Utah Division of Water Quality
Addendum to Statement of Basis
Wasteload Analysis and Antidegradation Level I Review
Upgrade to Mechanical Treatment Plant

Date: **October 19, 2016**

Facility: **Salem City Wastewater Treatment Facility**
UPDES No. UT0020249

Receiving water: **Beer Creek (2B, 3C, 4)**

This addendum summarizes the wasteload analysis that was performed to determine water quality based effluent limits (WQBEL) for this discharge. 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 (UAC R317-2-8). Projected concentrations are compared to numeric water quality standards to determine acceptability. The numeric criteria in this wasteload analysis may be modified by narrative criteria and other conditions determined by staff of the Division of Water Quality.

Discharge
Outfall 001: Beer Creek → Benjamin Slough of Utah Lake

The maximum daily design discharge is 3.0 MGD and the maximum monthly average design discharge is 1.5 MGD for the facility.

Receiving Water
The receiving water for Outfall 001 is Beer Creek, which drains to Benjamin Slough of Utah Lake.

Per UAC R317-2-13.5.c, the designated beneficial uses for Beer Creek (Utah County) from 4850 West (in NE1/4NE1/4 sec. 36, T.8 S., R.1 E.) to headwaters are 2B, 3C, and 4.

- *Class 2B - Protected for infrequent primary contact recreation. Also protected for secondary contact recreation where there is a low likelihood of ingestion of water or a low degree of bodily contact with the water. Examples include, but are not limited to, wading, hunting, and fishing.*
- *Class 3C - Protected for nongame fish and other aquatic life, including the necessary aquatic organisms in their food chain*
- *Class 4 - Protected for agricultural uses including irrigation of crops and stock watering.*

Typically, the critical low flow for the wasteload analysis is considered the lowest stream flow for seven consecutive days with a ten year return frequency (7Q10). Due to a lack of flow records for Beer Creek, the 20th percentile of flow measurements was calculated to estimate annual critical flow in the receiving water (Table 1).

Table 1: Annual critical low flow

Waterbody	Flow (cfs)
Beer Creek at Arrowhead Road	2.5
Salem Lagoons	0.3
Beer Creek above Mechanical Treatment Plant	2.2

Receiving water quality data was obtained from monitoring site 5919820 Beer Creek at Arrowhead Road. The average seasonal value was calculated for each constituent with available data in the receiving water.

TMDL

Beer Creek is listed as impaired for macroinvertebrate bioassessment according to the 2012/2014 303(d) list. Utah Lake is listed as impaired for total phosphorus, total dissolved solids, and PCBs in fish tissue.

Mixing Zone

The allowable mixing zone is 15 minutes of travel time for acute conditions, not to exceed 50% of stream width, and 2,500 feet for chronic conditions, per UAC R317-2-5. Water quality standards must be met at the end of the mixing zone.

The actual length of the mixing zone was not determined; however, it was presumed to remain within the maximum allowable mixing zone dimensions. Acute limits were calculated using 50% of the annual critical low flow.

Parameters of Concern

The potential parameters of concern identified for the discharge/receiving water were total suspended solids (TSS), dissolved oxygen (DO), BOD_5, total phosphorus (TP), total nitrogen (TN), total ammonia (NH3), E. coli, and pH, as determined in consultation with the UPDES Permit Writer.

Water Quality Modeling

A QUAL2Kw model of the receiving water was built based on physiographic information from Google Earth and site data collected by DWQ staff. The model extends along Beer Creek from the facility outfall to Utah Lake. Insufficient observed data was available for model calibration. The rate parameters used in the model were the same as those used for the Payson WWTP and Payson Power QUAL2Kw model, which was calibrated model for a downstream segment of Beer Creek.

Average seasonal flow and concentrations were calculated from DWQ monitoring data and input for Payson WWTP and Payson Power. No other tributary inflows or irrigation return flows were considered.

The QUAL2Kw model was used for determining WQBELs for DO, BOD_5, TP, TN, and ammonia. Effluent concentrations were adjusted so that water quality standards were not

exceeded in the receiving water. Where WQBELs exceeded secondary standards or categorical limits, the concentration in the model was set at the secondary standard or categorical limit. QUAL2Kw rates, input and output are summarized in Appendix A.

A mass balance mixing analysis was calculated for conservative constituents such as dissolved metals. The WQBELs determined using the mass balance mixing analysis are summarized in Appendix B.

Models and supporting documentation are available for review upon request.

WET Limits

The percent of effluent in the receiving water in a fully mixed condition, and acute and chronic dilution in a not fully mixed condition are calculated in the WLA in order to generate WET limits. The LC_{50} (lethal concentration, 50%) percent effluent for acute toxicity and the IC_{25} (inhibition concentration, 25%) percent effluent for chronic toxicity, as determined by the WET test, needs to be below the WET limits, as determined by the WLA. The WET limit for LC_{50} is typically 100% effluent and does not need to be determined by the WLA.

Table 2: WET Limits for IC_{25}

Season	Percent Effluent
Annual	51%

Ammonia

The QUAL2Kw model was utilized to determine seasonal limits for ammonia. Ammonia exerts an oxygen demand on the water column through nitrification to nitrate and is toxic to aquatic life above certain thresholds that are pH and temperature dependent. Seasonal limits were determined that meet both in-stream DO criteria and in-stream toxicity criteria.

The pH and temperature of the effluent from the proposed treatment plant was estimated by Forsgren Associates based on data from other plants with similar treatment processes. Annual average pH and seasonal average temperature was used for determining chronic limits (30-day average) and maximum pH was used for determining acute limits (1-hour).

In 2013, EPA adopted new criteria for ammonia that are lower than current criteria based on the presence of unionid mussels and nonpulmonate snails. States are required to adopt the criteria or establish alternative, scientifically defensible criteria. Utah is initiating studies to support adoption of new ammonia criteria. For planning purposes, ammonia limits were calculated to meet the new criteria assuming presence of the most sensitive species (Table 3).

Table 3: Ammonia Limits to Meet EPA 2013 Ammonia Criteria with Mussels Present

Effluent Constituent	Acute			Chronic		
	Standard	Limit	Averaging Period	Standard	Limit	Averaging Period
Ammonia (mg/l) [Toxicity]						
Summer		2.5			0.6	
Fall	Varies	5.0	1 hour	Varies	1.5	30 days
Winter		6.0			1.5	
Spring		4.0			1.5	

Effluent Limits

The effect of the effluent on the DO in the receiving water was evaluated using the QUAL2Kw model. A DO sag downstream resulting from the plant discharge was predicted by the model in Beer Creek. However, secondary standards for BOD_5 were determined to be sufficient to meet in-stream DO criteria (Table 4).

Table 4: Water Quality Based Effluent Limits Summary

Effluent Constituent	Acute			Chronic		
	Standard	Limit	Averaging Period	Standard	Limit	Averaging Period
Flow (MGD)		3.0	1 day		1.5	30 days
Ammonia (mg/L)						
Summer		5.0			2.5	
Fall	Varies	6.0	1 hour	Varies	3.0	30 days
Winter		7.0			3.0	
Spring		6.0			3.0	
Min. Dissolved Oxygen (mg/L)	3.0	5.0	Instantaneous	5.0	5.0	30 days
BOD_5 (mg/L)	None	35	7 days	None	25	30 days

Antidegradation Level I Review

The objective of the Level I ADR is to ensure the protection of existing uses, defined as the beneficial uses attained in the receiving water on or after November 28, 1975. No evidence is known that the existing uses deviate from the designated beneficial uses for the receiving water. Therefore, the beneficial uses will be protected if the discharge remains below the WQBELs presented in this wasteload.

A Level II Antidegradation Review (ADR) is required for this discharge, as this wasteload is for a new mechanical wastewater treatment plant with a new outfall location to Beer Creek.

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Documents

WLA Document: *salem_potw_plant_wla_2016-10-19.docx*
QUAL2Kw Wasteload Model: *salem_wwtp_plant_wla_2016.xlsm*

References:

Neilson, B.T., A.J. Hobson, N. von Stackelberg, M. Shupryt, and J.D. Ostermiller. 2012. *Using QUAL2K Modeling to Support Nutrient Criteria Development and Wasteload Analyses in Utah*.

Utah Division of Water Quality. 2012. *Utah Wasteload Analysis Procedures Version 1.0*.

Utah Division of Water Quality. *2012/2014 Utah Integrated Report.*

WASTELOAD ANALYSIS [WLA] Date: 10/19/2016
Appendix A: QUAL2Kw Analysis for Eutrophication

Discharging Facility:	Salem WWTP		
UPDES No:	UT-0020249		
Permit Flow [MGD]:	1.50	Maximum Monthly Flow	
	3.00	Maximum Daily Flow	
Receiving Water:	Beer Creek		
Stream Classification:	2B, 3C, 4		
Stream Flows [cfs]:	2.20	Summer (July-Sept)	Critical Low Flow
	2.20	Fall (Oct-Dec)	
	2.20	Winter (Jan-Mar)	
	2.20	Spring (Apr-June)	
Fully Mixed:	NO		
Acute River Width:	50%		
Chronic River Width:	100%		

Modeling Information

A QUAL2Kw model was used to determine these effluent limits.

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.

Headwater/Upstream Information	**Summer**	**Fall**	**Winter**	**Spring**
Flow (cfs)	2.2	2.2	2.2	2.2
Temperature (deg C)	24.6	10.7	4.3	15.4
Specific Conductance (µmhos)	1050	1050	1050	1050
Inorganic Suspended Solids (mg/L)	44.3	34.6	13.0	38.0
Dissolved Oxygen (mg/L)	8.2	9.4	10.5	8.7
$CBOD_5$ (mg/L)	6.9	2.3	3.6	9.0
Organic Nitrogen (mg/L)	1.000	1.000	1.000	1.000
NH4-Nitrogen (mg/L)	0.227	0.123	0.451	0.387
NO3-Nitrogen (mg/L)	1.000	1.000	1.000	1.000
Organic Phosphorus (mg/L)	0.577	0.351	0.350	0.306
Inorganic Ortho-Phosphorus (mg/L)	0.144	0.088	0.087	0.077
Phytoplankton (µg/L)	0.0	0.0	0.0	0.0
Detritus [POM] (mg/L)	4.9	3.8	1.4	4.2
Alkalinity (mg/L)	235	235	235	235
pH	8.2	8.2	8.2	8.2

Discharge Information - Salem WWTP

Chronic	**Summer**	**Fall**	**Winter**	**Spring**
Flow (MGD)	1.5	1.5	1.5	1.5
Temperature (deg C)	22.7	17.1	11.4	16.9
Specific Conductance (µmhos)	1318	1318	1318	1318
Inorganic Suspended Solids (mg/L)	12.0	13.3	21.8	23.6
Dissolved Oxygen (mg/L)	5.0	5.0	5.0	5.0
$CBOD_5$ (mg/L)	25.0	25.0	25.0	25.0
Organic Nitrogen (mg/L)	5.000	5.000	5.000	5.000
NH4-Nitrogen (mg/L)	2.500	3.000	3.000	3.000
NO3-Nitrogen (mg/L)	0.833	3.033	0.444	2.148
Organic Phosphorus (mg/L)	0.000	0.000	0.000	0.000
Inorganic Ortho-Phosphorus (mg/L)	1.000	1.000	1.000	1.000
Phytoplankton (µg/L)	0.000	0.000	0.000	0.000
Detritus [POM] (mg/L)	0.0	0.0	0.0	0.0
Alkalinity (mg/L)	235	235	235	235
pH	7.8	7.8	7.8	7.8

Acute	Summer	Fall	Winter	Spring
Flow (MGD)	3.0	3.0	3.0	3.0
Temperature (deg C)	22.7	17.1	11.4	16.9
Specific Conductance (µmhos)	1318	1318	1318	1318
Inorganic Suspended Solids (mg/L)	12.0	13.3	21.8	23.6
Dissolved Oxygen (mg/L)	5.0	5.0	5.0	5.0
$CBOD_5$ (mg/L)	35.0	35.0	35.0	35.0
Organic Nitrogen (mg/L)	5.000	5.000	5.000	5.000
NH4-Nitrogen (mg/L)	5.000	6.000	7.000	6.000
NO3-Nitrogen (mg/L)	0.833	3.033	0.444	2.148
Organic Phosphorus (mg/L)	0.000	0.000	0.000	0.000
Inorganic Ortho-Phosphorus (mg/L)	1.000	1.000	1.000	1.000
Phytoplankton (µg/L)	0.000	0.000	0.000	0.000
Detritus [POM] (mg/L)	0.0	0.0	0.0	0.0
Alkalinity (mg/L)	235	235	235	235
pH	8.0	8.0	8.0	8.0

Payson WWTP	Summer	Fall	Winter	Spring
Flow (MGD)	1.6	1.5	1.5	1.6
Temperature (deg C)	22.7	17.1	11.4	16.9
Specific Conductance (µmhos)	1450	1450	1450	1450
Inorganic Suspended Solids (mg/L)	6.0	4.0	5.3	5.0
Dissolved Oxygen (mg/L)	5.9	5.8	6.4	5.9
$CBOD_5$ (mg/L)	3.6	5.0	6.4	3.3
Organic Nitrogen (mg/L)	5.000	5.000	5.000	5.000
NH4-Nitrogen (mg/L)	0.259	1.476	3.172	2.196
NO3-Nitrogen (mg/L)	21.700	22.875	28.820	28.500
Organic Phosphorus (mg/L)	0.000	0.000	0.359	0.940
Inorganic Ortho-Phosphorus (mg/L)	4.198	4.677	3.710	3.525
Phytoplankton (µg/L)	0.000	0.000	0.000	0.000
Detritus [POM] (mg/L)	0.0	0.0	0.0	0.0
Alkalinity (mg/L)	235	235	235	235
pH	7.6	7.6	7.5	7.5

Payson Power	Summer	Fall	Winter	Spring
Flow (gpm)	359.0	359.0	359.0	359.0
Temperature (deg C)	30.0	25.9	27.5	23.6
Specific Conductance (µmhos)	4022	4090	4330	3799
Inorganic Suspended Solids (mg/L)	5.4	4.3	4.2	3.7
Dissolved Oxygen (mg/L)	9.0	7.3	8.3	8.0
$CBOD_5$ (mg/L)	3.6	5.0	6.4	3.3
Organic Nitrogen (mg/L)	1.300	1.300	1.300	1.300
NH4-Nitrogen (mg/L)	0.194	2.689	4.067	1.243
NO3-Nitrogen (mg/L)	37.267	34.400	55.500	45.800
Organic Phosphorus (mg/L)	0.000	0.610	1.130	2.886
Inorganic Ortho-Phosphorus (mg/L)	3.549	4.341	10.220	5.524
Phytoplankton (µg/L)	0.000	0.000	0.000	0.000
Detritus [POM] (mg/L)	0.0	0.0	0.0	0.0
Alkalinity (mg/L)	222	222	222	222
pH	7.1	6.6	6.7	6.9

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

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 reflect the environmental conditions expected at low stream flows.

Effluent Limitations based upon Water Quality Standards for DO, and Ammonia and Total Residual Chlorine Toxicity

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

Chronic	Standard	Summer	Fall	Winter	Spring
Flow (MGD)	N/A	1.50	1.50	1.50	1.50
NH4-Nitrogen (mg/L)	Varies	2.5	3.0	3.0	3.0
$CBOD_5$ (mg/L)	N/A	25.0	25.0	25.0	25.0
Dissolved Oxygen [30-day Ave] (mg/L)	5.0	5.0	5.0	5.0	5.0

Acute	Standard	Summer	Fall	Winter	Spring
Flow (MGD)	N/A	3.0	3.0	3.0	3.0
NH4-Nitrogen (mg/L)	Varies	5.0	6.0	7.0	6.0
$CBOD_5$ (mg/L)	N/A	35.0	35.0	35.0	35.0
Dissolved Oxygen [Minimum] (mg/L)	3.0	5.0	5.0	5.0	5.0

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 down-stream segments, will not occur for the evaluated parameters of concern as discussed above if the effluent limitations indicated above are met.

Coefficients and Other Model Information

Parameter	*Value*	*Units*
Stoichiometry:		
Carbon	40	gC
Nitrogen	7.2	gN
Phosphorus	1	gP
Dry weight	100	gD
Chlorophyll	1	gA
Inorganic suspended solids:		
Settling velocity	0.001	m/d
Oxygen:		
Reaeration model	Thackston-Dawson	
Temp correction	1.024	
Reaeration wind effect	None	
O2 for carbon oxidation	2.69	gO2/gC
O2 for NH4 nitrification	4.57	gO2/gN
Oxygen inhib model CBOD oxidation	Exponential	
Oxygen inhib parameter CBOD oxidation	0.60	L/mgO2
Oxygen inhib model nitrification	Exponential	
Oxygen inhib parameter nitrification	0.60	L/mgO2
Oxygen enhance model denitrification	Exponential	
Oxygen enhance parameter denitrification	0.60	L/mgO2
Oxygen inhib model phyto resp	Exponential	
Oxygen inhib parameter phyto resp	0.60	L/mgO2
Oxygen enhance model bot alg resp	Exponential	
Oxygen enhance parameter bot alg resp	0.60	L/mgO2
Slow CBOD:		
Hydrolysis rate	0	/d
Temp correction	1.047	
Oxidation rate	0.103	/d
Temp correction	1.047	
Fast CBOD:		
Oxidation rate	10	/d
Temp correction	1.047	
Organic N:		
Hydrolysis	0.88120891	/d
Temp correction	1.07	
Settling velocity	0.099218	m/d
Ammonium:		
Nitrification	0.2064034	/d
Temp correction	1.07	
Nitrate:		
Denitrification	0.28353818	/d
Temp correction	1.07	
Sed denitrification transfer coeff	0.053355	m/d
Temp correction	1.07	
Organic P:		
Hydrolysis	0.79805215	/d
Temp correction	1.07	
Settling velocity	0.096605	m/d
Inorganic P:		
Settling velocity	0.04793	m/d
Sed P oxygen attenuation half sat constant	0.53889	mgO2/L

Phytoplankton:		
Max Growth rate	2.8944	/d
Temp correction	1.07	
Respiration rate	0.480803	/d
Temp correction	1.07	
Death rate	0.86518	/d
Temp correction	1	
Nitrogen half sat constant	15	ugN/L
Phosphorus half sat constant	2	ugP/L
Inorganic carbon half sat constant	1.30E-05	moles/L
Phytoplankton use HCO3- as substrate	Yes	
Light model	Smith	
Light constant	57.6	langleys/d
Ammonia preference	25.4151	ugN/L
Settling velocity	0.468545	m/d
Bottom Plants:		
Growth model	Zero-order	
Max Growth rate	10.8314	gD/m2/d or /d
Temp correction	1.07	
First-order model carrying capacity	100	gD/m2
Basal respiration rate	0.2458802	/d
Photo-respiration rate parameter	0.01	unitless
Temp correction	1.07	
Excretion rate	0.046004	/d
Temp correction	1.07	
Death rate	0.036896	/d
Temp correction	1.07	
External nitrogen half sat constant	711.113	ugN/L
External phosphorus half sat constant	123.473	ugP/L
Inorganic carbon half sat constant	7.44E-05	moles/L
Bottom algae use HCO3- as substrate	Yes	
Light model	Smith	
Light constant	41.6646	mgO^2/L
Ammonia preference	28.99375	ugN/L
Subsistence quota for nitrogen	31.0379	mgN/gD
Subsistence quota for phosphorus	2.26157	mgP/gD
Maximum uptake rate for nitrogen	770.252	mgN/gD/d
Maximum uptake rate for phosphorus	36.4362	mgP/gD/d
Internal nitrogen half sat ratio	1.468463	
Internal phosphorus half sat ratio	3.2861345	
Nitrogen uptake water column fraction	1	
Phosphorus uptake water column fraction	1	
Detritus (POM):		
Dissolution rate	2.318491	/d
Temp correction	1.07	
Settling velocity	0.08897	m/d
pH:		
Partial pressure of carbon dioxide	370	ppm
TRC:		
Decay rate	0.8	/d

Atmospheric Inputs:	Summer	Fall	Winter	Spring
Min. Air Temperature, F	57.7	29.5	24.0	45.0
Max. Air Temperature, F	90.5	51.0	44.9	74.2
Dew Point, Temp., F	58.6	35.0	30.3	48.5
Wind, ft./sec. @ 21 ft.	9.8	7.5	7.6	9.2
Cloud Cover, %	10%	10%	10%	10%

Other Inputs:	
Bottom Algae Coverage	50%
Bottom SOD Coverage	100%
Prescribed SOD, $gO_2/m^2/day$	0

WASTELOAD ANALYSIS [WLA] Date: 10/18/2016

Appendix B: Mass Balance Mixing Analysis for Conservative Constituents

Discharging Facility:	Salem WWTP		
UPDES No:	UT-0020249		
Permit Flow [MGD]:	3.00	Maximum Daily	
	1.50	Maximum Monthly Average	
Receiving Water:	Beer Creek		
Stream Classification:	2B, 3C, 4		
Stream Flows [cfs]:	2.20	Annual	Critical Low Flow
Fully Mixed:	NO		
Acute River Width:	50%		
Chronic River Width:	100%		

Modeling Information

A simple mixing analysis was used to determine these effluent limits.

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.

Headwater/Upstream Information

Beer Creek	**Flow**	**Hardness**
	cfs	mg/L
Annual	2.2	300

Discharge Information

Salem WWTP	**Flow**	**Hardness**
	cfs	mg/L
Maximum Daily	4.6	
Maximum Monthly Average	2.3	392

Discharge Information

Mixed	**Flow**	**Hardness**
	cfs	mg/L
Acute	5.7	
Chronic	4.5	347

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

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 reflect the environmental conditions expected at low stream flows.

Effluent Limitations for Protection of Recreation (Class 2B Waters)

Physical Parameter	Maximum Concentration
pH Minimum	6.5
pH Maximum	9.0

Bacteriological	
E. coli (30 Day Geometric Mean)	206 (#/100 mL)
E. coli (Maximum)	668 (#/100 mL)

Effluent Limitations for Protection of Aquatic Wildlife (Class 3C Waters)

Physical Parameter	Maximum Concentration
Temperature (deg C)	27
Temperature Change (deg C)	4

Inorganics Parameter	Chronic Standard (4 Day Average) Standard	Acute Standard (1 Hour Average) Standard
Phenol (mg/L)		0.010
Hydrogen Sulfide (Undissociated) [mg/L]		0.002

Dissolved Metals (µg/L)	Chronic Standard (4 Day Average)[1]			Acute Standard (1 Hour Average)[1]		
Parameter	Standard	Background[2]	Limit	Standard	Background[2]	Limit
Aluminum (µg/L)[3]	N/A	5.4		750	5.4	926
Arsenic	150	7.7	285	340	7.7	419
Cadmium	0.6	0.4	0.8	6.7	0.4	8.2
Chromium VI	11.0	2.5	19.1	16.0	2.5	19.2
Chromium III	205	2.5	398	1,578	2.5	1,952
Copper	25.9	5.3	45.5	43.4	5.3	52.4
Cyanide	5.2	3.5	6.8	22.0	3.5	26.4
Iron				1,000	6.7	1,235
Lead	9.5	0.3	18.1	243	0.3	300
Mercury	0.012	0.008	0.016	2.4	0.008	3.0
Nickel	149	0.5	290	1,341	0.5	1,659
Selenium	4.6	1.9	7.2	18.4	1.9	22.3
Silver				27.3	0.1	33.8
Tributylin	0.072	0.048	0.095	0.46	0.05	0.56
Zinc	339	10.0	651	336	10.0	414

1: Based upon a Hardness of 347 mg/l as CaCO3

2: Background concentration average of monitoring data from 4995420 Beer Creek at U115 Crossing

3: Where the pH is equal to or greater than 7.0 and the hardness is equal to or greater than 50 ppm as $CaC0_3$ in the receiving water after mixing, the 87 ug/L chronic criterion (expressed as total recoverable) will not apply, and aluminum will be regulated based on compliance with the 750 ug/L acute aluminum criterion (expressed as total recoverable).

Organics [Pesticides] (µg/L)	Chronic Standard (4 Day Average)			Acute Standard (1 Hour Average)		
Parameter	Standard	Background[1]	Limit	Standard	Background[1]	Limit
Aldrin				1.5	1.0	1.6
Chlordane	0.0043	0.0029	0.0056	1.2	0.0	1.5
DDT, DDE	0.001	0.001	0.001	0.55	0.00	0.68
Diazinon	0.17	0.11	0.22	0.17	0.11	0.18
Dieldrin	0.0056	0.0038	0.0074	0.24	0.00	0.30
Endosulfan, a & b	0.056	0.038	0.074	0.11	0.04	0.13
Endrin	0.036	0.024	0.047	0.086	0.024	0.101
Heptachlor & H. epoxide	0.0038	0.0025	0.0050	0.26	0.00	0.32
Lindane	0.08	0.05	0.11	1.0	0.1	1.2
Methoxychlor				0.03	0.02	0.03
Mirex				0.001	0.001	0.001
Nonylphenol	6.6	4.4	8.7	28.0	4.4	33.6
Parathion	0.0130	0.0087	0.0171	0.066	0.009	0.080
PCB's	0.014	0.009	0.018			
Pentachlorophenol	15.0	10.1	19.7	19.0	10.1	21.1
Toxephene	0.0002	0.0001	0.0003	0.73	0.00	0.90

1: Background concentration assumed 67% of chronic standard

Radiological	Maximum Concentration		
Parameter	Standard	Background[1]	Limit
Gross Alpha (pCi/L)	15	10.1	19.7

1: Background concentration assumed 67% of chronic standard; TDS is based on observed ambient data

Effluent Limitation for Protection of Agriculture (Class 4 Waters)

	Maximum Concentration		
Parameter	Standard	Background[1]	Limit
Total Dissolved Solids (mg/L)	1200	753	1624
Boron (mg/L)	0.75	0.2	1.3
Arsenic, Dissolved (µg/L)	100	7.7	188
Cadmium, Dissolved (µg/L)	10	0.4	19.1
Chromium, Dissolved (µg/L)	100	2.5	192
Copper, Dissolved (µg/L)	200	5.3	385
Lead, Dissolved (µg/L)	100	0.3	195
Selenium, Dissolved (µg/L)	50	1.9	95.6
Gross Alpha (pCi/L)	15	10.1	19.7

1: Background concentration assumed 67% of chronic standard; TDS is based on observed ambient data

WASTELOAD ANALYSIS [WLA] Date: 2/5/2018
Addendum: Total Residual Chlorine

Discharging Facility: Salem WWTP
UPDES No: UT-0020249

CHRONIC

	Season	Receiving Water	Standard	Total Effluent	Mixing Zone Boundary	Effluent Limit Without Decay	Temperature (°C)	Decay Rate (/day) @ 20 deg C	Decay Rate (/day) @ T deg C	Travel Time (min)	Decay Coefficient	Effluent Limit
Discharge (cfs)	Summer	2.2		2.3	4.5							
	Fall	2.2		2.3	4.5							
	Winter	2.2		2.3	4.5							
	Spring	2.2		2.3	4.5							
TRC (mg/L)	Summer	0.000	0.011			0.021	1.5	29.86	12.8	5	0.9566	0.022
	Fall	0.000	0.011			0.021	1.5	29.86	12.8	5	0.9566	0.022
	Winter	0.000	0.011			0.021	1.5	29.86	12.8	5	0.9566	0.022
	Spring	0.000	0.011			0.021	1.5	29.86	12.8	5	0.9566	0.022

ACUTE

	Season	Receiving Water	Standard	Total Effluent	Mixing Zone Boundary	Effluent Limit Without Decay	Temperature (°C)	Decay Rate (/day) @ 20 °C	Decay Rate (/day) @ T °C	Travel Time (min)	Decay Coefficient	Effluent Limit
Discharge (cfs)	Summer	1.1		4.6	5.7							
	Fall	1.1		4.6	5.7							
	Winter	1.1		4.6	5.7							
	Spring	1.1		4.6	5.7							
TRC (mg/L)	Summer	0.000	0.019			0.024	3.0	29.86	13.7	5	0.9536	0.025
	Fall	0.000	0.019			0.024	3.0	29.86	13.7	5	0.9536	0.025
	Winter	0.000	0.019			0.024	3.0	29.86	13.7	5	0.9536	0.025
	Spring	0.000	0.019			0.024	3.0	29.86	13.7	5	0.9536	0.025

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