs/day	39.41	ug/l	0.164 lbs/day
Iron			1000.00	ug/l	4.169 lbs/day
Lead	12.88 ug/l	0.054 lbs/day	330.60	ug/l	1.378 lbs/day
Mercury	0.0120 ug/l	0.000 lbs/day	2.40	ug/l	0.010 lbs/day
Nickel	132.13 ug/l	0.551 lbs/day	1188.44	ug/l	4.955 lbs/day
Selenium	4.60 ug/l	0.019 lbs/day	20.00	ug/l	0.083 lbs/day
Silver	N/A ug/l	N/A lbs/day	25.04	ug/l	0.104 lbs/day
Zinc	303.93 ug/l	1.267 lbs/day	303.93	ug/l	1.267 lbs/day

* Allowed below discharge

**Chronic Aluminum standard applies only to waters with a pH < 7.0 and a Hardness < 50 mg/l as CaCO₃

Metals Standards Based upon a Hardness of 300 mg/l as CaCO₃

Organics [Pesticides]

Parameter	4 Day Average (Chronic) Standard		1 Hour Average (Acute) Standard		
	Concentration	Load*	Concentration		Load*
Aldrin			1.500	ug/l	0.006 lbs/day
Chlordane	0.004 ug/l	0.773 lbs/day	1.200	ug/l	0.005 lbs/day
DDT, DDE	0.001 ug/l	0.180 lbs/day	0.550	ug/l	0.002 lbs/day
Dieldrin	0.002 ug/l	0.342 lbs/day	1.250	ug/l	0.005 lbs/day
Endosulfan	0.056 ug/l	10.073 lbs/day	0.110	ug/l	0.000 lbs/day
Endrin	0.002 ug/l	0.414 lbs/day	0.090	ug/l	0.000 lbs/day
Guthion			0.010	ug/l	0.000 lbs/day
Heptachlor	0.004 ug/l	0.684 lbs/day	0.260	ug/l	0.001 lbs/day
Lindane	0.080 ug/l	14.391 lbs/day	1.000	ug/l	0.004 lbs/day
Methoxychlor			0.030	ug/l	0.000 lbs/day
Mirex			0.010	ug/l	0.000 lbs/day
Parathion			0.040	ug/l	0.000 lbs/day
PCB's	0.014 ug/l	2.518 lbs/day	2.000	ug/l	0.008 lbs/day
Pentachlorophenol	13.00 ug/l	2338.481 lbs/day	20.000	ug/l	0.083 lbs/day
Toxephene	0.0002 ug/l	0.036 lbs/day	0.7300	ug/l	0.003 lbs/day

IV. Numeric Stream Standards for Protection of Agriculture

	4 Day Average (Chronic) Standard		1 Hour Average (Acute) Standard	
	Concentration	Load*	Concentration	Load*
Arsenic			100.0 ug/l	lbs/day
Boron			750.0 ug/l	lbs/day
Cadmium			10.0 ug/l	0.02 lbs/day
Chromium			100.0 ug/l	lbs/day

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Copper	200.0 ug/l	lbs/day
Lead	100.0 ug/l	lbs/day
Selenium	50.0 ug/l	lbs/day
TDS, Summer	1200.0 mg/l	2.50 tons/day

V. Numeric Stream Standards for Protection of Human Health (Class 1C Waters)

Metals	4 Day Average (Chronic) Standard		1 Hour Average (Acute) Standard	
	Concentration	Load*	Concentration	Load*
Arsenic			ug/l	lbs/day
Barium			ug/l	lbs/day
Cadmium			ug/l	lbs/day
Chromium			ug/l	lbs/day
Lead			ug/l	lbs/day
Mercury			ug/l	lbs/day
Selenium			ug/l	lbs/day
Silver			ug/l	lbs/day
Fluoride (3)			ug/l	lbs/day
to			ug/l	lbs/day
Nitrates as N			ug/l	lbs/day
Chlorophenoxy Herbicides				
2,4-D			ug/l	lbs/day
2,4,5-TP			ug/l	lbs/day
Endrin			ug/l	lbs/day
cyclohexane (Lindane)			ug/l	lbs/day
Methoxychlor			ug/l	lbs/day
Toxaphene			ug/l	lbs/day

VI. Numeric Stream Standards the Protection of Human Health from Water & Fish Consumption [Toxics]

Toxic Organics	Maximum Conc., ug/l - Acute Standards			
	Class 1C		Class 3A, 3B	
	[2 Liters/Day for 70 Kg Person over 70 Yr.]		[6.5 g for 70 Kg Person over 70 Yr.]	
Acenaphthene	ug/l	lbs/day	2700.0 ug/l	485.68 lbs/day
Acrolein	ug/l	lbs/day	780.0 ug/l	140.31 lbs/day
Acrylonitrile	ug/l	lbs/day	0.7 ug/l	0.12 lbs/day
Benzene	ug/l	lbs/day	71.0 ug/l	12.77 lbs/day
Benzidine	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Carbon tetrachloride	ug/l	lbs/day	4.4 ug/l	0.79 lbs/day
Chlorobenzene	ug/l	lbs/day	21000.0 ug/l	3777.55 lbs/day
1,2,4-Trichlorobenzene				
Hexachlorobenzene	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
1,2-Dichloroethane	ug/l	lbs/day	99.0 ug/l	17.81 lbs/day
1,1,1-Trichloroethane				
Hexachloroethane	ug/l	lbs/day	8.9 ug/l	1.60 lbs/day
1,1-Dichloroethane				
1,1,2-Trichloroethane	ug/l	lbs/day	42.0 ug/l	7.56 lbs/day
1,1,2,2-Tetrachloroethane	ug/l	lbs/day	11.0 ug/l	1.98 lbs/day
Chloroethane			0.0 ug/l	0.00 lbs/day
Bis(2-chloroethyl) ether	ug/l	lbs/day	1.4 ug/l	0.25 lbs/day

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2-Chloroethyl vinyl ether	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
2-Chloronaphthalene	ug/l	lbs/day	4300.0 ug/l	773.50 lbs/day
2,4,6-Trichlorophenol	ug/l	lbs/day	6.5 ug/l	1.17 lbs/day
p-Chloro-m-cresol			0.0 ug/l	0.00 lbs/day
Chloroform (HM)	ug/l	lbs/day	470.0 ug/l	84.55 lbs/day
2-Chlorophenol	ug/l	lbs/day	400.0 ug/l	71.95 lbs/day
1,2-Dichlorobenzene	ug/l	lbs/day	17000.0 ug/l	3058.01 lbs/day
1,3-Dichlorobenzene	ug/l	lbs/day	2600.0 ug/l	467.70 lbs/day
1,4-Dichlorobenzene	ug/l	lbs/day	2600.0 ug/l	467.70 lbs/day
3,3'-Dichlorobenzidine	ug/l	lbs/day	0.1 ug/l	0.01 lbs/day
1,1-Dichloroethylene	ug/l	lbs/day	3.2 ug/l	0.58 lbs/day
1,2-trans-Dichloroethyle	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
2,4-Dichlorophenol	ug/l	lbs/day	790.0 ug/l	142.11 lbs/day
1,2-Dichloropropane	ug/l	lbs/day	39.0 ug/l	7.02 lbs/day
1,3-Dichloropropylene	ug/l	lbs/day	1700.0 ug/l	305.80 lbs/day
2,4-Dimethylphenol	ug/l	lbs/day	2300.0 ug/l	413.73 lbs/day
2,4-Dinitrotoluene	ug/l	lbs/day	9.1 ug/l	1.64 lbs/day
2,6-Dinitrotoluene	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
1,2-Diphenylhydrazine	ug/l	lbs/day	0.5 ug/l	0.10 lbs/day
Ethylbenzene	ug/l	lbs/day	29000.0 ug/l	5216.61 lbs/day
Fluoranthene	ug/l	lbs/day	370.0 ug/l	66.56 lbs/day
4-Chlorophenyl phenyl ether				
4-Bromophenyl phenyl ether				
Bis(2-chloroisopropyl) e'	ug/l	lbs/day	170000.0 ug/l	30580.14 lbs/day
Bis(2-chloroethoxy) met	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Methylene chloride (HM)	ug/l	lbs/day	1600.0 ug/l	287.81 lbs/day
Methyl chloride (HM)	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Methyl bromide (HM)	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Bromoform (HM)	ug/l	lbs/day	360.0 ug/l	64.76 lbs/day
Dichlorobromomethane	ug/l	lbs/day	22.0 ug/l	3.96 lbs/day
Chlorodibromomethane	ug/l	lbs/day	34.0 ug/l	6.12 lbs/day
Hexachlorobutadiene(c)	ug/l	lbs/day	50.0 ug/l	8.99 lbs/day
Hexachlorocyclopentadi	ug/l	lbs/day	17000.0 ug/l	3058.01 lbs/day
Isophorone	ug/l	lbs/day	600.0 ug/l	107.93 lbs/day
Naphthalene				
Nitrobenzene	ug/l	lbs/day	1900.0 ug/l	341.78 lbs/day
2-Nitrophenol	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
4-Nitrophenol	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
2,4-Dinitrophenol	ug/l	lbs/day	14000.0 ug/l	2518.36 lbs/day
4,6-Dinitro-o-cresol	ug/l	lbs/day	765.0 ug/l	137.61 lbs/day
N-Nitrosodimethylamine	ug/l	lbs/day	8.1 ug/l	1.46 lbs/day
N-Nitrosodiphenylamine	ug/l	lbs/day	16.0 ug/l	2.88 lbs/day
N-Nitrosodi-n-propylami	ug/l	lbs/day	1.4 ug/l	0.25 lbs/day
Pentachlorophenol	ug/l	lbs/day	8.2 ug/l	1.48 lbs/day
Phenol	ug/l	lbs/day	4.6E+06 ug/l	8.27E+05 lbs/day
Bis(2-ethylhexyl)phthala	ug/l	lbs/day	5.9 ug/l	1.06 lbs/day
Butyl benzyl phthalate	ug/l	lbs/day	5200.0 ug/l	935.39 lbs/day
Di-n-butyl phthalate	ug/l	lbs/day	12000.0 ug/l	2158.60 lbs/day
Di-n-octyl phthlate				
Diethyl phthalate	ug/l	lbs/day	120000.0 ug/l	21585.98 lbs/day
Dimethyl phthlate	ug/l	lbs/day	2.9E+06 ug/l	5.22E+05 lbs/day

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Benzo(a)anthracene (PAH)	ug/l	lbs/day	0.0 ug/l	0.01 lbs/day
Benzo(a)pyrene (PAH)	ug/l	lbs/day	0.0 ug/l	0.01 lbs/day
Benzo(b)fluoranthene (PAH)	ug/l	lbs/day	0.0 ug/l	0.01 lbs/day
Benzo(k)fluoranthene (PAH)	ug/l	lbs/day	0.0 ug/l	0.01 lbs/day
Chrysene (PAH)	ug/l	lbs/day	0.0 ug/l	0.01 lbs/day
Acenaphthylene (PAH)				
Anthracene (PAH)	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Dibenzo(a,h)anthracene	ug/l	lbs/day	0.0 ug/l	0.01 lbs/day
Indeno(1,2,3-cd)pyrene	ug/l	lbs/day	0.0 ug/l	0.01 lbs/day
Pyrene (PAH)	ug/l	lbs/day	11000.0 ug/l	1978.71 lbs/day
Tetrachloroethylene	ug/l	lbs/day	8.9 ug/l	1.60 lbs/day
Toluene	ug/l	lbs/day	200000.0 ug/l	35976.63 lbs/day
Trichloroethylene	ug/l	lbs/day	81.0 ug/l	14.57 lbs/day
Vinyl chloride	ug/l	lbs/day	525.0 ug/l	94.44 lbs/day
				lbs/day
Pesticides				lbs/day
Aldrin	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Dieldrin	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Chlordane	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
4,4'-DDT	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
4,4'-DDE	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
4,4'-DDD	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
alpha-Endosulfan	ug/l	lbs/day	2.0 ug/l	0.36 lbs/day
beta-Endosulfan	ug/l	lbs/day	2.0 ug/l	0.36 lbs/day
Endosulfan sulfate	ug/l	lbs/day	2.0 ug/l	0.36 lbs/day
Endrin	ug/l	lbs/day	0.8 ug/l	0.15 lbs/day
Endrin aldehyde	ug/l	lbs/day	0.8 ug/l	0.15 lbs/day
Heptachlor	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Heptachlor epoxide				
PCB's				
PCB 1242 (Arochlor 1242)	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
PCB-1254 (Arochlor 1254)	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
PCB-1221 (Arochlor 1221)	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
PCB-1232 (Arochlor 1232)	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
PCB-1248 (Arochlor 1248)	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
PCB-1260 (Arochlor 1260)	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
PCB-1016 (Arochlor 1016)	ug/l	lbs/day	0.0 ug/l	0.00 lbs/day
Pesticide				
Toxaphene	ug/l		0.0 ug/l	0.00 lbs/day
Dioxin				
Dioxin (2,3,7,8-TCDD)	ug/l	lbs/day		
Metals				
Antimony	ug/l	lbs/day		
Arsenic	ug/l	lbs/day	4300.00 ug/l	773.50 lbs/day
Asbestos	ug/l	lbs/day		
Beryllium				

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Cadmium				
Chromium (III)				
Chromium (VI)				
Copper				
Cyanide	ug/l	lbs/day	2.2E+05 ug/l	39574.30 lbs/day
Lead	ug/l	lbs/day		
Mercury			0.15 ug/l	0.03 lbs/day
Nickel			4600.00 ug/l	827.46 lbs/day
Selenium	ug/l	lbs/day		
Silver	ug/l	lbs/day		
Thallium			6.30 ug/l	1.13 lbs/day
Zinc				

There are additional standards that apply to this receiving water, but were not considered in this modeling/waste load allocation analysis.

VII. Mathematical Modeling of Stream Quality

Model configuration was accomplished utilizing standard modeling procedures. Data points were plotted and coefficients adjusted as required to match observed data as closely as possible.

The modeling approach used in this analysis included one or a combination of the following models.

- (1) The Utah River Model, Utah Division of Water Quality, 1992. Based upon STREAMDO IV (Region VIII) and Supplemental Ammonia Toxicity Models; EPA Region VIII, Sept. 1990 and QUAL2E (EPA, Athens, GA).
- (2) Utah Ammonia/Chlorine Model, Utah Division of Water Quality, 1992.
- (3) AMMTOX Model, University of Colorado, Center of Limnology, and EPA Region 8
- (4) Principles of Surface Water Quality Modeling and Control. Robert V. Thomann, et.al. Harper Collins Publisher, Inc. 1987, pp. 644.

Coefficients used in the model were based, in part, upon the following references:

- (1) Rates, Constants, and Kinetics Formulations in Surface Water Quality Modeling. Environmental Research Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, Athens Georgia. EPA/600/3-85/040 June 1985.
- (2) Principles of Surface Water Quality Modeling and Control. Robert V. Thomann, et.al. Harper Collins Publisher, Inc. 1987, pp. 644.

VIII. Modeling Information

The required information for the model may include the following information for both the

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upstream conditions at low flow and the effluent conditions:

Flow, Q, (cfs or MGD)	D.O. mg/l
Temperature, Deg. C.	Total Residual Chlorine (TRC), mg/l
pH	Total NH3-N, mg/l
BOD5, mg/l	Total Dissolved Solids (TDS), mg/l
Metals, ug/l	Toxic Organics of Concern, ug/l

Other Conditions

In addition to the upstream and effluent conditions, the models require a variety of physical and biological coefficients and other technical information. In the process of actually establishing the permit limits for an effluent, values are used based upon the available data, model calibration, literature values, site visits and best professional judgement.

Model Inputs

The following is upstream and discharge information that was utilized as inputs for the analysis. Dry washes are considered to have an upstream flow equal to the flow of the discharge.

**Current Upstream Information
Stream
Critical**

	Low Flow cfs	Temp. Deg. C	pH	T-NH3 mg/l as N	BOD5 mg/l	DO mg/l	TRC mg/l	TDS mg/l
Summer (Irrig. Season)	32.6	20.0	8.2	0.10	0.50	6.86	0.00	338.4
Fall	32.6	12.0	8.1	0.10	0.50	---	0.00	338.4
Winter	32.6	4.0	8.0	0.10	0.50	---	0.00	338.4
Spring	32.6	12.0	8.1	0.10	0.50	---	0.00	338.4
Dissolved Metals	Al ug/l	As ug/l	Cd ug/l	CrIII ug/l	CrVI ug/l	Copper ug/l	Fe ug/l	Pb ug/l
All Seasons	1.59*	0.53*	0.053*	0.53*	2.65*	0.53*	0.83*	0.53*
Dissolved Metals	Hg ug/l	Ni ug/l	Se ug/l	Ag ug/l	Zn ug/l	Boron ug/l		
All Seasons	0.0000	0.53*	1.06*	0.1*	0.053*	10.0		* 1/2 MDL

Projected Discharge Information

Season	Flow, MGD	Temp.	TDS mg/l	TDS tons/day
Summer	0.50000	17.0	400.00	0.83383
Fall	0.50000	15.0		
Winter	0.50000	12.0		
Spring	0.50000	15.0		

All model numerical inputs, intermediate calculations, outputs and graphs are available for discussion, inspection and copy at the Division of Water Quality.

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IX. Effluent Limitations

Current State water quality standards are required to be met under a variety of conditions including in-stream flows targeted to the 7-day, 10-year low flow (R317-2-9).

Other conditions used in the modeling effort coincide with the environmental conditions expected at low stream flows.

Effluent Limitation for Flow based upon Water Quality Standards

In-stream criteria of downstream segments will be met with an effluent flow maximum value as follows:

Season	Daily Average	
Summer	0.500 MGD	0.774 cfs
Fall	0.500 MGD	0.774 cfs
Winter	0.500 MGD	0.774 cfs
Spring	0.500 MGD	0.774 cfs

Flow Requirement or Loading Requirement

The calculations in this wasteload analysis utilize the maximum effluent discharge flow of 0.5 MGD. If the discharger is allowed to have a flow greater than 0.5 MGD during 7Q10 conditions, and effluent limit concentrations as indicated, then water quality standards will be violated. In order to prevent this from occurring, the permit writers must include the discharge flow limitation as indicated above; or, include loading effluent limits in the permit.

Effluent Limitation for Whole Effluent Toxicity (WET) based upon WET Policy

Effluent Toxicity will not occur in downstream segments if the values below are met.

WET Requirements	LC50 >	15.8% Effluent	[Acute]
	IC25 >	2.3% Effluent	[Chronic]

Effluent Limitation for Biological Oxygen Demand (BOD) based upon Water Quality Standards or Regulations

In-stream criteria of downstream segments for Dissolved Oxygen will be met with an effluent BOD limitation as follows:

Season	Concentration	
Summer	25.0 mg/l as BOD5	104.2 lbs/day
Fall	25.0 mg/l as BOD5	104.2 lbs/day
Winter	25.0 mg/l as BOD5	104.2 lbs/day
Spring	25.0 mg/l as BOD5	104.2 lbs/day

Effluent Limitation for Dissolved Oxygen (DO) based upon Water Quality Standards

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In-stream criteria of downstream segments for Dissolved Oxygen will be met with an effluent D.O. limitation as follows:

Season	Concentration
Summer	5.00
Fall	5.00
Winter	5.00
Spring	5.00

Effluent Limitation for Total Ammonia based upon Water Quality Standards

In-stream criteria of downstream segments for Total Ammonia will be met with an effluent limitation (expressed as Total Ammonia as N) as follows:

Season		Concentration	Load
Summer	4 Day Avg. - Chronic	52.6 mg/l as N	219.3 lbs/day
	1 Hour Avg. - Acute	97.8 mg/l as N	407.7 lbs/day
Fall	4 Day Avg. - Chronic	88.5 mg/l as N	368.8 lbs/day
	1 Hour Avg. - Acute	109.6 mg/l as N	457.1 lbs/day
Winter	4 Day Avg. - Chronic	101.7 mg/l as N	423.9 lbs/day
	1 Hour Avg. - Acute	128.3 mg/l as N	534.7 lbs/day
Spring	4 Day Avg. - Chronic	88.5 mg/l as N	0.0 lbs/day
	1 Hour Avg. - Acute	109.6 mg/l as N	0.0 lbs/day

Acute limit calculated with an Acute Zone of Initial Dilution (ZID) to be equal to 50.0%.

Effluent Limitation for Total Residual Chlorine based upon Water Quality Standards

In-stream criteria of downstream segments for Total Residual Chlorine will be met with an effluent limitation as follows:

Season		Concentration	Load
Summer	4 Day Avg. - Chronic	0.475 mg/l	1.98 lbs/day
	1 Hour Avg. - Acute	0.419 mg/l	1.75 lbs/day
Fall	4 Day Avg. - Chronic	0.475 mg/l	1.98 lbs/day
	1 Hour Avg. - Acute	0.419 mg/l	1.75 lbs/day
Winter	4 Day Avg. - Chronic	0.475 mg/l	1.98 lbs/day
	1 Hour Avg. - Acute	0.419 mg/l	1.75 lbs/day
Spring	4 Day Avg. - Chronic	0.475 mg/l	0.00 lbs/day
	1 Hour Avg. - Acute	0.419 mg/l	0.00 lbs/day

Effluent Limitations for Total Dissolved Solids based upon Water Quality Standards

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Season		Concentration	Load
Summer	Maximum, Acute	37513.1 mg/l	78.20 tons/day
Fall	Maximum, Acute	37513.1 mg/l	78.20 tons/day
Winter	Maximum, Acute	37513.1 mg/l	78.20 tons/day
Spring	4 Day Avg. - Chronic	37513.1 mg/l	78.20 tons/day

Colorado Salinity Form Limits Determined by Permitting Section

**Effluent Limitations for Total Recoverable Metals based upon
Water Quality Standards**

In-stream criteria of downstream segments for Dissolved Metals will be met with an effluent limitation as follows (based upon a hardness of 300 mg/l):

	4 Day Average		1 Hour Average	
	Concentration	Load	Concentration	Load
Aluminum	N/A	N/A	16,504.5 ug/l	68.8 lbs/day
Arsenic	8,164.25 ug/l	22.0 lbs/day	7,488.1 ug/l	31.2 lbs/day
Cadmium	23.00 ug/l	0.1 lbs/day	142.2 ug/l	0.6 lbs/day
Chromium III	9,109.88 ug/l	24.6 lbs/day	97,848.7 ug/l	407.9 lbs/day
Chromium VI	307.08 ug/l	0.8 lbs/day	269.4 ug/l	1.1 lbs/day
Copper	995.63 ug/l	2.7 lbs/day	853.2 ug/l	3.6 lbs/day
Iron	N/A	N/A	22,046.7 ug/l	91.9 lbs/day
Lead	522.35 ug/l	1.4 lbs/day	7,280.6 ug/l	30.4 lbs/day
Mercury	0.52 ug/l	0.0 lbs/day	53.0 ug/l	0.2 lbs/day
Nickel	5,667.45 ug/l	15.3 lbs/day	26,215.7 ug/l	109.3 lbs/day
Selenium	131.46 ug/l	0.4 lbs/day	408.0 ug/l	1.7 lbs/day
Silver	N/A ug/l	N/A lbs/day	552.7 ug/l	2.3 lbs/day
Zinc	##### ug/l	35.3 lbs/day	6,707.1 ug/l	28.0 lbs/day
Cyanide	224.36 ug/l	0.6 lbs/day	485.6 ug/l	2.0 lbs/day

**Effluent Limitations for Heat/Temperature based upon
Water Quality Standards**

Summer	64.1 Deg. C.	147.5 Deg. F
Fall	56.1 Deg. C.	133.1 Deg. F
Winter	48.1 Deg. C.	118.7 Deg. F
Spring	56.1 Deg. C.	133.1 Deg. F

**Effluent Limitations for Organics [Pesticides]
Based upon Water Quality Standards**

In-stream criteria of downstream segments for Organics [Pesticides] will be met with an effluent limit as follows:

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	4 Day Average		1 Hour Average		Load
	Concentration	Load	Concentration	Load	
Aldrin			1.5E+00	ug/l	9.67E-03 lbs/day
Chlordane	4.30E-03 ug/l	1.79E-02 lbs/day	1.2E+00	ug/l	7.74E-03 lbs/day
DDT, DDE	1.00E-03 ug/l	4.17E-03 lbs/day	5.5E-01	ug/l	3.55E-03 lbs/day
Dieldrin	1.90E-03 ug/l	7.92E-03 lbs/day	1.3E+00	ug/l	8.06E-03 lbs/day
Endosulfan	5.60E-02 ug/l	2.33E-01 lbs/day	1.1E-01	ug/l	7.09E-04 lbs/day
Endrin	2.30E-03 ug/l	9.59E-03 lbs/day	9.0E-02	ug/l	5.80E-04 lbs/day
Guthion	0.00E+00 ug/l	0.00E+00 lbs/day	1.0E-02	ug/l	6.45E-05 lbs/day
Heptachlor	3.80E-03 ug/l	1.58E-02 lbs/day	2.6E-01	ug/l	1.68E-03 lbs/day
Lindane	8.00E-02 ug/l	3.34E-01 lbs/day	1.0E+00	ug/l	6.45E-03 lbs/day
Methoxychlor	0.00E+00 ug/l	0.00E+00 lbs/day	3.0E-02	ug/l	1.93E-04 lbs/day
Mirex	0.00E+00 ug/l	0.00E+00 lbs/day	1.0E-02	ug/l	6.45E-05 lbs/day
Parathion	0.00E+00 ug/l	0.00E+00 lbs/day	4.0E-02	ug/l	2.58E-04 lbs/day
PCB's	1.40E-02 ug/l	5.84E-02 lbs/day	2.0E+00	ug/l	1.29E-02 lbs/day
Pentachlorophenol	1.30E+01 ug/l	5.42E+01 lbs/day	2.0E+01	ug/l	1.29E-01 lbs/day
Toxephene	2.00E-04 ug/l	8.34E-04 lbs/day	7.3E-01	ug/l	4.71E-03 lbs/day

**Effluent Targets for Pollution Indicators
Based upon Water Quality Standards**

In-stream indicator criteria of downstream segments for Pollution Indicators would be met by achieving the following effluent targets

	1 Hour Average	
	Concentration	Loading
Gross Beta (pCi/l)	50.0 pCi/L	
BOD (mg/l)	5.0 mg/l	20.8 lbs/day
Nitrates as N	4.0 mg/l	16.7 lbs/day
Total Phosphorus as P	0.05 mg/l	0.2 lbs/day
Total Suspended Solids	90.0 mg/l	375.2 lbs/day

Note: Pollution indicator targets are for information purposes only.

**Effluent Limitations for Protection of Human Health [Toxics Rule]
Based upon Water Quality Standards (Most stringent of 1C or 3A & 3B as appropriate.)**

In-stream criteria of downstream segments for Protection of Human Health [Toxics] will be met with an effluent limit as follows:

Toxic Organics	Maximum Concentration	
	Concentration	Load
Acenaphthene	1.16E+05 ug/l	4.86E+02 lbs/day
Acrolein	3.37E+04 ug/l	1.40E+02 lbs/day
Acrylonitrile	2.85E+01 ug/l	1.19E-01 lbs/day
Benzene	3.06E+03 ug/l	1.28E+01 lbs/day

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	ug/l	lbs/day
Benzidine		
Carbon tetrachloride	1.90E+02 ug/l	7.91E-01 lbs/day
Chlorobenzene	9.06E+05 ug/l	3.78E+03 lbs/day
1,2,4-Trichlorobenzene		
Hexachlorobenzene	3.32E-02 ug/l	1.39E-04 lbs/day
1,2-Dichloroethane	4.27E+03 ug/l	1.78E+01 lbs/day
1,1,1-Trichloroethane		
Hexachloroethane	3.84E+02 ug/l	1.60E+00 lbs/day
1,1-Dichloroethane		
1,1,2-Trichloroethane	1.81E+03 ug/l	7.56E+00 lbs/day
1,1,2,2-Tetrachloroethane	4.75E+02 ug/l	1.98E+00 lbs/day
Chloroethane		
Bis(2-chloroethyl) ether	6.04E+01 ug/l	2.52E-01 lbs/day
2-Chloroethyl vinyl ether		
2-Chloronaphthalene	1.86E+05 ug/l	7.73E+02 lbs/day
2,4,6-Trichlorophenol	2.80E+02 ug/l	1.17E+00 lbs/day
p-Chloro-m-cresol		
Chloroform (HM)	2.03E+04 ug/l	8.45E+01 lbs/day
2-Chlorophenol	1.73E+04 ug/l	7.20E+01 lbs/day
1,2-Dichlorobenzene	7.33E+05 ug/l	3.06E+03 lbs/day
1,3-Dichlorobenzene	1.12E+05 ug/l	4.68E+02 lbs/day
1,4-Dichlorobenzene	1.12E+05 ug/l	4.68E+02 lbs/day
3,3'-Dichlorobenzidine	3.32E+00 ug/l	1.39E-02 lbs/day
1,1-Dichloroethylene	1.38E+02 ug/l	5.76E-01 lbs/day
1,2-trans-Dichloroethylene ¹		
2,4-Dichlorophenol	3.41E+04 ug/l	1.42E+02 lbs/day
1,2-Dichloropropane	1.68E+03 ug/l	7.02E+00 lbs/day
1,3-Dichloropropylene	7.33E+04 ug/l	3.06E+02 lbs/day
2,4-Dimethylphenol	9.92E+04 ug/l	4.14E+02 lbs/day
2,4-Dinitrotoluene	3.93E+02 ug/l	1.64E+00 lbs/day
2,6-Dinitrotoluene		
1,2-Diphenylhydrazine	2.33E+01 ug/l	9.71E-02 lbs/day
Ethylbenzene	1.25E+06 ug/l	5.22E+03 lbs/day
Fluoranthene	1.60E+04 ug/l	6.66E+01 lbs/day
4-Chlorophenyl phenyl ether		
4-Bromophenyl phenyl ether		
Bis(2-chloroisopropyl) ether	7.33E+06 ug/l	3.06E+04 lbs/day
Bis(2-chloroethoxy) methane		
Methylene chloride (HM)	6.90E+04 ug/l	2.88E+02 lbs/day
Methyl chloride (HM)		
Methyl bromide (HM)		
Bromoform (HM)	1.55E+04 ug/l	6.48E+01 lbs/day
Dichlorobromomethane(HM)	9.49E+02 ug/l	3.96E+00 lbs/day
Chlorodibromomethane (HM)	1.47E+03 ug/l	6.12E+00 lbs/day
Hexachlorocyclopentadiene	7.33E+05 ug/l	3.06E+03 lbs/day
Isophorone	2.59E+04 ug/l	1.08E+02 lbs/day
Naphthalene		
Nitrobenzene	8.20E+04 ug/l	3.42E+02 lbs/day
2-Nitrophenol		
4-Nitrophenol		
2,4-Dinitrophenol	6.04E+05 ug/l	2.52E+03 lbs/day

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4,6-Dinitro-o-cresol	3.30E+04 ug/l	1.38E+02 lbs/day
N-Nitrosodimethylamine	3.49E+02 ug/l	1.46E+00 lbs/day
N-Nitrosodiphenylamine	6.90E+02 ug/l	2.88E+00 lbs/day
N-Nitrosodi-n-propylamine	6.04E+01 ug/l	2.52E-01 lbs/day
Pentachlorophenol	3.54E+02 ug/l	1.48E+00 lbs/day
Phenol	1.98E+08 ug/l	8.27E+05 lbs/day
Bis(2-ethylhexyl)phthalate	2.55E+02 ug/l	1.06E+00 lbs/day
Butyl benzyl phthalate	2.24E+05 ug/l	9.35E+02 lbs/day
Di-n-butyl phthalate	5.18E+05 ug/l	2.16E+03 lbs/day
Di-n-octyl phthalate		
Diethyl phthalate	5.18E+06 ug/l	2.16E+04 lbs/day
Dimethyl phthalate	1.25E+08 ug/l	5.22E+05 lbs/day
Benzo(a)anthracene (PAH)	1.34E+00 ug/l	5.58E-03 lbs/day
Benzo(a)pyrene (PAH)	1.34E+00 ug/l	5.58E-03 lbs/day
Benzo(b)fluoranthene (PAH)	1.34E+00 ug/l	5.58E-03 lbs/day
Benzo(k)fluoranthene (PAH)	1.34E+00 ug/l	5.58E-03 lbs/day
Chrysene (PAH)	1.34E+00 ug/l	5.58E-03 lbs/day
Acenaphthylene (PAH)		
Anthracene (PAH)		
Dibenzo(a,h)anthracene (PAH)	1.34E+00 ug/l	5.58E-03 lbs/day
Indeno(1,2,3-cd)pyrene (PAH)	1.34E+00 ug/l	5.58E-03 lbs/day
Pyrene (PAH)	4.75E+05 ug/l	1.98E+03 lbs/day
Tetrachloroethylene	3.84E+02 ug/l	1.60E+00 lbs/day
Toluene	8.63E+06 ug/l	3.60E+04 lbs/day
Trichloroethylene	3.49E+03 ug/l	1.46E+01 lbs/day
Vinyl chloride	2.27E+04 ug/l	9.44E+01 lbs/day
Pesticides		
Aldrin	6.04E-03 ug/l	2.52E-05 lbs/day
Dieldrin	6.04E-03 ug/l	2.52E-05 lbs/day
Chlordane	2.55E-02 ug/l	1.06E-04 lbs/day
4,4'-DDT	2.55E-02 ug/l	1.06E-04 lbs/day
4,4'-DDE	2.55E-02 ug/l	1.06E-04 lbs/day
4,4'-DDD	3.62E-02 ug/l	1.51E-04 lbs/day
alpha-Endosulfan	8.63E+01 ug/l	3.60E-01 lbs/day
beta-Endosulfan	8.63E+01 ug/l	3.60E-01 lbs/day
Endosulfan sulfate	8.63E+01 ug/l	3.60E-01 lbs/day
Endrin	3.49E+01 ug/l	1.46E-01 lbs/day
Endrin aldehyde	3.49E+01 ug/l	1.46E-01 lbs/day
Heptachlor	9.06E-03 ug/l	3.78E-05 lbs/day
Heptachlor epoxide		
PCB's		
PCB 1242 (Arochlor 1242)	1.94E-03 ug/l	8.09E-06 lbs/day
PCB-1254 (Arochlor 1254)	1.94E-03 ug/l	8.09E-06 lbs/day
PCB-1221 (Arochlor 1221)	1.94E-03 ug/l	8.09E-06 lbs/day
PCB-1232 (Arochlor 1232)	1.94E-03 ug/l	8.09E-06 lbs/day
PCB-1248 (Arochlor 1248)	1.94E-03 ug/l	8.09E-06 lbs/day
PCB-1260 (Arochlor 1260)	1.94E-03 ug/l	8.09E-06 lbs/day
PCB-1016 (Arochlor 1016)	1.94E-03 ug/l	8.09E-06 lbs/day

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Pesticide		
Toxaphene	3.24E-02 ug/l	1.35E-04 lbs/day
Metals		
Antimony	ug/l	lbs/day
Arsenic	ug/l	lbs/day
Asbestos	ug/l	lbs/day
Beryllium		
Cadmium		
Chromium (III)		
Chromium (VI)		
Copper	ug/l	lbs/day
Cyanide	ug/l	lbs/day
Lead		
Mercury	ug/l	lbs/day
Nickel	ug/l	lbs/day
Selenium		
Silver		
Thallium	ug/l	lbs/day
Zinc		
Dioxin		
Dioxin (2,3,7,8-TCDD)	6.04E-07 ug/l	2.52E-09 lbs/day

**Metals Effluent Limitations for Protection of All Beneficial Uses
Based upon Water Quality Standards and Toxics Rule**

	Class 4 Acute Agricultural ug/l	Class 3 Acute Aquatic Wildlife ug/l	Acute Toxics Drinking Water Source ug/l	Acute Toxics Wildlife ug/l	1C Acute Health Criteria ug/l	Acute Most Stringent ug/l	Class 3 Chronic Aquatic Wildlife ug/l
Aluminum		16504.5				16504.5	N/A
Antimony				185528.2		185528.2	
Arsenic	4314.6	7488.1			0.0	4314.6	8164.3
Barium						0.0	
Beryllium						0.0	
Cadmium	428.1	142.2			0.0	142.2	23.0
Chromium (III)		97848.7			0.0	97848.7	9109.9
Chromium (VI)	4281.1	269.4			0.0	269.40	307.08
Copper	8595.7	853.2				853.2	995.6
Cyanide		485.6	9492139.6			485.6	224.4
Iron		22046.7				22046.7	
Lead	4281.1	7280.6			0.0	4281.1	522.3
Mercury		52.98		6.47	0.0	6.47	0.518
Nickel		26215.7		198472.0		26215.7	5667.4
Selenium	2090.3	408.0			0.0	408.0	131.5

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Silver	552.7		0.0	552.7	
Thallium		271.8		271.8	
Zinc	6707.1			6707.1	13110.2
Boron	32359.6			32359.6	

Summary Effluent Limitations for Metals [Wasteload Allocation, TMDL]

[If Acute is more stringent than Chronic, then the Chronic takes on the Acute value.]

	WLA Acute ug/l	WLA Chronic ug/l	
Aluminum	16504.5	N/A	
Antimony	185528.18		
Arsenic	4314.6	8164.3	Acute Controls
Asbestos	0.00E+00		
Barium			
Beryllium			
Cadmium	142.2	23.0	
Chromium (III)	97848.7	9110	
Chromium (VI)	269.4	307.1	Acute Controls
Copper	853.2	995.6	Acute Controls
Cyanide	485.6	224.4	
Iron	22046.7		
Lead	4281.1	522.3	
Mercury	6.472	0.518	
Nickel	26215.7	5667	
Selenium	408.0	131.5	
Silver	552.7	N/A	
Thallium	271.8		
Zinc	6707.1	13110.2	Acute Controls
Boron	32359.57		

Other Effluent Limitations are based upon R317-1.

E. coli 126.0 organisms per 100 ml

X. Antidegradation Considerations

The Utah Antidegradation Policy allows for degradation of existing quality where it is determined that such lowering of water quality is necessary to accommodate important economic or social development in the area in which the waters are protected [R317-2-3]. It has been determined that certain chemical parameters introduced by this discharge will cause an increase of the concentration of said parameters in the receiving waters. Under no conditions will the increase in concentration be allowed to interfere with existing instream water uses.

The antidegradation rules and procedures allow for modification of effluent limits less than those based strictly upon mass balance equations utilizing 100% of the assimilative capacity of the receiving water. Additional factors include considerations for "Blue-ribbon" fisheries, special recreational areas, threatened and endangered species, and drinking water sources.

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An Antidegradation Level I Review was conducted on this discharge and its effect on the receiving water. Based upon that review, it has been determined that an Antidegradation Level II review is NOT required.

XI. Colorado River Salinity Forum Considerations

Discharges in the Colorado River Basin are required to have their discharge at a TDS loading of less than 1.00 tons/day unless certain exemptions apply. Refer to the Forum's Guidelines for additional information allowing for an exceedence of this value.

XII. Summary Comments

The mathematical modeling and best professional judgement indicate that violations of receiving water beneficial uses with their associated water quality standards, including important downstream segments, will not occur for the evaluated parameters of concern as discussed above if the effluent limitations indicated above are met.

XIII. Notice of UPDES Requirement

This Addendum to the Statement of Basis does not authorize any entity or party to discharge to the waters of the State of Utah. That authority is granted through a UPDES permit issued by the Utah Division of Water Quality. The numbers presented here may be changed as a function of other factors. Dischargers are strongly urged to contact the Permits Section for further information. Permit writers may utilize other information to adjust these limits and/or to determine other limits based upon best available technology and other considerations provided that the values in this wasteload analysis [TMDL] are not compromised.

XIV. Special Considerations - TMDL

The Richmond Lagoons discharge to a segment of the Cub River that is 303(d) listed for total phosphorous (TP). A TP Total Maximum Daily Load (TMDL) was completed for the Cub River on December 23, 1997. The TMDL indicated that the lagoons were contributing a TP load of approximately 2.3 kg/d, and recommended a load reduction to .23 kg/d TP. The city is currently constructing a membrane bioreactor wastewater plant to achieve these more stringent phosphorous limits. When construction is completed, the current permit will be reopened to include TP limits. Additionally, the Cutler Reservoir and Cub River TMDLs are currently scheduled for revision by 2014.

Prepared by:
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801-538-6052
File Name: Richmond _WLA_7-2-13

APPENDIX - Coefficients and Other Model Information

CBOD	CBOD	CBOD	REAER.	REAER.	REAER.	NBOD	NBOD
Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.

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(Kd)20	FORCED	(Ka)T	(Ka)20	FORCED	(Ka)T	(Kn)20	(Kn)T
1/day	(Kd)/day	1/day	(Ka)/day	1/day	1/day	1/day	1/day
2.000	0.000	2.000	13.890	0.000	13.890	0.400	0.400
Open	Open	NH3	NH3	NO2+NO3	NO2+NO3	TRC	TRC
Coeff.	Coeff.	LOSS	LOSS	LOSS	LOSS	Decay	
(K4)20	(K4)T	(K5)20	(K5)T	(K6)20	(K6)T	K(Cl)20	K(Cl)(T)
1/day	1/day	1/day	1/day	1/day	1/day	1/day	1/day
0.000	0.000	4.000	4.000	0.000	0.000	32.000	32.000
BENTHIC	BENTHIC						
DEMAND	DEMAND						
(SOD)20	(SOD)T						
gm/m2/day	gm/m2/day						
1.000	1.000						
K1	K2	K3	K4	K5	K6	K(Cl)	S
CBOD	Reaer.	NH3	Open	NH3 Loss	NO2+3	TRC	Benthic
{theta}	{theta}	{theta}	{theta}	{theta}	{theta}	{theta}	{theta}
1.0	1.0	1.1	1.0	1.0	1.0	1.1	1.1